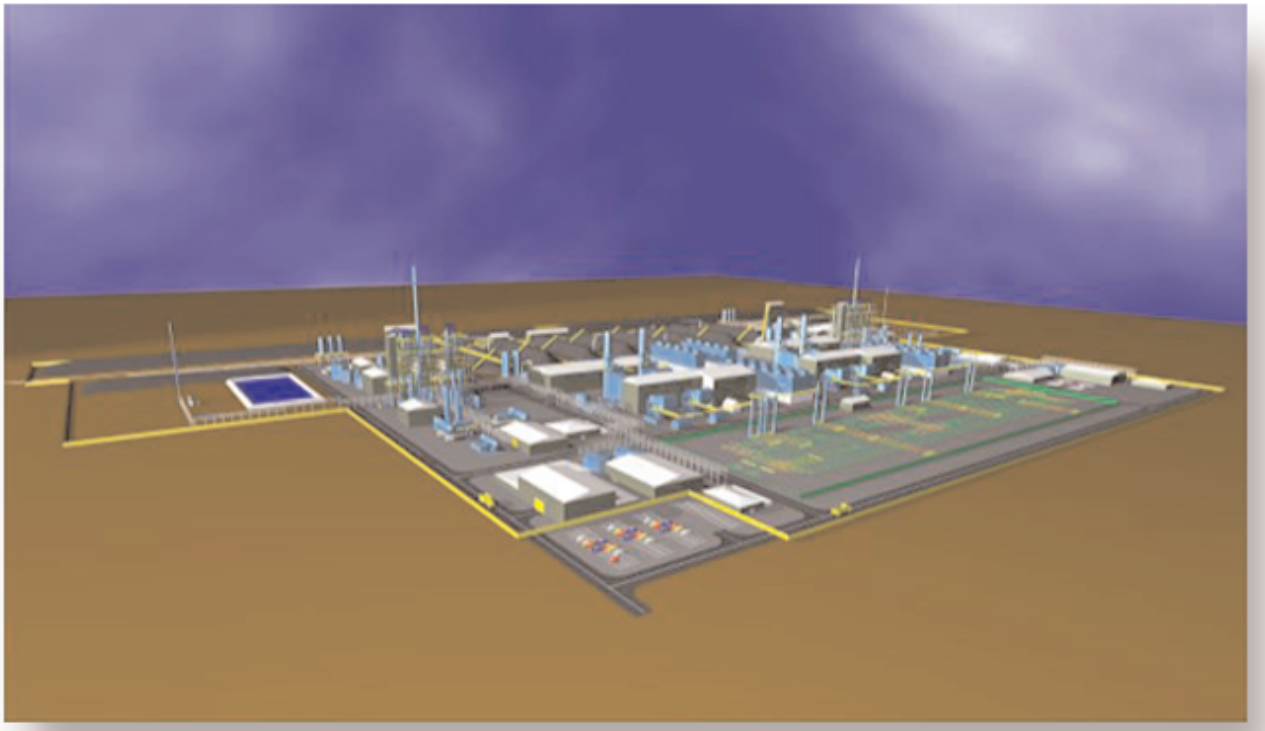
U.S. Department of Energy
in cooperation with
Minnesota Department of Commerce

MESABA ENERGY PROJECT

FINAL ENVIRONMENTAL IMPACT STATEMENT

VOLUME I

DOE/EIS-0382
MN PUC DOCKET # E6472/GS-06-668



NOVEMBER 2009

Office of Fossil Energy
National Energy Technology Laboratory

COVER SHEET

Responsible Federal Agency: U.S. Department of Energy (DOE)

Responsible State Agency: Minnesota Department of Commerce (MDOC)

Cooperating Agencies: U.S. Army Corps of Engineers **(USACE)** and U.S. Department of Agriculture **(USDA)** Forest Service

Title: Mesaba Energy Project, **Final** Environmental Impact Statement (DOE/EIS-0382)

Location: Taconite Tax Relief Area of northeastern Minnesota; Itasca and St. Louis Counties

Contact:

For further information about this Environmental Impact Statement, contact:

Richard A. Hargis, Jr., Document Manager
U.S. Department of Energy
National Energy Technology Laboratory
P.O. Box 10940
Pittsburgh, PA 15236–0940
(412) 386-6065 or fax (412) 386-4604

For general information on the Department of Energy's process for implementing the National Environmental Policy Act, contact:

Carol Borgstrom, Director
Office of NEPA Policy and Compliance (GC-20)
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0103
(202) 586-4600 or leave message at (800) 472-2756

Abstract:

This **Final** Environmental Impact Statement (EIS) provides information about the potential environmental impacts of the proposed Mesaba Energy Project, a coal-based Integrated Gasification Combined Cycle (IGCC) electric power generating facility that would be located in the Taconite Tax Relief Area (TTRA) of northeastern Minnesota. Excelsior Energy Inc. (Excelsior) proposes to design, construct, and operate the Mesaba Energy Project in two phases; each phase would nominally generate **600** megawatts of electricity (MWe) for export to the electrical grid, **1,200** MWe total. DOE's Proposed Action is to provide a total of $36 million in co-funding, through a cooperative agreement with Excelsior under the Clean Coal Power Initiative (CCPI) Program, for the design and one-year operational demonstration testing period for Phase I. The total cost of Phase I is currently estimated **in the cooperative agreement** at $2.16 billion. This EIS addresses the impacts of both phases of the Mesaba Energy Project as connected actions, even though only Phase I would be co-funded under the CCPI Program. DOE may also provide a loan guarantee to Excelsior pursuant to the Energy Policy Act of 2005 **for Phase I of the proposed project**. **Approval of the loan guarantee is also considered a major Federal action subject to NEPA review.**

Because the proposed facility is considered a Large Electric Power Generating Plant, the Project is subject to the Minnesota Power Plant Siting Act (Minnesota Statutes Chapter 216E), which requires the preparation of a state-equivalent EIS. The EIS requirements under the National Environmental Policy Act **(NEPA)** and the Minnesota Power Plant Siting Act are substantially similar, and DOE has prepared this EIS in cooperation with the MDOC to fulfill the requirements of both laws.

The *Federal Register* "Notice of Intent to Prepare an Environmental Impact Statement and Notice of Proposed Floodplain and Wetlands Involvement for the Mesaba Energy Project Integrated Gasification Combined Cycle (IGCC) Demonstration Plant Northern Minnesota Iron Range, Itasca County, MN" was published on October 5, 2005 (70 *FR* 58207). DOE held public scoping meetings on October 25, 2005, in Taconite, MN, and on October 26, 2005, in Hoyt Lakes, MN. MDOC held public scoping meetings at the same two locations, respectively, on August 22 and 23, 2006. This EIS evaluates the environmental consequences that may result from the Proposed Action at two possible sites (West Range and East Range Sites). Excelsior's preferred site is the West Range Site in the City of Taconite in Itasca County, MN. The East Range Site is Excelsior's alternative site in the City of Hoyt Lakes in St. Louis County, MN. This EIS also analyzes the No Action Alternative, under which DOE would not provide cost-shared funding to demonstrate the Mesaba Energy Project **or a loan guarantee for the project**, beyond that required to complete the NEPA process.

Public Participation:

DOE encourages public participation in the NEPA process. Comments were invited on the Draft EIS for a period of 63 days after publication of the Notice of Availability in the *Federal Register* on November 9, 2007. DOE considered all comments to the extent practicable. DOE conducted formal public hearings jointly with MDOC to receive comments on the Draft EIS in Taconite, Minnesota, on November 27, 2007, and in Hoyt Lakes, Minnesota, on November 28, 2007. An informational session was held prior to each hearing for the public to learn more about the project. The public was encouraged to provide oral comments at the hearings and to submit written comments to DOE and MDOC by the close of the comment period on January 11, 2008.

Changes from the Draft EIS:

Vertical lines in the left margin of a page indicate where text in the Draft EIS has been deleted, revised, or supplemented for this Final EIS, except for Volume III, which contains the public comments on the Draft EIS and DOE's responses. Additionally, revised and supplemental text in the Summary and Volumes I and II are shown in boldface text (as in this paragraph). Sections that include revisions are also identified in the Table of Contents.

INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

SUMMARY **1**
PROPOSED ACTION 2
DOE Proposed Action and Alternatives 2
Alternatives Available to the Minnesota Public Utilities Commission 8
Excelsior's Proposed Project and Alternatives 8
EIS SCOPING 25
DOE Scoping Process 25
MDOC Scoping Process 25
Outreach to Native American Tribes 26
Scoping Issues 27
COMMENTS ON THE DRAFT EIS 29
PRINCIPAL CHANGES BETWEEN THE DRAFT AND FINAL EIS 31
ENVIRONMENTAL IMPACTS 36
CONCLUSIONS 62

1. PURPOSE AND NEED **1-1**
1.1 INTRODUCTION 1-1
1.2 FEDERAL AND STATE CONTEXTS 1-3
1.2.1 Clean Coal Power Initiative 1-3
1.2.2 State Legislative Incentives 1-6
1.3 PROPOSED ACTION 1-7
1.3.1 DOE Proposed Action 1-7
1.3.2 State Proposed Action 1-8
1.4 PURPOSE AND NEED FOR ACTION 1-8
1.4.1 DOE Purpose and Need 1-8
1.4.2 State Purpose and Need 1-8
1.4.3 Project Proponent Purpose 1-9
1.5 REGULATORY FRAMEWORK 1-9
1.5.1 National Environmental Policy Act 1-9
1.5.2 State Requirements 1-10
1.6 SCOPE OF THIS EIS 1-16
1.6.1 Federal NEPA Scoping Process 1-16
1.6.2 Minnesota EIS Scoping Process 1-21
1.6.3 Special CCPI Program Considerations under NEPA 1-24
1.6.4 Connected Actions 1-25
1.7 COMMENTS ON THE DRAFT EIS 1-25
1.8 CONTINUING OUTREACH TO NATIVE AMERICAN TRIBES 1-26

2. PROPOSED ACTION AND ALTERNATIVES **2-1**
2.1 INTRODUCTION 2-1
2.1.1 Agency Action and Alternatives Considered by DOE 2-1
2.1.2 Proposed Project and Alternatives Considered by Excelsior 2-6
2.1.3 Alternatives Available to the Minnesota Public Utilities Commission 2-11
2.2 DESCRIPTION OF THE PROPOSED PROJECT 2-11
2.2.1 Technology Selection and Process Description 2-12
2.2.2 Resource Requirements (and Inputs) 2-29
2.2.3 Discharges, Wastes, and Products (Outputs) 2-36

2.2.4 Construction Plans 2-51
2.2.5 Operational Plans 2-54
2.3 DESCRIPTION OF ALTERNATIVE SITES AND CORRIDORS 2-57
2.3.1 West Range Site and Corridors 2-57
2.3.2 East Range Site and Corridors 2-77
2.4 SUMMARY COMPARISON OF ALTERNATIVES AND IMPACTS 2-90

3. AFFECTED ENVIRONMENT 3.1-1
3.1 CHAPTER OVERVIEW 3.1-1
3.2 AESTHETICS 3.2-1
3.2.1 Background and Definitions 3.2-1
3.2.2 Viewsheds 3.2-2
3.2.3 Scenic Resources 3.2-8
3.3 AIR QUALITY AND CLIMATE 3.3-1
3.3.1 Sensitive Air Quality Receptors 3.3-1
3.3.2 Local and Regional Climate 3.3-1
3.3.3 Local and Regional Air Quality 3.3-3
3.3.4 Pertinent Air Quality Regulations 3.3-8
3.4 GEOLOGY AND SOILS 3.4-1
3.4.1 Geology 3.4-1
3.4.2 Mineral Resources and Mining 3.4-7
3.4.3 Seismic Activity 3.4-10
3.4.4 Paleontological Resources 3.4-14
3.4.5 Soils 3.4-14
3.4.6 Prime Farmland 3.4-17
3.4.7 Suitable Formations for Geologic Sequestration of Carbon Dioxide 3.4-20
3.5 WATER RESOURCES 3.5-1
3.5.1 West Range Site and Corridors 3.5-1
3.5.2 East Range Site and Corridors 3.5-14
3.6 FLOODPLAINS 3.6-1
3.6.1 Local Hydrology Features 3.6-1
3.6.2 Flood Hazard Areas 3.6-1
3.7 WETLANDS 3.7-1
3.7.1 Introduction 3.7-1
3.7.2 Regulatory Framework 3.7-1
3.7.3 Wetland Classification Systems 3.7-2
3.7.4 Wetland Identification and Mapping Methodology 3.7-3
3.7.5 Wetlands within the West Range Site Buffer Land and Utility and Transportation Corridors 3.7-11
3.7.6 Wetlands within the East Range Site Buffer Land and Utility and Transportation Corridors 3.7-17
3.7.7 Wetland Functional Assessment 3.7-20
3.8 BIOLOGICAL RESOURCES 3.8-1
3.8.1 Terrestrial Communities 3.8-1
3.8.2 Aquatic Communities 3.8-19
3.8.3 Protected Species and Habitats 3.8-22

3.9 CULTURAL RESOURCES 3.9-1
3.9.1 Regional Setting 3.9-1
3.9.2 Archaeological Resources 3.9-2
3.9.3 Historic Resources 3.9-4
3.9.4 Native American Resources 3.9-8
3.10 LAND USE 3.10-1
3.10.1 Existing Land Use 3.10-1
3.10.2 Zoning Ordinances 3.10-8
3.10.3 Land Use Planning 3.10-9
3.11 SOCIOECONOMICS 3.11-1
3.11.1 Demographics 3.11-1
3.11.2 Housing 3.11-4
3.11.3 Employment and Income 3.11-6
3.11.4 Business and Economy 3.11-8
3.12 ENVIRONMENTAL JUSTICE 3.12-1
3.12.1 Background and Definitions 3.12-1
3.12.2 Minority Populations 3.12-1
3.12.3 Low Income Populations 3.12-3
3.13 COMMUNITY SERVICES 3.13-1
3.13.1 Law Enforcement 3.13-1
3.13.2 Emergency Response 3.13-1
3.13.3 Parks and Recreation 3.13-2
3.13.4 School Systems 3.13-3
3.14 UTILITY SYSTEMS 3.14-1
3.14.1 Potable Water Supply 3.14-1
3.14.2 Sanitary Wastewater 3.14-1
3.14.3 Electricity 3.14-2
3.14.4 Natural Gas 3.14-3
3.15 TRAFFIC AND TRANSPORTATION 3.15-1
3.15.1 Regional Transportation System 3.15-1
3.15.2 Roadway System and Local Traffic 3.15-2
3.15.3 Rail System 3.15-6
3.16 MATERIALS AND WASTE MANAGEMENT 3.16-1
3.16.1 Regional and Local Conditions 3.16-1
3.16.2 West Range Site and Corridors Site Assessment 3.16-3
3.16.3 East Range Site and Corridors Site Assessment 3.16-4
3.17 SAFETY AND HEALTH 3.17-1
3.17.1 Occupational Safety and Health 3.17-1
3.17.2 Transportation Safety 3.17-1
3.17.3 Community Health Issues 3.17-4
3.17.4 Sensitive Receptors and Chemicals of Potential Concern 3.17-6
3.17.5 Electromagnetic Fields 3.17-7
3.18 NOISE 3.18-1
3.18.1 Background 3.18-1
3.18.2 Existing Noise Levels 3.18-5

4. ENVIRONMENTAL CONSEQUENCES 4-1
4.1 CHAPTER OVERVIEW 4-1
4.2 AESTHETICS 4.2-1
4.2.1 Approach to Impacts Analysis 4.2-1
4.2.2 Common Impacts of the Proposed Action 4.2-2

4.2.3 Impacts on West Range Site and Corridors 4.2-4
4.2.4 Impacts on East Range Site and Corridors 4.2-12
4.2.5 Impacts of the No Action Alternative 4.2-18
4.2.6 Summary of Impacts 4.2-18
4.3 AIR QUALITY 4.3-1
4.3.1 Approach to Impacts Analysis 4.3-1
4.3.2 Impacts of the Proposed Action 4.3-10
4.3.3 Impacts of the No Action Alternative 4.3-37
4.3.4 Summary of Impacts 4.3-38
4.3.5 Mitigation Issues 4.3-43
4.4 GEOLOGY AND SOILS 4.4-1
4.4.1 Approach to Impacts Analysis 4.4-1
4.4.2 Common Impacts of the Proposed Action 4.4-2
4.4.3 Impacts on West Range Site and Corridors 4.4-4
4.4.4 Impacts on East Range Site and Corridors 4.4-9
4.4.5 Impacts of the No Action Alternative 4.4-13
4.4.6 Summary of Impacts 4.4-14
4.5 WATER RESOURCES 4.5-1
4.5.1 Approach to Impacts Analysis 4.5-1
4.5.2 Common Impacts of the Proposed Action 4.5-1
4.5.3 Impacts on the West Range Site and Corridors 4.5-10
4.5.4 Impacts on East Range Site and Corridors 4.5-32
4.5.5 Impacts of the No Action Alternative 4.5-45
4.5.6 Summary of Impacts 4.5-46
4.6 FLOODPLAINS 4.6-1
4.6.1 Approach to Impacts Analysis 4.6-1
4.6.2 Common Impacts of the Proposed Action 4.6-1
4.6.3 Impacts on West Range Site and Corridors 4.6-1
4.6.4 Impacts on East Range Site and Corridors 4.6-2
4.6.5 Impacts of the No Action Alternative 4.6-3
4.6.6 Summary of Impacts 4.6-4
4.6.7 Floodplain Mitigation Issues 4.6-4
4.7 WETLANDS 4.7-1
4.7.1 Approach to Impacts Analysis 4.7-1
4.7.2 Common Impacts of the Proposed Action 4.7-2
4.7.3 Impacts on West Range Site and Corridors 4.7-4
4.7.4 Impacts on East Range Site and Corridors 4.7-24
4.7.5 Impacts of the No Action Alternative 4.7-37
4.7.6 Summary of Impacts 4.7-37
4.7.7 Wetland Permitting and Mitigation Issues 4.7-39
4.8 BIOLOGICAL RESOURCES 4.8-1
4.8.1 Approach to Impacts Analysis 4.8-1
4.8.2 Common Impacts of the Proposed Action 4.8-1
4.8.3 Impacts on West Range Site and Corridors 4.8-8
4.8.4 Impacts on East Range Site and Corridors 4.8-24
4.8.5 Impacts of the No Action Alternative 4.8-35
4.8.6 Summary of Impacts 4.8-35
4.8.7 Biological Resources Regulatory Implications and Mitigation 4.8-38
4.9 CULTURAL RESOURCES 4.9-1
4.9.1 Approach to Impacts Analysis 4.9-1
4.9.2 Common Impacts of the Proposed Action 4.9-2

4.9.3 Impacts on West Range Site and Corridors 4.9-3
4.9.4 Impacts on East Range Site and Corridors 4.9-6
4.9.5 Impacts of the No Action Alternative 4.9-8
4.9.6 Summary of Impacts 4.9-9
4.10 LAND USE 4.10-1
4.10.1 Approach to Impacts Analysis 4.10-1
4.10.2 Common Impacts of the Proposed Action 4.10-1
4.10.3 Impacts on West Range Site and Corridors 4.10-2
4.10.4 Impacts on East Range Site and Corridors 4.10-4
4.10.5 Impacts of the No Action Alternative 4.10-6
4.10.6 Summary of Impacts 4.10-7
4.11 SOCIOECONOMICS 4.11-1
4.11.1 Approach to Impacts Analysis 4.11-1
4.11.2 Common Impacts of the Proposed Action 4.11-2
4.11.3 Impacts on West Range Site and Corridors 4.11-7
4.11.4 Impacts on East Range Site and Corridors 4.11-9
4.11.5 Impacts of the No Action Alternative 4.11-10
4.11.6 Summary of Impacts 4.11-11
4.12 ENVIRONMENTAL JUSTICE 4.12-1
4.12.1 Approach to Impacts Analysis 4.12-1
4.12.2 Impacts on West Range Site and Corridors 4.12-2
4.12.3 Impacts on East Range Site and Corridors 4.12-2
4.12.4 Health Risk-related Environment Justice Impacts 4.12-3
4.12.5 Impacts of the No Action Alternative 4.12-4
4.12.6 Summary of Impacts 4.12-4
4.13 COMMUNITY SERVICES 4.13-1
4.13.1 Approach to Impacts Analysis 4.13-1
4.13.2 Common Impacts of the Proposed Action 4.13-1
4.13.3 Impacts on West Range Site and Corridors 4.13-4
4.13.4 Impacts on East Range Site and Corridors 4.13-6
4.13.5 Impacts of the No Action Alternative 4.13-7
4.13.6 Summary of Impacts 4.13-8
4.14 UTILITY SYSTEMS 4.14-1
4.14.1 Approach to Impacts Analysis 4.14-1
4.14.2 Common Impacts of the Proposed Action 4.14-1
4.14.3 Impacts on West Range Site and Corridors 4.14-3
4.14.4 Impacts on East Range Site and Corridors 4.14-10
4.14.5 Impacts of the No Action Alternative 4.14-12
4.14.6 Summary of Impacts 4.14-13
4.15 TRAFFIC AND TRANSPORTATION 4.15-1
4.15.1 Approach to Impacts Analysis 4.15-1
4.15.2 Common Impacts of the Proposed Action 4.15-2
4.15.3 Impacts on West Range Site and Corridors 4.15-4
4.15.4 Impacts on East Range Site and Corridors 4.15-9
4.15.5 Impacts of the No Action Alternative 4.15-12
4.15.6 Summary of Impacts 4.15-13
4.16 MATERIALS AND WASTE MANAGEMENT 4.16-1
4.16.1 Approach to Impacts Analysis 4.16-1
4.16.2 Common Impacts of the Proposed Action 4.16-1
4.16.3 Impacts on West Range Site and Corridors 4.16-14
4.16.4 Impacts on East Range Site and Corridors 4.16-15

4.16.5 Impacts of the No Action Alternative 4.16-15
4.16.6 Summary of Impacts 4.16-16
4.17 SAFETY AND HEALTH 4.17-1
4.17.1 Approach to Impacts Analysis 4.17-1
4.17.2 Common Impacts of the Proposed Action 4.17-5
4.17.3 Corridor-Specific Impacts 4.17-13
4.17.4 Intentional Destructive Acts 4.17-17
4.17.5 Impacts of the No Action Alternative 4.17-18
4.17.6 Summary of Impacts 4.17-19
4.18 NOISE 4.18-1
4.18.1 Approach to Impacts Analysis 4.18-1
4.18.2 Impacts of the Proposed Action 4.18-8
4.18.3 Impacts of No Action Alternative 4.18-20
4.18.4 Summary of Impacts 4.18-21
4.18.5 Plant Noise and Mitigation Issues 4.18-22

5. SUMMARY OF ENVIRONMENTAL CONSEQUENCES 5.1-1
5.1 COMPARATIVE IMPACTS OF ALTERNATIVES 5.1-1
5.1.1 Summary Comparison of Alternatives and Impacts 5.1-1
5.1.2 Impacts of Commercial Operation 5.1-1
5.2 POTENTIAL CUMULATIVE IMPACTS 5.2-1
5.2.1 Approach and Analytical Perspective 5.2-1
5.2.2 Air Quality 5.2-1
5.2.3 Air Inhalation Health Risk 5.2-14
5.2.4 Water Resources 5.2-18
5.2.5 Wetlands 5.2-22
5.2.6 Wildlife Habitat 5.2-25
5.2.7 Rail Traffic 5.2-36
5.2.8 Greenhouse Gases and Climate Change 5.2-39
5.3 MITIGATION OF IMPACTS 5.3-1
5.3.1 Mitigation Measures 5.3-1
5.3.2 Additional Mitigation Options 5.3-6
5.4 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS 5.4-1
5.5 RELATIONSHIP BETWEEN SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY 5.5-1

6. REGULATORY AND PERMIT REQUIREMENTS 6-1

7. AGENCIES AND TRIBES CONTACTED 7-1

8. DISTRIBUTION LIST 8-1

9. REFERENCES 9-1

10. LIST OF PREPARERS 10-1

LIST OF APPENDICES

APPENDIX A CARBON CAPTURE AND SEQUESTRATION
- A1 EXCELSIOR'S PLAN FOR CARBON CAPTURE AND SEQUESTRATION
- A2 DOE ANALYSIS OF FEASIBILITY OF CARBON CAPTURE AND SEQUESTRATION FOR THE MESABA ENERGY PROJECT

APPENDIX B AIR QUALITY ANALYSIS DATA

APPENDIX C AIR EMISSION RISK ANALYSIS DATA

APPENDIX D CUMULATIVE IMPACT ANALYSES
- D1 AIR
- D2 HEALTH RISK
- D3 WATER RESOURCES
- D4 WETLANDS
- D5 WILDLIFE HABITAT
- D6 RAIL TRAFFIC

APPENDIX E CONSULTATION

APPENDIX F WETLANDS DOCUMENTS
- F1 DOCUMENTATION FOR USACE
- F2 FLOODPLAIN AND WETLANDS ASSESSMENT

APPENDIX G MDOC SCOPING DECISION

APPENDIX H PROCESS WATER DISCHARGE ALTERNATIVES (WEST RANGE SITE)

LIST OF TABLES

Table S-1. Key Technology Aspects of the Mesaba Energy Project 9
Table S-2. Expected Operating Characteristics – Mesaba Energy Project (Values for West and East Range Sites are equal except where noted) 11
Table S-3. Key Pollution Prevention, Recycling and Reuse Features 12
Table S-4. West Range Site Features 14
Table S-5. East Range Site Features 20
Table S-6. Summary of Comments on the Draft EIS 29
Table S-7. Changes Between Draft and Final EIS 31
Table S-8. Summary Comparison of Impacts (Phases I & II) 37
Table 1.6-1. Issues Identified in the NOI for Consideration in the EIS 1-17
Table 2.1-1. Expected Operating Characteristics – Mesaba Energy Project (Values for West and East Range Sites are equal except where noted) 2-7
Table 2.2-1. Principal Buildings Associated with Phase I of the Mesaba Generating Station 2-13
Table 2.2-2. Major Process Equipment 2-14
Table 2.2-3. Process Water Requirements 2-32
Table 2.2-4. Feedstock and Byproduct Storage Requirements for Each Phase 2-36
Table 2.2-5. Comparison of Mesaba Energy Project Performance Target to Other IGCC and state-of-the-art Power Plant Technologies 2-37
Table 2.2-6. Emissions (tons per year) from Trains Delivering Feedstock for Phases I and II of the Mesaba Energy Project 2-41
Table 2.2-7. Emissions (tons per year) from Trucks Transporting Solid Byproducts and Waste from Phases I and II of the Mesaba Energy Project 2-41
Table 2.2-8. On site Toxic and Hazardous Materials (Totals for Phase I and II) 2-47
Table 2.2-9. Key Pollution Prevention, Recycling and Reuse Features 2-49
Table 2.2-10. Estimated Operating Staff Required for the Mesaba Generating Station 2-55
Table 2.2-11. Key Performance Indicators Used to Assess Worst Case Environmental Impacts or Emissions of Mesaba Energy Project (Phase I, partial slurry quench Mode) 2-57
Table 2.3-1. Rail Access Alternatives – West Range Site 2-63
Table 2.3-2. Estimated Wastewater Discharge Rates to Receiving Waters – West Range Site 2-68
Table 2.3-3. Natural Gas Pipeline Alternative Routes – West Range Site 2-72

Table 2.3-4. Rail Access Alternatives – East Range Site 2-79

Table 2.3-5. Process Water Sources – East Range Site 2-83

Table 2.4-1. Summary Comparison of Impacts 2-91

Table 3.2-1. Public Lands Near the West Range 3.2-12

Table 3.2-2. Public Lands Near the East Range 3.2-13

Table 3.3-1. National and Minnesota Ambient Air Quality Standards 3.3-3

Table 3.3-2. Monitored Background Concentrations 3.3-6

Table 3.3-3. Allowable PSD Increments 3.3-7

Table 3.3-4. Distances to Class I Areas 3.3-7

Table 3.3-5. Pertinent Air Quality Regulations 3.3-9

Table 3.4-1. Bedrock Geology at the West and East Range Sites 3.4-2

Table 3.4-2. Quaternary Geology at the West and East Range Sites 3.4-5

Table 3.4-3. Minnesota Earthquakes within the Last 100 Years 3.4-13

Table 3.4-4. Soil Types along the West Range Site and Corridors 3.4-16

Table 3.5-1. Surface Water Bodies 3.5-2

Table 3.5-2. Capacity of West Range Mine Pits (November 2005) 3.5-5

Table 3.5-3. Existing Water Appropriation Permits for Surface Waters Near The West Range Site 3.5-5

Table 3.5-4. Current Water Quality for West Range Water Bodies 3.5-9

Table 3.5-5. Pumping Groundwater Elevations City Municipal Wells 3.5-11

Table 3.5-6. East Range Surface Water Bodies 3.5-17

Table 3.5-7. Abandoned Mine Pit Water Sources 3.5-18

Table 3.5-8. Water Quality Data for East Range Water Sources 3.5-19

Table 3.6-1. Communities with Potentially Affected Floodplains near the East Range Site 3.6-2

Table 3.7-1. Comparison of Wetland Classification Systems in Minnesota 3.7-3

Table 3.7-2 West Range Site Wetland Summary 3.7-11

Table 3.7-3. Utility and Corridor Crossings of Surface Waters (West Range Site) 3.7-17

Table 3.7-4. East Range Site Wetland Summary 3.7-17

Table 3.7-5. Utility and Transportation Corridor Crossings of Surface Waters (East Range Site) 3.7-20

Table 3.8-1. Wildlife Species Assemblages by Habitat Association 3.8-2

Table 3.8-2. Terrestrial Land Cover Types from LandSat-Based Land Use-Land Cover 3.8-12

Table 3.8-3. Terrestrial Land Cover Types within Utility and Transportation Corridor ROWs (West Range Site) 3.8-12

Table 3.8-4. Avifauna Potentially Utilizing Wetland Habitat (West Range Site) 3.8-15

Table 3.8-5. Terrestrial Land Cover Types Encountered within the Utility and Transportation Corridor ROWs (East Range Site) 3.8-17

Table 3.8-6. MNDNR NHIS Plant Species Occurrences Near the West Range Site 3.8-25

Table 3.8-7. MNDNR NHIS Species Occurrences within 1 Mile of Transportation or Utility Corridors (West Range Site) 3.8-27

Table 3.8-8. MNDNR NHIS Species Occurrences within 1 Mile of Transportation or Utility Corridors Associated (East Range Site) 3.8-29

Table 3.9-1. Archaeological Sites Previously Identified Within the Study Area 3.9-3

Table 3.9-2. Historic Properties Within the West Range Site APE 3.9-4

Table 3.9-3. Historic Properties Within the East Range Site APE 3.9-6

Table 3.11-1. Population Trends by County for Arrowhead Region 3.11-2

Table 3.11-2. The 10 Largest Municipalities in Northeast Minnesota (2002) 3.11-2

Table 3.11-3. Local Population Change, West Range (1990 to 2000) 3.11-3

Table 3.11-4. Population Trend in Taconite (1980 to 2004) 3.11-3

Table 3.11-5. Population Trend in Hoyt Lakes (1980 to 2004) 3.11-4

Table 3.11-6. Itasca County Housing Characteristics (2000) 3.11-5

Table 3.11-7. St. Louis County Housing Characteristics (2000) 3.11-6

Table 3.12-1. National and Regional Population Distributions (2000) 3.12-2

Table 3.12-2. Population Profiles (2000): Percentage of Minorities, West Range 3.12-2

Table 3.12-3. Population Profiles (2000): Percentage of Minorities, East Range 3.12-3

Table 3.12-4. Regional and National Poverty Rates 3.12-3

Table 3.12-5. Population Profiles (2000): Local Poverty Rates, West Range 3.12-4

Table 3.12-6. Population Profiles (2000): Local Poverty Rates, East Range 3.12-4

Table 3.13-1. Educational Statistics for Greenway School District in Itasca County 3.13-3

Table 3.13-2. Educational Statistics for Mesabi East School District in St. Louis County 3.13-4

Table 3.15-1. Annual Average Daily Traffic Volumes and Levels of Service on US 169 and CR 7 (Itasca County, Minnesota) 3.15-4

Table 3.15-2. Annual Average Daily Traffic Volumes and Levels of Service on CR 110 and CR 666 (St. Louis County, Minnesota) 3.15-5

Table 3.15-3. Location of Railroad At-Grade Crossings – West Range Site 3.15-8

Table 3.15-4. Location of Railroad At-Grade Crossings – East Range Site 3.15-10

Table 3.16-1. Shipments of Manifested Waste from Minnesota Generators to Treatment, Storage or Disposal Facilities (1996 and 1999) 3.16-1

Table 3.17-1. Statistics for Work Place Hazards 3.17-1

Table 3.17-2. Five-Year Traffic Accident History near Intersection of US 169 and CR 7 at West Range Site 3.17-3

Table 3.17-3. Estimated Percent of Adults with Behavioral Health Risk Factors (2004) 3.17-4

Table 3.17-4. Estimated Number of Adults with Cancer Incidences (2004) 3.17-5

Table 3.17-5. Causes of Mortality, State and County Statistics (2003 and 2004) 3.17-5

Table 3.17-6. State Transmission Line Standards and Guidelines 3.17-10

Table 3.18-1. Noise Levels for Common Sounds 3.18-1

Table 3.18-2. Noise Area Classification (NAC) Thresholds 3.18-4

Table 3.18-3. Existing Noise Levels at Ambient Noise Receptors for West Range Site 3.18-5

Table 3.18-4. Existing Noise Levels at Ambient Noise Receptors for East Range Site 3.18-11

Table 4.2-1. IGCC Power Plant Structure Dimensions 4.2-2

Table 4.3-1. Permitted Emission Rates for Existing and Permitted IGCC Plants 4.3-4

Table 4.3-2. Applicable Air Quality Standards, Maximum Allowable PSD Class II Increments, and Significant Impact Levels 4.3-7

Table 4.3-3. Daily Emission Rates from Vehicle Traffic – Peak Construction 4.3-11

Table 4.3-5. Emissions from Trucks Phases I and II of the Mesaba Energy Project (tpy) 4.3-12

Table 4.3-6. Annual Hazardous Air Pollutant Emissions (Phase I and Phases I & II).....4.3-14

Table 4.3-7. Annual Criteria Air Pollutant Emissions (Phase I Only and Phase I & II Combined) 4.3-17

Table 4.3-8. Highest Project Impacts and PSD SILs for Phases I and II Combined.....4.3-18

Table 4.3-9. Results of Class II PSD Increment Analysis for Phases I and II Combined.....4.3-20

Table 4.3-10. Results of Class II NAAQS Modeling for Phases I and II Combined.....4.3-21

Table 4.3-11. Estimated $PM_{2.5}$ Concentration for Phase I and II Combined.....4.3-21

Table 4.3-12. PSD Significant Monitoring Concentrations and Maximum Impacts from Mesaba Energy Project (Phases I and II Combined) 4.3-22

Table 4.3-13. Class I PSD Increment Modeling Results for West Range Site (Phase I & II at 'Proposed' Emission Levels) 4.3-23

Table 4.3-14. Class I PSD Increment Modeling Results for East Range Site (Phase I at 'Proposed' Emission Levels; Phase II at 'Enhanced' Emission Levels) 4.3-24

Table 4.3-15. Class I Visibility Modeling Results – West Range Site.....4.3-27

Table 4.3-16. Class I Visibility Modeling Results – East Range Site.....4.3-28

Table 4.3-17. Class I Visibility Modeling – Comparison of Meteorological Data Resolutions for 2002 - West Range Site / East Range Site.....4.3-29

Table 4.3-18. Class I Visibility Supplementary Modeling Results – West Range Site 4.3-31

Table 4.3-19. Class I Visibility Supplementary Modeling Results – East Range Site.....4.3-31

Table 4.3-20. Class I Deposition Modeling Results – West Range Site / East Range Site.....4.3-33

Table 4.4-1. Areas of Disturbance (West Range Site) 4.4-4

Table 4.4-2. Areas of Disturbance Associated with HVTL Corridors (West Range Site).....4.4-5

Table 4.4-3. Areas of Disturbance Along Proposed Pipeline Corridors (West Range Site) 4.4-6

Table 4.4-4. Areas of Disturbance Along Rail Alignment Alternatives and Access Road (West Range Site).....4.4-8

Table 4.4-5. Areas of Disturbance (East Range Site).....4.4-10

Table 4.4-6. Areas of Disturbance Associated with HVTL Corridors (East Range Site) 4.4-10

Table 4.4-7. Areas of Disturbance Along Proposed Pipeline Corridors (East Range Site) 4.4-11

Table 4.4-8. Areas of Disturbance Along Rail Alignment Alternatives and Access Road (East Range Site).....4.4-12

Table 4.5-1. Process Water Requirements, Phases I and Phases I & II 4.5-4

Table 4.5-2. Process Water Resources Identified for Use at the West Range Site 4.5-12

Table 4.5-3. Water Source Supply Capability 4.5-13

Table 4.5-4. Process Water Requirements Matched with Water Supply Capabilities 4.5-14

Table 4.5-5. Flow Rates To/From Water Sources at the West Range Site 4.5-15

Table 4.5-6. West Range Pumping Station Capacities 4.5-15

Table 4.5-7. Through-Screen Velocities for Intake Structures at West Range Site 4.5-16

Table 4.5-8. Average Annual Discharge to Panasa Lakes 4.5-22

Table 4.5-9. Discharge Flow Rates, West Range Site 4.5-24

Table 4.5-10. Current Phosphorus Levels, West Range Site 4.5-24

Table 4.5-11. Water Quality Criteria Standards for the Swan River 4.5-26

Table 4.5-12. Water Supply Alternatives for the East Range Mesaba IGCC Power Plant 4.5-33

Table 4.5-13. Existing Water Appropriation Permits for Surface Waters around East Range Site .. 4.5-41

Table 4.7-1. Comparison of Wetland Impacts (acres), New Preferred and Original Plant Site 4.7-5

Table 4.7-2. Wetland Fill (acres), Mesaba Generating Station (Central – Draft EIS Footprint) at West Range Site 4.7-7

Table 4.7-3. Wetland Fill (acres), Mesaba Generating Station (Central – Final EIS Footprint) at West Range Site 4.7-8

Table 4.7-4. Wetland Impacts (acres), HVTL Alternative 1 (West Range Site) 4.7-10

Table 4.7-5. Water Crossings for HVTL Alternative 1 (West Range Site) 4.7-11

Table 4.7-6. Wetland Impacts (acres), HVTL Alternative 1A (West Range Site) 4.7-12

Table 4.7-7. Water Crossings for HVTL Alternative 1A (West Range Site) 4.7-13

Table 4.7-8. Water Crossings for HVTL Alternative Plan B Phase II (West Range Site) 4.7-13

Table 4.7-9. Wetland Impacts (acres), Natural Gas Pipeline Alternative 1 (West Range Site) 4.7-15

Table 4.7-10. Water Crossings for Natural Gas Pipeline Alternative 1 (West Range Site) 4.7-16

Table 4.7-11. Wetland Impacts (acres), Natural Gas Pipeline Alternative 2 (West Range Site) 4.7-16

Table 4.7-12. Water Crossings for Natural Gas Pipeline Alternative 2 (West Range Site) 4.7-17

Table 4.7-13. Wetland Impacts (acres), Natural Gas Pipeline Alternative 3 (West Range Site) 4.7-17

Table 4.7-14. Water Crossings for Natural Gas Pipeline Alternative 3 (West Range Site) 4.7-18

Table 4.7-15. Wetland Impacts (acres), Process Water Supply Pipelines (West Range Site) 4.7-19

Table 4.7-16. Wetland Fill (acres), Rail Alternative 1A (West Range Site) 4.7-21

Table 4.7-17. Wetland Fill (acres), Rail Alternative 3B (West Range Site) 4.7-22

Table 4.7-18. Wetland Fill (acres), Access Roads 1 and 2 (West Range Site) 4.7-23

Table 4.7-19. Wetland Fill (acres), Access Road 3 (West Range Site) 4.7-23

Table 4.7-20. Wetland Fill (acres), Mesaba Generating Station (East Range Site) 4.7-25

Table 4.7-21. Wetland Fill (acres), HVTL Alternatives (East Range Site) 4.7-27

Table 4.7-22. Wetland Conversion (acres), HVTL Alternatives (East Range Site) 4.7-29

Table 4.7-23. Water Crossings for HVTL Alternatives (East Range Site) 4.7-30

Table 4.7-24. Wetland Impacts (acres), Natural Gas Pipeline (East Range Site) 4.7-32

Table 4.7-25. Water Crossings for Natural Gas Pipeline (East Range Site) 4.7-33

Table 4.7-26. Wetland Impacts (acres), Process Water Supply Pipelines (East Range Site) 4.7-34

Table 4.7-27. Water Crossings for Process Water Supply Pipeline (East Range Site) 4.7-35

Table 4.7-28. Water Crossings for Potable Water and Sewer Pipelines (East Range Site) 4.7-35

Table 4.7-29. Wetland Fill (acres), Rail Alternative 1 (East Range Site) 4.7-36

Table 4.7-30. Water Crossings for Rail Alternative 1 (East Range Site) 4.7-36

Table 4.7-31. Water Crossings for Rail Alternative 2 (East Range Site) 4.7-36

Table 4.7-32. Wetland Fill for Revised Access Road (East Range Site) 4.7-37

Table 4.7-33. Summary Comparison of Wetland Impacts (acres), West Range Site and Corridors 4.7-38

Table 4.7-34. Summary Comparison of Wetland Impacts (acres), East Range Site and Corridors 4.7-39

Table 4.8-1. Vegetation and Habitat Impacts (acres), Mesaba IGCC Power Plant Footprint (West Range Site) 4.8-9

Table 4.8-2. Vegetation and Habitat Impacts (acres), HVTLs (West Range Site) 4.8-11

Table 4.8-3. Vegetation and Habitat Impacts (acres), Natural Gas Pipeline (West Range Site) 4.8-14

Table 4.8-4. Vegetation and Habitat Impacts (acres), Process Water Supply Pipelines (West Range Site) 4.8-18

Table 4.8-5. Vegetation and Habitat Impacts (acres), Potable Water and Sewer Pipelines (West Range Site) 4.8-21

Table 4.8-6. Vegetation and Habitat (acres), Rail Line (West Range Site) 4.8-22

Table 4.8-7. Vegetation and Habitat Impacts (acres), Access Roads (West Range Site) 4.8-24

Table 4.8-8. Vegetation and Habitat Impacts (acres), Mesaba IGCC Power Plant Footprint (East Range Site) 4.8-26

Table 4.8-9. Vegetation and Habitat Impacts (acres), HVTLs (East Range Site) 4.8-27

Table 4.8-10. Vegetation and Habitat Impacts (acres), Natural Gas Pipeline (East Range Site) 4.8-29

Table 4.8-11. Vegetation and Habitat Impacts (acres), Process Water Supply Pipelines (East Range Site) 4.8-31

Table 4.8-12. Vegetation and Habitat Impacts (acres), Potable Water and Sewer Pipelines (East Range Site) 4.8-32

Table 4.8-13. Vegetation and Habitat (acres), Rail Line (East Range Site) 4.8-33

Table 4.8-14. Vegetation and Habitat Impacts (acres), Access Road (East Range Site) 4.8-35

Table 4.8-15. Permanent Vegetation and Habitat Impacts (acres), West Range Site and Corridors 4.8-36

Table 4.8-16. Permanent Vegetation and Habitat Impacts (acres), East Range Site and Corridors 4.8-37

Table 4.9-1. Results of the 2005 Archaeological Assessment Model at the West Range Site 4.9-3

Table 4.9-2. Results of the 2005 Archaeological Assessment Model at the West Range Site 4.9-6

Table 4.11-1. Estimated Employment – Construction Jobs (Mesaba Generating Station) 4.11-2

Table 4.11-2. Value Added Economic Impacts for the Arrowhead Region During Construction of Mesaba Phases I and II ($ millions) 4.11-3

Table 4.11-3. Total Output Economic Impacts for the Arrowhead Region During Construction of Mesaba Phases I and II ($ millions) 4.11-4

Table 4.11-4. Estimated Jobs Created in the Arrowhead Region During Construction of Mesaba Phases I and II 4.11-4

Table 4.11-5. Estimated Employment, Permanent Operating Jobs (Mesaba Generating Station) 4.11-5

Table 4.11-6. Value Added Economic Impacts for the Arrowhead Region for a Typical Year of Operation, Mesaba Phases I and II ($ millions) 4.11-6

Table 4.11-7. Total Output Economic Impacts for the Arrowhead Region for a Typical Year of Operation, Mesaba Phases I and II ($ millions) 4.11-6

Table 4.11-8. Estimated Jobs Created in the Arrowhead Region During a Typical Year of Operation, Mesaba Phases I and II 4.11-6

Table 4.14-1. HVTL Route and Voltage Options for the West Range Site 4.14-4

Table 4.14-2. Environmental Comparison of Natural Gas Pipeline Alternatives – West Range Site 4.14-10

Table 4.15-1. "No Build" and "Build" ADT Volumes and LOS at West Range Site (to year 2010) 4.15-6

Table 4.15-2. "No Build" and "Build" ADT Volumes and LOS at West Range Site (to year 2028) 4.15-7

Table 4.15-3. "No Build" and "Build" ADT Volumes and LOS at East Range Site (year 2010) 4.15-10

Table 4.15-4. "No Build" and "Build" ADT Volumes and LOS at East Range Site (year 2028) 4.15-11

Table 4.16-1. Estimated Construction Waste Streams (Phase I and II) 4.16-4

Table 4.16-2. Feedstock Storage Requirements (Each Phase) 4.16-6

Table 4.16-3 Toxicity Characteristic Leaching Procedure test results for E-Gas™ Slag 4.16-8

Table 4.16-4. Annual Quantity of Non-Hazardous and Hazardous Waste Generated from Phase I and Phase II Operations 4.16-11

Table 4.17-1. Chemicals Evaluated in the AERA (Phases I and II) Reflecting Additional Conservatism for Risk Assessment 4.17-2

Table 4.17-2. IRAP Exposure Pathways Evaluated 4.17-4

Table 4.17-3. Predicted Incidents for the Proposed Action 4.17-6

Table 4.17-4. IRAP Summary of Highest Total Risks and Hazard Indices by Exposure Scenarios 4.17-8

Table 4.18-1. Noise Levels of Typical Construction Equipment at 50 feet from Source 4.18-2

Table 4.18-2. Noise Area Classification (NAC) Thresholds 4.18-2

Table 4.18-3. Ground-Borne Vibration Guideline for Residential Land Use 4.18-4

Table 4.18-4. Proposed Train Operating Conditions 4.18-4

Table 4.18-5. Receptor Locations for Noise Analyses at the West Range Site 4.18-6

Table 4.18-6. Receptor Locations for Noise Analyses at the East Range Site 4.18-7

Table 4.18-7. Aggregate Estimated Noise Levels Generated by Construction Activities at the West Range Site 4.18-9

Table 4.18-8. Estimated Steam Blow Noise Levels at West Range Site 4.18-10

Table 4.18-9. Aggregate Estimated Noise Levels during Construction at East Range Site 4.18-11

Table 4.18-10. Estimated Steam Blow Noise Levels at East Range Site 4.18-11

Table 4.18-11. Estimated Plant Noise Levels (without mitigation) at Receptors for West Range Site for Phases I and II 4.18-12

Table 4.18-12. Estimated Operational Noise Levels (without mitigation) at Receptors at East Range Site for Phases I and II 4.18-14

Table 4.18-13. Estimated Freight Train and Yard Activity Noise Levels at West Range Site 4.18-15

Table 4.18-14. Estimated Freight Train and Yard Activity Noise Levels at East Range Site 4.18-16

Table 4.18-15. MINNOISE L_{10} Noise Levels at Virtual Receptor Locations for West Range Site.. 4.18-19

Table 4.18-16. Summary of Noise Mitigation Project Design Features 4.18-23

Table 5.1-1. Expected Characteristics of CO2 Capture Scenarios 5.1-4

Table 5.1-2. Summary of Impacts and Mitigation Measures for CO_2 Capture and Storage 5.1-12

Table 5.2.2-1. Estimated Impacts of Mesaba Phases I and II and All Other Existing/Planned Increment Consuming/Expanding Sources on PSD Increments at Relevant Class I Area Receptors (all tabulated concentrations expressed in $\mu g/m^3$) 5.2-5

Table 5.2.2-2. Estimated Cumulative Impacts of Mesaba Phases I and II, All Existing Sources, and Reasonably Foreseeable Future Sources on Ambient Air Quality at Relevant Class I Area Receptors (all tabulated concentrations expressed in $\mu g/m^3$) 5.2-6

Table 5.2.2-3. Comparison of Annual Cumulative Sulfur and Nitrogen Deposition to Green Line Criteria or DAT Threshold for Impacts to Terrestrial and Aquatic Ecosystems 5.2-10

Table 5.2.2-4. Comparison of Cumulative SO_2 Concentrations to Green Line Criteria for Impacts to Terrestrial Ecosystems, Flora and Fauna (All Tabulated Concentrations Expressed in $\mu g/m^3$) 5.2-12

Table 5.2.2-5. Maximum Estimated West Range Mercury Concentration & Impacts on Background Mercury Concentration 5.2-13

Table 5.2.2-6. Maximum Estimated East Range Mercury Concentration & Impacts on Background Mercury Concentration 5.2-13

Table 5.2.5-1. Foreseeable Future Actions within the Defined Study Areas 5.2-23

Table 5.2.5-2. West Range Site Cumulative Wetland Impacts Analysis Results 5.2-24

Table 5.2.5-3. East Range Site Cumulative Wetland Impacts Analysis Results 5.2-25

Table 5.2.6-1. Reasonably Foreseeable Future Actions within the Defined Study Areas 5.2-26

Table 5.2.6-2. West Range Site Cumulative Wildlife Habitat Impacts Analysis Results 5.2-28

Table 5.2.6-3. Total Habitat Impacts for Existing Conditions and Proportion Lost Due to Reasonably Foreseeable Future Actions within West Range Site Study Area 5.2-28
Table 5.2.6-4. Mesaba Energy Project Wildlife Habitat Impacts 5.2-29
Table 5.2.6-5. Minnesota Steel Industries Wildlife Habitat Impacts 5.2-29
Table 5.2.6-6. Nashwauk Gas Pipeline Wildlife Habitat Impacts 5.2-30
Table 5.2.6-7. Itasca County Highway 7 Realignment Wildlife Habitat Impact s 5.2-30
Table 5.2.6-8. Itasca County Railroad Wildlife Habitat Impacts 5.2-31
Table 5.2.6-9. Keetac Mine Expansion Wildlife Habitat Impacts 5.2-31
Table 5.2.6-10. East Range Site Cumulative Wildlife Habitat Impacts Analysis Results 5.2-33
Table 5.2.6-11. Total Habitat for Existing Conditions and Proportion Lost Due to Reasonably Foreseeable Future Actions within East Range Study Area 5.2-33
Table 5.2.6-12. Mesaba Energy Project Wildlife Habitat Impacts 5.2-34
Table 5.2.6-13. PolyMet Mining NorthMet Project Wildlife Habitat Impacts 5.2-34
Table 5.2.6-14. Mesabi Nugget Wildlife Habitat Impacts 5.2-35
Table 5.2.7-1. Grade Rail Crossing Delay Times 5.2-37
Table 5.3-1. Mitigation Measures for the Mesaba Energy Project 5.3-1
Table 5.3-2. Summary of CTB Mitigation Alternatives 5.3-6
Table 5.3-3. Water Source Supply Capacities 5.3-8
Table 5.3-4. Expected IGCC Power Station Discharges for the Base Case and Mitigation Alternative 1 and Applicable State Numerical Water Quality Standards 5.3-10
Table 5.3-5. Class I Visibility Supplementary Modeling Results – Offset Scenarios 5.3-18

LIST OF FIGURES

Figure S-1A. General Location Map 1
Figure S-1B. Potential Project Locations in Taconite Tax Relief Area 6
Figure S-2A. West Range Site 18
Figure S-2B. West Range Site and Corridors 19
Figure S-3A. East Range Site 23
Figure S-3. East Range Site and Corridors 24
Figure 1.1-1. General Location Map 1-2
Figure 1.5-1. The NEPA Process 1-10
Figure 1.5-2. Minnesota Power Plant Siting Process 1-12
Figure 2.1-1. West and East Range Sites in Taconite Tax Relief Area 2-5
Figure 2.1-2. West Range Site and Corridors 2-9
Figure 2.1-3. East Range Site and Corridors 2-10
Figure 2.2-1. Process Block Diagram, Mesaba Energy Project 2-16
Figure 2.2-2. E-Gas™ Process for IGCC Power Generation 2-17
Figure 2.2-3. Feedstock Grinding and Slurry Preparation 2-18
Figure 2.2-4. Gasification and Slag Handling 2-19
Figure 2.2-5. Particulate Matter Removal 2-21
Figure 2.2-6. Syngas Scrubbing 2-22
Figure 2.2-7. Acid Gas Removal and Mercury Removal 2-23
Figure 2.2-8. Sulfur Recovery Unit 2-25
Figure 2.2-9. Sour Water Treatment System 2-28
Figure 2.2-10. Water Balance Diagram Applicable to Phases I & II 2-43
Figure 2.3-1. West Range Plant Site 2-59
Figure 2.3-2. West Range Rail and Road Alternatives 2-62
Figure 2.3-3. West Range Water Sources and Discharges 2-71
Figure 2.3-4. West Range Natural Gas Pipeline and HVTL Alternatives 2-74
Figure 2.3-5. East Range Plant Site 2-78
Figure 2.3-5. East Range Plant Site 2-78
Figure 2.3-6. East Range Rail and Road Alternatives 2-80
Figure 2.3-7. East Range Water Sources and Discharges 2-84
Figure 2.3-8. East Range Natural Gas Pipeline and HVTL Alternatives 2-88
Figure 3.2-1. View of the Canisteo Mine Pit and Tailings Pile Looking North 3.2-2
Figure 3.2-2. View from the Lind Mine Pit Tailings Pile Looking East 3.2-2

Figure 3.2-3. View of West Range Site Looking North along HVTL (45L) 3.2-3
Figure 3.2-4. View of CR 7 Near West Range Site Looking North 3.2-4
Figure 3.2-5. View of Diamond Lake Road Near Potential Rail Crossing 3.2-4
Figure 3.2-6. Receptors along the West Range Corridor 3.2-5
Figure 3.2-7. Receptors near the West Range Power Plant 3.2-6
Figure 3.2-8. View of East Range Site from Tailings Pile Looking East 3.2-7
Figure 3.2-9. Receptors along the East Range Corridor 3.2-9
Figure 3.2-10. Receptors near the East Range Power Plant 3.2-10
Figure 3.2-11. State Parks and Other Public Lands in Minnesota 3.2-11
Figure 3.2-12. View of Syl Laskin Energy Center from Birch Cove Park Looking North 3.2-12
Figure 3.3-1. Wind Rose Data at Hibbing, Minnesota 3.3-2
Figure 3.4-1. West Range Site Bedrock Geology 3.4-3
Figure 3.4-2. West Range Corridor Depth to Bedrock 3.4-6
Figure 3.4-3. East Range Site Bedrock Geology 3.4-8
Figure 3.4-4. East Range Corridor Depth to Bedrock 3.4-9
Figure 3.4-5. Mining Disturbances in the Vicinity of the West Range 3.4-11
Figure 3.4-6. Mining Disturbances in the Vicinity of the East Range 3.4-12
Figure 3.4-7. West Range Location of Prime Farmland Soils 3.4-19
Figure 3.5-1. West Range Drainage Features 3.5-3
Figure 3.5-2. West Range Receiving Waters 3.5-4
Figure 3.5-3. East Range Drainage Features 3.5-15
Figure 3.5-4. East Range Process Water Sources 3.5-16
Figure 3.6-1. West Range Corridor FEMA Floodplains 3.6-3
Figure 3.6-2. East Range Corridor FEMA Floodplains 3.6-4
Figure 3.7-1A. Wetlands at West Range Site 3.7-6
Figure 3.7-1B. Wetlands along West Range Corridors 3.7-7
Figure 3.7-2A. Wetlands at East Range Site 3.7-8
Figure 3.7-2B. Wetlands along East Range Corridors 3.7-9
Figure 3.10-1. West Range Site Land Use/Land Cover 3.10-3
Figure 3.10-3. East Range Site Land Use/Land Cover 3.10-6
Figure 3.10-4. East Range Corridor Land Use/Land Cover 3.10-7
Figure 3.11-1. Arrowhead Region 3.11-1
Figure 3.11-2. Census Tract 9810 in Itasca County 3.11-3
Figure 3.11-3. Hoyt Lakes (Census Tract 140) in St. Louis County 3.11-4
Figure 3.11-4. Annual Unemployment Rate (Percent), Arrowhead Region vs. Statewide Average 3.11-7

Figure 3.14-1. Minnesota Transmission Lines, Northeast Planning Zone 3.14-4
Figure 3.14-2. West Range Existing Utilities 3.14-5
Figure 3.14-3. East Range Existing Utilities 3.14-6
Figure 3.15-1. BNSF and CN Rail Lines in Vicinity of Project Sites (BNSF, 2005) 3.15-7
Figure 3.15-2. At-Grade Rail Crossings near the West Range 3.15-9
Figure 3.15-3. At-Grade Rail Crossings near the East Range 3.15-11
Figure 3.17-1. Number of Vehicles, Drivers, and Fatalities in Minnesota from 1962-2005 ..... 3.17-2
Figure 4.2-1. Predicted Visibility Impact Areas for the West Range Site and Corridors 4.2-10
Figure 4.2-2. Predicted Visibility Impact Areas for the East Range Site and Corridors 4.2-16
Figure 4.5-1. Conceptual Diagram for ZLD Unit for Treatment of Non-Contact Water (Granherne, 2009) (added for Final EIS) 4.5-4
Figure 4.5-2. Water Intake Structures, Conceptual Designs (angle well intake option added in Final EIS) 4.5-6
Figure 4.5-3. Phase I Water Balance: West Range IGCC Power Station (revised in Final EIS) 4.5-11
Figure 4.5-4. Phase I and II Water Balance: West Range IGCC Power Station (revised in Final EIS) 4.5-12
Figure 4.5-5. Temperature Profiles for the Canisteo Mine Pit Using 2006 Data (Barr, 2008b) 4.5-21
Figure 4.7-1. West Range Eggers and Reed Wetland Classifications 4.7-6
Figure 4.7-2. East Range Eggers and Reed Wetland Classifications 4.7-26
Figure 4.9-1. Archaeological Model for West Range Corridor 4.9-4
Figure 4.9-2. Archaeological Model for East Range Corridor 4.9-7
Figure 4.11-1. View of Syl Laskin Plant from Residences on Colby Lake 4.11-10
Figure 4.14-1. Typical Cross Section, Natural Gas Pipeline Open Trench Installation 4.14-3
Figure 4.17-1. West Range, EMF for 230-kV – 2 Circuit Vertical Configuration 4.17-14
Figure 4.17-2. West Range, EMF for 345-kV – 1 Circuit Delta Configuration 4.17-15
Figure 4.17-3. East Range, EMF for 345-kV – Vertical Configuration Bundle with 115-kV - Vertical Configuration Rail 4.17-16
Figure 4.18-1. MINNOISE L_{10} Virtual Receptor Locations for West Range Site (HDR, 2009) 4.18-18
Figure 5-1.2-1. Potential Pipeline Routes from the Mesaba Energy Project to EOR Fields 5.1-6
Figure 5-1.2-2. Potential Pipeline Route to the Lower Cretaceous Saline Formation 5.1-8

INTENTIONALLY LEFT BLANK

ACRONYMS AND GLOSSARY

Acronym or Term	Definition
7Q10	seven-day low flow average with a 10-year recurrence interval
A/m	Amperes per meter
AADT	annual average daily traffic
AC	alternating-current
ACHP	**Advisory Council on Historic Preservation**
ADT	average daily traffic
AERA	Air Emission Risk Assessment
AERMOD	AMS/EPA Regulatory MODel (an air dispersion model)
aerodynamic diameter	A term used to describe particles with common aerodynamic properties, which avoids the complications associated with varying particle sizes, shapes, and densities. For example, PM_{10} is defined in 40 CFR Part 50 as consisting of particles 10 micrometers or less in aerodynamic diameter, meaning particles that behave aerodynamically like spherical particles of unit density (1 gram per cubic centimeter) having diameters of 10 micrometers or less.
aerosol	A suspension of fine solid or liquid particles in a gas.
AGR	acid gas removal
air dispersion model	A computer program that incorporates a series of mathematical equations used to predict downwind concentrations in the ambient air resulting from emissions of a pollutant. Inputs to a dispersion model include the emission rate; characteristics of the emission release such as stack height, exhaust temperature, and flow rate; and atmospheric dispersion parameters such as wind speed and direction, air temperature, atmospheric stability, and height of the mixed layer.
air quality	The cleanliness of the air as measured by the levels of pollutants relative to standards or guideline levels established to protect human health and welfare. Air quality is often expressed in terms of the pollutant for which concentrations are the highest percentage of a standard (e.g., air quality may be unacceptable if the level of one pollutant is 150% of its standard, even if levels of other pollutants are well below their respective standards).
alignment	The location of a rail line in a corridor.
alluvium	A general term for the sedimentary material deposited by flowing water.
AMP	Arcturus Mine Pit
anthracite	The hardest type of coal, characteristically black in color, lustrous, with a conchoidal fracture (smoothly curved, irregular breakage surface). Anthracite coal consists of 92-98% carbon and less than 8% volatile constituents by weight.
anticline	A geologic fold that is arch-like in form, with rock layers dipping outward from both sides of the axis, and older rocks in the core. The opposite of syncline.
APE	area of potential effect
AQRV	air quality related value

Acronym or Term	Definition
aquifer	A subsurface saturated rock unit (formation, group of formations, or part of a formation) of sufficient permeability to transmit groundwater and yield usable quantities of water to wells and springs.
area of potential effect (APE)	The geographic region that may be impacted as a result of the construction and operation of the Proposed Action or alternatives.
AREMA	American Railway Engineering and Maintenance of Way Association
artesian	Groundwater conditions in which water in wells rises above its level in the aquifer, including conditions in which groundwater rises to the ground surface or above.
ash	The mineral content of a product remaining after complete combustion.
ASU	air separation unit
attainment	Air quality in the locality that meets the established standards.
BA	**biological assessment**
BACT	best available control technology
baghouse	An air pollution control device that filters particulate emissions, consisting of a bank of bags that function like a vacuum cleaner bag to intercept particles that are mostly larger than 10 micrometers in aerodynamic diameter.
BART	best available retrofit technology
base level	The level below which a stream cannot erode its valley further.
batholith	The largest pluton form, defined as an irregular-shaped mass with a surface exposure greater than 100 square kilometers that has invaded layers of crustal rocks.
BBER	Bureau of Business and Economic Research
BCC	bioaccumulative chemical of concern
bedrock	The rock of Earth's crust that is below the soil and largely unweathered.
beneficiation	The process of washing or otherwise cleaning coal to increase the energy content by reducing the ash content.
berm	A mound or wall of earth.
bgs	below ground surface
biocide	A substance (e.g., chlorine) that is toxic or lethal to many organisms and is used to treat water.
BLM	Bureau of Land Management
blowdown	The portion of steam or water removed from a boiler at regular intervals to prevent excessive accumulation of dissolved and suspended materials.
BMP	best management practice
BNSF	Burlington Northern/Santa Fe (Railway Company)
BOD	biochemical oxygen demand
bottom ash	Combustion residue composed of large particles that settle to the bottom of a combustor from where they can be physically removed.
brackish	Water that has high concentrations of salts (typically 1,000 to 10,000 parts per million of dissolved solids), but that may still be suitable for some uses.
brine	Water saturated with salt.
Btu	British thermal unit

Acronym or Term	Definition
building downwash	The downward movement of an elevated plume toward the area of low pressure created on the lee side of a structure in the wake around which the air flows.
BWCAW	Boundary Waters Canoe Area Wilderness
CAA	Clean Air Act
CAIR	Clean Air Interstate Rule
CAM	Compliance Assurance Monitoring
CAMR	Clean Air Mercury Rule
capacity factor	The percentage of energy output during a period of time, compared to the energy that would have been produced if the equipment operated at its maximum power throughout the period.
CapX2020	Capital Expansion by the year 2020
carcinogenic	Capable of producing or inducing cancer.
CBT	Coleraine – Bovey – Taconite
CCPI	Clean Coal Power Initiative
CCS	carbon capture and sequestration
CCT	clean coal technology
CDT	Central Daylight Time
CE	Cliffs-Erie, LLC
census tract	A small, relatively permanent statistical subdivision of a county. Census tracts, which average about 4,000 inhabitants, are designed to be relatively homogeneous units with respect to population characteristics, economic status, and living conditions.
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
CH_4	methane
CL	centerline
Class I area	Under the Clean Air Act, a Class I area is one in which visibility is protected more stringently than under the national ambient air quality standards, with only a small increase in pollution allowed. Class I areas include national parks, wilderness areas, monuments, and other areas of special national and cultural significance.
Class II area	Under the Clean Air Act, Class II areas are all other clean air regions not designated Class I areas, with moderate pollution increases allowed. See **Class I area**.
CLOMR	conditional letter of map revision
CMP	Canisteo Mine Pit
CN	Canadian National (Railway Company)
CO	carbon monoxide
CO_2	carbon dioxide
coal gasification	A process that converts coal into a gaseous product, which involves crushing coal into a powder and heating the powder in the presence of steam and oxygen. After impurities (e.g., sulfur) are removed, the gas can be used as a fuel or further processed and concentrated into a chemical or liquid fuel.

Acronym or Term	Definition
COC	cycles of concentration
cold box	An air separation cryogenic unit contained in the air separation unit (ASU).
Combined-cycle electric power plant	A power plant that uses both a steam turbine generator and a combustion turbine generator at one location to produce electricity.
combustor	Equipment in which coal or other fuel is burned at high temperatures.
confined aquifer	An aquifer that is bounded by two confining units, and in which the water level in wells usually rises above the top of the aquifer.
confining unit	A geologic formation or bed that has lower permeability than layers above and below it, and therefore restricts vertical water movement. (Confining units are also called aquitards.)
contaminant	A substance that contaminates (pollutes) air, soil, or water. It may also be a hazardous substance that does not occur naturally or that occurs at levels greater than those that occur naturally in the surrounding environment.
contamination	The intrusion of undesirable elements (unwanted physical, chemical, biological, or radiological substances; or matter that has an adverse effect) to air, water, or land.
cooling tower	A structure that cools heated condenser water by circulating the water along a series of louvers and baffles through which cool, outside air convects naturally or is forced by large fans.
cooling water	Water that is heated as a result of being used to cool steam and condense it to water.
COS	carbonyl sulfide
CR	County Road
Cr^{+3}	**trivalent chromium**
Cr^{+6}	**hexavalent chromium**
craton	Ancient crystalline rock that has generally been eroded to a low elevation and relief, forming the stable center of a continent.
CSAH	County State Aid Highway
CTB	cooling tower blowdown
CTG	combustion turbine generator
culm	Coal waste that consists of rock and coal with varying amounts of carbon material remaining after removal of higher-quality saleable coal.
culm bank	A pile or other deposit of culm on the land surface. See **culm**.
CWA	Clean Water Act
D.A.R.E.	Drug Abuse Resistance Education
DAT	deposition analysis threshold
dB	decibel
dBA	decibels as measured on the A-weighted scale
DC	direct current
decibel (dB)	A unit for expressing the relative intensity of sounds on a logarithmic scale from zero for the average least perceptible sound to about 130 for the average level at which sound causes pain to humans.
DMIR	Duluth, Missabe, and Iron Range (Railway Company)
DO	dissolved oxygen

Acronym or Term	Definition
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
drawdown	The process by which the water table adjacent to a well is drawn down after active pumping from an aquifer.
dredged material	Material that is dredged or excavated from waters of the United States, including wetlands.
EAW	Environmental Assessment Worksheet
ECS	Ecological Classification System
EERC	Energy and Environmental Research Center
EERE	Energy Efficiency and Renewable Energy
EGU	electric generating unit
EIS	Environmental Impact Statement
electrostatic precipitator	A device that removes particles from a stream of exhaust gas. It imparts an electrical charge to the particles, which causes them to adhere to metal plates that can be rapped to cause the particles to fall into a hopper for disposal.
EMF	electromagnetic field
eminent domain	The right of a government to appropriate private property for public use upon payment of its fair market value to the owner.
EMT	Emergency Medical Technician
endangered species	A species that is in danger of extinction throughout all or a significant part of its range; a formal listing of the U.S. Fish and Wildlife Service under the Endangered Species Act.
environmental justice	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. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic groups, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of Federal, state, local, and tribal programs and policies. Executive Order 12898 directs Federal agencies to make achieving environmental justice part of their missions by identifying and addressing disproportionately high and adverse effects of agency programs, policies, and activities on minority and low-income populations.
EOR	enhanced oil recovery
EPA	U.S. Environmental Protection Agency
EPAct	Energy Policy Act
epicenter	Area on the earth's surface directly above the focus of an earthquake.
EQB	Environmental Quality Board
ERER	equivalent risk emission rate
evapotranspiration	The amount of water removed from a land area by the combination of direct evaporation and plant transpiration.
EVM	Eveleth-Virginia Municipal Airport
FAA	Federal Aviation Administration
FAC	facultative plant species
FACU	facultative upland plant species

Acronym or Term	Definition
FACW	facultative wetland plant species
fault	A fracture or fracture zone in rock along which the sides have been displaced vertically or horizontally relative to one another.
FEED	Front-End Engineering and Design
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FHWA	Federal Highway Administration
fill material	Material used for the primary purpose of replacing an aquatic or wetland area with dry land, or changing the bottom elevation of a waterway.
FIRM	Flood Insurance Rate Map
Fischer-Tropsch (F-T) synthesis	A process that uses a metal-containing catalyst to convert a mixture of carbon monoxide and hydrogen (known as synthesis gas) into a mixture of carbon dioxide, water, and aliphatic compounds (organic hydrocarbon compounds joined in straight or branched chains), which are used to produce liquid fuels.
FLAG	Federal Land Managers' Air Quality Related Values Work Group
FLM	Federal Land Manager
floodplain	The strip of relatively level land adjacent to a river channel that becomes covered with water if the river overflows its banks.
flue gas	Residual gases after combustion that are vented to the atmosphere through a flue or chimney.
flux	A material (e.g., limestone) that is added to a substance to lower the melting temperature of the substance and promote fluidity.
fly ash	Combustion residue composed of fine particles (e.g., soot) that are entrained with the draft leaving the combustor.
formation	The primary unit associated with formal geological mapping of an area. Formations possess distinctive geological features and can be combined into "groups" or subdivided into "members."
FR	Federal Register
FRA	Federal Railroad Administration
freshwater	Water with a low concentration of salts (typically less than 1,000 parts per million of dissolved solids).
fuel flexible	The ability of a generating station to operate at or near maximum capacity using various fuels or blends of fuels. This allows the station to adapt its fuel mix over the life of the facility thereby minimizing the cost of power.
fugitive dust	Particulate matter composed of soil; can include emissions from haul roads, wind erosion of exposed surfaces, and other activities in which soil is removed and redistributed.
fugitive emissions	Emissions released directly into the atmosphere that could not reasonably pass through a stack, chimney, vent, or other functionally equivalent opening.
FY	fiscal year
G	Gauss
GACT	generally available control technology
Gaussian	Concentrations of pollutants downwind of a source are assumed to form a normal distribution (i.e., bell-shaped curve) from the centerline of the plume in the vertical and lateral directions.

Acronym or Term	Definition
GEP	good engineering practice
GIS	Geographic Information Systems
glacial till	Direct glacial deposits that are unsorted and unstratified.
GLG	Great Lakes Gas (Transmission Company)
GLTZ	Great Lakes Tectonic Zone
GMMP	Gross-Marble Mine Pit
gpd	gallons per day
gpm	gallons per minute
GPS	Global Positioning System
groundwater	Water contained in pores or fractures, in either the unsaturated zone or saturated zone, below ground level.
GTG	Gas Turbine Generator
H_2	hydrogen
H_2O	water
H_2S	hydrogen sulfide
HAMP	Hill-Annex Mine Pit
HAP	hazardous air pollutant
hazardous air pollutant (HAP)	Air pollutants that are not covered by ambient air quality standards, but may present a threat of adverse human health effects or adverse environmental effects, and are specifically listed on the Federal list of 189 hazardous air pollutants in 40 CFR 61.01.
hazardous waste	A category of waste regulated under the Resource Conservation and Recovery Act (RCRA). To be considered hazardous, a waste must be a solid waste under RCRA and must exhibit at least one of four characteristics described in 40 CFR 261.20 through 40 CFR 261.24 (i.e., ignitability, corrosivity, reactivity, or toxicity) or be specifically listed by the Environmental Protection Agency in 40 CFR 261.31 through 40 CFR 261.33.
Henshaw Effect	The interaction of electric fields from power lines with electrical charges on airborne particles, resulting in an increased charge on the particles. This phenomenon may indirectly affect health by increasing the likelihood of inhaled particles that would be deposited on the surface of the lungs and airways, even at considerable distances from the power line. One study found a possible link between the Henshaw Effect and elevated rates of childhood leukemia.
Hg	mercury
HHRAP	Human Health Risk Assessment Protocol
HRSG	heat recovery steam generator
HVTL	high voltage transmission line
hydrology	(1) The study of water characteristics, especially the movement of water. (2) The study of water, involving aspects of geology, oceanography, and meteorology.
hydrotest	hydrostatic pressure-testing
Hz	Hertz
I/I	inflow and infiltration

Acronym or Term	Definition
IGCC	integrated gasification combined cycle; A process that uses synthesis gas derived from coal to drive a gas combustion turbine and exhaust gas from the gas turbine to generate steam from water to drive a steam turbine.
igneous	(1) A type of rock formed from a molten, or partially molten, material. (2) An activity related to the formation and movement of molten rock either in the subsurface (plutonic) or on the surface (volcanic).
IMPROVE	Interagency Monitoring of Protected Visual Environments
infiltration	The process of water entering the soil at the ground surface and the ensuing movement downward. Infiltration becomes percolation when water has moved below the depth at which it can return to the atmosphere by evaporation or evapotranspiration.
IPCC	**Intergovernmental Panel on Climate Change**
IRAP	Industrial Risk Assessment Program
IRNP	Isle Royale National Park
kV	kilovolt
kW	kilowatt
L_{10}	sound pressure level exceeded 10 percent of the time
lacustrine deposit	Deposit associated with lake-level fluctuations.
laydown area	Material and equipment storage area during the construction phase of a project.
L_{dn}	day-night equivalent sound level
leachate	Solution or product obtained by leaching, in which a substance is dissolved by the action of a percolating liquid.
LEDPA	**least environmentally damaging practicable alternative**
LEPGP	large electric power generating plant
L_{eq}	continuous equivalent sound level
LGPO	**Loan Guarantee Program Office**
LGU	local government unit
liquefaction	The process of transforming a gas into a liquid.
lithic scatters	Concentrations of waste flakes resulting from the manufacture of stone tools.
LLC	Limited Liability Company
L_{max}	highest sound pressure level measured
L_{min}	lowest sound pressure level measured
LMP	Lind Mine Pit
loam	A soil composed of a mixture of clay, silt, sand, and organic matter.
LOS	level of service
L_p	sound pressure level
L_w	sound power level
MAAQS	Minnesota Ambient Air Quality Standards
MACT	maximum achievable control technology

Acronym or Term	Definition
magnitude (of an earthquake)	A quantity that is characteristic of the total energy released by an earthquake. Magnitude is determined by taking the common logarithm of the largest ground motion recorded on a seismograph during the arrival of a seismic wave type and applying a standard correction factor for distance to the epicenter. A one-unit increase in magnitude (e.g., from magnitude 6 to magnitude 7) represents a 30-fold increase in the amount of energy released.
makeup pond	Pond used to store makeup for cooling water.
maximum contaminant level goal (MCLG)	The maximum concentration of a substance in drinking water at which there is no known or anticipated adverse effect on human health, and which allows an adequate margin of safety, as determined by the U.S. Environmental Protection Agency.
MBTA	Migratory Bird Treaty Act
MCBS	Minnesota County Biological Survey
MCCAG	**Minnesota Climate Change Advisory Group**
MD	mining district; An area usually designated by name with described or understood boundaries where minerals are found and mined under rules prescribed by the miners, consistent with the General Mining Law of 1872.
MDEA	methyl-diethanolamine
MDH	Minnesota Department of Health
MDOA	Minnesota Department of Administration
MDOC	Minnesota Department of Commerce
MEPA	Minnesota Environmental Policy Act
metamorphic rocks	Rocks that have undergone chemical or structural changes produced by an increase in heat and temperature or by replacement of elements by hot, chemically active fluids.
mG	milligauss
Minority population	A community in which the percent of the population of a racial or ethnic minority is 10 points higher than the percent found in the population as a whole.
MISO	Midwest Independent System Operator
mixing height	The height in the lower atmosphere within which relatively vigorous mixing of pollutant emissions occurs.
MMBtu	Million British thermal units
Mn/DOT	Minnesota Department of Transportation
MNDNR	Minnesota Department of Natural Resources
MOA	**Memorandum of Agreement**
moraine	Glacial deposits of unsorted and unstratified material.
MP	Minnesota Power (Company)
MPCA	Minnesota Pollution Control Agency
mph	miles per hour
MSDC	Minnesota State Demographic Center
MSI	Minnesota Steel Industries**, now known as Essar Steel Minnesota**
msl	mean sea level
MSW	municipal solid waste

Acronym or Term	Definition
MVR	mechanical vapor recompression
MW	megawatt
MWe	megawatt electricity
N	nitrogen
N_2	nitrogen gas
NAAQS	National Ambient Air Quality Standards
NAC	noise abatement criteria
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Council
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NETL	National Energy Technology Laboratory
new source performance standards (NSPS)	Regulation under Section 111 of the Clean Air Act enforcing stringent emission standards for power plants constructed on or after January 30, 2004.
NH_3	ammonia
NHIS	National Heritage Information System
NI	no indicator
NIEHS	National Institute of Environmental Health Sciences
NIOSH	National Industrial and Occupational Safety and Health
NIR	non-ionizing radiation
NNG	Northern Natural Gas (Company)
NOI	Notice of Intent
noise	Any sound that is undesirable because it interferes with speech and hearing; if intense enough, it can damage hearing.
NO_x	Nitrogen oxides including NO, NO_2, N_2O, N_2O_3, N_2O_4, and N_2O_5
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NPUC	Nashwauk Public Utilities Commission
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NRPB	National Radiological Protection Board
NSPS	New Source Performance Standards
NWI	National Wetlands Inventory
O&M	operation and maintenance
O_2	oxygen
O_3	ozone
OBL	obligate wetland plant species
OPS	Office of Pipeline Safety
OSHA	Occupational Safety and Health Administration
PA	**Programmatic Agreement**
parent material	The unconsolidated material, from both organic and mineral sources, that is the basis of soil development.

Acronym or Term	Definition
particulate matter	Fine liquid or solid particles such as dust, smoke, mist, fumes, or smog, found in air or emissions.
Pb	lead
PCBs	polychlorinated biphenyls
petroleum coke	A high-sulfur, high-energy product having the appearance of coal, which is produced by oil refineries by heating and removing volatile organic compounds (VOCs) from the residue remaining after the refining process.
pH	A measure of the relative acidity or alkalinity of a solution, expressed on a scale from 0 to 14, with the neutral point at 7. Acid solutions have pH values lower than 7, and basic (i.e., alkaline) solutions have pH values higher than 7.
plume (atmospheric)	A visible or measurable elongated pattern of emissions spreading downwind from a source through the atmosphere.
pluton	A general term for any intrusive igneous rock body.
PM	particulate matter
PM_{10}	particulate matter having an aerodynamic diameter less than 10 microns
POI	point of interconnection
potentiometric surface	Imaginary surface defined by the elevations to which the groundwater in an aquifer would rise in wells completed in the aquifer.
POTW	Publicly Owned Treatment Works
POV	**personally owned vehicle**
ppm	parts per million
ppmvd	parts per million, volumetric dry
PRB	Powder River Basin
PRIME	Plume Rise Model Enhancements
prime farmland	Land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and without intolerable soil erosion.
Proposed Action	The activity proposed to accomplish a Federal agency's purpose and need. An EIS analyzes the environmental impacts of the Proposed Action. A proposed action includes the project and its related support activities (preconstruction, construction, and operation, along with post-operational requirements).
PSD	Prevention of Significant Deterioration
PUC	Public Utilities Commission
PWI	Protected Waters Inventory
PWL	sound power level
RACT	reasonable available control technology
RASS	Risk Assessment Screening Spreadsheet
RCRA	Resource Conservation and Recovery Act
recharge	The movement of water from an unsaturated zone to a saturated zone.
reference concentrations	Estimates of continuous inhalation exposure to human population (including sensitive subgroups) that are likely to be without an appreciable risk of deleterious effects during a lifetime.
region of influence (ROI)	The physical area that bounds the environmental, sociologic, economic, or cultural features of interest for the purpose of analysis.

Acronym or Term	Definition
RGGS	RGGS Land & Minerals, LTD., L.P.
Richter scale	A measure of earthquake magnitude developed by Charles Richter.
riparian	Of, on, or pertaining to the bank of a river or stream, or of a pond or small lake.
RLW	Rainbow Lakes Wilderness Area
RO	reverse osmosis
ROD	Record of Decision
ROW	right-of-way
S	sulfur
safe yield	The maximum quantity of water that can be withdrawn continuously from a surface water or groundwater source during a 50-year (or greater) drought without ultimate depletion of the source (considering intrusion of undesirable – quality water, interference with other existing water sources, downstream flow requirements, and other factors).
saline	Describes water with high concentrations of salts (typically more than 10,000 parts per million dissolved solids), making it unsuitable for use.
scf	Standard cubic foot
SCORE	Governor's Select Committee on Recycling and the Environment
scrubber	Chemical or physical devices, also known as flue gas desulfurization systems, that remove sulfur compounds formed during coal combustion by combining the sulfur in gaseous emissions with another chemical medium to form inert sludge, which is removed for disposal.
SEC	sediment and erosion control
secondary drinking water standards	Non-enforceable Federal guidelines regarding cosmetic effects (e.g., tooth or skin discoloration) or aesthetic effects (e.g., taste, odor, or color) of drinking water.
sedimentary rocks	Rocks formed by the accumulation of sediment in water or from air. Sandstone, chert, limestone, dolomite, shale, siltstone, and mudstone are types of sedimentary rocks identified in the EIS. They are differentiated by chemistry and texture.
SEH	Short Elliott Hendrickson, Inc.
seismic	Pertaining to, characteristic of, or produced by earthquakes or earth vibrations.
seismicity	A seismic event or activity such as an earthquake or earth tremor; seismic action.
selective catalytic reduction	A system to reduce NO_x emissions by injecting a reagent, such as ammonia, into exhaust gas to convert NO_x emissions to nitrogen gas and water via a chemical reduction reaction.
sensitive receptor	As used in this EIS, it is any specific resource (i.e., population or facility) that would be more susceptible to the effects of the impact of implementing the proposed action than would otherwise be.
SGCN	**Species in Greatest Conservation Need**
SHPO	State Historic Preservation Office
SIL	Significant impact level; used at the screening level to determine whether a more refined modeling is required to evaluate impacts.
SIP	State Implementation Plan

Acronym or Term	Definition
slag	Molten inorganic material collected at the bottom of a combustor and discharged into a water-filled compartment where it is quenched and removed as glassy particles resembling sand.
slickens	Mine tailings left over from the taconite concentration process. This material is in basins having containment dikes constructed from mine overburden.
sludge	A semi-solid residue containing a mixture of solid waste material and water from air or water treatment processes.
slurry	A watery mixture or suspension of fine solids, not thick enough to consolidate as a sludge.
SO_2	sulfur dioxide
sound pressure	The physical force from a sound wave that affects the human ear, typically discussed in terms of decibels (dB).
sour water	Water with dissolved sulfur compounds and other contaminants condensed from synthesis gas (syngas).
SPCC	Spill Prevention, Control, and Countermeasures
specific yield	The volume of water released from storage in a unit area of an unconfined aquifer per unit decline in the water table. Values are dimensionless (corresponding, for example, to cubic feet of water per square foot of aquifer per foot of water table decline) and typically are between 0.01 and 0.3. In physical terms, the specific yield can be understood as the fraction of the aquifer volume that consists of drainable void space.
SPL	sound pressure level
spring	A location on the land surface or the bed of a surface water body where groundwater emerges from rock or soil without artificial assistance.
SR	State Route
SRU	sulfur recovery unit
steam-stripping	A two-step process in which dissolved gases (CO_2, NH_3, H_2S) and other trace contamination are removed from sour water.
STG	steam turbine generator
sub-bituminous	A type of coal, which is used primarily as fuel for electrical power generation, whose properties range between those of lignite and those of bituminous coal. At the lower end of the range it may be dull, dark brown to black, soft, and crumbly. At the higher end of the range it may be bright, jet black, hard, and relatively strong. Sub-bituminous coal contains 20 to 30% moisture by weight. Heating value varies from 7,000 Btu/lb to slightly over 9,000 Btu/lb.
SWANCC	Solid Waste Agency of Northern Cook County
SWPPP	Storm Water Pollution Prevention Plan
syncline	A geologic fold in which the rock layers dip inward from both sides toward the axis, with younger rocks in the core. The opposite of anticline.
syngas	synthesis gas
synthesis gas (syngas)	A mixture of gases produced as feedstock, especially as a fuel produced by controlled combustion of coal in the presence of water vapor.

Acronym or Term	Definition
tailings pond	An outside water-filled enclosure that receives discharges of wastewater containing solid residues from processing of minerals. The solid residues settle due to gravity and separate from the water.
TDS	total dissolved solids
TH	Trunk Highway
THPO	Tribal Historic Preservation Office
threatened species	A species that is likely to become an endangered species within the foreseeable future throughout all or a significant part of its range.
TMDL	total maximum daily load
TP	total phosphorous
tpd	tons per day
tpy	tons per year
transmission corridor	Area used to provide separation between the transmission lines and the general public and to provide access to the transmission lines for construction and maintenance.
TSP	total suspended particulate matter
TSS	total suspended solids
TTRA	Taconite Tax Relief Area
TVB	tank vent boiler
UIC	**Underground Injection Control (5.1)**
UP	Union Pacific/Wisconsin Central (Railway Company)
UPL	obligate upland plant species
US	U.S. Highway
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USDI	U.S. Department of the Interior
USFWS	U.S. Fish and Wildlife Service
USGCRP	**U.S. Global Change Research Program**
USGS	U.S. Geological Survey
V/m	Volts per meter
viewshed	A non-managed area with aesthetic value.
VIP	Value Improving Practices
VNP	Voyageurs National Park
VOC	volatile organic compound
water table	(1) The upper limit of the saturated zone (the portion of the ground wholly saturated with water). (2) The upper surface of a zone of saturation above which the majority of pore spaces and fractures are less than 100 percent saturated with water most of the time (unsaturated zone) and below which the opposite is true (saturated zone).
WCA	Wetland Conservation Act

Acronym or Term	Definition
wetlands	Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas.
WHO	**World Health Organization**
wind rose	A graph in which the frequency of wind blowing from each direction is plotted as a bar that extends from the center of the diagram. Wind speeds are denoted by bar widths and shading; the frequency of wind speed within each wind direction is depicted according to the length of that section of the bar.
WWTF	wastewater treatment facility
WWTP	wastewater treatment plant
ZLD	zero liquid discharge

INTENTIONALLY LEFT BLANK

SUMMARY

The U.S. Department of Energy (DOE) has prepared this Environmental Impact Statement (EIS) in cooperation with the Minnesota Department of Commerce (MDOC) to evaluate the potential environmental impacts of the Mesaba Energy Project. The project **would demonstrate the commercial-readiness of the ConocoPhillips E-Gas™ gasification technology in a fully integrated and quintessential Integrated Gasification Combined Cycle (IGCC) utility-scale application. The project proponent intends to demonstrate this particular IGCC technology at** a two-phased nominal **600** megawatt electricity ($MWe_{(net)}$) per phase **(1,200** $MWe_{(net)}$ total) generating station proposed to be located in northeastern Minnesota (Figure S-1). This EIS has been prepared in compliance with the National Environmental Policy Act (NEPA) of 1969 as amended (42 USC 4321 et seq.) and the Minnesota Power Plant Siting Act (Minnesota Statutes § 216E.001-.18).

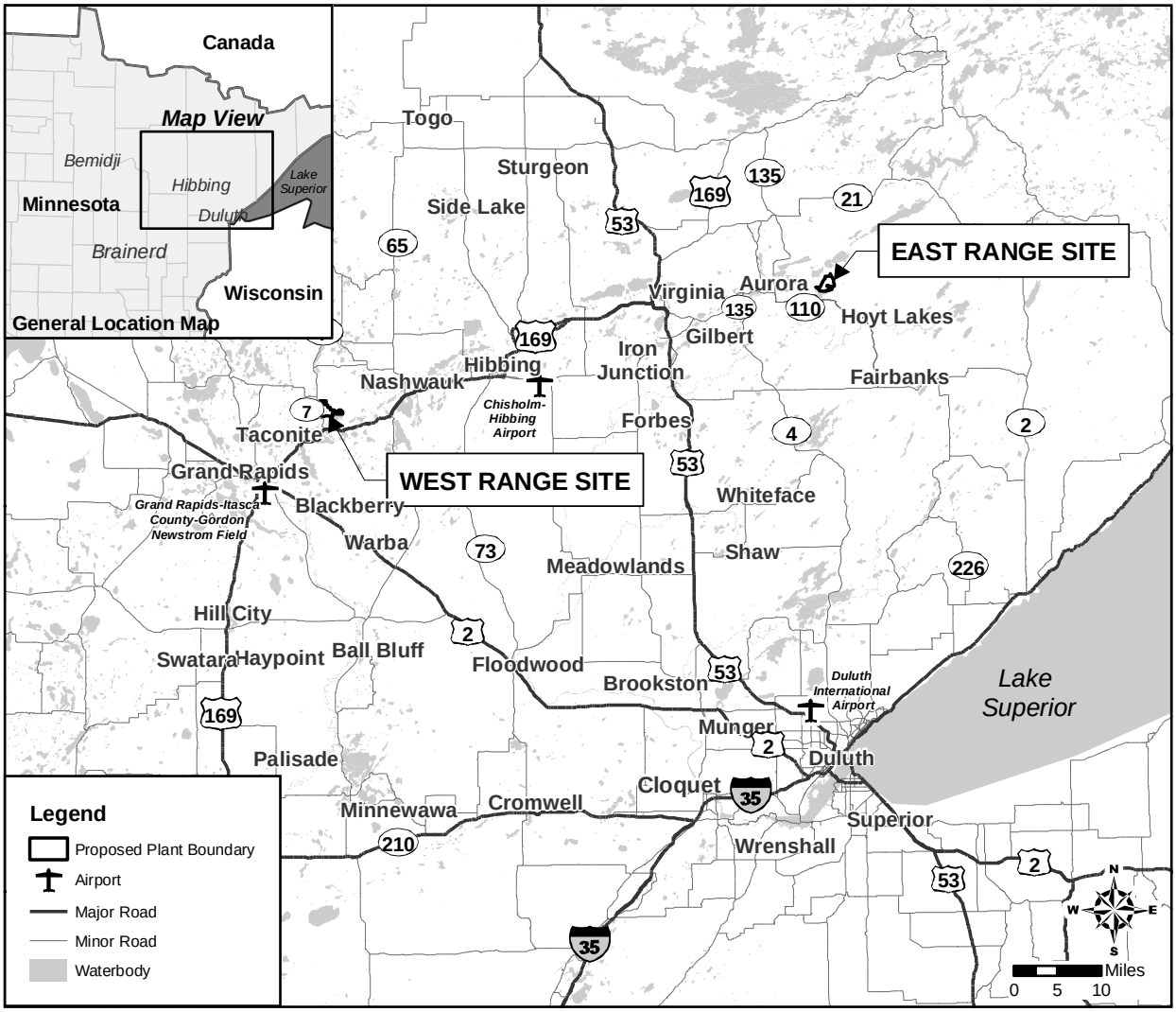


Figure S-1A. General Location Map

DOE is the lead Federal agency for this EIS; MDOC is the lead state agency. Both the U.S. Army Corps of Engineers (USACE) (St. Paul District, Brainerd Office) and the U.S. Department of Agriculture (USDA) Forest Service (Superior National Forest, Laurentian District) have participated as cooperating agencies. USACE agreed to be a cooperating agency because the placement of dredged or fill material in waters of the U.S., including wetlands, associated with the **proposed project** would require its authorization pursuant to Section 404 of the Clean Water Act (CWA). **The USDA Forest Service agreed to be a cooperating agency because, as a Federal Land Manager, the Forest Service has a responsibility to protect air quality-related values of wilderness areas. In its role as a cooperating agency, Forest Service staff has provided technical expertise in the review of air quality impacts on wilderness areas**. The proponent for the project is Excelsior Energy, Inc. (Excelsior), an independent energy development company based in Minnetonka, Minnesota. **Excelsior is proposing the project through and on behalf of its wholly owned project company, MEP-I, LLC (a legal entity established for the purpose of undertaking the Mesaba Energy Project, Phase I).**

PROPOSED ACTION

DOE Proposed Action and Alternatives

The DOE Proposed Action is to provide a total of $36 million in co-funding, through a cooperative agreement with Excelsior **(as MEP-I, LLC)** for the **definition and preliminary** design and one-year operational demonstration testing period for Phase I of the proposed two-phased Mesaba Energy Project**. The project was selected in Round 2 of funding opportunity announcements issued for the Clean Coal Power Initiative (CCPI) as authorized under Pubic Law No. 107-63**. **In addition, DOE may provide a loan guarantee to MEP-I, LLC pursuant to Energy Policy Act of 2005 (EPAct05) Section 1703 for Phase I of the proposed project.** This first phase would be a nominal **600** $MWe_{(net)}$ IGCC power plant with an estimated cost of $2.16 billion **as documented in the cooperative agreement** (NETL, 2006a). Phase II, which would be an identical, co-located **600** MWe plant, would be privately financed and not involve co-funding **or a loan guarantee from** DOE.

A portion ($22,245,505) of the total funding has been made available for cost-sharing in the first budget period under the cooperative agreement, prior to completion of the NEPA process. The activities eligible for cost-sharing during the first period allow for the development of information (such as project definition, preliminary design, and environmental studies and permitting) that provide the basis for this EIS. This is typical both in the amount of funding and the types of allowable activities for a CCPI project of this scope. Making these funds available does not prejudice DOE's ultimate decision on the proposed action and is consistent with DOE and Council on Environmental Quality (CEQ) regulations (10 CFR 1021.211 and 40 CFR 1506.1, respectively), which **permit the DOE to participate in the data collection and analysis necessary to make an informed decision but otherwise** restrict DOE from taking action that would have an adverse environmental impact or limit the choice of reasonable alternatives until the Record of Decision (ROD) has been issued.

Project applications selected for the CCPI may also be eligible to apply for Federal loan guarantees. The EPAct05 established a Federal loan guarantee program for eligible energy projects that employ innovative technologies. Title XVII of the EPAct05 authorizes the Secretary of Energy to make loan guarantees for a variety of projects, including projects that "avoid, reduce, or sequester air pollutants or anthropogenic emissions of greenhouse gases; and employ new or significantly improved technologies as compared to commercial technologies in service in the United States at the time the guarantee is issued" (Section 1703[a][[1], 42 U.S.C. 16513). Excelsior has submitted a formal application to DOE for a loan guarantee. The Loan Guarantee Program Office (LGPO) formally notified Excelsior by letter dated December 19, 2008, that its application under

solicitation DE-PS01-06LG00001 has been judged sufficiently complete for the project to move to the due diligence stage.

This EIS considers the impacts of both phases of the Mesaba Energy Project as connected actions, consistent with NEPA policy, even though only Phase I would be co-funded under the CCPI. A**t the request of USACE, the Final EIS has been revised as appropriate to describe the potential impacts of Phase I separately from the impacts of the combined two-phased project.**

DOE Purpose and Need

The DOE purpose in the context of the CCPI is to demonstrate the commercial-readiness of the ConocoPhillips E-Gas™ gasification technology in a fully integrated and quintessential IGCC utility-scale application. The principal need addressed by DOE**, pursuant to Public Law 107-63 and subsequent legislative appropriations,** is to accelerate the commercialization of clean coal technologies that achieve greater efficiencies, environmental performance, and cost-competitiveness.

The purpose of the DOE action with regard to the proposed issuance of a Federal loan guarantee is to encourage early commercial use in the United States of a new or significantly improved energy technology and to avoid or reduce emissions of greenhouse gases and other air pollutants pursuant to Title XVII of EPAct05. The action is needed to fulfill the DOE mandate under EPAct05 to issue loan guarantees to eligible projects that "avoid, reduce, or sequester air pollutants or anthropogenic emissions of greenhouse gases" and/or "employ new or significantly improved technologies as compared to technologies in service in the United States at the time the guarantee is issued."

The proposed project was selected under the CCPI as one of a portfolio of projects that would represent the most appropriate mix to achieve programmatic objectives and meet legislative requirements. IGCC technology meets the goals of the CCPI by utilizing an estimated 240-year domestic supply of reliable, low-cost coal in an environmentally acceptable manner. **The specific technology that would be deployed in the Mesaba Energy Project represents a significant advancement on the base design of the smaller-scale 262 $MWe_{(net)}$ Wabash River Coal Gasification Re-Power Project (Wabash River Plant) in Terre Haute, Indiana, which was a project completed under the DOE Clean Coal Technology Demonstration Program, a predecessor to the CCPI. The advancements would include enhanced environmental performance, greater capacity, increased efficiency and availability, as well as fuel flexibility and enhanced integration of IGCC plant systems.** The technologies would be more efficient, economical, reliable, and environmentally favorable than conventional coal-**fired** steam electric generating plants. After a one-year demonstration period, if economically **viable**, the Mesaba IGCC power plant may be operated commercially for a period of 20 years or longer.

Alternatives Determined to be Reasonable by DOE

Section 102 of NEPA requires that agencies discuss the reasonable alternatives to the proposed action in an EIS. The term "reasonable alternatives" is not self-defining, but rather must be determined in the **programmatic** context of the statutory purpose expressed by the underlying legislation.

Congress established the CCPI with a specific goal — to accelerate commercial deployment of advanced coal-based technologies that can generate clean, reliable, and affordable electricity in the United States. The CCPI legislation (Pubic Law No. 107-63) has a narrow focus in directing DOE to demonstrate **the commercial viability of** technology advancements related to coal-based power

generation designed to reduce the barriers to continued and expanded use of coal. Technologies capable of producing any combination of heat, fuels, chemicals, or other use byproducts in conjunction with power generation were considered; however, coal is required to provide at least 75 percent of the fuel for power generation. Other technologies that cannot serve to carry out the goal of the CCPI (e.g., natural gas, wind power, conservation) are not relevant to DOE's decision of whether or not to provide cost-shared funding support for the Mesaba Energy Project, and therefore, are not reasonable alternatives.

The CCPI only allows for **Federal co-funding** of proposed **private sector/industry** projects **for which an application has been prepared, submitted, selected, and awarded in response to a formal funding opportunity announcement issued by DOE.** DOE issued the CCPI **Round 2 funding opportunity announcement in 2004**. **Thirteen applications for co-funding of proposed industry project demonstrations from across the nation were received and evaluated in response to the CCPI Round 2 funding opportunity announcement. These applications represented diverse technologies and proposed the use of a variety of coals consistent with the requirements embodied in the funding opportunity announcement. Pursuant to Federal regulations, the choices available to DOE were limited to those applications submitted in response to the funding opportunity announcement. Two of the 13 applications were for co-funding of proposed archetypal IGCC projects. In all, four of the 13 applications were selected, including both proposed archetypal IGCC projects, one of which was the Mesaba Energy Project (NETL, 2006a). The two archetypal IGCC projects that were selected for co-funding involved the demonstration of different gasifier types, which is important in achieving a diversity of technology approaches and methods in the CCPI. They also involved different coal types, operating environments, and environmental considerations, all of which enhance the potential for widespread commercialization of IGCC technology in a competitive marketplace. The Mesaba Energy Project was selected because of the opportunity to demonstrate the specific technology proposed—the Conoco-Phillips E-Gas™ gasification technology—in a fully integrated and quintessential large commercial utility-scale IGCC setting. No other applicants proposed this specific IGCC technology.** Other projects that proposed to demonstrate other technologies are not alternatives to the proposed project for NEPA purposes.

Congress not only prescribed a narrow goal for the CCPI, but also directed DOE to use a process to accomplish that goal that would involve a more limited role for the Federal government. Instead of requiring government ownership of the **CCPI** demonstrations, Congress provided for cost-sharing in a project sponsored by the private parties **as a means to provide incentive for accelerated deployment**, with the provision for repayment of the public funds invested. Therefore, rather than being responsible for the siting, construction and operation of the projects, DOE is in the more limited role of evaluating CCPI project applications to determine if they meet the **requirements and national goals embodied in the** CCPI. **The same is true of the DOE role with regard to applications under the Federal loan guarantee program.** It is well established that an agency should take into account the needs and goals of the applicant in determining the scope of the EIS for the applicant's project. When an applicant's needs and goals are factored into the deliberations, a narrower scope of alternatives may emerge than would be the case if the agency is the proprietor responsible for all project-related decisions.

DOE's preferred alternative is to provide financial assistance in the form of co-funding under the CCPI cooperative agreement and possibly a loan guarantee under Title XVII of the EPAct 05 to the Mesaba Energy Project, assuming that one of the two sites proposed by Excelsior (see below) would be found acceptable and granted a site permit by the Minnesota Public Utilities Commission (PUC). DOE tentatively finds both sites to be acceptable. DOE does not have a preference among the alternatives considered for utility and transportation infrastructure necessary to support the project. These routing decisions are also under the jurisdiction of the PUC in its permitting process. If DOE ultimately selects the preferred alternative, DOE would then determine for each

site whether mitigation of specified potential impacts would be required. DOE is also free, however, to ultimately determine in the ROD that only one of the two sites is acceptable, or to select no action.

No Action Alternative

Under the No-Action Alternative, DOE would not provide cost-shared funding **or a loan guarantee** to **the Mesaba Energy Project to** demonstrate the commercial readiness of the Conoco-Phillips E-Gas™ gasification technology in a fully integrated and quintessential IGCC utility-scale application (beyond funding required to complete the NEPA process). DOE assumes that if Excelsior were to proceed with development in the absence of DOE funding **or loan guarantee**, the project would include all of the features, attributes and impacts as described for the Proposed Action. However, without DOE participation, it is possible that the proposed project would be canceled. Therefore, for the purposes of analysis in this EIS, the DOE No Action Alternative is assumed equivalent to a "No Build" Alternative, meaning that environmental conditions would remain in the status quo (no new construction **and no change in localized** resource utilization, emissions, discharges, or wastes generated).

If the project were canceled, the proposed technology may not be demonstrated elsewhere. Consequently, eventual commercialization of the integrated technologies would probably not occur because utilities and industries tend to use known and demonstrated technologies rather than unproven technologies. This scenario would not contribute to the **legislative mandate embodied in the** CCPI goal of accelerating commercial deployment of advanced coal-based technologies that can generate clean, reliable, and affordable electricity in the United States. **Similarly, the No Action Alternative would not contribute to the Federal loan guarantee program goals to make loan guarantees for energy projects that "avoid, reduce, or sequester air pollutants or anthropogenic emissions of greenhouse gases; and employ new or significantly improved technologies."**

Alternative Sites

The DOE Proposed Action to co-fund the Mesaba Energy Project as an application selected under CCPI Round 2 constitutes a decision only to select a specific technology for commercial-scale operational demonstration. DOE has not participated in the identification or selection of alternative sites or alignments for the Mesaba Energy Project. Excelsior Energy was founded in the State of Minnesota because of the experience of the firm's leadership team with the electric power industry in Minnesota. Therefore, the initial consideration of potential sites by the project proponent (Excelsior) was limited to the State of Minnesota.

As described in Section 1.2.2, Excelsior decided to locate the Mesaba Energy Project within the Taconite Tax Relief Area (TTRA) of northeastern Minnesota (Figure S-1B) in advance of submitting an application to DOE for co-funding in response to the CCPI Round 2 funding opportunity announcement. Excelsior decided on that area because the funding provided by the Iron Range Resources Rehabilitation Board required that the project be located within the TTRA and because the company believes the incentives created by the Minnesota Legislature in the Innovative Energy Project statute (Minnesota Statutes § 216B.1694) are necessary for project viability. Excelsior has stated that it has no intention to locate the Mesaba Energy Project elsewhere in the State of Minnesota or anywhere other than the TTRA and that it would not have submitted an application in response to the CCPI Round 2 funding opportunity announcement if it did not intend to locate the Mesaba Energy Project in the TTRA. Therefore, if the project would not be located in the TTRA, the project would not exist, since no other applicants to CCPI Round 2 proposed the same technology in any other location. From the DOE perspective, any consideration

of an alternative location outside of the TTRA would be the equivalent of the No Action Alternative for this EIS.

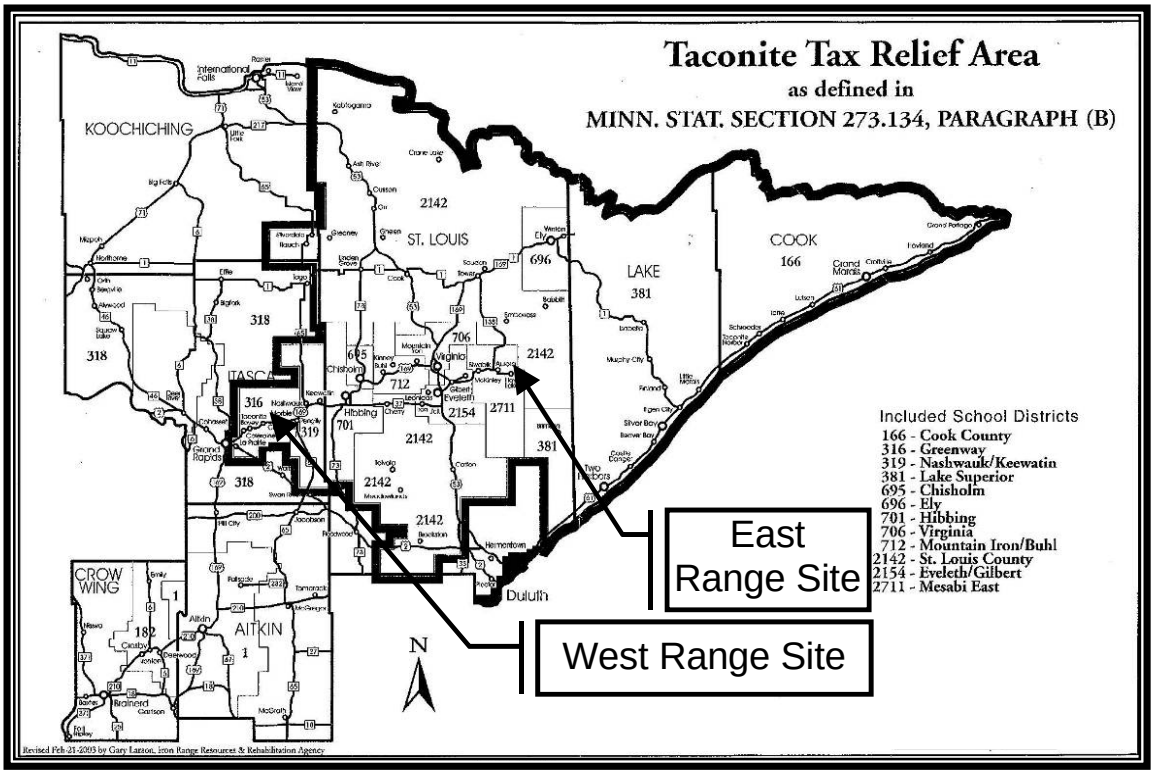


Figure S-1B. Potential Project Locations in Taconite Tax Relief Area

As described in Section 1.5, Excelsior is required by state regulations to consider at least two potential sites for the proposed plant and two potential alignments for high voltage transmission lines (HVTLs). Excelsior's preferred and alternative sites and alignments are described in Section 2.3. **At the specific request of USACE in its role as a cooperating agency under NEPA and as the Federal agency responsible for compliance with Section 404 of the CWA, Excelsior provided an analysis of the range of alternative sites it considered within the TTRA (see Appendix F1). Excelsior concluded from the analysis that the West Range and East Range sites are the only practicable alternative sites available to Excelsior. DOE has reviewed Excelsior's siting analysis and found it to be adequate for purposes of determining reasonable site alternatives for this EIS. Accordingly, DOE has evaluated the West and East Range sites in detail as reasonable alternatives in this EIS. The USACE will make a determination on the practicability of alternative sites within the context of the Section 404 permitting process.** Figure S-1**B** shows the boundary of the TTRA and the two alternative locations (West Range Site and East Range Site) for the proposed project.

Alternatives Eliminated from Further Consideration

DOE considered the following alternatives in addition to the Proposed Action and No Action Alternative.

Alternative Sizes

No other applicant proposed a smaller-sized plant **using this specific technology. Further, a smaller plant** would not be sufficiently large to demonstrate the large utility-scale commercial viability of the IGCC technology advancements, which is the central purpose of this CCPI project. The smaller-sized, single process system IGCC plant was successfully demonstrated as part of the predecessor Clean Coal Technology (CCT) **Demonstration P**rogram at the Wabash River Plant located in Terre Haute, Indiana. Following the Wabash River Plant demonstration, a Value Improving Practices (VIP) process – a formal industry process applying nine separate practices – was applied to examine lessons learned, identify options to improve cost and performance, and optimize the design for application to large utility-scale commercial plant configurations. An availability target above 85 percent would be needed to successfully compete against older technology base load facilities in the power generation industry. Multiple process systems would be required to meet this availability requirement, including a more cost-effective redundancy within the plant, low-cost back-up systems of conventional technologies, and the integration of these features throughout the plant. The proposed project would demonstrate the large utility-scale commercial design configuration resultant from the Wabash River Plant VIP process and subsequent research and development consistent with the DOE IGCC Roadmap.

Alternative Technologies

DOE could demonstrate other coal gasification technologies instead of the Proposed Action; however, such alternatives would not demonstrate the commercial readiness of the Conoco-Phillips E-Gas™ gasification technology, which is DOE's purpose for this demonstration project. **As already stated, DOE selected both applications proposing IGCC technology under the CCPI Round 2 funding opportunity announcement, but only the Mesaba Energy Project proposed the E-Gas™ technology.**

Other Alternatives

Federal legislation authorizing and funding CCPI specifically directs DOE to demonstrate technology advancements related to coal-based power generation. Therefore, other technologies that cannot serve to carry out the goal of the CCPI (e.g., natural gas, wind power, solar energy, and conservation) are not reasonable alternatives in this EIS. However, DOE conducts various other programs that support those technologies.

The alternative of incorporating technologies to reduce the "carbon footprint" of the Mesaba Energy Project was also considered. DOE recognizes that **the use of** fossil fuel**s** is **a** primary contributor to increasing carbon dioxide (CO_2) concentrations in the atmosphere (IPCC, **2007**). CO_2 is a significant greenhouse gas, and increasing concentrations of greenhouse gases show correlation with global warming. DOE recognizes that there are concerns about the effects of fossil fuel use on global climate change **as most recently evidenced by U.S. EPA's "Proposed Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act" signed on April 17, 2009 and published in the *Federal Register* (74 FR 18886) on April 24, 2009 (http://edocket.access.gpo.gov/2009/pdf/E9-9339.pdf)**. Therefore, DOE oversees other **synergistic** research programs aimed at reducing the cost of electricity associated with power production and proving the viability of technologies for carbon capture and **storage** (CCS)**, or beneficial reuse,** to reduce CO_2 emissions from fossil fuel use. DOE expects that the combined efforts of these programs will enable large-scale plants to come on-line by 2020 that offer 90 percent carbon capture with 99 percent storage permanence at less than a 10 percent increase in the cost of energy services (NETL, 2007). The planned in-service date for the Mesaba Energy Project is well in advance of the timeline for achieving the DOE CCS goal.

Based on an analysis of the current feasibility of carbon capture and **storage (geologic sequestration)** provided in Appendix A2, CCS is not considered a reasonable alternative to **the** DOE Proposed Action. However, because CCS could become feasible during the commercial lifetime (at least 20 years) of the facility, DOE has evaluated the impacts of implementing CCS during commercial operation of the project in Section 5.1.2.1 of this EIS based on the most current and representative information about available technologies.

Alternatives Available to the Minnesota Public Utilities Commission

The Minnesota PUC, as supported by the MDOC, has the responsibility for siting power plants having the capacity to operate at 50 MWe or greater (i.e., Large Electric Power Generating Plants [LEPGPs]) and transmission lines designed or capable of operation at a voltage of 100-kilovolts (kV) or greater (i.e., HVTLs). The Minnesota legislature directed the PUC to designate sites that minimize adverse human and environmental impacts while ensuring electric power system reliability and integrity and ensuring that electric energy needs are met and fulfilled in an orderly and timely fashion. Minnesota Rules Chapter **7849** establishes the requirements for submitting and processing a permit application. In the application, the applicant must identify the preferred site for the power plant and one alternative site. As part of the permitting process, the MDOC prepares an EIS on the project and holds a contested case hearing. The PUC has up to one year from the time the application is accepted to complete the process and make a decision on the permit**, unless the applicant agrees to a delay of this statutory time limit.**

In accordance with these requirements, and after considering the potential impacts of the project, the PUC has the responsibility for taking one of the following actions:

(1) Approve and issue permits for Excelsior's preferred West Range Site and corridors.
(2) Approve and issue permits for Excelsior's alternative East Range Site and corridors.
(3) Disapprove the joint permit application submitted by Excelsior.

Excelsior's Proposed Project and Alternatives

As the project proponent, Excelsior proposes to construct and operate a **nominal 1,200**-$MWe_{(net)}$ Mesaba Generating Station, together with its associated support structures and utility lines, within the TTRA. The TTRA (see Figure S-1**B**) is a geographic area in northeastern Minnesota that encompasses approximately 13,000 square miles and stretches from Crosby, Minnesota across the state's Cuyuna, Mesabi, and Vermilion iron ore ranges to the north shore of Lake Superior. This area was the site of some of the largest iron mines in the world, but is now economically depressed. Excelsior's project siting efforts centered on the TTRA in part to qualify for favorable consideration as an "innovative energy project" under Minnesota Statutes § 216B.1694. Excelsior focused particularly on potential sites within the Mesabi Iron Range due to the existing infrastructure system developed in response to earlier industrial mining activities.

At the request of, and in consultation with, USACE regulatory staff, Excelsior developed a purpose statement to satisfy USACE NEPA and CWA Section 404 requirements. The project purpose provided in Appendix F1 will be carried into the CWA Section 404 permit evaluation, and will be the basis for the alternatives analysis required by USACE regulations.

The Mesaba Generating Station would consist of the Mesaba Energy Project (Phase I) and an identical facility (Phase II) on the same site. Each phase would be rated nominally at peak to deliver **600** $MWe_{(net)}$ to the **point of interconnection with the regional electric grid.**

The project would employ ConocoPhillips E-Gas™ technology. Gasification is the process of converting coal, petroleum coke, or blends of these resources to a gaseous fuel called synthesis gas (syngas). A combined-cycle electric power plant is one that uses both **combustion turbine generator(s) and** steam turbine generator**(s)** at one location to produce electricity. Combining (integrating) the gasification process with the combined-cycle power plant is known as IGCC, which is an inherently lower-polluting and more energy-efficient technology for producing electricity from solid feedstocks. Key aspects of the project are presented in Table S-1.

In the E-Gas™ process, coal, petroleum coke, or blends of coal and petroleum coke would be crushed, slurried with water, and pumped into a pressurized vessel (the gasifier) along with purified oxygen. In the gasifier, controlled reactions take place, thermally converting feedstock materials into syngas. The syngas is cooled, cleaned of contaminants, and then combusted in a combustion turbine, which is directly connected to an electric generator. The assembly of the combustion turbine and generator is known as a combustion turbine generator (CTG). The expansion of hot combustion gases inside the combustion turbine creates rotational energy that spins the generator and produces electricity. The hot exhaust gases exiting the CTG would pass through a heat recovery steam generator (HRSG), a type of boiler, where steam is produced. The resulting steam is piped to a steam turbine that is connected to an electric generator. The expansion of steam inside the steam turbine spins the generator to produce an additional source of electricity. Electric power for each phase of the project would be produced in two CTGs (about 220 $MWe_{(gross)}$ each) and in one steam turbine generator (STG) (up to 300 $MWe_{(gross)}$), for a total production of 740 $MWe_{(gross)}$ per phase, or 1480 $MWe_{(gross)}$ for Phases I and II.

Table S-1. Key Technology Aspects of the Mesaba Energy Project

Two-Stage Gasifier	Gasifier consists of two stages: a slagging first stage, and an entrained flow, non-slagging second stage. Unlike traditional pulverized coal power plants, where fuel is actually combusted, in an IGCC power plant, slurry is fed to the gasifier along with oxygen (O_2) at an elevated temperature and pressure. The feedstock would be almost totally gasified in this environment to form syngas consisting principally of hydrogen (H_2), carbon monoxide (CO), CO_2, and water.
Syngas Cleanup	Syngas cleanup and desulfurization systems that include the processes for syngas cooling, particulate matter removal, syngas scrubbing, acid gas removal, mercury removal, and potential future retrofit for carbon capture.
Mercury Removal	For mercury removal, the syngas would pass through fixed beds of activated carbon prepared with a special impregnate to remove mercury. Multiple beds would be used to obtain optimized adsorption.
Carbon Capture Adaptable	The IGCC power plant would be designed to allow for future carbon capture, if required. Technologies currently exist that could allow the removal of CO_2 from the syngas, reducing CO_2 emissions by roughly 30 percent **(when using sub-bituminous coal)**. Future technologies are expected to be demonstrated that could capture up to 90 percent of the CO_2 emission from the combustion gases. Once captured, the CO_2 could be used for enhanced oil recovery or stored in appropriate geologic (saline) formations. As part of its Power Purchase Agreement approval process, Excelsior has submitted a carbon capture and sequestration plan to the PUC (see Appendix A).

Excelsior is required by state regulations to consider at least two potential sites for the proposed plant and, under certain conditions, two potential alignments for HVTLs. Excelsior's site selection process required several years of study that included a three-tiered siting process to identify the most favorable location for the Mesaba Generating Station. The first tier was conducted under a state statute enacted in 2003 (Minnesota Statutes § 216B.1694, Subdivision. 1(3)) that included, among other things, a provision allowing up to three "innovative energy projects" to be located in the TTRA. Excelsior then determined which regions throughout the TTRA have the necessary minimum infrastructure (e.g., HVTLs, water, and gas), rail access, road access, and other necessary components to develop the project. Once the initial candidate areas of the TTRA were identified, a second tier of evaluation was performed that included a

review of engineering feasibility, environmental compatibility, community support and acceptance, and other criteria. The third tier of evaluation consisted of a detailed analysis of the candidate project sites in Excelsior's joint permit application.

Excelsior documented the site screening and selection process (see revised Appendix F1) in support of its application to USACE for a CWA Section 404 wetlands permit. Using the selection process, Excelsior identified 17 candidate sites within the TTRA. As explained in Appendix F1, Excelsior eliminated 14 sites from further consideration based on issues relating to water availability, rail access, nearby residences, wetland acreage, constructability, and property size and availability. Of the three remaining sites, one was subsequently eliminated by Excelsior, because it was deemed unavailable due to conflicting development plans for the property. Excelsior thus identified its preferred (West Range) and alternative (East Range) sites from the two remaining properties.

Expected operational characteristics of the project would generally be the same for the alternative sites**. As explained in the Draft EIS, the East Range Site is located in the Lake Superior Watershed of the Great Lakes Basin, while the West Range Site is in the Upper Mississippi River Basin. Because of severe restrictions on discharges of mercury to surface waters in the Great Lakes Basin, the generating station at the East Range Site would include an enhanced zero liquid discharge (ZLD) system to process cooling tower blowdown, thus eliminating all discharges. As considered in the Draft EIS, the generating station at the West Range Site would discharge cooling tower blowdown water to surface waters, while meeting water quality standards for these discharges. However, after publication of the Draft EIS, Excelsior announced its intent in January 2008 to employ enhanced ZLD at the West Range Site, thereby eliminating discharges to surface waters at either site.** Thus, at either site the generating station would employ a ZLD system to remove contaminants in the discharge from the gasification process.

The expected operational characteristics for **Phase I and the combined Phases I and II** are summarized in Table S-2 **(which has been updated for the Final EIS)**. **The operational characteristics would be generally the same at either site except where indicated. In particular, the lower quality of process water sources at the East Range Site would cause:**

- **Greater amounts of particulate matter emissions from the cooling towers;**
- **Increased power load by the ZLD system reducing the net generating capacity by 1 MWe per phase; and**
- **Increased solid waste disposal requirements for ZLD filter cake.**

[Text in the Draft EIS describing differences in plant operations between the West Range Site and East Range Site was deleted as no longer applicable based on Excelsior's announcement to employ an enhanced ZLD system at the West Range Site.]

Pollution prevention, recycling, and reuse features are presented in Table S-3. The location and extent of HVTLs, water sources, rail, gas pipelines, and other infrastructure requirements are dependent upon each of the sites under consideration by Excelsior. Information on these project features as they relate to the sites being considered is provided in the following sections.

Table S-2. Expected Operating Characteristics – Mesaba Energy Project (Values for West and East Range Sites are equal except where noted)

Operating Characteristics	Phase I	Phase I & II
Net Generating Capacity - megawatts electricity (MWe)[1]		
West Range (WR)	605	1,210
East Range (ER)	604	1,208
Load output		
Capacity Factor - percent	92	92
Coal consumption[2] - tons per day (tpd)		
Sub-bituminous (SB)	8,550	17,100
Bituminous (B)	6,120	12,240
Sub-bituminous/petroleum coke (50:50 blend)	6,450	12,900
Water requirements - gallons per minute (gpm)		
Average water use	3,500	7,000
Peak water use	5,000	10,000
Air emissions - tons per year (except CO_2)		
Sulfur dioxide (SO_2)	695	1,390
Oxides of nitrogen (NO_x)	1,436	2,872
Particulate matter $\leq$10 microns (PM_{10}) – WR[3]	266	532
Particulate matter $\leq$10 microns (PM_{10}) – ER[3]	355	709
Carbon monoxide (CO)	1,270	2,539
Mercury (Hg)	0.014	0.027
Lead (Pb)	0.015	0.030
Volatile organic compounds (VOCs)	99	197
Carbon dioxide[4] (CO_2) - million tons per year	5.3(SB)/4.7(B)	10.6(SB)/9.4(B)
Effluent discharges		
Sanitary wastewater[5] in gallons per day	3,750	7,500
Cooling tower blowdown discharge (gpm)	0	0
Solid wastes[6] - tons per year		
Mercury removal carbon (hazardous [H])	7	14
Sour water sludge (H)	15	30
Sour water carbon (H)	24	48
Syngas treatment carbon (H)	30	60
Waste char and ash (non-hazardous)	80	160
Zero Liquid Discharge (ZLD) filter cake – WR[7]	~2,200(GI)[H]/<2,500(PB)	~4,400(GI)[H]/<5,000(PB)
Zero Liquid Discharge (ZLD) filter cake (H) – ER[7]	~2,200(GI)[H]/<12,250(PB)	~4,400(GI)[H]/<24,500(PB)
Marketable byproducts – tons per day		
Slag	500 – 800	1,000 – 1,600
Sulfur	30 – 165	60 – 330

[1] The generating capacity at the East Range Site is expected to be approximately 1 MWe less than the West Range Site per phase because the lower source water quality at the East Range Site increases the load from the enhanced zero liquid discharge system.
[2] Peak use of alternative feedstocks in partial slurry quench (PSQ) mode. Fuel flexibility allows the IGCC power plant to operate on sub-bituminous coal, bituminous coal, or a coal/petroleum coke blend.
[3] Because of the lower quality of water used for cooling at the East Range Site, PM10 emissions from cooling towers would be greater than for the West Range Site.
[4] CO2 emissions are a function of the feedstock consumed and of the Mesaba Generating Station's net heat rate. SB = Sub-bituminous coal, such as Power River Basin Coal; B = Bituminous coal, such as Illinois Basin Coal.
[5] Discharged to publicly owned treatment works; the discharge rate shown is conservatively assumed to equal the expected use of water for domestic purposes.
[6] Fuel dependent; highest values listed.
[7] Because of the lower quality of water used for cooling at the East Range Site, solid waste production of ZLD filter cake from the power block would be greater than for the West Range Site; GI = Gasification Island; PB = Power Block.

Table S-3. Key Pollution Prevention, Recycling and Reuse Features

Spill Prevention Control and Countermeasure (SPCC) Plan	The SPCC Plan would develop measures to take in the event of a spill, thereby insulating environmental media from the effect of accidental releases. All aboveground chemical storage tanks would be lined or paved, curbed/diked, and would have sufficient volume to meet all regulatory requirements. A site drainage plan would also be developed that would isolate routine, process-related operations from affecting the surrounding environment.
Feed Material Handling	The coal storage area would be paved or lined so that runoff can be collected, tested, and treated as necessary. The coal storage area has facilities to control fugitive dust emissions. The coal conveyors would be covered.
Coal Grinding and Slurry Preparation	The coal grinding equipment would be enclosed and any vents would be routed to the tank vent incinerator/auxiliary boiler. The water used to prepare the coal slurry would be stripped process condensate (recycled).
Gasification, High Temperature Heat Recovery, Dry Char Removal and Slag Grinding	The char produced in gasification would be removed and returned to the first stage of the gasifier (recycled). This improves the carbon conversion in the gasifier and reduces the amount of carbon contained in the gasifier slag. Reduced carbon content makes the slag more marketable and reduces the likelihood that it must be disposed in a landfill.
Slag Handling	The slag dewatering system would generate some flash gas that contains hydrogen sulfide (H_2S). The flash gas would be recycled back to the gasifier via the syngas recycle compressor. Water that is entrained with the slag would be collected and sent to the sour water stripper for recycling.
Sour Water System	Sour water would be collected from slag dewatering and the low temperature heat recovery system, and the ammonia and H_2S would be stripped out and sent to the Sulfur Recovery Unit (SRU). The stripped condensate would be used to prepare coal slurry. Surplus stripped condensate would be sent to the zero liquid discharge system.
Zero Liquid Discharge (ZLD) System	The ZLD system would concentrate and evaporate the process condensate. The ZLD would produce high purity water for reuse and a solid filter cake for disposal off site. The ZLD would concentrate and dispose of heavy metals and other contaminants in the process condensate. The ZLD would also be a recycle unit because the recovered water would be reused, reducing the total plant water consumption. **An enhanced ZLD system would also recover and treat cooling tower blowdown water for recycle and reuse within the plant, thereby eliminating all discharges to surface waters.**
Carbonyl Sulfide (COS) Hydrolysis	The gasifier would produce small quantities of COS that cannot be absorbed in the Acid Gas Removal (AGR) system. The COS hydrolysis unit would convert COS to H_2S, which would then be removed in the AGR unit. The COS hydrolysis unit would improve the sulfur recovery efficiency and reduce the total amount of sulfur in the syngas, and ultimately, the release of sulfur dioxide (SO_2) from the heat recovery steam generator (HRSG)stacks.
Mercury Removal Features	The mercury removal unit would use specially formulated activated carbon to capture trace quantities of mercury that may remain in the syngas. Mercury in the sour water handling system would be captured via activated carbon filters strategically placed prior to potential release points.
Acid Gas Removal (AGR)	The AGR system would remove H_2S from the raw syngas and produce a sweet (low sulfur) syngas for use in the combined cycle power block. The AGR would produce concentrated H_2S feed for the SRU.
Sulfur Recovery Unit (SRU)	The SRU would convert the H_2S to elemental sulfur that would be marketed for use as a fertilizer additive or for production of sulfuric acid. The tail gas from the SRU would be recycled back to the gasifier.

Table S-3. Key Pollution Prevention, Recycling and Reuse Features

Fuel Gas Moisturization	The fuel gas moisturization system would improve the recovery of low level heat from the gasification process and serve as a diluent for the syngas used in the combustion turbines. Nitrogen from the air separation unit would also be used as a diluent. Dry, clean syngas typically has a heating value in the range of 250 to 300 British thermal units per standard cubic foot. If the dry syngas was used directly in the combustion turbines, the thermal NO_x formed would be too high. Earlier IGCC plants used steam injection for NO_x control, which is less efficient than using fuel moisturization and nitrogen.
Integration of the air separation unit (ASU) and Power Block	The ASU would produce nitrogen as a by-product; this is an effective diluent for NO_x control. The ASU would require large amounts of electrical power for air compression. Part of the air compression requirements would be provided by the combustion turbine compressors, further integrating the gasification and combined cycle power block portions. This integration reduces the ASU auxiliary power requirement and increases the net power output by the plant.
Boiler Blowdown and Steam Condensate Recovery	Boiler blowdown and steam condensate would be recovered from the combined cycle power block and gasification facilities and would be reused as cooling tower makeup.
Training and Leadership	All corporate and plant personnel would be trained on continuous improvement in environmental performance especially as such training and programs apply to: (1) setting, measuring, evaluating and achieving waste reduction goals, and (2) reporting the results of such programs in annual reports made available to the public.

West Range Site and Corridors

Excelsior proposes to locate the Mesaba Generating Station on an approximately 1,**708-**acre site in the City of Taconite within Iron Range Township in Itasca County. The project's generating facilities would connect to the power grid via new and existing HVTL corridors to a substation near the unincorporated community of Blackberry. Excelsior or a local public utility would construct, own, and operate a new natural gas pipeline connecting to two existing 36-inch pipelines owned by Great Lakes Gas Transmission Company (GLG) to provide start-up and backup fuel for the station. Key features of the West Range Site and corridors, including Excelsior's preferred choices for utilities and transportation components and alternatives they considered, are listed in Table S-4 and illustrated in **Figures S-2A and S-2B**. **Note that disused mine pits shown on these figures have been filling with surface water and groundwater. Therefore, the areas within these pits shown as surface waters based on available geographic information system data may not represent the actual extent of surface waters currently in these pits.**

East Range Site and Corridors

Excelsior's alternative East Range Site for the proposed Mesaba Generating Station is an approximately **1,322-**acre site within the city limits of Hoyt Lakes in St. Louis County, approximately 1 mile north of the downtown area. The project's generating facilities would connect to the grid via existing HVTL corridors that lead to a substation near the unincorporated community of Forbes. Northern Natural Gas (NNG) would construct, own, and operate a gas pipeline as an extension of the company's interstate pipeline system to provide start-up and back-up fuel for the station. Key features of the East Range Site and corridors, including Excelsior's preferred choices for utilities and transportation components and alternatives they considered, are listed in Table S-5 and shown in **Figures S-3A and S-3B**. **The same comment above for the West Range Site and Corridors relating to the extent of surface waters within mine pits also applies to the East Range Site and Corridor maps.**

Table S-4. West Range Site Features

Feature	Description	Alternatives Considered by the Project Proponent
Rail Access	Coal could be delivered to the West Range Site by either BNSF Railway or CN Railway, which operate on a single track located less than 2 mi from the West Range Site. Direct access to the site would be provided by the construction of short spurs from the mainline tracks onto the site boundary. Construction of 2 mi of new track would be required between the existing mainline track and the boundary of the West Range Site; an additional 4 mi of new track would be required for the portion of the rail loop within the site boundaries. Three alternative rail access alignments were considered **in the Draft EIS** for the West Range Site, identified as Alternatives 1A, 1B, and 2. **Two additional alternatives were considered based on agency comments on the Draft EIS; one of which was identified as Excelsior's new preferred alignment (3B).** Permanent rights-of-way for the rail alignments would be 100 feet wide. Limits of construction could range from 60 to 760 feet in width depending upon topography.	Alternative 1A (**Excelsior** preferred **in Draft EIS**). Requires **15** ac of **off-site** right-of-way (ROW) and **21,539 feet** of track. Three residences within 1,000 feet and one residence within **470** feet. Alternative 1B. **[Eliminated from further consideration based on analysis documented in the Draft EIS.]** Alternative 2. **[Screened in the Draft EIS and eliminated from detailed evaluation as documented in the Draft EIS.]** **Alternative 3A. [Eliminated from consideration based on a screening-level analysis following publication of the Draft EIS; see Appendix F2.]** **Alternative 3B (Excelsior preferred in Final EIS). Developed in collaboration by DOE and Excelsior with objective of minimizing wetland impacts. Requires 15 ac of off-site right- ROW and 22,070 feet of track. Three residences within 1,000 feet and one residence within 470 feet.**
Roadway Access	The West Range Site is located about 1.5 mi north of U.S. Highway (US) 169 and about 0.25 mi to the east of Itasca County Road (CR) 7. Other roadways include the Cross-Range Heavy Haul Road, which is a gravel road used to allow heavy or slow loads to be transported between mines across the Iron Range. The Cross-Range Heavy Haul Road also provides access to a cluster of homes in the Big Diamond Lake/Dunning Lake area. Excelsior considered two access road alternatives **in the Draft EIS** (Access Road 1 and Access Road 2) to provide access to the West Range Site. **Following publication of the Draft EIS, Itasca County deferred the realignment of CR 7, which required Excelsior to consider a new Access Road 3 alignment.**	Access Road 1. **[Eliminated from consideration following Draft EIS based on Itasca County's decision to defer the realignment of CR 7 due to changes in state highway funding priorities.]** Project would use the realignment of CR 7 to serve as the primary access road (Access Road 1). Access Road 2. **[Eliminated from consideration following Draft EIS based on Itasca County's decision to defer the realignment of CR 7 due to changes in state highway funding priorities.]** This segment is an extension of Access Road 1 into the site using the CR 7 **realignment.** **Access Road 3 (Excelsior preferred in Final EIS). Developed in collaboration by DOE and Excelsior with objective of minimizing wetland impacts. Would connect the plant footprint with existing CR 7 alignment near the southwestern corner of the site; 2 residences within 1,250 ft.**
Process Water Supply	Excelsior initially considered three alternatives for providing process water to the West Range Site, including the use of nearby abandoned mine pits, the Mississippi River, and groundwater sources.	Alternative 1 (**Excelsior** preferred). Involves pumping water from nearby abandoned mine pits, including the Canisteo Mine Pit (CMP), the Lind Mine Pit (LMP), and the Hill Annex Mine Pit (HAMP) Complex. Alternative 2. Use of the Mississippi River; eliminated due to extensive infrastructure requirements to convey water. Alternative 3. Use of groundwater sources; eliminated due to extensive infrastructure requirements to accommodate low pumping yields.

Table S-4. West Range Site Features

Feature	Description	Alternatives Considered by the Project Proponent
Process Wastewater	Process wastewater would consist primarily of cooling tower blowdown blended with relatively low-flow additional wastewater streams from other plant systems. All other contact process water would be managed and treated in the ZLD system. All sanitary wastewater would be treated separately.	**Excelsior** Proposed Plan. **Following publication of the Draft EIS, Excelsior announced its intention to employ an enhanced ZLD system at the West Range Site (comparable to the East Range Site) to additionally treat cooling tower blowdown water. Therefore, Outfalls 001 and 002 to the Canisteo Mine Pit and Holman Lake proposed in the Draft EIS were eliminated from consideration in the Final EIS.**
Potable Water Supply	During construction, the Mesaba Generating Station would require a peak of 45,000 gpd of potable water based on 1,500 personnel using 30 gallons of potable water per day each. After construction of Phase I and II, the water demand would drop to about 7,500 gpd assuming 250 individuals on site year around. Two alternatives were considered to provide potable water to the West Range Site.	Alternative 1 (**Excelsior** preferred). Obtain potable water from the City of Taconite, located 2.5 mi southwest of the project site, which would require construction of an 8-inch diameter pipeline from the Taconite system to the site and a booster station. The Taconite system currently has adequate capacity for the project during the operational phase, but the requirements during construction exceed existing capacity. Planned water system improvements will provide the necessary capacity, otherwise Excelsior will need to provide potable water via truck during construction. Alternative 2. Construct an on-site water treatment facility with the capacity to treat 7,500 gpd of water from the CMP and HAMP Complex. Excelsior would own the water treatment facility and be responsible for the operation and maintenance of the facility.
Domestic Wastewater Treatment	The sanitary wastewater discharge from the plant during construction and during operation would be comparable to the volume of daily potable water use. Two alternatives were considered for disposal of domestic wastewater.	Alternative 1. Construct and operate a wastewater treatment facility, discharging to Little Diamond Lake. Alternative 2 (**Excelsior** preferred). Discharge domestic wastewater to the Coleraine-Bovey-Taconite **(CBT)** wastewater collection and treatment system. Consists of constructing approximately 10,000 feet of 12-inch gravity sewer, a pump station, and 2,400 feet of force main from the West Range Site to the City of Taconite's main pump station. Also requires a 50-foot construction ROW and a permanent 30-foot ROW affecting approximately 14 ac and 8 ac, respectively. Alternative would avoid the discharge of treated domestic effluent to public waters impaired for dissolved oxygen (DO) and nutrients. **In conjunction with its announced intention to employ an enhanced ZLD system at the West Range Site, Excelsior proposed to fund improvements in the CBT collection and treatment system to reduce wet-weather capacity problems and improve effluent quality.**

Table S-4. West Range Site Features

Feature	Description	Alternatives Considered by the Project Proponent
Natural Gas Facilities	Excelsior or a local public utility proposes to construct, own, and operate one 16-inch (or potentially 24-inch) diameter gas pipeline to supply natural gas to the Mesaba Generating Station that would tap the two existing 36-inch GLG pipelines approximately 12 mi due south of the West Range Site. Three potential natural gas pipeline alternatives were initially considered by Excelsior to provide natural gas to the West Range Site.	Alternative 1 (**Excelsior** preferred). Includes 2.5 mi and 10.7 mi of new pipeline, in existing and new corridors, respectively. Four water crossings and three residential units within 300 feet. Pipeline would be licensed/permitted, constructed, owned, and operated by Excelsior **or a local public utility**. Alternative 2. Includes 10.5 mi and 4.5 mi of new pipeline, in existing and new corridors, respectively. Four water crossings and five residential units within 300 feet. Pipeline would be licensed/permitted, constructed, owned, and operated by NNG (as an interstate pipeline operator). Alternative 3. Includes 7 mi and 5.5 mi of new pipeline, in existing and new corridors respectively. Four water crossings and 29 residential units within 300 feet. Pipeline would be licensed/permitted, constructed, owned, and operated by NNG (as an interstate pipeline operator).
HVTL – Plan A	Excelsior's Plan A assumes the use of 345-kV circuits. Plan A provides for a preferred route (WRA-1) and an alternative route (WRA-1A). Both routes would share two common segments (one existing and one new ROW), and each route would include two unique segments (one existing ROW and one new ROW). The major difference between the routes is that WRA-1A would run east of and parallel to Twin Lakes Road, while WRA-1 would run west of and parallel to Twin Lakes Road. Both routes would avoid residences located on the road. Excelsior prefers WRA-1, because it would have fewer water crossings, would cross fewer open fields, would avoid gravel mining operations, and would generally be less visible. Both routes are similar in that they traverse areas that have similar residential densities and provide the shortest and most direct routes to the substation.	**HVTL Alternative** 1 (**Excelsior** preferred). Excelsior would acquire 100-foot ROWs, which would result in a total permanent ROW of approximately 134 ac **in alignment WRA-1**. Existing HVTL ROWs would not require widening of corridors. Approximately 66 residences would be located within 0.5 mi of the centerline of the preferred alignment, of which 17 would be located within 0.25 mi of the alignment. One residence would be located within 300 feet of the alignment and three others would be located within 500 feet. **HVTL Alternative** 1A. Excelsior would acquire 100-foot ROWs, which would result in a total permanent ROW of approximately 121 ac **in alignment WRA-1A**. Existing HVTL ROWs would not require widening of corridors. Approximately 62 residences would be located within 0.5 mi of the centerline of the preferred alignment, of which 21 would be located within 0.25 mi of the alignment. Two residences would be located within 300 feet of the alignment and five others would be located within 500 feet.

Table S-4. West Range Site Features

Feature	Description	Alternatives Considered by the Project Proponent
HVTL – Plan B	Excelsior's Plan B provides a contingency to allow the use of 230-kV circuits. If the Midwest Independent System Operator (MISO) determines that the 345-kV transmission infrastructure is incompatible with regional transmission planning initiatives, or if the timetable for building 345-kV transmission in the region would not be acceptable, Excelsior would implement a 230-kV transmission contingency plan. Plan B would begin with two 230-kV HVTL circuits mounted on a single steel pole structure, which would accommodate the full 60**5**-MWe output of Phase I and meet the single failure criterion. Although the double-circuit 230-kV HVTLs could accommodate the entire 1,21**0**-MW output of the combined Phases I and II, they would not meet the single failure criterion. Therefore, Plan B would provide for an additional HVTL with the construction of Phase II.	**HVTL Alternative** 1 (**Excelsior** preferred). Double-circuit 230-kV HVTLs would follow the same alignment **(WRB-1)** as the preferred route (WRA-1) of Plan A. However, the single-pole HVTL structures required for 230-kV HVTLs would be shorter. The new alignment segments would require a ROW with a minimum width of approximately 73 feet. Existing HVTL ROWs would not require widening. **HVTL Alternative** 1A. Would follow the same alignment as the alternative route (WRA-1A) of Plan A for Phase I. WRB-2 (**Excelsior** preferred). The preferred route for Phase II of Plan B would be the route not selected for the double-circuit 230-kV HVTL in Phase I of Plan B. The structures and new ROW requirements would be comparable to those described for WRB-1, but the poles would be shorter (by approximately 20 feet). In the segments where the double-circuit 230-kV HVTL alignment would coincide with the single-circuit 230-kV alignment, a minimum permanent ROW width of approximately 138 feet would be required for the parallel pole structures (affecting approximately 1.7 mi of new ROW). The new alignments for Plan B, Phases I and II (including both routes) would require permanent ROWs affecting approximately 255 ac. Existing HVTL ROWs would not require widening. **HVTL Alternative Phase 2 Plan B (**WRB-2A**)**. The alternative route proposed for Phase II of Plan B would combine segments from two existing HVTL corridors, one of which traverses the northern section of the West Range Site. WRB-2A would follow an alignment including portions of the ROWs for the Minnesota Power (MP) 45L/28L and 62L/63L HVTLs. Because of the 18-mi length, Excelsior proposes to use HVTLs rated at 345-kV on this route to avoid excessive line losses and elaborate switching requirements that would be required for 230-kV. Excelsior proposes to use delta configuration 345-kV structures with an underbuild feature that would carry the existing MP 115-kV HVTLs below the arms holding the 345-kV conductors. The delta configuration structures would require a minimum permanent ROW width of 106 feet, generally within the parameters of the existing ROWs. Therefore, the new alignments for Plan B, Phases I and II (including both routes) would require permanent ROWs affecting approximately 134 ac. Approximately 214 residences are located within 0.5 mi of the ROWs that would be used for Alternative WRB-2A; 98 are located within 0.25 mi of the ROWs. Eight residences are located within 300 feet and 21 others are located within 500 feet.

Acronyms: ac = acre(s); BNSF = formerly Burlington Northern/Santa Fe (Railway Company); CMP = Canisteo Mine Pit; CN = Canadian National (Railway Company); COC = cycles of concentration; CR = County Road; DO – dissolved oxygen; GLG = Great Lakes Gas (Transmission Company); gpd = gallons per day; HAMP = Hill Annex Mine Pit; HVTL = high voltage transmission line; LMP = Lind Mine Pit; mi = mile(s); MISO = Midwest Independent System Operator; MP = Minnesota Power (Company); NNG = Northern Natural Gas (Company); ROW = right-of-way; US = U.S. Highway; ZLD = zero liquid discharge

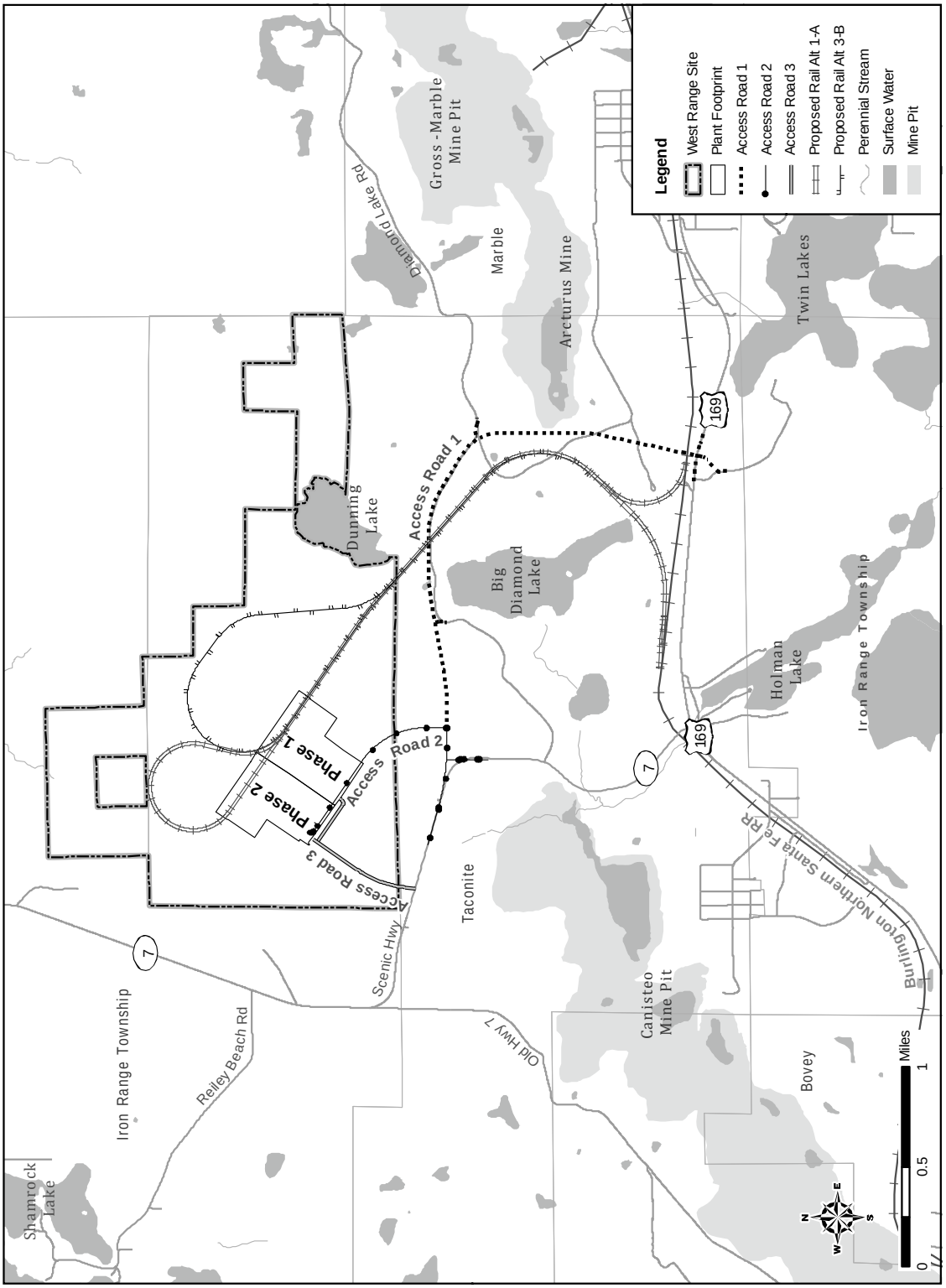


Figure S-2A. West Range Site

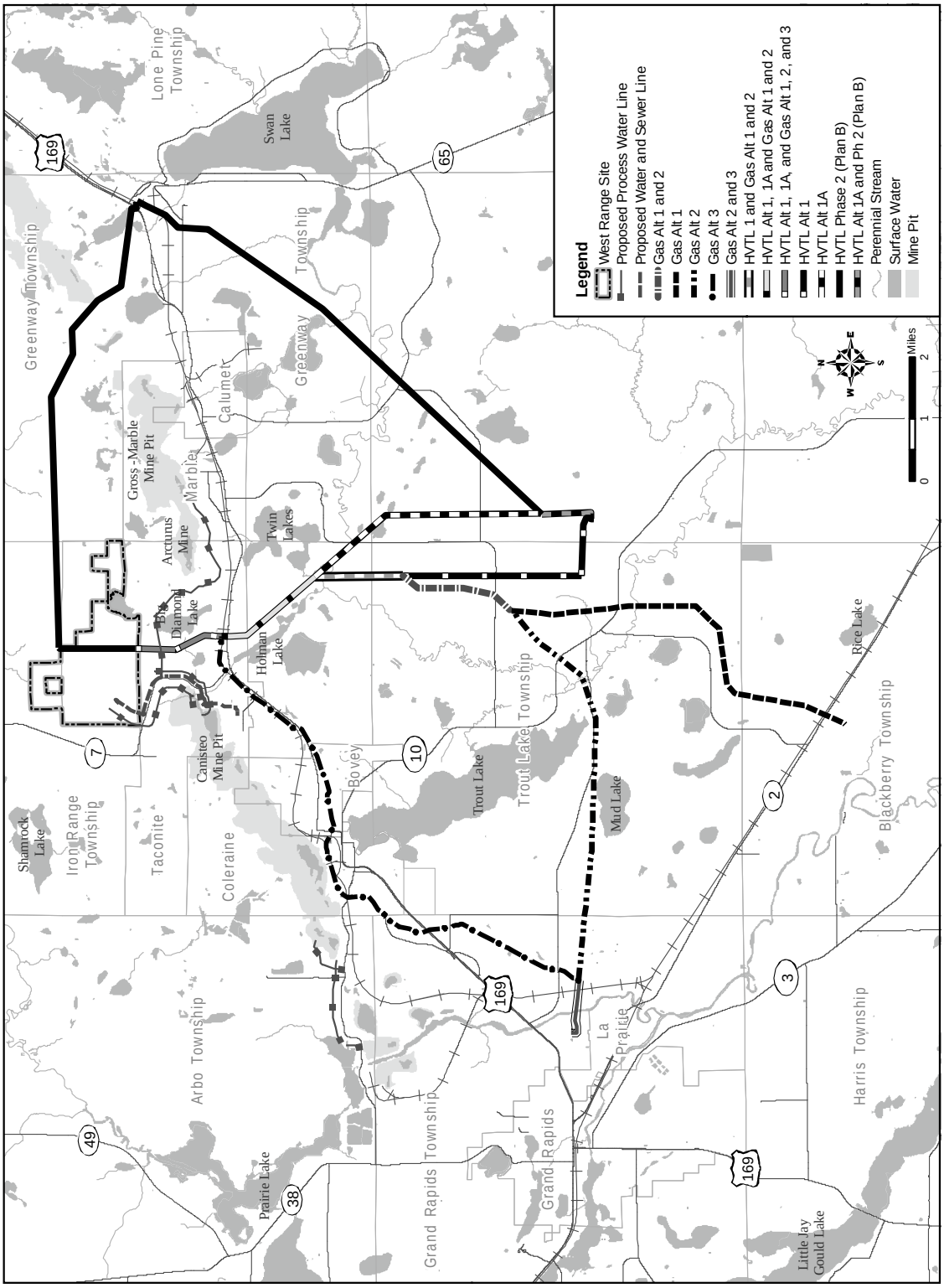


Figure S-2B. West Range Site and Corridors

Table S-5. East Range Site Features

Feature	Description	Alternatives Considered by the Project Proponent
Rail Access	Coal would be delivered to the East Range Site by a subsidiary of CN Railway that serves the area. The nearest access to the BNSF Railway is at Hibbing, 40 mi from the East Range Site. Therefore, the CN would be the only feasible near-term rail provider to the East Range Site. The power plant footprint is located approximately 1 mi north and 1 mi west of two CN railroad tracks. The east-west track runs from Eveleth, Minnesota, to Two Harbors, Minnesota. The north-south track connects with the east-west track at Wyman Junction (about 1.7 mi southeast of the East Range Site) and extends north to Embarrass, Minnesota. Permanent ROWs for the rail alignments would be 100 feet wide. Limits of construction could range from 60 to 500 feet in width depending upon topography.	Alternative 1 (**Excelsior** preferred). Alternative 1 would provide a traditional rail loop to accommodate a unit train that would return in the same direction. The track would originate near MP's Syl Laskin Energy Center rail spur and travel east-northeast to the Mesaba Generating Station. The track would be about 17,800 feet long. No residential dwellings are located near the proposed alignment. Alternative 2. Alternative 2 would cross the site (rather than looping within it) and connect to the CN north-south track just north of Wyman Junction. This track would be about 18,500 feet long to accommodate a unit train with the rotary coal dumper near the midpoint. To maintain a workable grade, the track would need to cross under CR 666, which would require construction of a roadway bridge.
Roadway Access	The proposed access road would consist of a looped roadway intersecting CR 666 at two locations to provide gradual curves and good sightlines. Traffic would enter the site from the north access point. During construction and other periods of peak volumes, traffic would exit the site at the south access point. Providing two access points from CR 666 would allow flexibility in accessing the station during construction and when maintenance work is performed on CR 666.	**Excelsior** Proposed Plan. CR 666 adjoins the proposed East Range Site and is the most practical choice for public road system access. **In the Draft EIS, Excelsior proposed a looped access road connecting at both a northern and a southern intersection with CR 666.** **In the Final EIS, based on agency comments on the Draft EIS, Excelsior eliminated the northern intersection and road section from consideration.**
Process Water Supply	**Based on Excelsior's** new proposal **to employ an enhanced ZLD system at the West Range Site comparable to the East Range Site, the water demands at either site would be the same. The water quality in the mine pits on the East Range Site is lower than in the pits on the West Range Site, which would result in increased particulate matter emissions by the cooling towers and increased solid waste from ZLD filter cake.**	**Excelsior** Proposed Plan. Process water for the East Range Site would be drawn from numerous mine pits located in the vicinity. Excelsior proposes to link the various mine pits using water intakes, pump stations, and pipelines. In the event of high inflow rates into Colby Lake during spring runoff or during high precipitation events, water also may be pumped from Colby Lake into Mine Pit 2 West Extension. Mine Pit 2 West Extension would serve as the primary source. A permanent pumping station would be added to this mine pit. The pit would receive input from one or more of the following pits: Mine Pit 6, Mine Pit 2 West, Mine Pit 2 East, Mine Pit 3, Stephens Mine Pit, Knox Mine Pit, Mine Pit 9S, **Mine Pit 5N,** Mine Pit 1 Effluent, PolyMet Mining Dewatering Operations, and/or Colby Lake. **In the event that mining takes place in Mine Pit 2 West Extension, either the Knox and/or Stephens Mine Pits could serve as alternative receiving reservoirs and permanent pump station sites.**

Table S-5. East Range Site Features

Feature	Description	Alternatives Considered by the Project Proponent
Process Wastewater	The East Range Site is located within the Lake Superior Basin watershed, which is regulated for bioaccumulative chemicals of concern (BCCs), such as mercury, in discharges. Excelsior concluded that there are no proven technologies to remove mercury at such low concentrations at the high flow rates of the Mesaba Generating Station (the peak discharge from Phase I and II would approach 3,500 gpm). Therefore, **enhancing** the **existing** ZLD is the preferred alternative.	**Excelsior** Proposed Plan. Excelsior's preferred method for dealing with the mercury discharge limitations at the East Range Site would be to totally eliminate the discharge of cooling tower blowdown by **augmenting** the ZLD system to handle all of the generating station's process wastewater streams. The system would evaporate any water that could not be reused in the plant processes leaving only a solid stream of salts for disposal at a licensed treatment/disposal facility. Excelsior considered discharging process wastewater to the Hoyt Lakes POTW as an alternative, but the POTW does not have sufficient capacity to manage the daily volumes of cooling tower blowdown.
Potable Water Supply	During construction, the Mesaba Generating Station would require a peak of 45,000 gpd of potable water based on 1,500 personnel using 30 gallons of potable water per day each. After construction of Phase I and II, the water demand will drop to about 7,500 gpd assuming 250 individuals on site year around. Two alternatives were considered to provide potable water.	Alternative 1 (**Excelsior** preferred). Obtain potable water from the City of Hoyt Lakes by constructing a 6-inch diameter pipeline approximately 11,000 feet from the East Range Site connecting to a 12-inch water main that serves MP. The city would own and maintain the pipeline and sell water to the station. Alternative 2. Construct an on-site treatment facility with the capacity to treat 7,500 gpd of water from nearby mine pits. Excelsior would own the water treatment facility and be responsible for operation and maintenance.
Domestic Wastewater Treatment	The sanitary wastewater discharge from the plant during construction and during operation would be comparable to the volume of daily potable water use. Two alternatives were considered for disposal of domestic wastewater.	Alternative 1. Construct an on-site wastewater treatment facility comparable to the facility described for the West Range Site. A 12-inch gravity sewer would be constructed to convey treated effluent to the mine drainage stream running from northeast to southwest through the site and discharging into Colby Lake. Would require NPDES permit and licensed operator, and would discharge to Colby Lake, which is the source for the Hoyt Lakes drinking water treatment plant. Alternative 2 (**Excelsior** preferred). Discharge domestic wastewater to the City of Hoyt Lakes' wastewater collection and treatment system. Consists of constructing approximately 9,500 feet of 12-inch diameter gravity sewer, a pump station, and about 2,500 feet of 4-inch force main. The wastewater piping would parallel the existing HVTL easement along the west side of the proposed property boundary, south to Colby Lake. A pump station would be located on the north side of Colby Lake. The City of Hoyt Lakes would operate and maintain the sewer line and would be compensated through sewer user fees.

Table S-5. East Range Site Features

Feature	Description	Alternatives Considered by the Project Proponent
Natural Gas Facilities	NNG is the only pipeline company serving the immediate vicinity of the East Range Site. A 10-inch diameter branch of NNG's pipeline from Iron Junction, Minnesota serves the nearby **plant, formerly owned by** Cliffs-Erie (CE) and directly adjoins the eastern boundary of the East Range Site. However, this branch line lacks adequate capacity to supply the Mesaba Generating Station demand. Therefore, to provide natural gas in the quantity and at the pressure required to supply the station, the following infrastructure would be required.	**Excelsior** Proposed Plan. Installation of approximately 33 mi of new, 16- to 24-inch pipeline placed within the existing ROW for the 10-inch CE branch line; addition of a new compressor at the existing point where the GLG and NNG pipelines interconnect; and installation of an ultrasonic meter facility to serve the Mesaba Generating Station. As an interstate pipeline, it would be permitted by NNG under the Federal Energy Regulatory Commission (FERC) review process. Approximately 856 residences are located within 0.5 mi of the existing pipeline ROW, 46 of which are located within 300 feet of the ROW.
HVTL	Excelsior would configure the high voltage switchyard for the East Range Site at 345-kV for both phases of the Mesaba Generating Station. The option to operate the switchyard at 345-kV at the start of Phase I was based on a 5-MW lower net line loss than would occur if the facilities were operated at 230-kV. Over the project life, the capacity gain associated with the 345-kV option would offset its higher capital cost. The high voltage switchyard required to transmit the entire output from Phase I and Phase II to the point of interconnection with minimum line loss would be installed during construction of Phase I. No further development would be required to accommodate Phase II. Excelsior is proposing to construct new HVTLs to the Forbes Substation, approximately 30 mi directly west-southwest of the East Range Site. The Forbes Substation is a major electrical hub on the east end of the Iron Range that has 500-kV, 230-kV, and 115-kV buses owned by both MP (115/230-kV) and Xcel Energy (500-kV). Excelsior proposes to use two existing corridors, the 39L/37L corridor and the 38L corridor, as routes for its two 345-kV HVTLs. To avoid the high cost and dangerous conditions associated with "hot line" construction methods, Excelsior proposes to acquire an additional 30 feet of ROW along one of the routes between the Laskin and Forbes Substations.	**HVTL Alternative 1 -** Widen 38L Route. Acquire an additional 30 feet of ROW along the 38L corridor on the north side of the existing structures. This route conflicts with three to four short sections of existing 38L ROW where single family residences are located on the north side of the existing 115-kV ROW. The ROW in these locations is too narrow for a 30-foot expansion. Therefore, Excelsior would propose constructing these sections during short, scheduled line outages, or under hot line conditions on the existing 38L 115-kV centerline. Approximately 271 residences are located within 0.5 mi of the centerline of the existing ROWs of the 38L, of which 116 are located within 0.25 mi of the alignment. Approximately 11 residences are located within 300 feet of the ROWs and 11 others are located within 500 feet. **HVTL Alternative 2 -** Widen 39L/37L Route (**Excelsior** preferred). Acquire 30 feet of additional ROW on the south side of the existing ROW from the Laskin Substation to CR 97, then move to the north side from CR 97 to and across the Thunderbird Mine. The 39L has single-family residential conflicts in three potential locations and potentially one industrial site conflict. These narrow sections of ROW would necessitate either hot line construction or construction in short, scheduled outage windows on the existing line in affected ROWs. The 37L could be widened on either side of the ROW since the only conflicts involve existing transmission lines, which may require outage windows for construction. Approximately 962 residences are located within 0.5 mi of the centerline of the existing ROWs of the 39L and 37L, of which 369 are located within 0.25 mi of the alignment **(many of these residences are located in the city of Eveleth, MN)**. Approximately 16 residences are located within 300 feet of the ROWs and 33 others are located within 500 feet.

Acronyms: ac = acre(s); BCCs = bioaccumulative chemicals of concern; BNSF = formerly Burlington Northern/Santa Fe (Railway Company); CE = Cliffs-Erie; CN = Canadian National (Railway Company); CR = County Road; FERC = Federal Energy Regulatory Commission; GLG = Great Lakes Gas (Transmission Company); gpd = gallons per day; gpm = gallons per minute; HVTL = high voltage transmission line; mi = mile(s); MP = Minnesota Power (Company); NNG = Northern Natural Gas (Company); NPDES = National Pollutant Discharge Elimination System; POTW = Publicly Owned Treatment Works; ROW = right-of-way; ZLD = zero liquid discharge

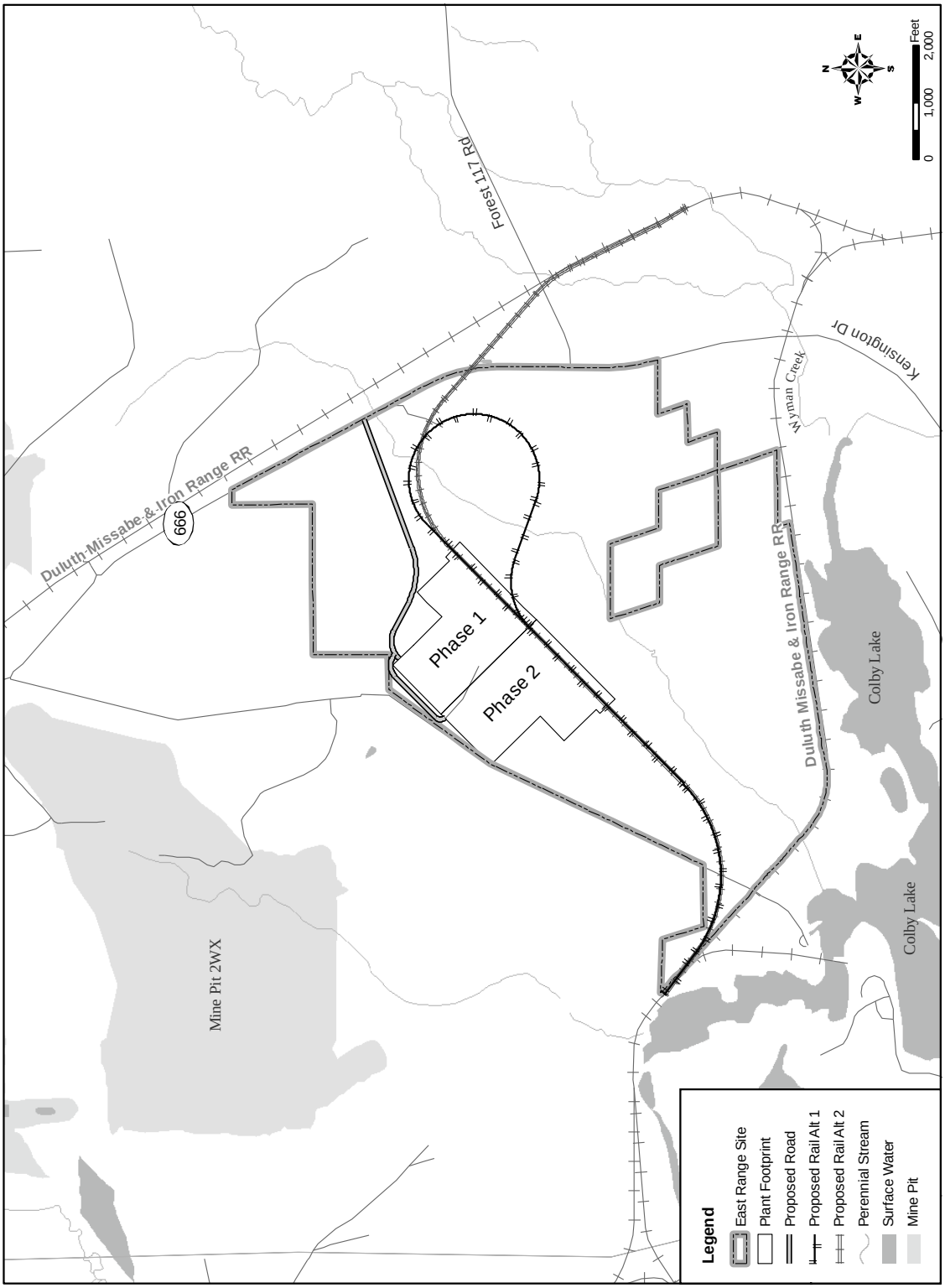


Figure S-3A. East Range Site

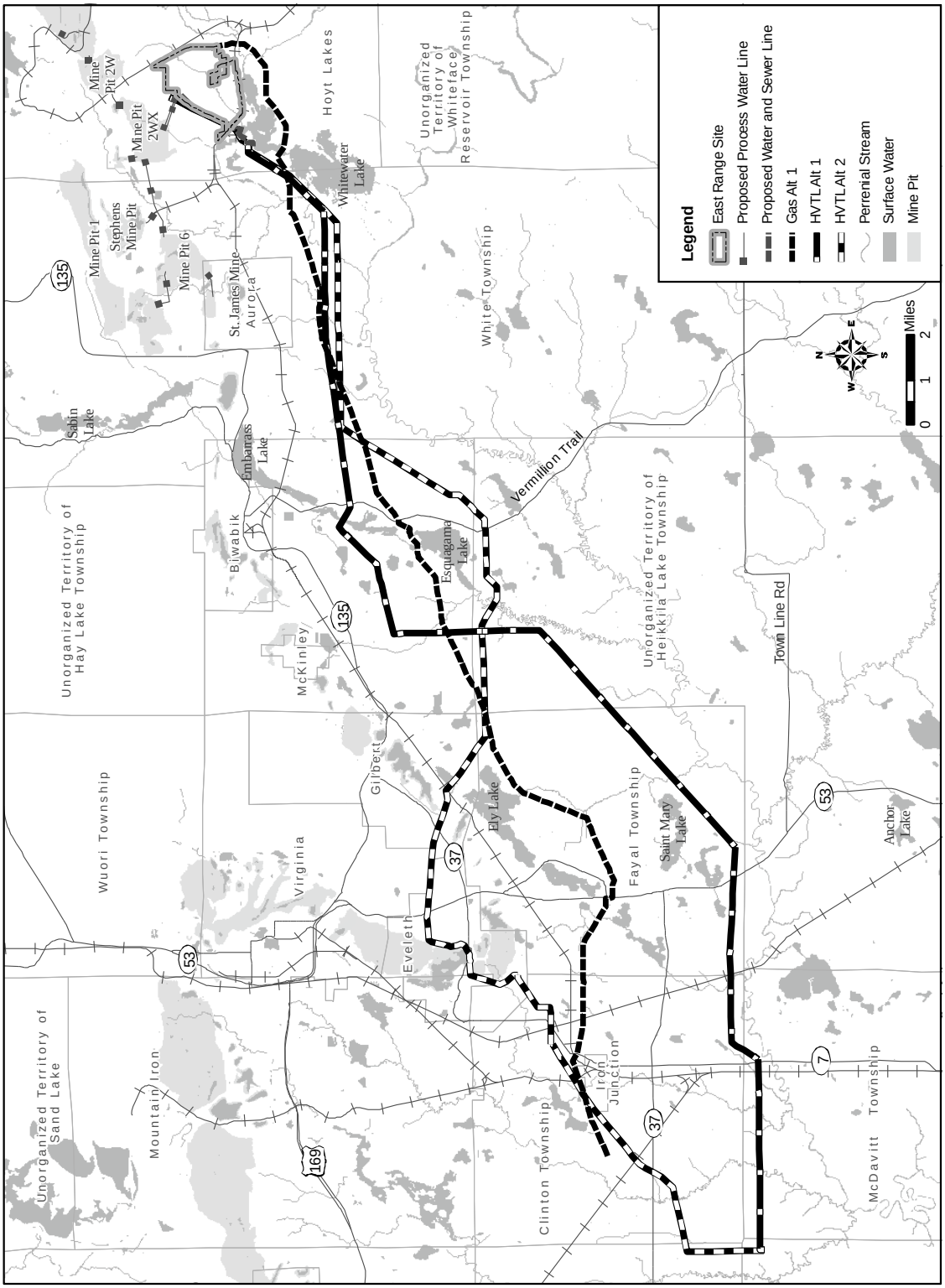


Figure S-3B. East Range Site and Corridors

EIS SCOPING

Because the EIS for the Mesaba Energy Project has been prepared as a joint Federal and state document to satisfy the requirements of NEPA and the Minnesota Power Plant Siting Act, the scoping requirements of both Federal and state legislation were applicable. The DOE public scoping process – including two public scoping meetings – was conducted early in the process as required by NEPA regulations. However, as required under state regulations, MDOC could not conduct public scoping meetings until after receipt of the joint permit application. Therefore, separate DOE and MDOC scoping meetings and scoping periods were held. However, representatives from DOE and MDOC attended all scoping meetings, and the agencies considered scoping comments received during both scoping periods.

DOE Scoping Process

DOE published the Notice of Intent (NOI) to prepare this EIS in the *Federal Register* on October 5, 2005 (70 *FR* 58207), and sent copies to Federal and state agencies. Publication of the NOI initiated the EIS process with a public scoping period (40 Code of Federal Regulations [CFR] Part 1501.7) for soliciting public input. The Federal EIS scoping period extended through November 14, 2005, and included two scoping meetings, one on October 25, 2005, in Taconite, Minnesota, and one on October 26, 2005, in Hoyt Lakes, Minnesota. These locations were selected for their close proximity to Excelsior's respective preferred and alternative sites.

DOE announced the public scoping meetings in the NOI and local newspapers. DOE also notified Federal, state, and local agencies; public officials; non-governmental organizations; and 26 Native American tribal governments, about the meetings. The public was encouraged to provide oral comments at the meeting and to submit comments to DOE by the close of the EIS scoping period. The NOI and announcements provided appropriate addresses and telephone numbers where comments could be communicated to DOE by U.S. Mail, e-mail, toll-free telephone, or facsimile. Collectively, 157 individuals attended the public scoping meetings. Twenty-nine individuals presented oral comments, and six comment sheets were submitted at the meetings. Additionally, 18 comments were submitted by e-mail, five letters were received by mail, four comments were received by facsimile, and two comments were received by telephone.

MDOC Scoping Process

The MDOC held two public scoping meetings for the project on consecutive nights, August 22 and 23, 2006, at the same facilities as the DOE public scoping meetings in Taconite and Hoyt Lakes, respectively. The scoping meetings were announced in the Environmental Quality Board (EQB) Monitor on July 31, 2006, and notices were published in local newspapers. Additionally, notice was sent to those persons whose names are on the EQB general notification list, regional and local governments, and each person whose property is adjacent to any of the proposed sites or routes. Approximately 300 individuals attended the public scoping meetings. All attendees were invited to provide comments, either written or oral, on the proposed project. In all, 50 comments were stated publicly at the meetings and 49 comments were submitted via e-mail, U.S. Mail, or facsimile. All of the various comment submissions were reviewed to characterize specific issues, concerns, and questions to ensure the consideration of all substantive concerns.

Additionally, a Citizens Advisory Task Force was established by the PUC to provide input to the scope of the EIS for the Mesaba Energy Project. The Task Force was requested to: (1) determine whether local site or route specific information as presented within the joint permit application is inaccurate or has missing information; (2) recommend which site- or route-specific impacts and issues of local concern

should be assessed in the EIS; and (3) express a preference for either the preferred or alternative site contained within the joint permit application if a consensus can be reached. Task Force members were selected by the MDOC based on the responses to a solicitation letter, and the Task Force met three times during August 2006 at locations near the West and East Range Sites.

During the final meeting of the Task Force, several members expressed an interest in developing statements related to the project that could be supported by all members. A unanimous consensus was not reached on any of the proposed statements, but a majority of the members voted affirmatively on the following statements (note that the recommendations of the Task Force on limitations to the scope are not binding on DOE):

- *This Task Force recommends that a site or sites be permitted and built on the Iron Range, assuming that all environmental concerns are considered and adequately addressed in the Environmental Impact Statement.*
- *This Task Force recommends that any analysis of cumulative impacts only be conducted on projects that have the necessary permits in place to proceed with the construction of the facility.*

The Commissioner of MDOC issued the EIS Scoping Decision on September 13, 2006 (MDOC, 2006). The EIS Scoping Decision is contained in Appendix G of the EIS.

Outreach to Native American Tribes

During scoping, it was and remains DOE's goal that all Federally recognized tribes with historic or current affiliation to Minnesota and the project area would be invited to participate in the consultation process. DOE contacted the Minnesota Indian Affairs Council to inform the council of the project and elicit any support that it might provide in facilitating consultation with tribal organizations. In September 2005, DOE contacted representatives of 26 regional Native American tribes and reservations by letter to inform them of the project and initiate formal consultation.

DOE received responses from the Tribal Historic Preservation Offices (THPOs) of the Keweenaw Bay Indian Community, Flandreau Santee Sioux Tribe, the Lac Vieux Desert Band of Lake Superior Chippewa Indians, the Mille Lacs Band of the Ojibwe Indians, and the Leech Lake Band of Ojibwe Indians. Because not all tribes responded to the initial consultation letters sent in September 2005, follow-up consultation letters were sent to the tribes listed above in May 2006 inviting them again to submit any concerns they might have that had not as yet been submitted. Following scoping and before issuing the Draft EIS, DOE had discussions with representatives of 13 tribes and organizations by telephone in May and June of 2007.

Since publication of the Draft EIS, DOE has held eight meetings between February 2008 and October 2009 with a group of tribal representatives usually lasting two to three days each at locations in northern Minnesota recommended by the tribes. DOE also met separately with the Upper Souix Community on three occasions between September 2008 and September 2009. DOE has also held conference calls with tribal representatives. The purposes of these meetings were to understand the concerns and interests of the tribes in the Mesaba Energy Project. DOE invited the tribes to consider participation in a possible Programmatic Agreement (PA) between DOE and the Minnesota State Historic Preservation Office that would be necessary to satisfy DOE's responsibilities under Section 106 of the National Historic Preservation Act. At the request of the tribes, DOE has also participated in discussions regarding a separate Memorandum of Agreement among DOE, Excelsior, and the tribes.

Consultation with the tribes regarding the PA will continue beyond the distribution of this Final EIS. The consultations with Native American tribes are outlined in Sections 1.6 and 1.8 of this Final EIS. DOE expects that the efforts made in the consultation process described in this EIS will result in execution of the agreement by tribes involved in the process.

Scoping Issues

The scope of issues to be addressed in this EIS, and the significant issues related to the action, were determined through several means including:

- The preliminary identification of issues by DOE as a part of the early project planning and internal scoping;
- Additional issues identified by DOE as a result of state and Federal agency consultation and coordination with representatives of Native American tribes;
- The identification of issues and concerns expressed in comments received from the public and interested parties during the NEPA scoping process; and
- Additional issues and concerns expressed in comments received from the public and interested parties during the Minnesota Power Plant Siting Act scoping process.

The Mesaba Energy Project has been assigned PUC Docket Number E6472/GS-06-668. Documents submitted by Excelsior in conjunction with the state permitting process, including the joint permit application (Excelsior, 2006a) and the environmental supplement (Excelsior, 2006b), as well as other documents relating to the state review process, and copies of all comments submitted in response to the DOE and MDOC scoping meetings can be accessed at the PUC website:

http://energyfacilities.puc.state.mn.us/Docket.html?Id=16573

Comments received by DOE and MDOC during the respective public scoping periods, and which have been considered appropriately in this EIS, generally aligned in the following categories:

General Comments

Among the general comments received during the DOE scoping period, respondents raised concerns about the absence of direct notification to all adjacent landowners about the meeting, the limited amount of material available about the project before the meetings, the desire for more written information to be available about the project that could be taken home from the meetings, and questions about how the process would proceed after the meetings. Other comments emphasized that the project should meet all regulatory requirements, expressed concerns regarding the project's emission of greenhouse gases, and raised concerns about the protection of Native American tribal interests.

During the MDOC scoping period, similar concerns were raised. Also, a number of comments contained statements of opinion and rhetorical questions, such as the desirability of a particular site. Such comments were not assimilated into the MDOC Scoping Decision in all cases; however, the EIS has attempted to address the subjects raised to the extent appropriate.

Comments on the Purpose and Need

During the DOE scoping period, respondents expressed concerns about the need for the proposed facility, both from the perspective of electricity demand (e.g., exemption from the Certificate of Need) and from the perspective of whether coal use is the best choice to meet that demand. Others conveyed concerns about the long-term operation and viability of the demonstration plant. Respondents questioned

whether the envisioned economic benefits of the proposed facility are valid, and whether economics should outweigh the potentially adverse environmental and human effects.

Many of the same comments were expressed during the MDOC scoping period. However, because Minnesota Statutes § 216B.1694, Subdivision 2, item 1 has exempted this facility from demonstrating need and because this facility qualifies as an "innovative energy project," issues related to the need, size, or type of the facility are excluded from consideration by the MDOC staff. Such issues are not within the scope of the state EIS.

Comments on the Proposed Action (Project Features)

During both the DOE and MDOC scoping periods, respondents recommended project information and details to be provided in the EIS, including process information, information about the expected efficiency and reliability of the plant, feedstocks, utility and resource requirements, emissions, and controls. Other comments addressed the size of the plant and the expected "footprint," rail alignments, transmission corridors, and various other features. This information has been incorporated into the project/process description sections of the EIS.

Comments on the Alternatives

Respondents during both scoping periods expressed concerns about the range of alternatives to be considered in the EIS. Specific comments were made regarding DOE's "No Fund" Alternative, as well as alternative site and technology selection (e.g., **G**reenfield versus **B**rownfield sites and the applicability of carbon sequestration technologies). Other respondents indicated that the project should include alternatives for renewable energy sources, such as wind and solar power that would reduce air pollutants, greenhouse gas emissions, and impacts on global climate change, or that the alternative of avoiding plant construction through increased energy efficiency and conservation should be considered. The range of alternatives available to DOE to satisfy DOE's purpose and need and to satisfy the goals of the CCPI is explained in this EIS; careful consideration was given to alternative technologies **within the context of CCPI**, including carbon sequestration. MDOC has determined that the project proponent has considered siting and routing alternatives as required by state law. MDOC will not, as part of its environmental review, consider whether a different size or different type of plant should be built instead, nor can the MDOC consider the "No Build" option.

Comments Related to Specific Environmental Resources

Numerous comments were received during both scoping periods with respect to specific natural and human environmental resources. The majority of the comments were related to the use of natural resources (e.g., coal, land, and water), the discharge of pollutants to the natural environment (e.g., air, water, and national parks), and the socioeconomic impacts of the project (e.g., jobs, taxes, and property values). Comments were also received relating to eminent domain, wetlands destruction, increased vehicular and rail traffic, the potential for adverse health effects, and demands on local community services (e.g., emergency responders, local water and sewer systems, and tourism/recreation). Native American tribal issues that were raised related to the following areas: surveys to identify cultural resources; protection of treaty rights to hunt, fish, and gather (i.e., potential impacts to wild game species, fisheries, and wild rice); avoidance or minimization of negative impacts to natural resources such as air quality, water quality, and wetlands; and cumulative effects. Concerns were also expressed by the public about connected actions and the cumulative effects of current industrial activities and future projects planned within the vicinity of the Mesaba Energy Project. MDOC incorporated these issues, along with the typical LEPGP, HVTL, and pipeline routing and siting impacts, into the proposed Order on the EIS

Scoping Decision. DOE has addressed these comments in respective resource sections throughout Chapter 4 of this EIS.

COMMENTS ON THE DRAFT EIS

The Draft EIS for the Mesaba Energy Project was published in November 2007. DOE and MDOC distributed copies of the Draft EIS to officials, agencies, Native American tribes, organizations, libraries and members of the public identified in the distribution list (Chapter 8 of the Draft EIS). MDOC announced the availability of the Draft EIS in the *EQB Monitor* on November 5, 2007 (Volume 31, Number 23, Page 9); DOE announced the Notice of Availability of the Draft EIS in the *Federal Register* on November 8, 2007 (72 *FR* 63169); and EPA published the Notice of Availability in the *Federal Register* on November 9, 2007 (72 *FR* 63579).

DOE and MDOC jointly held two public hearings for the Draft EIS, one in Taconite on November 27, 2007, and one in Hoyt Lakes on November 28, 2007 (at the same locations as the scoping meetings). DOE and MDOC advertised the hearings in the same regional newspapers as for the scoping meetings. Based on sign-in sheets, 107 individuals attended the Taconite hearing, and 34 individuals attended the Hoyt Lakes hearing. The public was encouraged to provide oral comments at the hearings and to submit written comments to DOE or MDOC by January 11, 2008.

Oral comments were given by 28 individuals at the Taconite hearing and by six individuals at the Hoyt Lakes hearing. In addition, DOE and MDOC received 88 written comments, including five from Federal agencies, four from state agencies, five from Native American tribal organizations, and several from national and regional non-governmental organizations and other affiliations.

The 122 oral statements and comment documents submitted by agencies, tribes, organizations, and individuals were subdivided into 770 comments distributed by subject area as listed in Table S-6. The distributions of comments by subject area are approximate, as numerous comments touched on two or more subjects. However, the distributions fairly depict the subject matters of concern to the 122 comment submitters. Representative concerns and issues expressed in the comments are summarized for the comments in each subject area. Volume 3 includes scanned images of the comment documents, beginning with the transcripts from both public hearings, and provides responses to all comments. DOE and MDOC considered all comments to the extent practicable in preparing the Final EIS.

Table S-6. Summary of Comments on the Draft EIS

Subject	Representative Issues and Concerns	Number of Comments
General	Inclusive of comments that could not be assigned to a particular subject area; general unfavorable and favorable comments about the project; concerns about the scope of the EIS; contentions that the EIS did not evaluate public scoping issues adequately; requests for corrections of claimed errors; and other comparable issues.	73
Cost	Cost of the project to taxpayers and rate payers; costs to residents and communities of adverse effects on recreational and natural resources.	13
Purpose & Need	Contentions about whether the need for the project has been adequately demonstrated; whether generation of electric power in northern Minnesota is justified by local need versus the needs of cities elsewhere.	41

Table S-6. Summary of Comments on the Draft EIS

Subject	Representative Issues and Concerns	Number of Comments
Proposed Action & Alternatives	Size and scope of the proposed action; justification for the proposed locations of sites and corridors; insufficient consideration of other potential sites; the reliance on coal and the lack of consideration for alternative energy sources or conservation measures.	43
Aesthetics	Visual impact of the proposed power plant to the surrounding communities.	4
Air Quality – General	Pollutant emissions by the proposed power plant and effects on local and regional air quality; adequacy of air modeling.	87
Air Quality – Climate Change	Volume of CO_2 and other greenhouse gases to be emitted by the proposed power plant and the effects on global climate.	19
Air Quality – Visibility	Potential for haze and visibility impacts in Class I areas; local visibility effects of emission plume.	26
Geology & Soils	Effects of plant siting on future mining of iron ore deposits; potential adverse effects on farmland soils.	7
Water Resources	Potential adverse effects of discharges to the Canisteo Mine Pit, Holman Lake, and the Swan River; effects of water withdrawals on mine pits; potential impacts on potable water wells.	124
Floodplains	No comments.	0
Wetlands	Potential loss or permanent conversion of wetlands for siting of plant facilities, transportation infrastructure, and utility corridors; impairment of wetland functions and quality; temporary impacts on wetlands.	37
Biological Resources	Potential loss or fragmentation of habitat and wildlife travel corridors; adverse effects on fisheries and aquatic resources from water withdrawals and effluent discharges; loss of woodland vegetation from clearing of site and corridors.	67
Cultural Resources	Need for surveys of corridors for potential archaeological resources; need for survey of East Range Site for potential archaeological resources; potential impacts on tribal heritage sites.	11
Land Use	Concerns about ownership of lands affected by utility corridors; questions about whether the sites provide adequate infrastructure for a project of its size.	7
Socioeconomics	Questions about the validity of predicted economic benefits and employment; concerns that beneficial effects won't accrue to the local communities; concerns about effects on housing; request to consider cost/benefit of proposed project.	52
Environmental Justice	Concerns about the impacts of the project on low income populations; disagreement with the geographic areas addressed in the environmental justice analysis.	9
Community Services	Effects of anticipated power plant demands on emergency response capacity in local communities; concerns about costs for emergency response being passed on to local taxpayers; effects on recreational resources and access.	5
Utility Systems	Need for new natural gas pipelines and HVTL corridors to serve the respective sites; potential need for extensive pipelines to transport CO_2 in the event of future capture and storage; effects of wastewater discharges on regional wastewater treatment plant that overflows during wet weather; effects on groundwater wells.	23
Traffic & Transportation	Effects of coal deliveries on rail traffic; questions about numbers of trains and effects of delays at crossings on local traffic.	17

Table S-6. Summary of Comments on the Draft EIS

Subject	Representative Issues and Concerns	Number of Comments
Materials & Waste Management	Potential for large quantities of slag and sulfur requiring landfill if no commercial markets are found; impacts on regional landfills; potential for spills of hazardous materials and effects on local responders.	24
Safety & Health	Health risks of plant emissions, especially particulates and mercury; bioaccumulation of mercury in fish; disagreement with characterization of at-risk receptors and impact areas.	39
Noise	Adverse noise levels from trains; effects of plant and rail operations on wilderness solitude.	2
Cumulative Impacts	Cumulative impacts analysis should use results of Minnesota Steel Final EIS; cumulative effects of industrial projects on treaty rights of Native American tribes to the use of natural resources;	11
Sequestration	Insufficient consideration for CO_2 capture and sequestration in EIS; energy expenditure required to build extensive CO_2 pipelines; potential amount of CO_2 that could be stored would not be significant in comparison to the amount of CO_2 that would be discharged under Excelsior's sequestration plan.	29

PRINCIPAL CHANGES BETWEEN THE DRAFT AND FINAL EIS

Table S-7 (new in the Final EIS) summarizes the principal changes in the project between the Draft EIS and Final EIS and explains how these changes affected respective sections in the Final EIS. The changes occurred as a result of comments on the Draft EIS as well as other circumstances not foreseen in the Draft EIS.

Table S-7. Changes Between Draft and Final EIS

Major Change to Final EIS	Site Affected	Basis and Description of Change	Section(s) of EIS Affected
Phase I versus Phase I and II	Both	At the request of USACE, the FEIS has been revised to describe the potential impacts of Phase I separately from the impacts of the combined two-phased project. In general, the separation of Phase I-only impacts results in the following changes: • Phase I-only plant would require half the footprint of the combined phases; • Material inputs/outputs for Phase I generally half of Phase II; • Not all water supply pipelines would be the same for Phase I and the combined phases: at West Range Site, water supply pipeline for Lind Mine Pit is only required for Phase II; similarly at East Range Site, not all Phase II waterlines would be constructed during Phase I, however, exact locations are unknown at this time due to uncertainties with nearby mining projects; • Domestic wastewater pipelines and potable water supply pipelines would be the same for both phases;	In Chapter 2, where necessary, the characteristics of Phase I are defined more specifically for differentiation from the combined phases I and II. (See Section 2.2 for descriptions of resource requirements, plant outputs, construction, and operations. See Section 2.3 for descriptions of plant and infrastructure features.) In Chapter 4, quantifiable impacts are presented separately for Phase I in comparison to the totals for both phases. Qualitative impacts are also discussed separately for Phase I only versus both phases.

Table S-7. Changes Between Draft and Final EIS

Major Change to Final EIS	Site Affected	Basis and Description of Change	Section(s) of EIS Affected
		• Length of natural gas pipelines would be the same for both phases; • Road and rail alignments would be the same for both phases; • Rail traffic would be half of Phase II rail traffic; vehicular traffic would be reduced but not half of Phase II traffic; • Noise would be reduced, but not half of Phase II noise; and • HVTL corridors would be as described in Sections 2.3.1.5 and 2.3.2.5 for respective sites.	
Avoidance and Minimization of Wetland Impacts	Both	Efforts were made by Excelsior/SEH to avoid and minimize wetland impacts at West Range property by adjusting plant footprint, rail, and road alignments Efforts were also made to avoid and minimize wetland impacts at East Range property. (These items are listed later in this table).	Appendix F2 (DOE Wetland and Floodplain Assessment) revised to explain the footprints and alignments considered and eliminated from further consideration based on the efforts taken to avoid and minimize wetland impacts. Only the alternatives listed later in this table were discussed in Volume 1 (main text) of the FEIS.
Enlarged Property Boundary	East Range	Excelsior acquired options on additional land between prior southern boundary and the CN rail alignment near Colby Lake. Additional property would increase the buffer land between the plant footprint and Hoyt Lake residences. The additional acreage at the East Range Site would remain undeveloped as buffer land.	References to East Range Site property acreage revised throughout document. Section 2.3.1.1 revised to describe Excelsior's option to acquire additional acreage at the East Range Site primarily to increase buffer land. In the event that any of the additional acreage would be disturbed for construction of facilities on the East Range Site, the impacts of the additional disturbance were identified where appropriate in Chapter 4 and affected acreage were considered in Section 5.2. Appendices D4 and D5 have been updated.

Table S-7. Changes Between Draft and Final EIS

Major Change to Final EIS	Site Affected	Basis and Description of Change	Section(s) of EIS Affected
Construction Laydown Areas	Both	Phase I construction: Phase II footprint would be used as staging/laydown area. Phase II construction: Several candidate locations near project site have been identified to serve as off-site staging and lay-down areas. Properties are owned by mineral extraction firms or tax forfeiture lands that have been cleared or disturbed, such properties and lands for which use as construction/laydown areas would not pose threats to surface waters, wetlands, or sensitive natural resources.	Section 2.2.4.1 revised to describe construction staging/laydown areas to be used for Phases I and II at both sites. Discussions of construction staging/laydown areas added to Sections 2.3.1.1 and 2.3.2.1, respectively, for the West Range and East Range sites. Resource sections in Chapter 4 edited as appropriate to identify impacts attributable to staging/laydown areas. Primarily affects Aesthetics, Wetlands, Biological Resources, Transportation, Noise, and to a lesser extent Land Use. Cumulative impacts analyses in Section 5.2 and Appendices D4 and D5 updated to reflect the revised acreages affected by construction staging/laydown areas.
Updates from System Impact Studies MISO Studies, Updates, and Actions affecting Network Upgrades	Both	West Range: An Optional System Impact Study confirmed that plans to construct a new 230 kV HVTL between the Clay Boswell and Wilton Substations (the latter near Bemidji, MN) and the Essar Minnesota steel plant – the latter of which is undergoing construction – would eliminate the need for network upgrades required to interconnect and inject 600 MWe of power from Mesaba Phase I to the regional electric grid at the Blackberry Substation (such upgrades including construction of a new 230kV HVTL between the Clay Boswell and Riverton Substations). East Range: The System Impact Study concluded that no network upgrades are required; however, the study was based on a maximum winter output of 552 MWe. A sensitivity analysis demonstrated that no injection limits requiring network upgrades were identified if the East Range IGCC Power Station would distribute 600 MWe.	Sections 2.2.2.4 and 4.14 updated to address the current status of MISO studies and decisions affecting Mesaba HVTLs.
Air Modeling for BACT and Visibility Analysis	Both	At the request of agencies and FLMs, Excelsior has provided a new modeling protocol by which impacts on air quality and visibility in Class I areas have been identified. Impacts of potential air emission scenarios based on modeling and visibility analysis results have been updated.	Discussions added to Sections 2.2.1.3 and 2.2.3.1 to explain the air emission control scenarios addressed by Excelsior in revised modeling and visibility analyses. Section 4.3 and Appendix B updated to discuss impacts of potential air emission scenarios based on modeling and visibility analysis results. Cumulative impact analysis updated in Section 5.2.2 and Appendix D1 based on revised air modeling.

Table S-7. Changes Between Draft and Final EIS

Major Change to Final EIS	Site Affected	Basis and Description of Change	Section(s) of EIS Affected
AERA Updates for Health Effects	Both	Based on agency comments on the DEIS, Excelsior and its consultants have conducted additional AERA analyses (independently reviewed by DOE) that generally increases the level of conservatism in the analysis and now addresses dioxin and furan emissions.	Sections 4.3 and 4.17 and Appendix C updated based on new AERA analysis. Cumulative impact analysis in Section 5.2.3 and Appendix D2 updated based on latest AERA results.
Implementation of enhanced ZLD system	West Range	After publication of the Draft EIS, Excelsior announced its commitment to implement an enhanced ZLD system for the West Range Site. Implementation of the enhanced ZLD system would eliminate all process wastewater discharge and reduce water demand. Process water requirements now the same as East Range Site: annual average of 3,500 gpm (Phase I) and 7,000 gpm (Phases I and II); annual peak of 5,000 gpm (Phase I) and 10,000 gpm (Phases I and II).	Sections 2.2.2.3 and 2.3.1.3 revised to discuss changes in process water requirements for the West Range Site. Section 2.2.3.2 revised to discuss elimination of process water effluents for West Range Site. Sections 4.5, 4.7, and 4.8 revised (and elsewhere as appropriate) to explain impacts of process water discharges would be avoided by ZLD. Cumulative impacts analyses in Section 5.2 and Appendices D3, D4, and D5 updated to reflect the elimination of the discharge pipelines and water quality improvements.
Plant Footprint Adjustment	West Range	West Range Site's plant footprint shifts approximately 280 feet to the northwest from the existing footprint outline. No change in size of footprint (same affected acreage amount); however, the Phase I and Phase II footprints would be reversed because of new Rail Alternative 3. Change in plant base elevation (rail yard is changed from 1,390 ft msl to approximately 1,405 ft msl; elevation from other plant tiers is minimally affected). Revised grading outside the plant footprint has increased fill slightly; however, amount of cut reduced is greater than amount of fill increased.	Section 2.3.1.1 revised to explain the shifting of the plant footprint toward the northwest and change in base elevation. Resource sections in Chapter 4 revised as appropriate to identify changes in impacts attributable to the footprint shift. Primarily affects Aesthetics, Wetlands, Biological Resources, and to a lesser extent Air, Land Use, and Noise. Cumulative impacts analyses in Section 5.2 and Appendices D4 and D5 updated to reflect the revised acreages affected by the plant footprint adjustment.

Table S-7. Changes Between Draft and Final EIS

Major Change to Final EIS	Site Affected	Basis and Description of Change	Section(s) of EIS Affected
Rail Alignment Alternative 3B	West Range	In response to agency comments on the DEIS to avoid and minimize impacts on wetlands, a new rail alignment, Alternative 3B, is now the preferred alternative. New alignment results in the following changes: • Routes rail loop around hill located to the northeast of the plant footprint avoiding substantial wetland acreage; • Adjustment in rail elevation affects base elevation of plant footprint by several feet resulting in reduced grading requirements (only the active coal yard would incur changes in elevation, not the entire footprint); and • Relocation of coal unloading point (nearly 2,000 feet closer to Diamond Lake Road) required by new rail loop would affect the duration of rail cars being located and moved in the vicinity of Diamond Lake Road residences.	Section 2.3.1.2 revised to explain the development and selection of Rail Alignment Alternative 3B as the new preferred rail alignment for the West Range Site. Resource sections in Chapter 4 edited as appropriate to identify impacts attributable to Alternative 3B. Primarily affects Aesthetics, Wetlands, Biological Resources, Transportation, Noise, and to a lesser extent Land Use. Cumulative impacts analyses in Section 5.2 and Appendices D4 and D5 updated to reflect the revised acreages affected by the new preferred rail alignment.
Proposed Access Road 3	West Range	In response to agency comments on the DEIS to avoid and minimize impacts on wetlands, a new road alignment, Access Road 3, is now the preferred alternative. The new alternative also avoids reliance on the proposed realignment of CR 7 by Itasca County, which has been deferred for the foreseeable future due to funding priorities. New road results in the following changes: • Locates access road at southwest corner of property and connecting with existing alignment of CR7 west of the Itasca County Solid Waste Transfer Station; • Places alignment within approximately 1000 feet of 2 residences north of CR7 outside western property boundary; and • Affects routing of utilities.	Section 2.3.1.2 revised to explain the development and selection of Access Road Alternative 3 as the new preferred alignment for the West Range Site. Resource sections in Chapter 4 edited as appropriate to identify impacts attributable to Alternative 3. Primarily affects Aesthetics, Wetlands, Biological Resources, Transportation, Noise, and to a lesser extent Land Use. Cumulative impacts analyses in Section 5.2 and Appendices D4 and D5 updated to reflect the revised acreages affected by the new preferred access road alignment.
Nashwauk Natural Gas Pipeline	West Range	After publication of the Mesaba Draft EIS, the Minnesota PUC issued a Pipeline Route Permit dated April 16, 2008 for Nashwauk Public Utilities Commission to construct and operate a 24-inch natural gas pipeline that would follow essentially the same route as the natural gas pipeline proposed by Excelsior for the Alternative 1 alignment between Blackberry and Taconite.	Sections 1.6.4, 2.1.2.1, and 2.3.1.4 updated to discuss planned construction of natural gas pipeline by Nashwauk PUC and potential purchase of natural gas by Mesaba in lieu of constructing a natural gas pipeline for the West Range Site. Where appropriate, resource sections in Chapter 4 updated.

Table S-7. Changes Between Draft and Final EIS

Major Change to Final EIS	Site Affected	Basis and Description of Change	Section(s) of EIS Affected
Access Road Alignment 2	East Range	After publication of the Draft EIS, Excelsior reconsidered the need for a looped access road based on comments received from USACE regarding potential impacts on wetlands. Therefore, as shown in revised Figure 2.3-6, only the southern portion of the access road described in the following paragraph would be constructed. Locates access road south of original proposed alignments to avoid wetlands and eliminates dual access roads originally proposed for improving traffic flow during construction.	Section 2.3.2.2 revised to explain the development and selection of Access Road Alternative 2 as the new preferred alignment for the East Range Site based on efforts made by DOE and Excelsior to avoid and minimize impacts on wetlands in response to agency comments on the DEIS. Resource sections in Chapter 4 edited as appropriate to identify impacts attributable to Alternative 2. Primarily affects Aesthetics, Wetlands, Biological Resources, Transportation, Noise, and to a lesser extent Land Use. Cumulative impacts analyses in Section 5.2 and Appendices D4 and D5 updated to reflect the revised acreages affected by the new preferred access road alignment.
Potential Water Use Conflicts with Neighboring Projects	East Range	Since publication of the Draft EIS, potential conflicts with other industrial users over Mine Pit 2 West Extension have developed. However, the Knox and Stephens Mine Pits are potential alternative reservoirs that could be used. Also, PolyMet Mining has proposed to reuse water from its dewatering activities instead of discharging it to the watershed (thus, not available for use by Excelsior).	Sections 2.3.2.3 and 4.5 revised to be consistent with updated water use plans of neighboring projects at the East Range Site. Appendix D3 also updated.

ENVIRONMENTAL IMPACTS

Chapter 3 of this EIS describes the baseline conditions for environmental resources that may be affected in the regions of influence for the preferred West Range and alternative East Range Sites. Chapter 4 analyzes the potential impacts or consequences that the Proposed Action and No Action Alternative may have on the respective environmental resources at the preferred and alternative sites. All substantive comments received during the public scoping process were considered in the impact analysis. Table **S-8** summarizes the impacts for the No Action Alternative and the Proposed Action at the West Range and East Range Sites for the 17 principal environmental resource subjects considered in this EIS. Chapter 5 provides discussions of mitigation, irreversible and irretrievable commitments, the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity, and the potential for cumulative impacts resulting from the Proposed Action.

Table S-8. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	Aesthetics	
No change in existing conditions; no change in viewsheds or aesthetic resources.	**Power Plant Site:** Change in viewshed for properties within sightline of power plant location. Security lighting and aircraft warning lights for power plant may be visible to closest residences (~50 within 1 mi). Three public lands are located within 20 mi, where vapor plumes may be visible at times (Hill Annex Mine State Park, Forest History Center, and Chippewa National Forest). See also: Noise. **Mesaba Generating Station (Phases I and II) would be twice the size of Phase I only and have 8 emission stacks instead of 4.** **No substantial differences in utility and transportation corridors for 2-phased plant compared to Phase I only.** **Transportation Facilities:** Aesthetic impacts from rail and road construction and operation for closest residences. See also: Noise. • Rail alt. 1A within 0.5 mi of 16 residences (closest within **470** ft). • Rail alt. 1B **eliminated based on Draft EIS.** • **Rail alt. 3B within 0.5 mi of 16 residences (closest within 470 ft).** • **Access Roads 1 and 2 eliminated after Draft EIS (CR 7 realignment deferred by Itasca County).** • **Access Road 3 within 0.5 mi of 2 residences (both within 1,250 ft).** **Water Sources and Discharges:** Temporary aesthetic impacts during construction. • Process water pipelines within 0.5 mi of 104 residences (4 within 500 ft). • Cooling water effluent pipelines **avoided using enhanced ZLD system.** • Potable/sanitary pipelines within 0.5 mi of 114 residences (4 within 500 ft). **Natural Gas Facilities:** Temporary aesthetic impacts during construction. Permanently cleared ROW (low-growing vegetation) • Alt. 1 within 0.5 mi of 153 residences (3 within 300 ft). • Alt. 2 within 0.5 mi of 339 residences (5 within 300 ft). • Alt. 3 within 0.5 mi of 935 residences (29 within 300 ft).	**Power Plant Site:** Change in viewshed for properties within sightline of power plant location. Security lighting and aircraft warning lights for power plant may be visible to closest residences (none within 1 mi). Site is on private land within Superior National Forest boundary, and two other public lands are located within 20 mi, where vapor plumes may be visible. See also: Noise. **Mesaba Generating Station (Phases I and II) would be twice the size of Phase I only and have 8 emission stacks instead of 4.** **No substantial differences in utility and transportation corridors for 2-phased plant compared to Phase I only.** **Transportation Facilities:** Aesthetic impacts from rail and road construction and operation for closest residences. See also: Noise. No residences within 0.5 mi of either rail alignment alternative (closest, ~1 mi). No residences within 0.5 mi of site access road (closest, >1 mi). **Water Sources and Discharges:** • No residences within 0.5 mi of process water pipeline segments (closest residence >0.75 mi). • No cooling water effluent pipeline (enhanced ZLD system). • No residences within 0.5 mi of potable/sanitary pipelines (closest >0.75 mi). **Natural Gas Facilities:** Temporary aesthetic impacts during construction. Proposed natural gas pipeline on existing pipeline ROW within 0.5 mi of 856 residences (46 within 300 ft).

Table S-8. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	HVTL Corridors: Change in viewshed for properties within sightline of new HVTLs (permanently cleared ROW with low-growing vegetation). Increased height and visibility of power poles in existing HVTL ROWs. • **HVTL Alt 1 (WRA-1 or WRB-1)** within 0.5 mi of 66 residences (4 within 500 ft). • **HVTL Alt 1A (WRA-1A or WRB-1A)** within 0.5 mi of 62 residences (7 within 500 ft). • **HVTL Phase 2 Plan B (WRB-2A)** existing HVTL ROW within 0.5 mi of 214 residences (29 within 500 ft).	**HVTL Corridors:** HVTLs on existing HVTL ROWs (<4 mi of new ROW); widening of one corridor required (permanently cleared ROW with low-growing vegetation). Increased height and visibility of power poles for properties within sightline of HVTLs. **Note that taller poles would be required for all HVTLs, but ROW widening would only occur on one of the two alignments.** • **HVTL Alt 1 (widen 38L ROW)** within 0.5 mi of 271 residences (22 within 500 ft). • **HVTL Alt 2 (widen 39L/37L ROW)** within 0.5 mi of 962 residences (49 within 500 ft).
Air Quality		
No change in existing conditions; no new emissions affecting air quality.	**Power Plant Site:** The facility would be a major source of SO_2, NO_X, CO, PM_{10}, and VOCs (for both Phase I-only and combined Phases I and II) under the PSD regulations (Table 4.3-7). Annual emissions of criteria pollutants **for combined Phases I and II** would include **(emissions for Phase I-only would be halved in comparison to the levels that would occur during the combined phase):** • 1,390 tons of SO_2, • 2,872 tons of NO_X, • 2,539 tons of CO, • 0.03 tons of Pb, • **532** tons of PM_{10}, and • 197 tons of VOCs; Predicted concentrations for each pollutant would be below allowable levels under NAAQS and MAAQS. The plant would potentially emit 0.026 tons per year (tpy) of mercury (below the HAP threshold of 25 tpy)**. EPA recently decided to develop emissions standards for power plants consistent with the D.C. Circuit's 2008 ruling to vacate CAMR. Although the final MACT is unknown at this time, the Mesaba Energy Project would implement mercury control technology, which would meet or exceed any anticipated regulatory requirement as activated carbon beds to treat pre-combustion syngas would be state-of-the art technology.**	**Power Plant Site: Similar to the West Range Site, the facility at the East Range Site would be a major source of SO_2, NO_X, CO, PM_{10}, and VOCs (for both Phase I-only and combined Phases I and II) under the PSD regulations (Table 4.3-7). Annual emissions of criteria pollutants for the East Range Site would be the same as the West Range Site, except for PM_{10}, which would be 709 tons.** Because of the source water quality at the East Range Site, emissions of PM_{10} would be higher than at the West Range Site. Similar to the West Range Site, predicted concentrations for each pollutant would be below allowable levels under NAAQS and MAAQS. The plant would potentially emit 0.026 tpy of mercury (below the HAP threshold of 25 tpy). **EPA recently decided to develop emissions standards for power plants consistent with the D.C. Circuit's 2008 ruling to vacate CAMR. Although the final MACT is unknown at this time, the Mesaba Energy Project would implement mercury control technology, which would meet or exceed any anticipated regulatory requirement as activated carbon beds to treat pre-combustion syngas would be state-of-the art technology.**

Table S-8. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	Class II PSD increment analysis: Because the highest predicted impacts were significant (i.e., above PSD Significant Impact Levels [SILs]), increment and NAAQS compliance modeling was necessary for SO_2, PM_{10}, and NO_X (Table 4.3-9). Class II PSD increment analysis indicates that the project would comply with all state and Federal Class II increment limits **(for both the single and combined phases). Results of Class II PSD increment analysis for Phases I and II combined (emissions for Phase I-only would be halved in comparison to the levels that would occur during the combined phase) are as follows:** • **SO_2 - 118.2 µg/m^3 for 1-hr averaging time; 71.2 µg/m^3 for 3-hr averaging time; 21.0 µg/m^3 for 24-hr averaging time; and 4.2 µg/m^3 for annual averaging time** • **PM_{10} – 24.8 µg/m^3 for 24-hr averaging time; and 1.7 µg/m^3 for annual averaging time** • **NO_2 – 7.6 µg/m^3 for annual averaging time** **NAAQS/MAAQS evaluation calculated the maximum impact of the Mesaba Generating Station, combined with all other regional sources and background concentrations. For Phase I-only and Phases I and II combined, the following predicted concentrations are below allowable levels, and the results demonstrate compliance with all MAAQS and NAAQS (Tables 4.3-10 and 4.3-11):** • **SO_2 – 521.9 µg/m^3 for 1-hr averaging time; 237.6 µg/m^3 for 3-hr averaging time; 73.3 µg/m^3 for 24-hr averaging time; and 8.6 µg/m^3 for annual averaging time** • **PM_{10} – 126.1 µg/m^3 for 24-hr averaging time; and 37.9 µg/m^3 for annual averaging time** • **$PM_{2.5}$ – 31.7 µg/m^3 for 24-hr averaging time; and 8.1 µg/m^3 for annual averaging time** • **NO_2 – 17.0 µg/m^3 for annual averaging time** • **CO – 8,959 µg/m^3 for 1-hr averaging time**	**Class II PSD increment analysis: Because the highest predicted impacts were significant (i.e., above PSD Significant Impact Levels [SILs]), increment and NAAQS compliance modeling was necessary for SO_2, PM_{10}, and NO_X (similar to West Range Site) (Table 4.3-9). Class II PSD increment analysis indicates that the project would comply with all state and Federal Class II increment limits for both the single and combined phases. Results of Class II PSD increment analysis for Phases I and II combined (emissions for Phase I-only would be halved in comparison to the levels that would occur during the combined phase) are as follows:** • **SO_2 – 294.3 µg/m^3 for 1-hr averaging time; 200.4 µg/m^3 for 3-hr averaging time; 52.5 µg/m^3 for 24-hr averaging time; and 2.9 µg/m^3 for annual averaging time** • **PM_{10} – 26.3 µg/m^3 for 24-hr averaging time; and 0.7 µg/m^3 for annual averaging time** • **NO_2 – 8.1 µg/m^3 for annual averaging time** **NAAQS/MAAQS evaluation calculated the maximum impact of the Mesaba Generating Station, combined with all other regional sources and background concentrations. Similar to West Range Site, for Phase I-only and Phases I and II combined, the following predicted concentrations are below allowable levels, and the results demonstrate compliance with all MAAQS and NAAQS (Tables 4.3-10 and 4.3-11):** • **SO_2 – 565.1 µg/m^3 for 1-hr averaging time; 360.4 µg/m^3 for 3-hr averaging time; 166.5 µg/m^3 for 24-hr averaging time; and 30.8 µg/m^3 for annual averaging time** • **PM_{10} – 112.2 µg/m^3 for 24-hr averaging time; and 32.9 µg/m^3 for annual averaging time** • **$PM_{2.5}$ – 30.1 µg/m^3 for 24-hr averaging time; and 7.5 µg/m^3 for annual averaging time** • **NO_2 – 32.5 µg/m^3 for annual averaging time** • **CO – 11,565 µg/m^3 for 1-hr averaging time**

Table S-8. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	Class I PSD increment analysis: Class I PSD increment modeling for West Range Site was based on Phase I and Phase II both operating at the "proposed" emission rates. Class I area impacts analysis indicates that the project impacts would be below allowable increments for all pollutants in Class I areas (i.e., BWCAW, VNP, and RLW) for both the Phase I-only emissions and Phases I and II combined emissions (Table 4.3-13). Long-term impacts are also below the SILs, indicating that impacts would not be significant, with no further analysis necessary. However, impacts are indicated to exceed the SILs for short-term SO_2 and PM_{10} at both BWCAW and VNP; therefore, a cumulative impact analysis (includes other regional SO_2 and PM_{10} increment sources, as well as reasonably foreseeable sources) was conducted to quantify total PSD increment consumption at both sites. The cumulative air impacts analysis indicates that there would be no exceedance of state/Federal standards (including applicable SIL) in any Class I area. Additionally, the cumulative impacts analyses demonstrate that there would be minor differences in cumulative impacts between the West Range Site versus East Range Site (Section 5.2.2.2; Table 5.2.2.-2).	**Class I PSD increment analysis: Because the East Range Site is in closer proximity to the Class I areas, the Class I PSD increment modeling for the East Range Site was based on Phase I operating at the "proposed" emission rates and Phase II was operating at the "enhanced" emission rates. Similar to the West Range Site, Class I area impacts analysis indicates that the project impacts would be below allowable increments for all pollutants in Class I areas (i.e., BWCAW, VNP, RLW, and IRNP – note, IRNP was analyzed for East Range Site due to proximity) for both the Phase I-only emissions and Phases I and II combined emissions (Table 4.3-14). Long-term impacts are also below the SILs, indicating that impacts would not be significant, with no further analysis necessary. However, impacts are indicated to exceed the SILs for short-term SO_2 and PM_{10} at BWCAW and short-term SO_2 at VNP; therefore, a cumulative impact analysis (includes other regional SO_2 and PM_{10} increment sources, as well as reasonably foreseeable sources) was conducted to quantify total PSD increment consumption at both sites. Similar to the West Range Site, the cumulative air impacts analysis indicates that there would be no exceedance of state/Federal standards (including applicable SIL) in any Class I area. Additionally, the cumulative impacts analyses demonstrate that there would be minor differences in cumulative impacts between the West Range Site versus East Range Site (Section 5.2.2.2; Table 5.2.2-2).**
	Class I Visibility/Regional Haze Analysis: Visibility/regional haze analysis in Class I areas using Method 2 predict that there would be days with ≥5% change in light extinction or ≥10% change in light extinction (Table 4.3-15). Results based on Method 8, indicate that emissions associated with Phases I and II would have the potential to produce impacts above the 5% limit at BWCAW and VNP (Table 4.3-15). The following summarizes the visibility impacts analysis results for both Method 2 and Method 8: **BWCAW** • **Method 2 (in a given year): 1 to 21 days of ≥5% light extinction and 0 to 6 days of ≥10% light extinction, depending on operating scenario.**	**Class I Visibility/Regional Haze Analysis: The visibility modeling analysis results for the East Range Site reflect the influence of the site's closer proximity to BWCAW by the commensurate higher predicted number of days with a change in light extinction above 5% and 10% for the same operating scenarios (Table 4.3-16). The following summarizes the visibility impacts analysis results for both Method 2 and Method 8:** **BWCAW** • **Method 2 (in a given year): 10 to 86 days of ≥5% light extinction and 0 to 29 days of ≥10% light extinction, depending on operating scenario.** • **Method 2 (2002-2004): 71 to 193 days of ≥5% light**

Table S-8. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	• Method 2 (2002-2004): 5 to 54 days of ≥5% light extinction and 0 to 13 days of ≥10% light extinction, depending on operating scenario. • Method 8 (annual): 8th highest values would exceed the 5% limit for "proposed" / "proposed" (highest value, 5.13%). • Method 8 (20%): 8th highest values would exceed the 5% limit for "proposed" / "proposed" (highest value, 7.4%) and "proposed" / "enhanced" (highest value, 5.75%). **VNP** • Method 2 (in a given year): 1 to 22 days of ≥5% light extinction and 0 to 7 days of ≥10% light extinction. • Method 2 (2002-2004): 9 to 51 days of ≥5% light extinction and 1 to 12 days of ≥10% light extinction, depending on operating scenario. • Method 8 (annual): 8th highest values would exceed the 5% limit for "proposed" / "proposed" (highest value, 5.95%). • Method 8 (20%): 8th highest values would exceed the 5% limit for "proposed" / "proposed" (highest value, 8.57%) and "proposed" / "enhanced" (highest value, 6.64%).	extinction and 7 to 43 days of ≥10% light extinction, depending on operating scenario. • Method 8 (annual): 8th highest values would exceed the 5% limit for all operating scenarios modeled (highest value, 10.28%). • Method 8 (20%): 8th highest values would exceed the 5% limit for all operating scenarios modeled (highest value, 14.69%). **VNP** • Method 2 (in a given year): 1 to 7 days of ≥5% light extinction and 0 to 2 days of ≥10% light extinction. • Method 2 (2002-2004): 4 to 14 days of ≥5% light extinction and 0 to 3 days of ≥10% light extinction, depending on operating scenario. • Method 8 (annual): 8th highest values would exceed the 5% limit for none of the operating scenarios modeled. • Method 8 (20%): 8th highest values would exceed the 5% limit for "proposed" / "proposed" (highest value, 5.49%). **IRNP** • Method 2 (in a given year): 0 to 2 days of ≥5% light extinction and 0 to 1 days of ≥10% light extinction. • Method 2 (2002-2004): 1 to 2 days of ≥5% light extinction and 0 to 1 days of ≥10% light extinction, depending on operating scenario. • Method 8 (annual): 8th highest values would exceed the 5% limit for none of the operating scenarios modeled. • Method 8 (20%): 8th highest values would exceed the 5% limit for none of the operating scenarios modeled.

Table S-8. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	Odors from H_2S and NH_3 would be negligible, because associated processes would be enclosed. Sulfur and Nitrogen Deposition: The National Park Service (NPS) has established a Deposition Analysis Threshold (DAT) of 0.01 kg/hectare/yr for both sulfur (S) and nitrogen (N) deposition in Class I areas, which is the level below which adverse impacts are not anticipated. **No exceedances of the DAT for nitrogen would occur under any of the operating scenarios (Table 4.3-20). No exceedances of the DAT for sulfur would occur under the Phase I-only scenario; exceedances of the DAT for sulfur would occur at BWCAW for the "proposed"/"proposed" scenario and at VNP for the "proposed"/"proposed" and "proposed"/ "enhanced" scenarios.**	Odors from H_2S and NH_3 would be negligible, because associated processes would be enclosed. Sulfur and Nitrogen Deposition: The DAT of 0.01 kg/hectare/yr established by NPS for both S and N deposition in Class I areas would apply to the East Range Site. **DAT exceedances for nitrogen would occur at the BWCAW for all operating scenarios (Table 4.3-20). DAT exceedances for sulfur would occur at BWCAW for all operating scenarios and at VNP for the "proposed"/ "proposed" scenario. Further cumulative analysis on nitrogen and sulfur deposition impacts are discussed in Section 5.2.2.**
	Modeled mercury concentration over lakes and watershed (from AERMOD modeling) = 1.3 x 10^{-5} µg/m^3. The deposition rate for mercury would be **1.3 x 10^{-9} µg/m^2 per** sec over lakes and **6.5 x 10^{-9} µg/m^2 per** sec over the rest of the watershed. Big Diamond Lake would be within the release plume of future facility emissions; therefore, the concentration and rate of deposition was used to determine the incremental contribution of mercury in fish tissues caught from Big Diamond Lake (see Section 4.17, Health and Safety). Mercury emissions and subsequent deposition would be reduced by the high efficiency IGCC technology combined with the design-added mercury removal carbon absorption beds to ensure that mercury emissions from the facility would be less than 10 percent of the mercury in the feedstock. **Maximum predicted concentration of elemental mercury concentration in Class I areas due to operation of Phase I and Phase II is 1.6 x 10^{-6} µg/m^3 at VNP (0.11% of background concentration of elemental mercury). See Table 5.2.2-5. Phase I impacts would be roughly halved.** **Transportation Facilities:** Fugitive dust emissions during construction and operations from vehicle traffic, transportation of materials, and material handling. The impacts would be localized and would decrease with distance from site and alignments. **Relative to plant-wide emissions and considering sources are mobile, transportation-related emissions are considered negligible for both the single and combined phases; estimated transportation-related emissions are as follows (Phase I-only**	**Modeled mercury concentration over lakes and watershed (from AERMOD modeling) = 1.3 x 10^{-5} µg/m^3. The deposition rate for** would be **1.3 x 10^{-9} µg/m^2 per** sec over lakes and **6.5 x 10^{-9} µg/m^2 per** sec over the rest of the watershed. Colby Lake would be within the release plume of future facility emissions; therefore, the concentration and rate of deposition was used to determine the incremental contribution of mercury in fish tissues caught from Colby Lake based on the analytical results for Big Diamond Lake (see Section 4.17, Health and Safety). Mercury emissions and subsequent deposition would be reduced by the high efficiency IGCC technology combined with the design-added mercury removal carbon absorption beds to ensure that mercury emissions from the facility would be less than 10 percent of the mercury in the feedstock. **Maximum predicted concentration of elemental mercury concentration in Class I areas due to operation of Phase I and Phase II is 4.1 x 10^{-6} µg/m^3 at BWCA (0.28% of background concentration of elemental mercury). See Table 5.2.2-6. Phase I impacts would be roughly halved.** **Transportation Facilities:** Fugitive dust emissions during construction and operations from vehicle traffic, transportation of materials, and material handling. The impacts would be localized and would decrease with distance from site and alignments. **Relative to plant-wide emissions and considering sources are mobile, transportation-related emissions are considered negligible for both the single and combined phases; estimated transportation-related emissions are as follows (Phase I-only**

Table S-8. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	emissions would be half of levels occurring under the combined phase): • **Emissions from personally owned vehicles (POVs): During peak construction activities, the following daily emission rates (lb/day) would occur: 0.8 NO_x; 11 CO; 0.48 NMOC (non-methane organic compounds); and 0.2 PM. Peak traffic counts from project (during Phase I and II construction overlap) would still be minor fraction of existing AADT threshold and, therefore, impacts are considered negligible.** • **Emissions from rail deliveries: During operation, the following annual emissions would occur (tpy): 150,000 CO_2; 1.5 SO_2; 2,300 NO_x; 80 PM; and 410 CO.** • **Emissions from truck deliveries: During operation, the following annual emissions would occur (tpy): 7,700 CO_2; 0.1 SO_2; 60 NO_x; 0.8 PM; and 7 CO.** **Water Sources and Discharges, Natural Gas Facilities, and HVTL Corridors:** Fugitive dust emissions during construction related to the respective lengths of potential alignments.	**emissions would be half of levels occurring under the combined phase):** • **Emissions from POVs: During peak construction activities, the daily emission rates and impacts would be similar to those of West Range Site.** • **Emissions from rail deliveries: During operation, the following annual emissions would occur (tpy): 170,000 CO_2; 1.7 SO_2; 2,600 NOx; 90 PM; and 460 CO.** • **Emissions from truck deliveries: During operation, the following annual emissions would occur (tpy): 8,100 CO_2; 0.1 SO_2; 61 NOx; 0.8 PM; and 7 CO.** **Water Sources and Discharges, Natural Gas Facilities, and HVTL Corridors:** Fugitive dust emissions during construction related to the respective lengths of potential alignments.
Geology and Soils		
No change in existing conditions; no new land disturbance.	**Power Plant Site:** The plant footprint (Phases I & II) would occupy approximately **202** ac. Site grading and preparation for the plant footprint would require approximately **3,100,000** yd^3 of cut land and approximately **2,350,000** yd^3 of fill land. **The Phase II footprint would be cleared to serve as a laydown area for Phase I construction. Therefore, the amount of disturbed soil on site would not dramatically change between Phase I and Phase II construction. Offsite laydown areas for Phase II construction would be established on 85 ac of lands at 4 potential sites that have been disturbed from prior mining activities.** **All utilities and transportation infrastructure would be developed for operation of Phase I (no difference in impacts for Phase I-only outcome).** Although the site is situated on **152** ac of soils classified as prime farmland or prime farmland if drained, no agriculture uses currently occur on the property. The Minnesota Prime Farmland Exclusion Rule does not apply to the site which is within 2 mi of a statutory city **(Taconite)**.	**Power Plant Site:** The plant footprint (Phases I & II) would occupy approximately **182** ac. Based on site topography, grading and preparation for the plant footprint would require **approximately 3,349,000 yd^3 of cut volume and less fill than the West Range Site**. **The Phase II footprint would be cleared to serve as a laydown area for Phase I construction. Therefore the amount of disturbed soil on site would not dramatically change between Phase I and Phase II construction. Offsite laydown areas for Phase II construction would be established on 85 ac of lands at 2 potential sites that have been disturbed from prior mining activities.** **All utilities and transportation infrastructure would be developed for operation of Phase I (no difference in impacts for Phase I-only outcome).** There are no areas designated as prime farmland within the East Range Site boundary and no agriculture uses currently occur on the property. The Minnesota Prime Farmland Exclusion Rule does not apply to the site which is within 2 mi of a statutory city.

Table S-8. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	Transportation Facilities: Construction impacts from rail and road alignments. No long-term operational impacts. • Rail alt. 1A would disturb **118** ac, require approximately **3,725,000** yd^3 of cut land and **610,000** yd^3 of fill land, and **affect** approximately **50** ac of prime farmland soils. • Rail alt. 1B **eliminated based on Draft EIS.** • **Rail alt. 3B would disturb 107 ac, require approximately 2,620,000 yd^3 of cut land and 620,000 yd^3 of fill land, and affect approximately 66 ac of prime farmland soils.** • **Access Roads 1 and 2 eliminated after Draft EIS (CR 7 realignment deferred by Itasca County).** • **Access Road 3 would disturb 20 ac, all of which are prime farmland soils.** **Water Sources and Discharges:** Construction of process water supply pipelines would disturb **134** ac and occupy **55** ac of prime farmland soils. Cooling water effluent pipelines **avoided using enhanced ZLD system**. Potable/sanitary pipelines would disturb **9** ac and occupy **<1** ac of prime farmland. **Natural Gas Facilities:** Construction impacts of alignments. • Alternative 1 would disturb **135** ac. • Alternative 2 would disturb **84** ac. • Alternative 3 would disturb **99** ac. **HVTL Corridors:** Impacts of alignments. • **HVTL Alt 1 (WRA-1 or WRB-1)** would disturb 134 ac and occupy <1 ac of prime farmland soils. • **HVTL Alt 1A (WRA-1A or WRB-1A)** would disturb **136** ac and occupy <1 ac of prime farmland soils. • **HVTL Phase 2 Plan B** (WRB-2A) would disturb land on an existing HVTL ROW.	**Transportation Facilities:** Construction impacts from rail and road alignments. No long-term operational impacts. • Rail alt. 1 would disturb **53** ac and require approximately **2,390,000** yd^3 of cut land and less fill than at West Range. • Rail alt. 2 would disturb **58** ac and require approximately **2,180,000** yd^3 of cut land and less fill than at West Range. • Access road construction **(single segment)** would disturb **26** ac. Impacts on prime farmland could not be determined from data available, because the soil survey for St. Louis County has not been completed. **However, the Minnesota Prime Farmland Exclusion Rule does not apply to the alignment which is in or within 2 mi of a statutory city (Hoyt Lakes).** **Water Sources and Discharges:** Construction of process water supply pipelines would disturb approximately 109 ac. No cooling water effluent pipelines required (due to the use of an enhanced ZLD system). Potable/sanitary pipelines would disturb 25 ac. Impacts on prime farmland could not be determined (soil survey for St. Louis County not complete). **Natural Gas Facilities:** Pipeline would be constructed within an existing gas pipeline ROW requiring disturbance of **259** ac. **HVTL Corridors:** HVTLs constructed on existing HVTL ROWs with new towers (<4 mi of new ROW); widening of one or the other corridor required. • **HVTL Alt 1 (widen 38L ROW)** would disturb **about** 457 ac. • **HVTL Alt 2 (widen 39L/37L ROW)** would disturb **about** 455 ac.

Table S-8. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	Water Resources	
No changes to water resources in the project area. **At West Range Site, potential to aid the state in maintaining mine pits that are currently being pumped (HAMP) or may overflow (CMP) would not occur. No benefits to water quality of Swan River as a result of funded I/I studies and planned improvements at CBT WWTF. At East Range Site, potential to aid other industrial users (e.g., PolyMet) in the treatment of their wastewaters would not occur.**	**Power Plant Site:** Disturbance of land areas during plant construction, as summarized for Geology and Soils, would create potential for erosion and sedimentation. Impacts on surface waters would be minimized through the implementation of an erosion and sediment control (ESC) plan required for a National Pollutant Discharge Elimination System (NPDES) General Construction Permit. Potential impacts during operation would be minimized through the implementation of a stormwater pollution prevention plan (SWPPP) based on state requirements. **All stormwater discharges (within a 24-hour, 100-year storm event) would be eliminated, as stormwater would be treated and reused within the plant, primarily for cooling water**. No impacts on groundwater from the construction or operation of the plant are expected. **Transportation Facilities:** Disturbance of land areas during road and railway construction, as described for Geology and Soils. Impacts on surface waters would be minimized through the implementation of a SEC plan required for a NPDES General Construction Permit. No impacts on surface waters or groundwater from the operation of the road and railway expected. **Water Sources and Discharges: No direct discharge of any process wastewaters to surface waters would occur due to the enhanced ZLD system. During Phase I, annual process water demand** from CMP and interconnected mine pits would not adversely affect water sources. Lowering of water level in CMP would reduce potential for overflow impacts on Coleraine and Bovey. **At the end of the 30-year project life, concentration of phosphorous in the CMP would increase from 0.0037 mg/L to 0.0057 mg/L; however, this predicted concentration is below the state's standard of 1 mg/L and is expected to have minimal impact on biota in the CMP. During Phase II, water demand would lower water levels in HAMP Complex and may cause exposure of land bridges. Use of HAMP would require consultation with MNDNR to determine agency's operating priorities and to ensure minimal impacts to water resources. Elimination of LMP's discharge to the Prairie River represents 1.3 percent of river's average annual flow during normal operating conditions for Phase II. During dry seasons, Prairie**	**Power Plant Site:** Disturbance of land areas during plant construction, as summarized for Geology and Soils, would create potential for erosion and sedimentation. Impacts on surface waters would be minimized through the implementation of an ESC plan required for a NPDES General Construction Permit. Potential impacts during operation would be minimized through the implementation of a SWPPP based on state requirements. **All stormwater discharges (within a 24-hour, 100-year storm event) would be eliminated, as stormwater would be treated and reused within the plant, primarily for cooling water**. No impacts on groundwater from the construction or operation of the plant are expected. **Transportation Facilities:** Disturbance of land areas during road and railway construction, as described for Geology and Soils. Impacts on surface waters would be minimized through the implementation of a SEC plan required for a NPDES General Construction Permit. No impacts on surface waters or groundwater from the operation of the road and railway expected. **Water Sources and Discharges: No direct discharge of any process wastewaters to surface waters would occur due to the enhanced ZLD system. During Phase I, annual process water demand of 3,500 gpm (average) and 5,000 gpm (peak) from interconnected mine pits would not adversely affect water sources. During Phase II, water demand would cause fluctuations of water levels in Colby Lake, which is expected to result in minor impacts to fish populations, boat access and property values; greater fluctuation may occur in Whitewater Reservoir, which may cause similar impacts, but to a greater extent, depending on level of fluctuation. Excelsior would conduct further hydrologic modeling and investigations into limiting losses of water from Whitewater Reservoir as part of the water appropriation permit process. Any credit ultimately ascribed to recovering waters leaking from Whitewater Reservoir would be required to be supported by in-depth studies conducted in conjunction with input from the MNDNR. There are potential water quality benefits to the**

Table S-8. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	River's normal low flow could be reduced by approximately 18 percent. If necessary, to protect river flows during such events, Excelsior would curtail direct appropriations from the river and instead withdraw from stored capacity in other mine pits. **I/I studies and planned improvements at the CBT WWTF would improve water quality of Swan River watershed.** Potable water use of 7,500 gpd during operation would not adversely affect Taconite water system, however, the existing water system does not have sufficient capacity to provide the 45,000 gpd during construction. Planned improvements to the system would be necessary to handle this demand, or Excelsior would provide potable water via truck during construction. Domestic wastewater discharges would be within the effective treatment capacity of the regional facility. **Natural Gas Facilities:** Best management practices (BMPs) would be implemented to minimize impacts from erosion and sedimentation during construction. **HVTL Corridors:** BMPs would be implemented to minimize impacts from erosion and sedimentation during construction.	**Lake Superior Basin watershed from providing treatment to industrial users' wastewaters.** Potable water use of 45,000 gpd during construction and 7,500 gpd during operation would not adversely affect the Hoyt Lakes water system. Domestic wastewater discharges would be within the effective treatment capacity of the municipal facility. **Natural Gas Facilities:** BMPs would be implemented to minimize impacts from erosion and sedimentation during construction. **HVTL Corridors:** BMPs would be implemented to minimize impacts from erosion and sedimentation during construction.
Floodplains		
No change in existing conditions; no impact on floodplains.	**Power Plant Site:** No impact. The site is approximately one mile from the nearest 100-year floodplain, along the Prairie River. **None of the candidate sites for Phase II staging and laydown activities is located within or would otherwise affect a 100-year floodplain.** **Transportation Facilities:** No impact. Proposed rail and access road alignments would be located outside of the 100-year floodplain. **Water Sources and Discharges:** No impact. Construction of pipelines would occur outside of the 100-year floodplain. **Natural Gas Facilities:** Temporary impacts may occur during construction of natural gas pipeline alt. 1, 2, or 3 as a result of trenching, stockpiling of soil, and storage of equipment where pipelines would cross the 100-year floodplain of Swan River or Prairie River However, impacts would be mitigated through the use of construction BMPs, and floodplain contours would be restored	**Power Plant Site:** No impact. The site is approximately one mile from the nearest 100-year floodplain, along the Partridge River. **None of the candidate sites for Phase II staging and laydown activities is located within or would otherwise affect a 100-year floodplain.** **Transportation Facilities:** No impact. Proposed rail and access road alignments would be located outside of the 100-year floodplain. **Water Sources and Discharges:** No impact. Construction of pipelines would occur outside of the 100-year floodplain. **Natural Gas Facilities:** Temporary impacts may occur during construction of the natural gas pipeline as a result of trenching, stockpiling of soil, and storage of equipment where the pipeline would cross the 100-year floodplain of the Partridge River. However, impacts would be mitigated through the use of construction BMPs, and floodplain contours would be restored

Table S-8. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	following construction. No permanent impacts on flood elevations would occur, because the pipelines would be located below the land surface. **HVTL Corridors:** No impact. Construction of HVTLs would occur outside of the 100-year floodplain.	following construction. No permanent impacts on flood elevations would occur, because the pipelines would be located below the land surface. **HVTL Corridors:** Temporary impacts may occur during widening of HVTL corridors (38L or 39L/37L) where the HVTLs would cross the 100-year floodplain of the Partridge, Embarrass, or East Two River. No permanent impact on flood elevations would occur, because permanent structures would be limited to HVTL towers that have small footprints.
Wetlands		
No change in existing conditions; wetlands would remain in their current status.	**Power Plant Site:** Wetland **fill for** the plant footprint (Phases I & II) would be approximately 31 ac **(13 ac for Phase I and 18 ac for Phase II)**. **No wetlands would be disturbed for use of offsite laydown areas to support Phase II construction.** **All utilities and transportation infrastructure would be developed for operation of Phase I (no difference in wetland impacts for Phase I-only outcome).** **Transportation Facilities:** Construction of rail and road access would result in **filling of wetlands and potential isolation of wetlands in rail loops:** • Rail alt. 1A would **fill 18 ac of wetlands and isolate 58 ac of additional wetlands in the rail loop**. • Rail alt. 1B **eliminated based on Draft EIS**. • **Rail alt. 3B would fill <6 ac of wetlands.** • **Access Roads 1 and 2 eliminated after Draft EIS (CR 7 realignment deferred by Itasca County).** • **Access Road 3 would fill <0.2 ac of wetlands.** **Water Sources and Discharges:** Construction of pipelines: • Process water supply pipelines would **permanently convert <5 ac and temporarily affect <3 ac of wetlands.** • Cooling water effluent pipelines **avoided using enhanced ZLD system**. • Potable/sanitary pipelines would **be installed in ROW developed for other plant infrastructure; no additional impacts**. **Natural Gas Facilities:** Construction of pipelines:	**Power Plant Site:** Wetland **fill for** the plant footprint (Phases I & II) would be approximately **17** ac **(13 ac for Phase I and <4 ac for Phase II)**. **No wetlands would be disturbed for use of offsite laydown areas to support Phase II construction.** **All utilities and transportation infrastructure would be developed for operation of Phase I (no difference in wetland impacts for Phase I-only outcome).** **Transportation Facilities:** Construction of rail and road access would result in **filling of wetlands and potential isolation of wetlands in rail loops:**: • Rail alt. 1 would **fill 13 ac of wetlands and isolate 51 ac of additional wetlands in the rail loop**. • Rail alt. 2 would **fill 18 ac of wetlands** (no center loop). • Access road construction **(single road segment)** would **fill <0.5 ac of wetlands**. **Water Sources and Discharges:** Construction of pipelines: • Process water supply pipelines would **permanently convert <2 ac and temporarily affect <1 ac of wetlands**. • No cooling water effluent pipelines required (due to the enhanced ZLD system). • No wetlands are located in the alignments for potable/sanitary pipelines **(would affect 1.1 ac segment of Colby Lake)**. **Natural Gas Facilities:** Construction of the natural gas pipeline would **permanently convert <0.5 ac and temporarily affect 24 ac of wetlands**.

Table S-8. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	• Alt. 1 would **permanently convert 16 ac and temporarily affect <5 ac of wetlands**. • Alt. 2 would **permanently convert 11 ac and temporarily affect <2 ac of wetlands**. • Alt. 3 would **permanently convert 4 ac and temporarily affect 8 ac of wetlands**. **HVTL Corridors:** Construction of HVTLs. • **HVTL Alt 1 (WRA-1 or WRB-1) would fill 0.01 ac, permanently convert 36 ac and temporarily affect 2 ac of wetlands**. • **HVTL Alt 1A (WRA-1A or WRB-1A) would fill 0.01 ac, permanently convert 25 ac and temporarily affect 4 ac of wetlands.** • **HVTL Phase 2 Plan B (WRB-2A) would fill 0.03 ac of wetland (construction in existing ROWs; no additional impacts).**	**HVTL Corridors:** HVTLs would be constructed on existing HVTL ROWs with new towers (<4 mi of new ROW); widening of one or the other corridor would be required. • **HVTL Alt 1 (widen 38L ROW) would fill 0.09 ac, permanently convert 62 ac and temporarily affect negligible ac of wetlands**. • **HVTL Alt 2 (widen 39L/37L ROW) would fill 0.09 ac, permanently convert 60 ac and temporarily affect 0.2 ac of wetlands**.
Biological Resources		
No change in existing conditions; biological resources would remain in current status.	**Power Plant Site:** Approximately **202** ac of vegetation **and habitat** would be lost or destroyed from construction for **the plant footprint in both phases (111 ac** for Phase I and **92 ac** for Phase II). **DOE determined, based on a Biological Assessment (see Appendix E), that the project may affect, but would not likely adversely affect, the Canada lynx or gray wolf; the USFWS has concurred with DOE's determination for the West Range Site. USFWS has also concurred with DOE's determination that the project is not likely to adversely affect the bald eagle.** Eight state-listed plant species (17 occurrences) in general area of site, but no occurrences within the site boundary. Possible, but unlikely, that these species could be affected. **85 ac of land on 4 potential sites would be cleared for offsite laydown areas to support Phase II construction. All 4 sites have been disturbed during prior mining activities.** **All utilities and transportation infrastructure would be developed for operation of Phase I (no difference in impacts for Phase I-only outcome).**	**Power Plant Site:** Approximately **183** ac of vegetation **and habitat** would be lost or destroyed from construction for **the plant footprint in both phases (98 ac** for Phase I and **85 ac** for Phase II. **DOE determined, based on a Biological Assessment (see Appendix E), that the project may affect, but would not likely adversely affect, the Canada lynx or gray wolf at the East Range Site; however, the USFWS stated that agency policy precludes consultation on more than one site and that it would only concur on the DOE determination for one of the two sites. DOE agreed that in the event that the East Range Site would be selected by the MPUC in the site permitting process, DOE would re-initiate consultation for the East Range Site. USFWS has concurred with DOE's determination that the project is not likely to adversely affect the bald eagle.** No known occurrences of state-listed species within 1 mi of site. **85 ac of land on 2 potential sites would be cleared for offsite laydown areas to support Phase II construction. Both sites have been disturbed during prior mining activities.** **All utilities and transportation infrastructure would be developed for operation of Phase I (no difference in impacts for Phase I-only outcome).**

Table S-8. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	Transportation Facilities: Construction of rail and road access: • Rail alt. 1A: **92** ac of vegetation **and habitat would be** lost or destroyed **(80 ac additional habitat in rail loop may be affected without Excelsior's assurances to the contrary)**. No known occurrences of state-listed species within 1 mi. • Rail alt. 1B: **Eliminated based on Draft EIS**. • **Rail alt. 3B: 94 ac of vegetation and habitat would be lost (212 ac additional habitat in rail loop may be affected). No known occurrences of state-listed species within 1 mi.** • **Access Roads 1 and 2 eliminated after Draft EIS (CR 7 realignment deferred by Itasca County).** • **Access Road 3: 12 ac of vegetation and habitat would be lost; 8 ac would additionally be cleared for construction. No known occurrences of state-listed species within 1 mi.**	**Transportation Facilities:** Construction of rail and road access: • Rail alt. 1**: 53 ac of vegetation and habitat would be lost (105 ac additional habitat in rail loop may be affected without Excelsior's assurances to the contrary).** Two stream crossings could cause direct mortality to aquatic biota, habitat fragmentation/conversion, increased water temperature, and increased sedimentation (causing loss in macroinvertebrate communities). No known occurrences of state-listed species within 1 mi. • Rail alt. 2**: 58 ac of vegetation and habitat would be lost (no rail loop).** One stream crossing could cause direct mortality to aquatic biota, habitat fragmentation/conversion, increased water temperature, and increased sedimentation (causing loss in macroinvertebrate communities). No known occurrences of state-listed species within 1 mi. • Access road **(single road segment)** would result in the loss of **16** ac of **habitat; 10 ac would additionally be cleared for construction**. No known occurrences of state-listed species within 1 mi.
	Water Sources and Discharges: Construction of pipelines: • Process water supply pipelines would result in **conversion of 47 ac of wooded habitat to grassland habitat as well as clearing 46 ac of additional habitat during construction**. Five known occurrences of five state-listed plant species within 1 mi of proposed pipeline. Possible, but unlikely, that these species could be affected by construction (usually found in different habitat types). • Cooling water effluent pipelines **avoided using enhanced ZLD system.** • Potable/sanitary pipelines would cause the **conversion of 1 ac of wooded habitat to grassland habitat as well as clearing 6 ac of additional habitat during construction.**	**Water Sources and Discharges:** Construction of pipelines: • Process water supply pipelines would result in the **conversion of 21 ac of wooded habitat to grassland habitat as well as clearing 38 ac of additional habitat during construction**. No known occurrences of state-listed species within 1 mi. • No cooling water effluent pipelines (due to the use of an enhanced ZLD system). • Potable/sanitary pipelines would cause the **conversion of 2 ac of wooded habitat to grassland habitat as well as clearing 12 ac of additional habitat during construction**. No known occurrences of state-listed species within 1 mi of potable/sanitary pipelines.
	Natural Gas Facilities: • Alt 1 would cause the **conversion of 76 ac of wooded habitat to grassland habitat as well as clearing 32 ac of additional habitat during construction.** Nine known occurrences of seven state-listed plant species within 1 mi of proposed pipeline. Possible, but unlikely, that these species could be affected by construction (usually found in different habitat types).	**Natural Gas Facilities:** Proposed alignment would cause the **conversion of 24 ac of wooded habitat to grassland habitat as well as clearing <2 ac of additional habitat during construction**. Five occurrences of three state-listed plant species and seven occurrences of two state-listed animal species within 1 mi of proposed pipeline. Possible that construction could affect these species.

Table S-8. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	• Alt 2 would cause the **conversion of 36 ac of wooded habitat to grassland habitat as well as clearing 6 ac of additional habitat during construction.** Three known occurrences of one state-listed plant species within 1 mi of proposed pipeline. Possible, but unlikely, that these species could be affected by construction (usually found in different habitat types). • Alt. 3 would cause the **conversion of 30 ac of wooded habitat to grassland habitat as well as clearing 20 ac of additional habitat during construction**. No known occurrences of state-listed species within 1 mi.	
	HVTL Corridors: • **HVTL Alt 1 (WRA-1 or WRB-1)** would cause the **conversion of 70 ac of wooded habitat to field/meadow habitat as well as clearing 22 ac of additional habitat during construction**. Seven occurrences of five state-listed plant species within 1 mi of proposed HVTL, which could be affected during construction and operation. • **HVTL Alt 1A (WRA-1A or WRB-1A)** would cause the **conversion of 70 ac of wooded habitat to field/meadow habitat as well as clearing 29 ac of additional habitat during construction**. Seven occurrences of five state-listed plant species within 1 mi of proposed HVTL, which could be affected during construction and operation. • **HVTL Phase 2 Plan B (WRB-2A)** would not have a permanent impact on vegetation because it would be located within an existing HVTL corridor. Eleven occurrences of eight state-listed plant species and one occurrence of a state-listed animal species within 1 mi of proposed HVTL, which could be affected during construction and operation.	**HVTL Corridors: With the exception of two 2-mi segments, all HVTLs would be constructed on existing HVTL ROWs with new towers; widening of one or the other corridor would be required.** • **HVTL Alt 1 (widen 38L ROW)** would cause the **conversion of 219 ac of wooded habitat to field/meadow habitat; additional construction would be limited to existing ROW**. Eight occurrences of five state-listed plant species and eight occurrences of two state-listed animal species within 1 mi of proposed HVTL, which could be affected during construction and operation. • **HVTL Alt 2 (widen 39L/37L ROW)** would cause the **conversion of 219 ac of wooded habitat to field/meadow habitat; additional construction would be limited to existing ROW**. Two occurrences of two state-listed plant species and 16 occurrences of three state-listed animal species within 1 mi of proposed HVTL, which could be affected during construction and operation.

Table S-8. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	Cultural Resources	
No new structures built, no archaeological or Native American sites disturbed.	**Power Plant Site:** Located within Western Mesabi Iron Range Early Mining Landscape District. MN State Historic Preservation Office (SHPO) has 11 historic properties recorded within the area of potential effect for the West Range Site and corridors. Coordination with SHPO required during construction to avoid or minimize potential impacts to the historic character of the District. No known archaeological resources or Native American cultural resources known to exist within 1 mi of site. The potential for the occurrence of archaeological resources is high within 55 ac (1%) and moderate on 108 ac (2%) of the site **(1,344 acres)**. Consistent with the recommendations of the SHPO, a Phase I archaeological survey of locations with high and medium potential was conducted in 2007. Although not yet final, the survey did not uncover any previously unknown resources within the site boundaries. **The Phase II footprint would be cleared to serve as a laydown area for Phase I construction. Therefore, the amount of disturbed land on site would not dramatically change between Phase I and Phase II construction. Offsite laydown areas for Phase II construction would be established on 85 ac of lands at 4 potential sites that have been disturbed from prior mining activities.** **All utilities and transportation infrastructure would be developed for operation of Phase I (no difference in impacts for Phase I-only outcome).**	**Power Plant Site:** No known archaeological sites or Native American cultural resources identified within 1 mi of the site. The study area (30,471 ac) included the site and associated transportation and utility corridors. A total of 4,862 ac (16%) of the study area has a high potential for archaeological resources and 457 ac (1.5%) has a moderate potential for archaeological resources. Phase I surveys are complete and the SHPO has agreed that no further study is needed, provided that there would be no terrain disturbance at the Longyear historic site. **The Phase II footprint would be cleared to serve as a laydown area for Phase I construction. Therefore, the amount of disturbed land on site would not dramatically change between Phase I and Phase II construction. Offsite laydown areas for Phase II construction would be established on 85 ac of lands at 2 potential sites that have been disturbed from prior mining activities.** **All utilities and transportation infrastructure would be developed for operation of Phase I (no difference in impacts for Phase I-only outcome).**
	Transportation Facilities, Water Sources and Discharges, Natural Gas Facilities, HVTL Corridors: Located within Western Mesabi Iron Range Early Mining Landscape District. SHPO has 11 historic properties recorded within the area of potential effect for site and corridors. Coordination with SHPO required during construction to avoid or minimize potential impacts to the historic character of the District. No known archaeological resources or Native American cultural resources exist within the transportation or utility corridors. A total of 330 ac (5%) of high potential for archaeological resources and 580 ac (12%) of moderate potential for archaeological	**Transportation Facilities:** Included in the discussion for Power Plant Site above. **Water Sources and Discharges:** The water pipeline corridors would be located within previously disturbed areas; therefore, these corridors would not be expected to contain archaeological or historical resources. **Natural Gas Facilities:** The natural gas pipeline corridor would follow an existing ROW; therefore, no archaeological or historical resources are anticipated. **HVTL Corridors:** The proposed HVTLs would follow existing HVTL corridors, which would minimize potential for impacts.

Table S-8. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	resources exists along the HVTLs, rail line, and pipeline corridors (combined for all transportation and utility corridors - **4,988 acres**). Archaeological surveys would be conducted only in those corridors to be permitted by the PUC if the West Range Site were selected for permitting. Although surveys would necessarily be completed after the DOE Record of Decision, the Record of Decision would be conditional upon implementing the provisions of an agreement between DOE, SHPO, and appropriate parties for the identification and protection of resources. **DOE is developing a Programmatic Agreement with the SHPO, ACHP, and Native American tribes for the appropriate protection of cultural resources during construction for the Mesaba Energy Project.** **DOE is also negotiating a separate Memorandum of Agreement with regional Native American tribes for the appropriate consideration of interests not addressed by the PA.**	There are two known archaeological sites located within 0.25 mi of the 39L/37L corridors; however, they are outside of the construction ROW. One National Register of Historic Places (NRHP)-listed building and one potentially eligible building are within the town of Eveleth in the vicinity of the 39L/37L route. One eligible site within the HVTL visual area of potential effect would be crossed by the HVTL corridor south of the plant site. Archaeological surveys would be conducted only in those corridors to be permitted by the PUC if the East Range Site were selected for permitting. Although surveys would necessarily be completed after the DOE Record of Decision, the Record of Decision would be conditional upon implementing the provisions of an agreement between DOE, SHPO, and appropriate parties for the identification and protection of resources **DOE is developing a Programmatic Agreement with the SHPO, ACHP, and Native American tribes for the appropriate protection of cultural resources during construction for the Mesaba Energy Project.** **DOE is also negotiating a separate Memorandum of Agreement with regional Native American tribes for the appropriate consideration of interests not addressed by the PA.**
Land Use		
No change in land use; sites and corridors would remain in current status.	**Power Plant Site:** Generating station on **1,708**-ac site, currently undeveloped and zoned for industrial use. ~50 residential properties within 1 mi of footprint (closest, 0.71 mi); buffered by ~0.5 mi of dense woodlands. No conflict with local or regional zoning ordinances or land use plans. **The** use of eminent domain, **as allowed by MN Statutes 216B.1694**, **may be** needed to acquire **parcels of land within** the site footprint and its surrounding buffer land. The use of eminent domain also may be necessary to acquire some public and private lands or easements if agreements to purchase such lands or easements (for **HVTLs,** associated facilities, utilities, or transportation infrastructure; or to interconnect the project with such features and available water resources) cannot be negotiated with property owners. **All utilities and transportation infrastructure would be developed for operation of Phase I (no difference in impacts for Phase I-only outcome).**	**Power Plant Site:** Generating station on **1,322**-ac site, currently undeveloped and zoned for mining use. No residential properties within 1 mi of footprint (closest, 1.28 mi); buffered by ~0.5 mi of dense woodlands. No conflict with local or regional zoning ordinances or land use plans. No use of eminent domain is needed to acquire the site footprint and its surrounding buffer land. The use of eminent domain as allowed by MN Statutes 216B.1694 may be necessary to acquire some public and private lands or easements if agreements to purchase such lands or easements (for **HVTLs,** associated facilities, utilities, or transportation infrastructure; or to interconnect the project with such features and available water resources) cannot be negotiated with property owners. **All utilities and transportation infrastructure would be developed for operation of Phase I (no difference in impacts for Phase I only outcome).**

Table S-8. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	Transportation Facilities: Rail alignment alternatives: • Alt. 1A within 0.5 mi of 16 residences (closest **within 470** ft). • Alt. 1B **eliminated based on Draft EIS.** • **Alt 3B within 0.5 mi of 16 residences (closest within 470 ft).** **Access Roads:** • **Access Roads 1 and 2 eliminated after Draft EIS (CR 7 realignment deferred by Itasca County).** • **Access Road 3 within 1,250 ft of 2 residences.** **Water Sources and Discharges:** • Process water pipelines within 0.5 mi of 104 residences (4 within 500 ft). • Cooling water effluent pipelines **avoided using enhanced ZLD system**. • Potable/sanitary pipelines within 0.5 mi of 114 residences (4 within 500 ft). **Natural Gas Facilities:** Natural gas pipelines: • Alt. 1 within 0.5 mi of 153 residences (3 within 300 ft). • Alt. 2 within 0.5 mi of 339 residences (5 within 300 ft). • Alt. 3 within 0.5 mi of 935 residences (29 within 300 ft). **HVTL Corridors:** HVTL routes: • **HVTL Alt 1** within 0.5 mi of 66 residences (4 within 500 ft). • **HVTL Alt 1A** within 0.5 mi of 62 residences (7 within 500 ft). • **HVTL Phase 2 Plan B** within 0.5 mi of 214 residences (29 within 500 ft).	**Transportation Facilities:** Rail and road alignments: No residences within 0.5 mi of either rail alignment alternative (closest ~1 mi). No residences within 0.5 mi of site access road (closest >1 mi). **Water Sources and Discharges:** • No residences within 0.5 mi of process water pipeline segments (closest >0.75 mi). • No cooling water effluent pipeline (enhanced ZLD system). • No residences within 0.5 mi of potable/sanitary pipelines (closest >0.75 mi). **Natural Gas Facilities:** Natural gas pipeline on existing ROW within 0.5 mi of 856 residences (46 within 300 ft). **HVTL Corridors:** HVTL routes on existing ROWs (<4 mi of new ROW); widening of one or the other corridor would be required. • **HVTL Alt 1 (widen 38L ROW)** within 0.5 mi of 271 residences (22 within 500 ft). • **HVTL Alt 2 (widen 39L/37L ROW)** within 0.5 mi of 962 residences (49 within 500 ft).
Socioeconomics		
No change in existing socioeconomic conditions; no potential for economic stimulus from proposed project.	**General:** Project spending and creation of new construction and operation jobs would provide **total output economic** benefits to regional economy. **For both phases, the project would generate** $3.1 billion **in total output benefits** over 6 years during construction **($2 billion for Phase I and $1.1 billion for Phase II). The Project would generate total output economic benefits of** $1.1 billion/yr during operation of both phases **($535 million/yr for Phase I operation alone)**; the power plant would be expected to operate commercially for 20 years or more). **Power Plant Site:** No displacement of population, housing, businesses, or jobs. Ten or more residential properties closest to	**General:** Project spending and creation of new construction and operation jobs would provide **total output economic** benefits to regional economy. **For both phases, the project would generate** $3.1 billion **in total output benefits** over 6 years during construction **($2 billion for Phase I and $1.1 billion for Phase II). The Project would generate total output economic benefits of** $1.1 billion/yr during operation of both phases **($535 million/yr for Phase I operation alone)**; the power plant would be expected to operate commercially for 20 years or more). **Power Plant Site:** No displacement of population, housing, businesses, or jobs. No impact on property values anticipated

Table S-8. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	the plant footprint could experience impacts on property values based on proximity to facility and resulting aesthetic and noise impacts. Potential temporary adverse impacts on housing demand related to influx of workers during peak construction (>1,500/yr in **2011-13**); less than 3,000 housing units in Census Tract 9810, of which 513 were vacant (non-seasonal) or rental units in 2000. **Note: The Minnesota Steel[1] Final EIS concluded that there would be no significant cumulative socioeconomic impacts even with consideration of the Mesaba Energy Project.**	based on distances to nearest residences. Potential temporary adverse impacts on housing demand related to influx of workers during peak construction (>1,500/yr in **2011-13**); less than 1,000 housing units in Hoyt Lakes (Census Tract 140), of which 143 were vacant (non-seasonal) or rental units in 2000.
	Transportation Facilities: No displacement of population, housing, businesses, or jobs. Three residences within 1,000 ft of Rail Alignment Alternatives **3B and** 1A could experience impacts on property values due to proximity and resulting aesthetic and noise impacts. Realignment of CR 7 (connected action) **could** influence local housing development in vicinity**, but project was deferred by Itasca County after Mesaba Draft EIS publication**.	**Transportation Facilities:** No displacement of population, housing, businesses, or jobs. No impact on property values anticipated based on distances to nearest residences.
	Water Sources and Discharges: No displacement of population, housing, businesses, or jobs. No impact on property values anticipated.	**Water Sources and Discharges:** No displacement of population, housing, businesses, or jobs. No impact on property values anticipated.
	Natural Gas Facilities: No displacement of population, housing, businesses, or jobs. No impact on property values anticipated. **Excelsior proposes to negotiate with Nashwauk PUC for the purchase of natural gas from its permitted pipeline, which would follow the same alignment as Excelsior's preferred alternative.**	**Natural Gas Facilities:** No displacement of population, housing, businesses, or jobs. No impact on property values anticipated.
	HVTL Corridors: No displacement of population, housing, businesses, or jobs. **A small number of the closest residences may experience adverse effects on property values depending upon the visibility of HVTL structures**.	**HVTL Corridors:** No displacement of population, housing, businesses, or jobs. **Although HVTLs would be constructed in existing HVTL ROWs except for two 2-mi segments, the addition of 30 feet of ROW on one of the corridors would place HVTLs closer to more residences, which may adversely affect property values depending upon the visibility of the taller towers**.
Environmental Justice		
No change in existing conditions relative to minority and low-income populations; no potential for economic benefits from proposed project.	**Power Plant Site:** Minority and low-income populations in the region of influence for the power plant do not exceed 50% of the population and are not meaningfully greater than the percentages in the general population. Therefore, the plant site would not have a disproportionately high and adverse impact on minority or low-income populations. The closest concentrations of American-Indian populations are located approximately 20 mi from the site. Local tribes expressed concern regarding health risks associated with project pollutants	**Power Plant Site:** Minority and low-income populations in the region of influence for the power plant do not exceed 50% of the population and are not meaningfully greater than the percentages in the general population. Therefore, the plant site would not have a disproportionately high and adverse impact on minority or low-income populations. The closest concentrations of American-Indian populations are located approximately **20** mi from the site. Local tribes expressed concern regarding health risks associated with project pollutants

Table S-8. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	and their impact on traditional food sources. However, the increment of mercury (less than 0.5 percent increase) and other pollutants from the project would be very low and human health impacts from fish consumption would be negligible even within 2 mi from the power plant site. **Transportation Facilities, Water Sources and Discharges, Natural Gas Facilities, HVTL Corridors:** No disproportionately high and adverse impacts on minority or low-income populations are indicated.	and their impact on traditional food sources. However, the increment of mercury (less than 0.5 percent increase) and other pollutants from the project would be very low and human health impacts from fish consumption would be negligible even within 2 mi from the power plant site. **Transportation Facilities, Water Sources and Discharges, Natural Gas Facilities, HVTL Corridors:** No disproportionately high and adverse impacts on minority or low-income populations are indicated.
Community Services		
No change in existing conditions relative to community services.	**Power Plant Site:** Demands by the generating station may require staff at local fire and emergency response agencies to increase by 30 to 50%. Large numbers of construction workers (>1,500 during 3 years of peak construction) may affect capacities of local law enforcement agencies. Security requirements for the generating station may affect capacities of local law enforcement agencies. **OSHA Standard 1910.120 requires the Mesaba Generating Station to provide and train first responders and first aid specialists to respond until local emergency personnel arrive.** **Transportation Facilities:** Potential for delays to emergency response vehicles at 17 rail grade crossings between Grand Rapids and Taconite (8 in Grand Rapids). Approximately 2.5% daily probability of delay at a crossing caused by train serving Mesaba plant; 4% probability of delay from combined rail traffic. **Water Sources and Discharges:** Security requirements for process water intake facilities may **affect public access for recreation in the Canisteo Mine Pit depending upon MNDNR**. **Natural Gas Facilities:** No displacement of providers or change in demand on community services. **HVTL Corridors:** No displacement of providers or change in demand on community services.	**Power Plant Site:** Demands by the generating station may require staff at local fire and emergency response agencies to increase by 20% or less. Large numbers of construction workers (>1,500 during 3 years of peak construction) may affect capacities of local law enforcement agencies. Security requirements for the generating station may affect capacities of local law enforcement agencies. **OSHA Standard 1910.120 requires the Mesaba Generating Station to provide and train first responders and first aid specialists to respond until local emergency personnel arrive.** **Transportation Facilities:** Potential for delays to emergency response vehicles at 8 rail grade crossings between Clinton Township and Hoyt Lakes. Approximately 2.5% daily probability of delay at a crossing caused by train serving Mesaba plant; 5.5% probability of delay from combined rail traffic. **Water Sources and Discharges:** No displacement of providers or change in demand on community services. **Natural Gas Facilities:** No displacement of providers or change in demand on community services. **HVTL Corridors:** No displacement of providers or change in demand on community services.

Table S-8. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	Utility Systems	
No change in existing conditions relating to utilities; the region would not benefit from the additional source of power from the Mesaba Energy Project.	**Power Plant Site:** The project would tie into the existing grid without service interruptions and would ensure necessary upgrades to substations and other infrastructure would be installed to prevent system failures. The project would provide another source of power for the region that could reduce outages and help meet future demand. **Transportation Facilities:** No expected impacts. **Proposed road and rail alignments would be the same for Phase I-only and combined Phases I and II.** **Water Sources and Discharges:** The Mesaba Energy Project would not adversely affect sanitary wastewater treatment capacity. The wastewater collection system in Taconite currently overflows during heavy rain and high water table events, which may be worsened by new flow from the West Range Site. This collection system would need to be redesigned or repaired regardless of the outcome of this project. During the construction phase of the project, potable water requirements would exceed the capacity of the existing Taconite water supply system; however, planned improvements and studies to the system would provide sufficient supplies **and improve water quality**. Otherwise, potable water supplies would be brought to the project site by truck**. Proposed sanitary wastewater and potable water pipelines would be the same for Phase I-only and combined Phases I and II. Proposed process water pipelines required for Phase I include pipelines to supply water from CMP and GMMP. Additional pipelines for Phase II would be required and include pipelines for LMP and Prairie River**. **Natural Gas Facilities:** No impacts on service providers or capacity expected**. Proposed natural gas pipeline route would be the same for Phase I-only and combined Phases I and II. Depending on status of Nashwauk Public Utilities Commission to construct the pipeline, Excelsior would operate a 16- or 24-inch diameter pipeline**. **HVTL Corridors:** The project's proposed utility lines would be constructed in accordance with all Federal and state regulations, and would pose no adverse impact on other resources**. No network upgrades required for Phase I. Specific network upgrades for Phase II unknown at this time; however, DOE considers the possible network upgrades that may be**	**Power Plant Site:** The project would tie into the existing grid without service interruptions and would ensure necessary upgrades to substations and other infrastructure would be installed to prevent system failures. The project would provide another source of power for the region that could reduce outages and help meet future demand. **Transportation Facilities:** No expected impacts**. Proposed road and rail alignments would be the same for Phase I-only and combined Phases I and II**. **Water Sources and Discharges:** The Mesaba Energy Project would not adversely impact existing potable and sanitary sewer systems, as both have capacity to serve the project**. Proposed sanitary wastewater and potable water pipelines would be the same for Phase I-only and combined Phases I and II. Proposed process water pipelines for Phase I include Mine Pit 2WX, Mine Pit 6, and Stephens Mine Pit (other mine pit sources may be used depending on other industrial users and consultation with MNDNR). Phase II would require additional process water pipelines from Colby Lake**. **Natural Gas Facilities:** No impacts on service providers or capacity expected**. Proposed natural gas pipeline route would be the same for Phase I-only and combined Phases I and II**. **HVTL Corridors:** The project's proposed utility lines would be constructed in accordance with all Federal and state regulations, and would pose no adverse impact on other resources**. No network upgrades required for Phase I. Specific network upgrades for Phase II unknown at this time; however, DOE considers the possible network upgrades that may be**

Table S-8. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	required for Mesaba Phase II to be unavailable information that is not essential for a reasoned choice among alternatives available to DOE (see 40 CFR 1502.22). Furthermore, if network upgrades or new HVTL's were to be required for Mesaba Phase II, the potential environmental impacts would be evaluated and disclosed to the public through the MDOC environmental review process. **Plan A: Same two 345-kV HVTLs would be utilized for both Phase I (operated at 230-kV) and combined Phases I and II (upgraded to operate at 345-kV).** **Plan B: Two 230-kV HVTLs would be utilized for Phase I. An additional 230-kV HVTL would be required for Phase II**.	**required for Mesaba Phase II to be unavailable information that is not essential for a reasoned choice among alternatives available to DOE (see 40 CFR 1502.22). Furthermore, if network upgrades or new HVTL's were to be required for Mesaba Phase II, the potential environmental impacts would be evaluated and disclosed to the public through the MDOC environmental review process. Same two HVTL corridors would be required for Phase I operation as well as Phase II. Installation of high voltage switchyard would occur at Phase I construction and no further development required for Phase II**.
Traffic and Transportation		
No change in existing vehicular traffic; Level of Service (LOS) conditions would remain the same.	**Power Plant Site:** During construction: temporary level of service (LOS) degradation of **CR 7 – from an LOS of A to B.** During operation: **For Mesaba Energy Project (Phase I) number of vehicle trips generated by personnel and from truck deliveries would be 165 and 30, respectively. LOS would remain the same and in stable operating conditions on nearby roadways. Up to one roundtrip train per day would be required. Combined Phases I and II would add 115 employee-generated vehicle trips and 30 truck trips. Except for CR 7 south of project site, no substantial differences in LOS for combined-phase plant compared to Phase I-only. CR 7 would degrade from an LOS of A to B. Up to two roundtrip trains per day would be required.** **Transportation Facilities:** Rail use during construction and operations is expected to have minimal adverse impacts to baseline rail traffic conditions. Access Roads: Access Roads 1 **and 2 eliminated after Draft EIS (CR 7 realignment deferred by Itasca County)**. • Access Road **3** would not impact LOS. **Water Sources and Discharges:** Temporary and localized traffic congestion during construction. **Natural Gas Facilities:** Temporary and localized traffic congestion during construction. **HVTL Corridors:** Temporary and localized traffic congestion during construction.	**Power Plant Site:** During construction: temporary LOS degradation of most of nearby roads; however, lowest LOS would be B. Reconstruction of Hampshire Drive expected to minimize potential congestion at intersection of CR 666 and CR 110. During operation: **For Mesaba Energy Project (Phase I) number of vehicle trips generated by personnel and from truck deliveries would be 165 and 30, respectively. Combined Phases I and II would add 115 employee-generated vehicle trips and 30 truck trips.** LOS would remain the same on nearby roadways, except for CR 666 (north of CR 110), which would degrade from A to B. **Up to one roundtrip train per day would be required for Phase I. Up to two roundtrip trains per day would be required for Phase II.** **Transportation Facilities:** Rail use during construction and operations is expected to have minimal adverse impacts to baseline rail traffic conditions. Access Roads: Access Road 1 **(single segment)** would provide access from CR 666 and would not affect LOS. **Water Sources and Discharges:** Temporary and localized traffic congestion during construction. **Natural Gas Facilities:** Temporary and localized traffic congestion during construction. **HVTL Corridors:** Temporary and localized traffic congestion during construction.

Table S-8. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
Materials and Waste Management		
No change in existing conditions; no increase in the risk of a hazardous waste release.	**Power Plant Site:** Proper handling and storage of materials and wastes would be conducted to minimize potential for release of a hazardous waste or material to the environment. In-state or out-of-state solid waste collection services and landfills would have the capability and capacity to accept solid wastes generated. Additional market analysis would be required to secure a market and avoid disposal of slag (1000-1600 tons per day generated for both phases); however, sufficient capacity is available if disposal of the slag is necessary. Commercially available treatment, stabilization, or disposal for waste streams generated. The Mesaba Generating Station would be regulated as a large quantity generator of hazardous waste (sulfuric acid, spent activated carbon and potentially the ZLD filter cake, as well as smaller quantities of other hazardous wastes). No substantial increase in risk of a hazardous waste release to the environment. Proper handling and storage of wastes in accordance with Resource Conservation and Recovery Act (RCRA) would be adhered to. **The Mesaba Generating Station (Phases I and II) would use the same materials and generate the same wastes as a Phase I-only plant, although the quantities would be approximately double.** **Transportation Facilities:** Proper handling and storage of materials and wastes would be conducted to minimize potential for a release of a hazardous waste or material to the environment. **Water Sources and Discharges:** Proper handling and storage of materials and wastes would be conducted to minimize potential for a release of a hazardous waste or material to the environment. **Natural Gas Facilities:** Proper handling and storage of materials and wastes would be conducted to minimize potential for a release of a hazardous waste or material to the environment. **HVTL Corridors:** Proper handling and storage of materials and wastes would be conducted to minimize potential for a release of a hazardous waste or material to the environment.	**Power Plant Site:** Proper handling and storage of materials and wastes would be conducted to minimize potential for a release of a hazardous waste or material to the environment. In-state or out-of-state solid waste collection services and landfills would have the capability and capacity to accept solid wastes generated. Additional market analysis would be required to secure a market and avoid disposal of slag (1000-1600 tons per day generated for both phases); however, sufficient capacity is available if disposal of the slag is necessary. Commercially available treatment, stabilization, or disposal for waste streams generated. The Mesaba Generating Station would be regulated as a large quantity generator of hazardous waste (sulfuric acid, spent activated carbon and potentially the ZLD filter cake, as well as smaller quantities of other hazardous wastes). No substantial increase in risk of a hazardous waste release to the environment. Proper handling and storage of wastes in accordance with RCRA would be adhered to. **The Mesaba Generating Station (Phases I and II) would use the same materials and generate the same wastes as a Phase I-only plant, although the quantities would be approximately double.** **Transportation Facilities:** Proper handling and storage of materials and wastes would be conducted to minimize potential for a release of a hazardous waste or material to the environment. **Water Sources and Discharges:** Proper handling and storage of materials and wastes would be conducted to minimize potential for a release of a hazardous waste or material to the environment. **Natural Gas Facilities:** Proper handling and storage of materials and wastes would be conducted to minimize potential for a release of a hazardous waste or material to the environment. **HVTL Corridors:** Proper handling and storage of materials and wastes would be conducted to minimize potential for a release of a hazardous waste or material to the environment.

Table S-8. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	Safety and Health	
No added health and safety risk, and no increase in the probability of construction or operational health and safety risks.	**Power Plant Site:** Construction workers would follow a safety plan and standard safety practices to reduce the potential for construction-related impacts. During the 5-year construction period, statistically less than 1 worker fatality (0.4) would occur. During the operation of the plant, statistically less than 1 operations-related worker fatality (0.01) would occur. **The potential for worker fatalities during Phase I construction and operation would be marginally lower than for both phases.** Based on air emission modeling results, cancer or morbidity hazards to workers or to the public would be small and would not exceed EPA standards. Specifically, the **highest cumulative** non-cancer **(morbidity)** hazard indices would be **0.081 and 0.082**, respectively **for adult and child,** compared to a threshold index of 1, and the **highest cumulative** projected cancer risks would be **$2.5x10^{-6}$ and $4.6x10^{-7}$, respectively for adult and child,** compared to a threshold of $1x10^{-5}$. **Risks from exposure to dioxins, furans, chromium, and $PM_{2.5}$ would be below established thresholds. These results, based on the emissions from both phases, indicate that the health risks associated with Phase I-only would also be below established thresholds.** Potential major operating accidents or intentional destructive acts, although not anticipated, could result in fires and localized airborne releases of substances **that are toxic in high concentrations**, such as CO, H_2S, and SO_2. In such cases, plant workers would be the most at-risk of injury or death, although the nearest residents, located 0.6 to 0.8 mi from the plant, would also be at-risk from a large release. **The probability of an accident or intentional destructive act occurring in Phase I-only or during the operation of both phases would be comparable and the potential for injury would be similar.** **All utilities and transportation infrastructure would be developed for operation of Phase I (no difference in impacts for Phase I-only outcome).** **Transportation Facilities:** During construction and operation, it is estimated, respectively, that approximately 1.2 and 0.53 fatalities could occur due to the movement of workers and material via trucks and personal vehicles. Because of the relatively low incremental	**Power Plant Site:** Construction workers would follow a safety plan and standard safety practices to reduce the potential for construction-related impacts. During the 5-year construction period, statistically less than 1 worker fatality (0.4) would occur. During the operation of the plant, statistically less than 1 operations-related worker fatality (0.01) would occur. **The potential for worker fatalities during Phase I construction and operation would be marginally lower than for both phases.** Based on air emission modeling results, cancer or morbidity hazards to workers or to the public would be small and would not exceed EPA standards. Specifically, the **highest cumulative** non-cancer **(morbidity)** hazard indices would be **0.081 and 0.082**, respectively **for adult and child**, compared to a threshold index of 1, and the **highest cumulative** projected cancer risks would be **$2.5x10^{-6}$ and $4.6x10^{-7}$, respectively for adult and child,** compared to a threshold of $1x10^{-5}$. **Risks from exposure to dioxins, furans, chromium, and $PM_{2.5}$ would be below established thresholds. These results, based on the emissions from both phases, indicate that the health risks associated with Phase I only would also be below established thresholds.** Potential major operating accidents or intentional destructive acts, although not anticipated, could result in fires and localized airborne releases of substances **that are toxic in high concentrations,** such as CO, H_2S, and SO_2. In such cases, plant workers would be the most at-risk of injury or death, although the nearest residents, located 1 mi from the plant, would also be at-risk from a large release. **The probability of an accident or intentional destructive act occurring in Phase I-only or during the operation of both phases would be comparable and the potential for injury would be similar.** **All utilities and transportation infrastructure would be developed for operation of Phase I (no difference in impacts for Phase I-only outcome).** **Transportation Facilities:** During construction and operation, it is estimated, respectively, that approximately 1.2 and 0.53 fatalities could occur due to the movement of workers and material via trucks and personal vehicles. Because of the relatively low incremental addition of project-related train trips (up to one and

Table S-8. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	addition of project-related train trips (up to one and two roundtrips per day during Phase I and II, respectively), it is expected that increases to safety hazards at at-grade crossings would be low because baseline vehicular traffic numbers within the region of influence are considered low. **Water Sources and Discharges:** No impacts would be expected. **Natural Gas Facilities:** No impacts would be expected. **HVTL Corridors:** Research regarding the potential for public health risks from the inhalation of pollutant particles charged by HVTLs (i.e., the Henshaw Effect) is currently inconclusive. Therefore, these risks are considered comparable to the risks imposed by tens of thousands of mi of HVTLs already in use throughout the U.S. EMF exposure from utility lines would fall **within the 8-kV/m MN standard inside the ROW; short segments of the 345-kV single-circuit delta configuration would be slightly above 2-kV/m at the edge of the ROW.** There would be no permanent residents located in areas exceeding 2-kV/m.	two roundtrips per day during Phase I and II, respectively), it is expected that increases to safety hazards at at-grade crossings would be low because baseline vehicular traffic numbers within the region of influence are considered low. **Water Sources and Discharges:** No impacts would be expected. **Natural Gas Facilities:** No impacts would be expected. **HVTL Corridors:** Research regarding the potential for public health risks from the inhalation of pollutant particles charged by HVTLs (i.e., the Henshaw Effect) is currently inconclusive. Therefore, these risks are considered comparable to the risks imposed by tens of thousands of mi of HVTLs already in use throughout the U.S. EMF exposure from utility lines would fall **within the 8-kV/m MN standard inside the ROW. One residence within 50-100 feet of the centerline of the 38L route and 2 residences within 50-100 feet of the centerline of the 39L/37L route could fall within areas where the electric fields exceed 2-kV/m.**
Noise		
No change in noise emissions. There would be no new violations or exceedances of noise standards.	**Power Plant Site:** During construction: Aggregate noise levels at receptors not expected to exceed MPCA thresholds **and would range from 27 to 56 dBA** (Table 4.18-7)**.** Steam blows would be an unavoidable adverse impact. A series of short steam blows, lasting two or three minutes each, would be performed several times daily over a period of two or three weeks during the final weeks of construction. Resultant levels at nearby receptors would range from **86 to 100** dBA (Table 4.18-8); however, steam piping would be equipped with silencers that would reduce noise levels by 20 dBA to 30 dBA at each receptor location. During operation: Daytime – MPCA noise thresholds would not be exceeded (Table 4.18-11). Nighttime (10:00 p.m. to 7:00 a.m.) – During Phase I-only (without mitigation), R3 and R4 would remain over state thresholds (note, existing noise levels at these receptors exceed state limits because of proximity to CR 7) (Table 4.18-11); however, no perceptible change in noise levels would occur at any of the receptors. During combined Phases I and II (without mitigation), the nighttime noise levels would exceed the L_{50} threshold at R3 and R4 by **3.5 and 3.4 dBA**, respectively; however, no perceptible noise increase would occur at any receptor.	**Power Plant Site:** During construction: Aggregate noise levels at receptors not expected to exceed MPCA thresholds and would range from **31 to 65 dBA** (Table 4.18-9). Steam blows would be an unavoidable adverse impact. A series of short steam blows, lasting two or three minutes each, would be performed several times daily over a period of two or three weeks during the final weeks of construction. Resultant sound levels at nearby receptors would range from 88 to **104** dBA (Table 4.18-10); however, steam piping would be equipped with silencers that would reduce noise levels by 20 dBA to 30 dBA at each receptor location. During operation: During Phase I-only and combined Phases I and II (and without mitigation), noise levels would not exceed daytime or nighttime MPCA noise thresholds (Table 4.18-11). During Phase I and combined Phases I and II (and without mitigation), predicted daytime and nighttime noise level increases would be greatest at R1 (**8.6-dBA** increase during combined Phase I and II); however, this is an isolated industrial area. No other perceptible changes in noise levels would occur at any of the receptor locations for each phase.

Table S-8. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	Transportation Facilities: Train operations: Freight train noise levels would range from **36 to 56** dBA (Table 4.18-13) at the modeled receptor locations during a train pass-by - noise from freight train operations could be noticeable to residences represented by receptors R2, R5, **and AAC-7** and may be considered an impact based on the FRA noise criteria, but would be short-term and relatively infrequent. Maximum noise levels generated by freight train operations would be below the ATPA guideline of 70 dBA at each receptor location and would not be considered significant. Train horns, as required under FRA regulations, would be adverse unavoidable impacts for receptors near at-grade crossings. Access Roads: **No perceptible noise increases would occur at any receptor during operation of proposed Access Road 3. MINNOISE modeling results indicate that noise levels at modeled receptors would range from 32.4 to 53.9 dBA during day-time hours and 32.6 to 55.1 dBA during nighttime hours (Table 4.18-15). Note that incremental noise levels related to transportation activities would be similar under the single and combined phases; however, Phase I-only would generally experience half the occurrences of noise increases that would occur under the combined phase (comparable to rail and vehicle traffic volumes analyzed).** **Water Sources and Discharges:** Temporary and localized increases in noise levels during construction of water pipelines. **Natural Gas Facilities:** Temporary and localized increases in noise levels during construction of natural gas pipelines. **HVTL Corridors:** Temporary and localized increases in noise levels during construction of HVTLs.	**Transportation Facilities:** Train operations: Freight train noise levels would range from **39 to 50** dBA (Table 4.18-14) at the modeled receptor locations during a train pass-by - noise from freight train operations could be noticeable to residences represented by receptor R1. Maximum noise levels generated by freight train operations would be below the ATPA guideline of 70 dBA at each receptor location and would not be considered significant. Train horns, as required under FRA regulations, would be adverse unavoidable impacts for receptors near at-grade crossings. Access Roads: There are no residences or sensitive noise receptors in proximity to the proposed access road intersecting CR 666. **Note that incremental noise levels related to transportation activities would be similar under the single and combined phases; however, Phase I-only would generally experience half the occurrences of noise increases that would occur under the combined phase (comparable to rail and vehicle traffic volumes analyzed).** **Water Sources and Discharges:** Temporary and localized increases in noise levels during construction of water pipelines. **Natural Gas Facilities:** Temporary and localized increases in noise levels during construction of natural gas pipelines. **HVTL Corridors:** Temporary and localized increases in noise levels during construction of HVTLs.

[1] **The Minnesota Steel project is now known as "Essar Steel Minnesota"; however it is identified throughout this EIS as "Minnesota Steel", Minnesota Steel Industries", or "MSI based on the name of the project in the Final EIS published for it.**

Acronyms: ac – acre(s); alt. – alternative; APTA – American Public Transportation Association; BMPs – best management practices; BWCAW – Boundary Waters Canoe Area Wilderness; CAMR – Clean Air Mercury Rule; CMP – Canisteo Mine Pit; CO – carbon monoxide; CO_2 – carbon dioxide; CR – County Road; DAT – deposition analysis threshold; dBA – A-weighted decibels; EMF – electromagnetic field; FRA – Federal Railroad Administration; ft – feet; gpd – gallons per day; gpm – gallons per minute; H_2S – hydrogen sulfide; HAP – hazardous air pollutant; HVTL – high voltage transmission line; IGCC – integrated gasification combined cycle; **IRNP – Isle Royale National Park;** kg – kilogram; kV – kilovolt; LOS – level of service; m – meter; M – million; MAAQS – Minnesota Ambient Air Quality Standards; mi – mile(s); MPCA – Minnesota Pollution Control Agency; N – nitrogen; NAAQS – National Ambient Air Quality Standards; NH_3 – ammonia; NO_x – nitrogen oxides; NPDES – National Pollutant Discharge Elimination System; NPS – National Park Service; NRHP – National Register of Historic Places; Pb – lead; PM_{10} – particulate matter (aerodynamic diameter <10 µm); PSD – prevention of significant deterioration; RCRA – Resource Conservation and Recovery Act; **RLW – Rainbow Lakes Wilderness Area;** ROW – right-of-way; S – sulfur; ESC – erosion and sediment control; SHPO – State Historic Preservation Office; SO_2 – sulfur dioxide; SWPPP – Stormwater Pollution Prevention Plan; tpy – tons per year; VNP – Voyageurs National Park; VOCs – volatile organic compounds; yd – yard; yr – year; ZLD – zero liquid discharge

CONCLUSIONS

The Proposed Action at either site would result in impacts to all resource areas as outlined in preceding Table S-8. For the Proposed Action at the East Range site, the impacts to the following resource areas would be greater relative to the West Range site:

- **Aesthetics, Land Use, and Socioeconomics – Longer HVTL corridors for the East Range Site would place a substantially greater number of residences within 500 feet of HVTLs than at the West Range Site, although many of these residences are already in the proximity of existing HVTL corridors. The height of the new HVTL double-circuited steel tower structures that would replace the existing wooden single-circuit 115 kV structures would be increased by about 40 to 60 feet, thereby increasing their visibility to residents and travelers; the number of the conductors on the towers would double, further increasing the visual impact.**

- **Air Quality – Predicted visibility impacts in Class I areas (Boundary Waters Canoe Area Wilderness and Voyageurs National Park) would be greater at the East Range Site compared to the West Range Site; more stringent controls and/or mitigation would be needed at the East Range site to reduce predicted visibility impacts to levels acceptable to the Federal Land Managers (FLMs). Similarly, predicted deposition of sulfur and nitrogen in Class I areas would be greater for the East Range Site. If mitigation of such impacts is recommended by the FLMs, DOE would consider such mitigation as a condition of the Record of Decision. Also, particulate matter emissions from cooling tower drift would be higher because of the greater solids content of source water at the East Range Site. Otherwise, air emissions would be generally equivalent at both sites.**

- **Water – Plans to reopen mine pits immediately northwest of the East Range Site, that were announced after Excelsior's June 2006 submission of the Joint Application, combined with PolyMet Mining's revised plans to use groundwater (from dewatering activities) and stormwater as their primary source of process water, introduced the likelihood that increased water appropriations from Colby Lake would be required to assure an adequate water supply for the power plant. Short term water level fluctuations in Whitewater Reservoir due to maximum appropriations from Colby Lake have been observed to swing 5 to 10 feet. Such fluctuations, without further mitigation, could affect fish populations, boat access, and property values for properties platted on the northeastern shoreline of the reservoir.**

- **Wetlands – The combined permanent and temporary direct impacts on wetland acreage from all of the proponent's preferred alignments for the plant footprint and infrastructure would be greater at the East Range Site than at the West Range Site without consideration of specific wetland functions.**

- **Biological Resources – Although DOE determined, based on a Biological Assessment, that the Proposed Action at either site may affect, but is not likely to adversely affect, the Canada lynx (a Federally listed endangered species), the East Range Site is closer to the range of the Canada lynx, while the West Range Site is located toward the southwest periphery of the lynx's range. The U.S. Fish and Wildlife Service (USFWS) concurred in the determination for the West Range Site. However, if the East Range Site were ultimately**

to be permitted by the Minnesota PUC, DOE would be required to re-initiate consultation with the USFWS for the East Range Site.

For the Proposed Action at the West Range Site, there would be greater impacts to the following resource areas relative to the East Range Site:

- **Aesthetics, Land Use, and Socioeconomics – The power plant footprint at the West Range Site is within 1 mile of approximately 50 residences; no residences are located within 1 mile of the footprint at the East Range Site. The proponent's preferred rail alignment would be closer to more residential properties (approximately 16 within 0.5 mile) at the West Range Site than the proponent's preferred rail alignment for the East Range Site (none within 0.5 mile). These conditions could potentially affect property values for the closest residences.**

- **Geology and Soils – Construction for the West Range Site would occupy more acreage of soils designated as prime farmland than at the East Range Site, although no active farming currently occurs on either site.**

- **Biological Resources – The West Range Site would cause greater loss of vegetation and habitat during clearing for the plant footprint and infrastructure corridors, including loss of more forested habitat than the East Range Site.**

- **Community Services (Recreation) – The proponent's need to protect the water intake structure on the Canisteo Mine Pit within a radius of the structure to be negotiated with MNDNR may affect recreational boating and fishing on the pit, which has developed a self-sustaining population of introduced lake trout after several years of stocking.**

- **Noise – The closer proximity of residences to the power plant footprint and rail alignment at the West Range Site would result in greater noise impacts from plant activities.**

For the No-Action Alternative, there would be no direct or indirect impacts to resources. However, there could be delays in commercialization of the E-Gas™ IGCC technology, and the potential benefits of deployment and widespread commercialization would likewise be delayed or jeopardized. These benefits include more cost-effective CCS options, progress in reducing greenhouse gas emissions in comparison to traditional coal-based electric power plants, and cost-effective reductions of emissions of criteria pollutants beyond levels required by regulatory caps in the utility sector. Also, potential direct and induced economic and employment benefits of the proposed project would not be experienced in the economically disadvantaged TTRA.

The Department of Energy acknowledges that there are areas of controversy regarding the Proposed Action; these areas were identified during the public involvement process and in consultation with Native American tribes and other Federal, state and local agencies. Many of these issues are not reconcilable, since they reflect differing points of view or uncertainties in predicting the future. The key areas of controversy are as follows:

- **The range of alternatives considered reasonable by DOE in meeting the agency's purpose and need. Members of the public would have preferred that renewable energy generation technologies or conservation measures be considered reasonable alternatives. However, as explained in Chapter 1, such alternatives do not meet the agency's purpose and need.**

- **The contribution from the Mesaba Energy Project to nationwide and global greenhouse gas emissions, mainly CO_2, and to global climate change. Members of the public would have preferred that the project implement carbon capture and storage for CO_2, emissions. However, DOE conducted an analysis of the feasibility of incorporating CCS and concluded that CCS is not considered feasible for the Mesaba Energy Project at this time. It is important to note that CCS was not a stated requirement under the CCPI funding opportunity announcement to which Excelsior responded.**

- **Impacts of air emissions from the power plant and associated activities, especially mercury and fine particulate matter, on public health, including ingestion of contaminated fish. With regard to mercury, the project would include state-of-the-art controls, and an analysis showed that incremental risk to human health would be below risk levels established by EPA and MPCA as described in Section 4.17.2.3. However, background mercury levels in nearby lakes are high from other sources, and there would still be an increase in mercury released to the environment by the Mesaba Energy Project that would be considered by MPCA in the permitting process. Likewise, for particulate matter emissions, the health risk analysis showed that the risks from the incremental increase in fine particulate matter emissions by the facility are expected to be negligible.**

- **Impacts of air emissions on visibility in Class I areas (especially Boundary Waters Canoe Area Wilderness and Voyageurs National Park). Since a final BACT determination has not been made by the MPCA, DOE analyzed the potential visibility impacts based on the emissions controls proposed by Excelsior in the air permit application. If the MPCA determines that more stringent controls are needed as a result of the permitting process, visibility impacts would be less than those predicted based on Excelsior's proposed controls. DOE understands that the Forest Service, a cooperating Federal agency and FLM, maintains that the modeled impacts from both Mesaba Phases I and II to visibility at either site, based on Excelsior's proposed controls, require mitigation. Therefore, DOE would consider appropriate mitigation as a condition of the Record of Decision, pending progress in negotiations between Excelsior and MPCA regarding the BACT determination.**

- **Concerns about the loss of recreational use of the Canisteo Mine Pit. Excelsior originlly requested that the CMP be closed to recreational access as a security measure to protect the cooling water intake structure at the West Range site. During the contested case proceedings overseen by the Minnesota Office of Energy Security, members of the public testified to their use of the CMP for boating and fishing. The MNDNR confirmed such use in their comments on the Draft EIS. It is not likely that MNDNR would agree to limit access to the entire pit. However, DOE has indicated in response to such concerns that Excelsior would be willing to consider other options that would allow public access to the CMP, while precluding access to areas of the pit near the intake structure.**

- **Effects of the Mesaba Energy Project and associated rail deliveries on traffic delays at crossings, on neighboring residences, especially aesthetic and noise impacts, as well as potential impacts on property values. These impacts are unavoidable.**

There are no issues that remain to be resolved for this Final EIS. However, the Record of Decision by DOE on whether or not to provide funding under CCPI or possibly a loan guarantee would be contingent on execution of an agreement among the State Historic Preservation Office, Advisory Council on Historic Preservation and DOE to satisfy Section 106 of the National Historic Preservation Act. In addition, if the East Range site were ultimately selected by the Minnesota PUC

for a joint site and routing permit, DOE would be required to re-initiate consultation with the USFWS under Section 7 of the Endangered Species Act.

Even if DOE were to provide funding under CCPI or possibly a loan guarantee, other issues must be resolved for the project to go forward. These issues include the negotiation of a power purchase agreement or off-take arrangement to sell the power generated by the Mesaba Energy Project, approval of the joint permit (for siting and routing) by the PUC, and approval of permits by other agencies (e.g. a Section 404 permit by the U.S. Army Corps of Engineers, an air permit by the MPCA, etc.). DOE is not involved in the negotiation of a power purchase agreement for the project, nor is DOE a participant in the decisions by other Federal and state agencies for these required permits.

INTENTIONALLY LEFT BLANK

1. PURPOSE AND NEED

This chapter introduces the purpose, need, and scope of the EIS for the Mesaba Energy Project. The chapter also summarizes the background **for the proposed project** and other aspects, including the **project proponent's preferred and alternate sites** and description **of surrounding areas**, the project components and objectives, a description of technologies associated with the Proposed Action, an explanation of the NEPA process, an explanation of relevant Minnesota environmental review and permitting processes, an overview of Federal and state public scoping comments, and a description of associated actions.

1.1 INTRODUCTION

DOE has prepared this EIS in cooperation with the MDOC to evaluate the potential environmental impacts of the Mesaba Energy Project, which **would be** a two-phased**,** nominal **600** $MWe_{(net)}$ per phase (**1,200** $MWe_{(net)}$ total) IGCC power plant (NETL, 2006a) proposed to be located in northeastern Minnesota (Figure 1.1-1). In IGCC, coal **would be** gasified **in a controlled thermal process converting it into** synthesis gas (syngas), which **would then be conditioned and** fed to **one or more** CTGs to generate electricity. **Heat from the CTG would be used to produce steam, which would be combined with steam produced from syngas cooling and fed to one or more STG to generate additional** electricity.

The project proponent, Excelsior Energy, Inc. (hereafter referred to as Excelsior), is an independent energy development company based in Minnetonka, Minnesota. **Excelsior is proposing the project through and on behalf of its wholly owned project company, MEP-I, LLC.**

The EIS has been prepared in compliance with the NEPA of 1969 as amended (42 USC 4321 et seq.) and with the Minnesota Power Plant Siting Act (Minnesota Statutes Chapter 216E). The lead Federal agency for the EIS is DOE. The lead state agency for the EIS is the MDOC, which has purview over the state permitting process. Under the Minnesota Power Plant Siting Act, a site permit is required from the Minnesota PUC to build a LEPGP, defined as a power plant and associated facilities capable of operating at a capacity of 50 MWe or more. The PUC normally has up to one year from the time the application is accepted to hold a contested case hearing and complete the process and make a decision on the permits. Since the state**-equivalent** EIS requirements under the Minnesota Power Plant Siting Act are comparable to those for NEPA, DOE has prepared this EIS in cooperation with the MDOC to fulfill the requirements of both laws.

A Federal, state, tribal, or local agency having special expertise with respect to an environmental issue or jurisdiction by law may be a cooperating agency in the NEPA process. USACE (St. Paul District, Brainerd Office) and the USDA Forest Service (Superior National Forest, Laurentian District) have participated as cooperating agencies for the EIS. A cooperating agency has the responsibility to assist the lead agency by participating in the NEPA process at the earliest possible time, by participating in the scoping process, by developing information and preparing environmental analyses including portions of the EIS for which the cooperating agency has special expertise, and by making staff support available at the lead agency's request to enhance the lead agency's interdisciplinary capabilities. USACE agreed to be a cooperating agency because the placement of dredged or fill material in waters of the U.S., including wetlands, associated with the **proposed project** would require its authorization pursuant to Section 404 of the CWA. In its role as a cooperating agency, USACE staff has provided input regarding potential aquatic resource impacts and related regulatory requirements. **The USDA Forest Service agreed to be a cooperating agency because, as a Federal Land Manager, the Forest Service has a responsibility to protect air quality-related values of wilderness areas. In its role as a cooperating agency, Forest Service staff has provided technical expertise in the review of air quality impacts.**

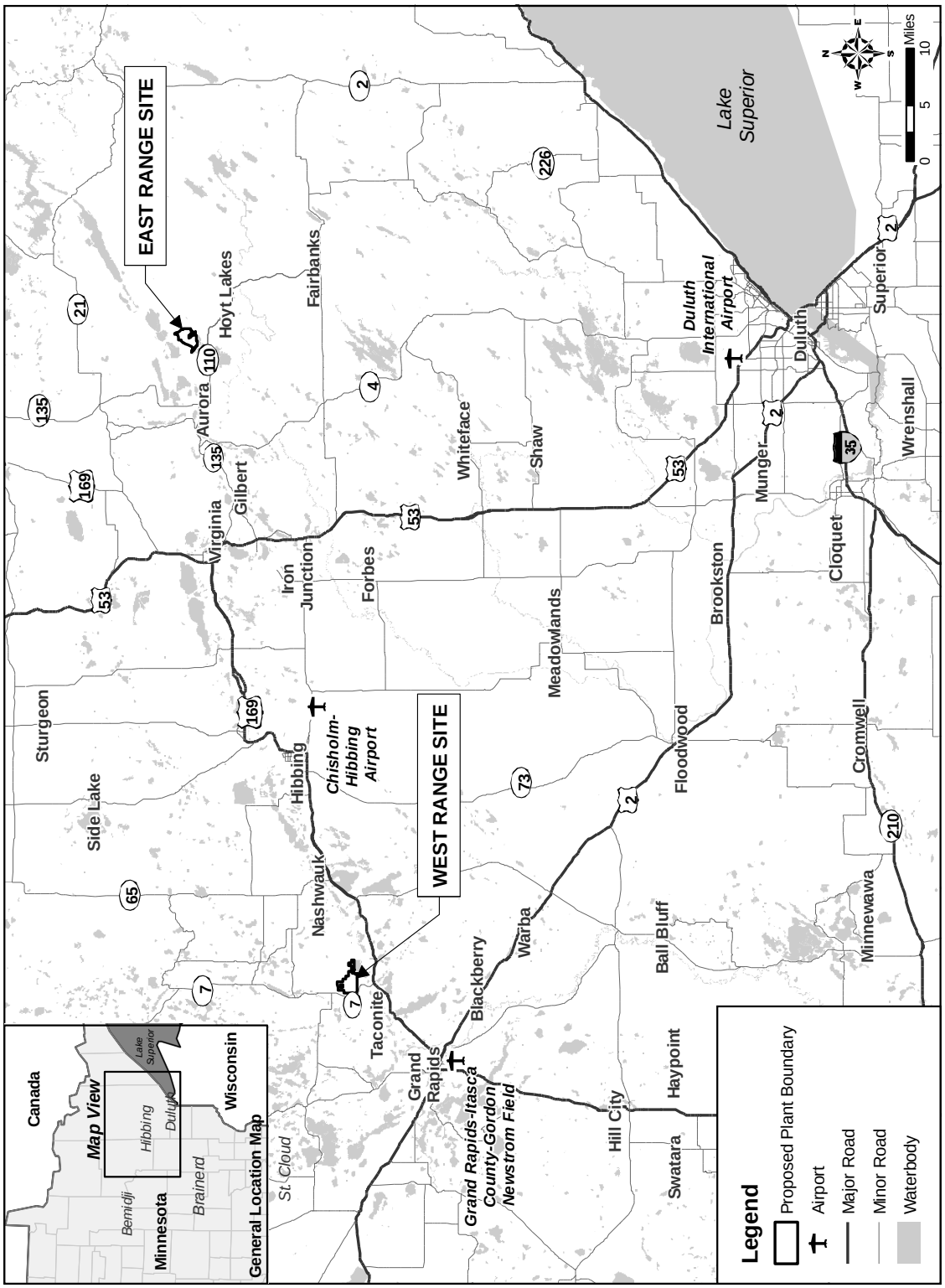


Figure 1.1-1 General Location Map

1.2 FEDERAL AND STATE CONTEXTS

1.2.1 Clean Coal Power Initiative

Coal**, an abundant and indigenous energy resource,** accounts for over 94 percent of the proven fossil energy reserves in the U.S. and supplies over 50 percent of **its electric power. Vital** to the nation's economy and global competitiveness**, demand for electricity is projected to increase by over 30 percent by 2030. Based on thorough analyses conducted by the Energy Information Agency, it is projected that this power increase can only be achieved if coal use is also increased (EIA, 2007). Furthermore, nearly** half of the nation's electric power generating infrastructure is over 30 years old**, with a significant portion in-service for twice as long**. These aging facilities are or will soon be in need of substantial refurbishment or replacement. Additional capacity must also be put in-service to keep pace with the nation's ever-growing demand for electricity. **Therefore, nearly half of the nation's electricity needs will continue to be served by coal for at least the next several decades.** Given heightened awareness of environmental stewardship, while at the same time meeting the demand for a reliable and cost-effective electric power supply, it is clearly in the public interest for the nation's energy infrastructure to be upgraded with the latest and most advanced commercially viable technologies to achieve greater efficiencies, environmental performance, and cost-competitiveness. **However, to realize** acceptance and replication **of these advanced technologies into the electric power generation sector, the technologies need to be "demonstrated," i.e., designed and constructed to industrial standards and operated at significant scale under industrial conditions**.

At current consumption levels, it is estimated the U.S. has about 240 years of recoverable coal reserves.

Public Law 107-63, enacted in November 2001, first provided funding for the CCPI**. The CCPI** is **the current** multi-year **Federal** program to accelerate the commercial readiness of advanced multi-pollutant emissions control, combustion, gasification, and efficiency improvement technologies to retrofit or re-power existing coal-based power plants and for deployment in new coal-based generating facilities. **The CCPI encompasses a broad spectrum of commercial-scale demonstrations that target today's most pressing environmental challenges, including reducing mercury emissions and reducing greenhouse gases by boosting the efficiency at which coal is converted to electricity or other energy forms. The CCPI is closely linked with research and development activities driving toward ultra-clean, fossil fuel-based energy complexes in the 21st century. When integrated with other DOE initiatives, the CCPI will help the nation successfully commercialize advanced power systems that will produce electricity at greater efficiencies, attain near-zero emissions, produce clean fuels, and have carbon dioxide-management capabilities. Improving power plant efficiency is a potentially significant way to reduce carbon dioxide emissions in the near- and mid-term. In the longer term, CCPI technologies offering carbon dioxide capture and storage, or beneficial reuse, will remove fossil-fueled power as a potential threat to global climate change (DOE, 2008).**

Accelerating commercialization of clean coal technologies also positions the U.S. to supply advanced coal-based power generation and pollution control technologies to a rapidly expanding world market.

Congress provided for competitively awarded **Federal cost-shared funding for** CCPI **demonstrations**. **In contrast to other Federally funded activities, CCPI demonstrations** are not Federal projects seeking private investment; **instead,** they are private projects seeking Federal financial **assistance**. Under the CCPI **funding opportunity announcements**, **industry** propose**s** projects that meet **its** needs and those of **its** customers and further national goals and objectives embodied in the CCPI. **Demonstrations** accepted into the CCPI portfolio become private-public cost-**shared** partnerships that satisfy a wide set of industry and government needs. Industry satisfies its short-term need to retrofit or re-

power a facility or develop new power generating capacity for the benefit of its customers. By providing financial incentive**s to the energy sector that reduce project risks associated with project financing and technical challenges** for emerging clean coal technologies, the government**: (a)** supports the verification of commercial readiness leading toward the long-term objective of transitioning the nation's existing fleet of electric power generating plants to the next generation of more efficient, environmentally sound, and cost-competitive facilities (NETL, 2006b)**; and, (b) facilitates the adoption of technologies that meet and enable more stringent environmental regulation through more efficient electric power generation, advanced environmental controls, and production of environmentally-attractive energy carriers and by-product utilization.**

Applications **for demonstrations under the CCPI** are evaluated against **specific** programmatic criteria**,** which include the following:

- Technical Merit – Scientific and engineering approach, data and other evidence to support technology claims, readiness of the technology, and potential benefits such as improved system performance, reliability, environmental performance, and costs;
- Feasibility – Appropriateness of proposed site**(s)**, including availability and access to water, power transmission, coal transportation, facilities and equipment infrastructure, and permits; the ability of the proposed project team to successfully implement the project; and the soundness and completeness of the statement of work, schedule, test plan, milestones, and decision points;
- Commercialization Potential – Commercial viability relative to the scale of the project, potential for broad market impact and widespread deployment, and soundness of the commercialization plan, including experience of the project team;
- Adequacy of the Financial and Business Plan – Financial condition and capability of proposed funding sources, priority placed by management on financing the project, and adequacy of the applicant's financial management system; and
- Adequacy of the Repayment Plan – Ability to repay the government co-funding.

Consistent with the CEQ NEPA regulations (40 Code of Federal Regulations [CFR] Parts 1500-1508) and DOE regulations (10 CFR Part 1021), DOE reviews preliminary environmental, health, safety, and socioeconomic information during the **evaluation and** selection process, particularly with respect to technical merit and feasibility. This is the first of two principal elements within the overall strategy under the CCPI for satisfying NEPA requirements. Program policy factors are also considered to ensure that the portfolio of **demonstrations** selected represents the most appropriate mix to achieve program objectives. These factors include program budget constraints, technological diversity, diversity of U.S. coals, and representation from a broad geographical cross-section of the country. No two **applications to the CCPI** are alike and therefore cannot be evaluated on an "apples-to-apples" basis.

As the second element of the overall CCPI NEPA compliance strategy, once an application has been selected for negotiation, the applicant must prepare detailed technology- and site-specific environmental information. This environmental information serves as the source material for analyses and preparation of NEPA documentation. As industry-led projects, the industry participants are responsible for project definition as well as design, construction, and operation of the facilities. DOE is responsible for (1) ensuring that the industry participants execute projects pursuant to the terms and conditions established in the cooperative agreements; (2) monitoring project activities; (3) reviewing project performance and documentation; (4) providing technical advice to ensure that critical programmatic issues are addressed; and (5) ensuring that project costs are allocable and allowable. The government also participates in decision-making at major project junctures.

DOE conducts its CCPI funding in a series of "rounds," or **funding opportunity announcements**, **to which industry can prepare and submit applications requesting Federal cost-sharing** for proposed **demonstrations**. DOE issued the first CCPI funding opportunity announcement (Round 1) in March 2002. A second funding opportunity announcement (Round 2) was issued in February 2004. These **announcements** emphasized advanced coal-based power generation, including gasification, efficiency improvements, optimization through neural networking, environmental/economic improvements, and mercury control. **A third funding opportunity announcement (Round 3) was issued in August 2008 and emphasized advanced coal-based technologies that capture and sequester, or put to beneficial reuse, carbon dioxide emissions.**

IGCC technology meets the goals of the Clean Coal Power Initiative by utilizing an estimated 240-year domestic supply of reliable, low-cost coal in an environmentally acceptable manner.

Thirteen applications **for Federal cost-shared demonstrations** were received in response to **CCPI** Round 2. Two **of the thirteen** applicants proposed archetypal IGCC **demonstrations**. Four **of the 13** applications were selected, including both archetypal IGCC **demonstrations**, one of which was the Mesaba Energy Project (NETL, 2006a). The selections were based on individual merit. The selected **demonstrations** were believed to represent the mix of technologies with the best potential to progress toward DOE objectives for CCPI Round 2. These objectives as stated in the Financial Assistance Announcement DE-PS26-04NT42061 were as follows:

(1) Demonstrate advanced coal-based technologies that have progressed beyond the research and development stage to a point of readiness for operation at a scale that can be readily replicated into commercial practice within the electric power industry; and

(2) Accelerate the likelihood of deploying the demonstrated technologies for widespread commercial use within the electric power sector.

Two technology priorities for **CCPI** Round 2 were gasification-based power generation systems and mercury control technology. The two IGCC **applications** that were selected involve the demonstration of different gasifier types, which is important in achieving a diversity of technology approaches and methods in the CCPI Program. They also involve different coals, operating environments, and environmental considerations, all of which enhance the potential for widespread commercialization of IGCC technology in the marketplace. The unique technological features of the Mesaba Energy Project include the following: integration of the air separation unit and the combustion turbine to improve efficiency; demonstration of full slurry quench for added efficiency improvements; the potential for demonstration of high availability and reliability needed for commercial acceptance of the technology; and the application of lessons learned through optimization studies conducted at a previous clean coal demonstration project.

Project applications selected for the CCPI Program may also be eligible to apply for Federal loan guarantees. The Energy Policy Act of 2005 (EPAct05) established a Federal loan guarantee program for eligible energy projects that employ innovative technologies. Title XVII of the EPAct05 authorizes the Secretary of Energy to make loan guarantees for a variety of types of projects, including projects that "avoid, reduce, or sequester air pollutants or anthropogenic emissions of greenhouse gases; and employ new or significantly improved technologies as compared to commercial technologies in service in the United States at the time the guarantee is issued." (Section 1703(a)(1), 42 U.S.C. 16513). Excelsior has submitted a formal application to DOE for a loan guarantee.

1.2.2 State Legislative Incentives

The Minnesota Legislature adopted legislation in 2003 that provided incentives for an "innovative energy project" to be located on as many as three sites in the TTRA of northeastern Minnesota (see Section 2.1.1). Minnesota Statutes § 216B.1694 define an innovative energy project as a proposed energy-generation facility or group of facilities that:

- **Makes use of an innovative generation technology utilizing coal as a primary fuel in a highly efficient combined-cycle configuration with significantly reduced sulfur dioxide, nitrogen oxide, particulate, and mercury emissions from those of traditional technologies;**
- **Is capable of offering a long-term supply contract at a hedged, predictable cost; and**
- **Is designated by the commissioner of the Iron Range Resources and Rehabilitation Board as located in the TTRA on a site that has substantial real property with adequate infrastructure to support new or expanded development and that has received prior financial and other support from the board.**

The specific incentives for an innovative energy project provided in the statutes include:

- **Exemption from the requirements for a Certificate of Need (under section 216B.243) for the generation facilities and associated transmission infrastructure;**
- **Eligibility, once permitted and constructed, to increase the capacity of the associated transmission facilities without additional state review;**
- **Power of eminent domain limited to the sites and routes approved by the PUC for the project facilities;**
- **Qualification as a "clean energy technology" as defined in section 216B.1693;**
- **Consideration of the project as a supply option prior to the approval by the PUC of any arrangement to build or expand a fossil fuel-fired generation facility, or to enter into an agreement to purchase capacity or energy from such a facility for a term exceeding five years;**
- **Entitlement to enter into a contract with a public utility that owns a nuclear generation facility in the state to provide 450 megawatts of baseload capacity and energy under a long-term contract subject to approval by the PUC; and**
- **Eligibility for a grant from the renewable development account.**

The statute also requires the innovative energy project to make a good faith effort to secure funding from DOE and USDA to conduct a demonstration project at the facility for either geologic or terrestrial carbon sequestration projects to achieve reductions in facility emissions or carbon dioxide. Other related state legislation provided a personal property **tax exemption and other benefits to the project and its investors. These incentives created by the Minnesota Legislature were a principal determinant in Excelsior's decision to locate the Mesaba Energy Project in the TTRA of northeastern Minnesota.**

The PUC has the responsibility for siting power plants having the capacity to operate at 50 MWe or greater (i.e., LEPGPs) and transmission lines designed for or capable of operation at a voltage of 100 kilovolts (kV) (i.e., high voltage transmission lines [HVTLs]). The Minnesota legislature directed the PUC to designate sites that minimize adverse human and environmental impacts while ensuring electric power system reliability and integrity and ensuring that electric energy needs are met and fulfilled in an orderly and timely fashion. Minnesota Rules Chapter 7849 establishes the requirements for submitting and processing a permit application. In the application, the applicant must identify the preferred site for the power plant and one alternative site. As part

of the permitting process, the MDOC prepares an EIS on the project and holds a contested case hearing. See further discussion of the state regulatory framework in Section 1.5.2.

The Mesaba Energy Project has been assigned PUC Docket Number E6472/GS-06-668. Documents submitted by Excelsior in conjunction with the state permitting process, including the Joint Application (Excelsior, 2006a) and the Environmental Supplement (Excelsior, 2006b), as well as other documents relating to the state review process, can be accessed at the PUC website (http://energyfacilities.puc.state.mn.us/Docket.html?Id=16573; "Mesaba Energy Project"). Although the project is exempt as an "innovative energy project" under Minnesota Statutes § 216B.1694 from Certificate of Need proceedings for all generation and transmission infrastructure, it otherwise remains subject to all applicable environmental review and permitting procedures.

1.3 PROPOSED ACTION

[Text in the Draft EIS summarizing the project proponent's proposed action has been removed from this chapter. Section 2.1.2 describes the project proponent's proposed project and alternatives.]

1.3.1 DOE Proposed Action

The DOE Proposed Action is to provide a total of $36 million in co-funding, through a cooperative agreement with Excelsior **(MEP-I, LLC)**, for the **definition and preliminary** design and one-year operational demonstration testing period for Phase I of the proposed two-phased Mesaba Energy Project. **In addition, DOE may provide a loan guarantee to Excelsior pursuant to EPAct05 Section 1703 for Phase I of the proposed project.** This first phase would be a nominal **600** $MWe_{(net)}$ IGCC power plant with an estimated cost of $2.16 billion **as documented in the cooperative agreement**. Phase II, which would be an identical, co-located **600** MWe plant, would be privately financed and not involve co-funding **or a loan guarantee from** DOE. **See further discussion of the DOE Proposed Action in Section 2.1.1.**

For the Mesaba Energy Project, DOE has determined that its Proposed Action to provide co-funding for the definition and preliminary design and the one-year operational demonstration period constitutes a major Federal action. Approval of the loan guarantee is also considered a major Federal action subject to NEPA review. Therefore, DOE has prepared this EIS as a record of its analysis of the potential impacts of the Proposed Action and reasonable alternatives available to the Department. DOE has considered information prepared by Excelsior and its team, as well as additional sources available from government agencies and other entities. The EIS has been prepared in accordance with Section 102(2)(C) of NEPA, as implemented under regulations promulgated by the CEQ (40 CFR Parts 1500-1508), and as provided in DOE regulations for compliance with NEPA (10 CFR Part 1021).

[Text repetitive to text in Section 2.1.1.1 has been removed.]

This EIS considers the impacts of both phases of the Mesaba Energy Project as connected actions, consistent with NEPA policy **(see Sections 1.5.1 and 1.6.4)**, even though only Phase I would be co-funded under the CCPI Program. **However, at the request of USACE, the Final EIS has been revised as appropriate to describe the potential impacts of Phase I separately from the impacts of the combined two-phased project.**

1.3.2 State Proposed Action

The Proposed Action for the State of Minnesota is to approve, through the PUC as supported by the MDOC, the pre-construction joint permit application submitted by Excelsior for the construction of the Mesaba Energy Project as an "innovative energy project" within the TTRA.

1.4 PURPOSE AND NEED FOR ACTION

[Text in the Draft EIS describing the DOE purpose and need separately has been revised to combine the purpose and need in one section to eliminate confusion. Text describing the project proponent's purpose has been eliminated.]

1.4.1 DOE Purpose and Need

The DOE purpose in the context of the CCPI Program is to demonstrate the commercial-readiness of the ConocoPhillips E-Gas™ gasification technology in a fully integrated and quintessential IGCC utility-scale application. The technical, environmental, and financial data generated from the design, construction, and operation of the facility would result in a commercial reference plant for the technology.

The purpose of the DOE action with regard to the proposed issuance of a Federal loan guarantee is to encourage early commercial use in the United States of a new or significantly improved energy technology and to avoid or reduce emissions of greenhouse gases and other air pollutants pursuant to Title XVII of EPAct05.

The specific technology that would be deployed in the Mesaba Energy Project represents a significant advancement on the base design of the smaller-scale 262 $MWe_{(net)}$ Wabash River Plant in Terre Haute, Indiana, which was a project completed under the DOE Clean Coal Technology Program, a predecessor to the CCPI. The advancements would include enhanced environmental performance, greater capacity, increased efficiency and availability, as well as fuel flexibility and enhanced integration of IGCC plant systems.

The principal need addressed by DOE, pursuant to Public Law 107-63 and subsequent legislative appropriations, is to accelerate the commercialization of clean coal technologies that achieve greater efficiencies, environmental performance, and cost-competitiveness (see Section 1.2). The proposed project was selected under the CCPI Program as one of a portfolio of projects that would represent the most appropriate mix to achieve programmatic objectives and meet legislative requirements.

With regard to the proposed issuance of a Federal loan guarantee, this action is needed to fulfill the DOE mandate under EPAct05 to issue loan guarantees to eligible projects that "avoid, reduce, or sequester air pollutants or anthropogenic emissions of greenhouse gases" and "employ new or significantly improved technologies as compared to technologies in service in the United States at the time the guarantee is issued."

1.4.2 State Purpose and Need

A purpose of the Minnesota Legislature, as intended in Minnesota Statutes § 216B.1694, is to provide incentives for the development of an "innovative energy project" on as many as three sites within the TTRA of northern Minnesota.

The mission of the PUC (supported by the MDOC) is to create and maintain a regulatory environment that ensures safe, reliable, and efficient utility services at fair and reasonable rates (PUC, 2006). The commission conducts its mission by:

- Emphasizing the production and consumption of energy resources that will minimize damage to the environment;
- Encouraging conservation;
- Implementing the state's energy policies, which include the provision of incentives for the construction of "innovative energy projects" within the TTRA;
- Establishing rules related to safety and quality of service; and
- Encouraging the development and appropriate implementation of new technologies and services for the public.

1.4.3 Project Proponent Purpose

At the request of, and in consultation with, USACE regulatory staff, Excelsior has developed a purpose statement to satisfy USACE NEPA and CWA Section 404 requirements. The project purpose provided in Appendix F1 will be carried into the CWA Section 404 permit evaluation, and will be the basis for the alternatives analysis required by USACE regulations.

1.5 REGULATORY FRAMEWORK

The following sections summarize the principal Federal and state regulations affecting the permitting process and required environmental documentation for the Mesaba Energy Project. The project would be subject to additional Federal, state, and local regulations and permit conditions in Chapter 6.

1.5.1 National Environmental Policy Act

NEPA requires Federal agencies to integrate environmental values into their decision-making processes by considering the environmental impacts of, and reasonable alternatives to, their proposed actions. For major Federal actions that have the potential to cause significant adverse impacts on the environment, NEPA requires sponsoring agencies to prepare an EIS. DOE determined that providing financial assistance for the design and operational demonstration of the proposed Mesaba Energy Project constitutes a major Federal action that may significantly affect the quality of the natural and human environment. Therefore, DOE prepared this EIS for use by decision-makers in determining whether to provide assistance.

NEPA also requires Federal agencies to ensure that the scope of an EIS considers connected actions. A connected action is one that is closely related to the Proposed Action. As defined in 40 CFR 1508.25, actions are connected if they:

"(i) Automatically trigger other actions which may require environmental impact statements.

(ii) Cannot or will not proceed unless other actions are taken previously or simultaneously.

(iii) Are interdependent parts of a larger action and depend on the larger action for their justification."

Accordingly, this EIS considers the impacts of both phases of the Mesaba Energy Project as connected actions (see further discussion in Section 1.6.4), even though only Phase I would be co-funded under the CCPI Program.

CWA Section 404 authorization is required for the proposed project, because its construction would require discharges of dredged and/or fill material into waters of the U.S. As a cooperating agency in the preparation of the EIS, and the agency responsible for determining whether to issue a permit for wetland impacts associated with the proposed project, it is the USACE's intention to adopt the EIS as part of its permit evaluation. Also, the USDA Forest Service has an affirmative responsibility to protect air quality-related values of wilderness areas as a Federal Land Manager and is providing technical expertise in the review of air quality impacts as a cooperating agency. This EIS assesses the potential impacts on the natural and human environment of the Proposed Action and reasonable alternatives within the scope of the CCPI Program. The NEPA process and opportunities for public input are illustrated in Figure 1.5-1. The scope of this EIS is discussed in Section 1.6.

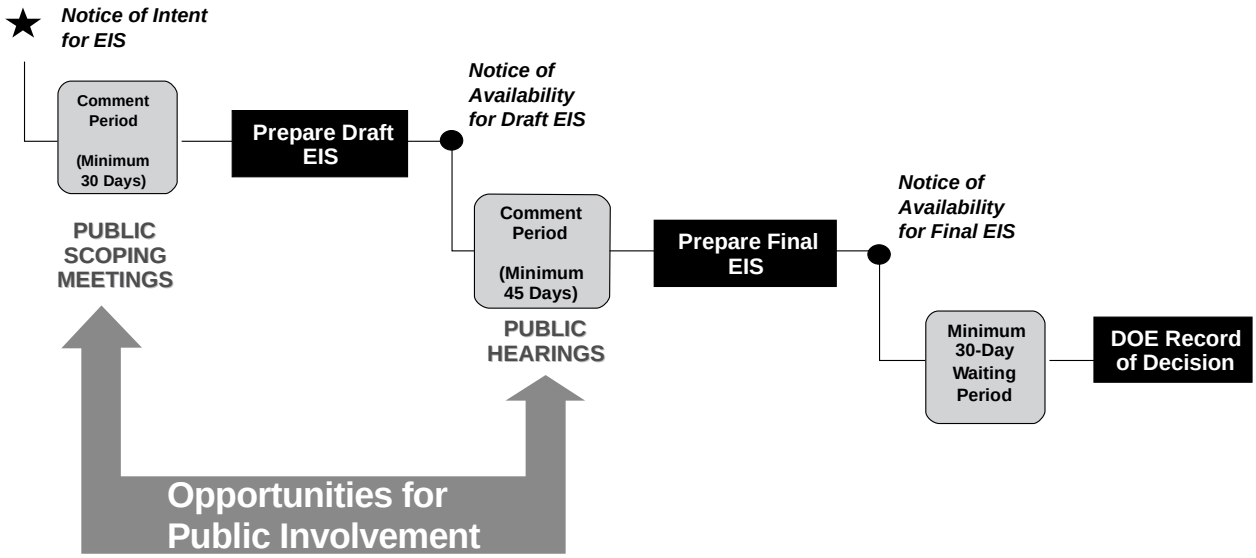


Figure 1.5-1. The NEPA Process

1.5.2 State Requirements

1.5.2.1 Minnesota Power Plant Siting Act

The Mesaba Energy Project is considered a Large Electric Power Generating Plant subject to the Minnesota Power Plant Siting Act, which requires the preparation of a state-equivalent EIS.

Because the proposed Mesaba Energy Project is considered a LEPGP and also includes a HVTL, it is subject to the Minnesota Power Plant Siting Act (Minnesota Statutes Chapter 216E), which requires the preparation of a state-equivalent EIS. Figure 1.5-2 illustrates the process to be undertaken by the state in producing the EIS. Section 1.5.2.2

discusses the requirements for compliance with the Minnesota Power Plant Siting Act in accordance with Minnesota Rules Chapter **7849**. Section 1.5.2.4 provides further information about the Minnesota Environmental Review Program.

1.5.2.2 Minnesota Rules Chapter 7849

Minnesota Rules Chapter **7849** implements and regulates the Power Plant Siting Act. The intent of the Act and Chapter **7849** is to ensure that LEPGPs are sited and HVTLs are routed in an orderly manner compatible with environmental preservation and the efficient use of resources. In accordance with this policy, the PUC must choose locations that minimize adverse human and environmental impacts while ensuring continuing electric power system reliability and integrity and ensuring that electric energy needs are met and fulfilled in an orderly and timely fashion. The PUC is also required to provide for broad-spectrum citizen participation in conjunction with these rules.

LEPGP Site Permit

In accordance with Minnesota Rules **7849.5220** Subpart 1, an application for a site permit for a LEPGP must contain the following information:

- A statement of proposed ownership of the facility as of the day of filing and after commercial operation;
- The precise name of any person or organization to be initially named as permittee or permittees and the name of any other person to whom the permit may be transferred if transfer of the permit is contemplated;
- At least two proposed sites for the proposed LEPGP and identification of the applicant's preferred site and the reasons for preferring the site;
- A description of the proposed LEPGP and all associated facilities, including the size and type of facility;
- Environmental information (see subsection below);
- The names of the owners of the property for each proposed site;
- The engineering and operational design for the LEPGP at each of the proposed sites;
- A cost analysis of the LEPGP at each proposed site, including the costs of constructing and operating the facility that are dependent on design and site;
- An engineering analysis of each of the proposed sites, including how each site could accommodate expansion of generating capacity in the future;
- Identification of transportation, pipeline, and electrical transmission systems that will be required to construct, maintain, and operate the facility;
- A listing and brief description of Federal, state, and local permits that may be required for the project at each proposed site; and
- A copy of the Certificate of Need for the project from the PUC or documentation that an application for a Certificate of Need has been submitted or is not required.

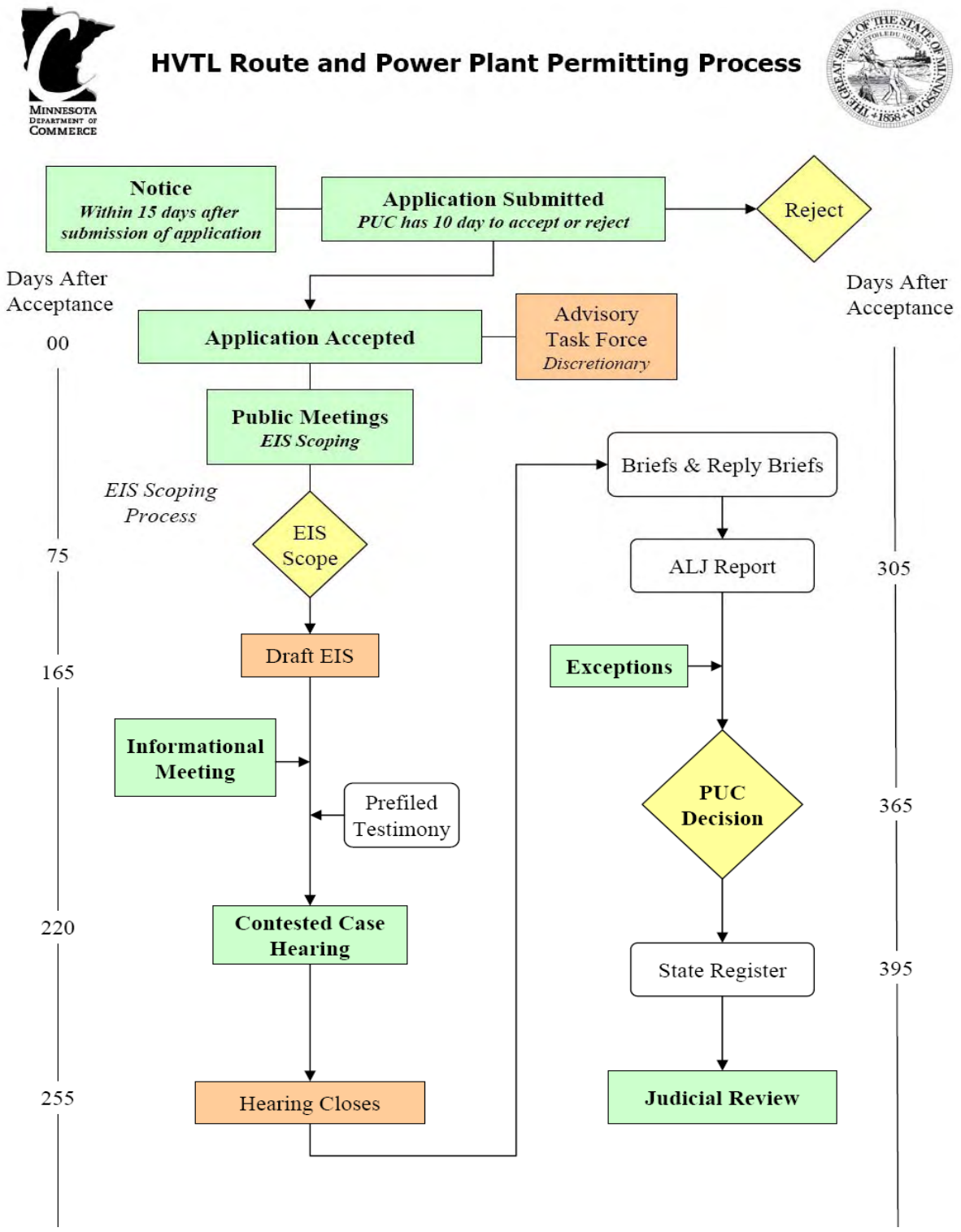


Figure 1.5-2. Minnesota Power Plant Siting Process

HVTL Route Permit

In accordance with Minnesota Rules **7849.5220** Subpart 2, an application for a route permit for a HVTL must contain the following information:

- A statement of proposed ownership of the facility at the time of filing the application and after commercial operation;
- The precise name of any person or organization to be initially named as permittee or permittees and the name of any other person to whom the permit may be transferred if transfer of the permit is contemplated;
- At least two proposed routes for the proposed HVTL and identification of the applicant's preferred route and the reasons for the preference;
- A description of the proposed HVTL and all associated facilities including the size and type of HVTL;
- Environmental information (see subsection below);
- Identification of land uses and environmental conditions along the proposed routes;
- The names of each owner whose property is within any of the proposed routes for the HVTL;
- U.S. Geological Survey (USGS) topographical maps or other maps acceptable to the state authority showing the entire length of the HVTL on all proposed routes;
- Identification of existing utility and public rights-of-way (ROWs) along or parallel to the proposed routes that have the potential to share the ROW with the proposed line;
- The engineering and operational design concepts for the proposed HVTL, including information on the electric and magnetic fields of the transmission line;
- The cost analysis of each route, including the costs of constructing, operating, and maintaining the HVTL that are dependent on design and route;
- A description of possible design options to accommodate expansion of the HVTL in the future;
- The procedures and practices proposed for the acquisition and restoration of the ROW, construction, and maintenance of the HVTL;
- A listing and brief description of Federal, state, and local permits that may be required for the proposed HVTL; and
- A copy of the Certificate of Need or the certified HVTL list containing the proposed HVTL or documentation that an application for a Certificate of Need has been submitted or is not required.

Environmental Information

A site permit or route permit application shall include the following environmental information for each proposed site or route to aid in the preparation of an EIS:

- Environmental setting for each site or route;
- Effects of construction and operation of the facility on human settlement, including, but not limited to, public health and safety, displacement, noise, aesthetics, socioeconomic impacts, cultural values, recreation, and public services;
- Effects of the facility on land-based economies, including, but not limited to, agriculture, forestry, tourism, and mining;
- Effects of the facility on archaeological and historic resources;
- Effects of the facility on the natural environment, including effects on air and water quality resources and flora and fauna;
- Effects of the facility on rare and unique natural resources;

- Identification of human and natural environmental effects that cannot be avoided if the facility is approved at a specific site or route; and
- Measures that might be implemented to mitigate the potential human and environmental impacts and the estimated costs of such mitigative measures.

Factors to be Considered

In determining whether to issue a permit for a LEPGP or HVTL, the state authority shall consider the following factors:

- Effects on human settlement, including, but not limited to, displacement, noise, aesthetics, cultural values, recreation, and public services;
- Effects on public health and safety;
- Effects on land-based economies, including, but not limited to, agriculture, forestry, tourism, and mining;
- Effects on archaeological and historic resources;
- Effects on the natural environment, including air and water quality resources and flora and fauna;
- Effects on rare and unique natural resources;
- Application of design options that maximize energy efficiencies, mitigate adverse environmental effects, and could accommodate expansion of transmission or generating capacity;
- Use or paralleling of existing ROWs, survey lines, natural division lines, and agricultural field boundaries;
- Use of existing LEPGP sites;
- Use of existing transportation, pipeline, and electrical transmission systems or ROWs;
- Electrical system reliability;
- Costs of constructing, operating, and maintaining the facility that are dependent on design and route;
- Adverse human and natural environmental effects which cannot be avoided; and
- Irreversible and irretrievable commitments of resources.

Joint Application Process

Per Minnesota Rules **7849.5070**, the proponent of a LEPGP that will require a HVTL may elect to apply for both a site permit for the plant and a route permit for the transmission line in one application process. The PUC also may elect to combine two pending applications if it is appropriate to consider both projects as part of one proceeding. Furthermore, an applicant may combine an application for a pipeline routing permit with a site permit if a natural gas or petroleum pipeline to a new LEPGP will be required.

Under Minnesota Rules, the applicant for a LEPGP can apply for the permits for the plant, transmission lines, and pipelines under one application.

1.5.2.3 Minnesota Pipeline Routing Rules

A pipeline routing permit from the PUC is required for the construction of certain pipelines (Minnesota Statutes § 216G.02). The PUC has jurisdiction over pipelines with a diameter of 6 inches or more that are designed to transport hazardous liquids like crude petroleum and those that are designed to carry natural gas and be operated at a pressure of more than 275 pounds per square inch. However, the PUC's authority does not apply to interstate natural gas pipelines regulated under the Federal Natural Gas Act or to a pipeline owner or operator who is defined as a natural gas public utility under Minnesota Statutes § 216B.02. The procedures are explained in detail in the Pipeline Routing Rules (Minnesota Rules Chapter **7852**).

For the Mesaba Energy Project, a natural gas pipeline would be required and would be subject to the Pipeline Routing Rules. The pipeline routing permit would supersede and preempt all zoning, building, or land use rules, regulations, or ordinances adopted by regional, county, local, or special purpose governments, as provided in Minnesota Statutes § 216G.02 Subdivision 4. As an "innovative energy project," the Mesaba Energy Project would have the power of eminent domain limited to routes approved by the PUC.

1.5.2.4 Minnesota Environmental Policy Act

The Minnesota Environmental Review Program is based on the Federal NEPA law. The Minnesota Environmental Policy Act (MEPA) was enacted in 1973 (Minnesota Statutes § 116D) to (1) declare a state policy that will encourage productive and enjoyable harmony between human beings and their environment; (2) promote efforts that will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of human beings; and (3) enrich the understanding of the ecological systems and natural resources important to the state and to the nation.

MEPA established a formal process for reviewing the environmental impacts of major developmental projects. The purpose of the review is to provide information to units of government on the environmental impacts of a project before approvals or necessary permits are issued. After projects are completed, unanticipated environmental consequences can be very costly to undo, and environmentally sensitive areas can be impossible to restore. Environmental review creates the opportunity to anticipate and correct these problems before projects are built.

MEPA is regulated by Minnesota Rules Chapter 4410. However, as stated in Minnesota Rules **7849.5300** Subpart 12, the requirements of Chapter 4410 do not apply to the preparation or consideration of an EIS for a LEPGP or HVTL. Instead, the requirements for preparation of an EIS under the Minnesota Power Plant Siting Act are specified in Minnesota Rules **7849.5300**, which embodies and implements the general intent of MEPA.

1.5.2.5 Taconite Tax Relief Area

The TTRA is a geographic area in northeastern Minnesota that encompasses approximately 13,000 square miles and stretches from Crosby, Minnesota across the state's Cuyuna, Mesabi, and Vermilion iron ore ranges to the north shore of Lake Superior. This area was the site of some of the largest iron mines in the world, but is now economically depressed. Pursuant to the "Innovative Energy Project" Statute, Excelsior's project siting efforts centered on sites within the TTRA. Excelsior focused particularly on potential sites within the Mesabi Iron Range due to the existing infrastructure system developed in response to earlier industrial mining activities. The location of the TTRA is discussed in Section **2.1.1.2.**

1.6 SCOPE OF THIS EIS

Because the EIS for the Mesaba Energy Project has been prepared as a joint Federal and state document to satisfy the requirements of NEPA and the Minnesota Power Plant Siting Act, the scoping requirements of both Federal and state legislation were applicable. The Federal public scoping process – including two public scoping meetings – was conducted early in the process as required by NEPA regulations. However, as required under state regulations, MDOC could not conduct public scoping meetings until after receipt of a joint application. Therefore, separate DOE and MDOC scoping meetings and scoping periods were held. However, representatives from DOE and MDOC attended all scoping meetings, and the EIS considered scoping comments received during both scoping periods.

1.6.1 Federal NEPA Scoping Process

1.6.1.1 The Notice of Intent

DOE published the NOI to prepare this EIS in the *Federal Register* on October 5, 2005 (70 *FR* 58207) and sent copies to Federal and state agencies (DOE, 2005). Publication of the NOI initiated the EIS process with a public scoping period (40 CFR 1501.7) for soliciting public input to ensure that (1) significant issues would be identified early and properly studied; (2) issues of minimal significance would not consume excessive time and effort; (3) the EIS would be thorough and balanced; and (4) potential delays that could result from an incomplete or inadequate EIS would be avoided. The Federal EIS scoping period extended through November 14, 2005.

The scope of issues to be addressed in this EIS, and the significant issues related to the action, were determined through several means including:

- The preliminary identification of issues by DOE as a part of the early project planning and internal scoping;
- Additional issues identified by DOE as a result of state and Federal agency consultation and coordination with representatives of Native American tribes;
- The identification of issues and concerns expressed in comments received from the public and interested parties during the NEPA scoping process; and
- Additional issues and concerns expressed in comments received from the public and interested parties during the Minnesota Power Plant Siting Act scoping process.

DOE initially identified the environmental issues listed in Table 1.6-1 in the NOI for analysis in the EIS. The list, which was developed based on reviews of the proposed project location and technology as well as the scope of the proposed project and similar projects, was presented to facilitate public comment on the planned scope of the EIS. It was not intended to be all-inclusive; nor was it meant as a pre-determined set of potential impacts. Also, the order in which issues were listed was not intended to imply any priority or level of significance.

Table 1.6-1. Issues Identified in the NOI for Consideration in the EIS

- Atmospheric resources: Potential air quality impacts resulting from emissions during construction and operation of the project, including potential impacts on Class I areas in the vicinity (Voyageurs National Park [VNP] and Boundary Waters Canoe Area Wilderness [BWCAW]) and local odor impacts.
- Water resources: Potential impacts on surface and groundwater resources and water quality, including effects of water usage, wastewater management, storm water management, and soil erosion and sedimentation in the Mississippi River and Great Lakes Basins.
- Cultural resources: Potential effects on historic and archaeological resources and Native American tribal resources.
- Ecological resources: Potential onsite and offsite impacts to vegetation, wildlife, protected species, and ecologically sensitive habitats.
- Floodplains and wetlands: Potential impacts on wetlands located within the East Range and West Range Sites and their associated transportation/utility corridors, and potential impacts on floodplains within the transportation/utility corridors for both sites. In accordance with DOE regulations (10 CFR Part 1022), the final EIS will include a floodplain and/or wetlands assessment and a statement of findings.
- Terrestrial resources: Land requirements and compatibility of plant facilities and operations, access roads, rail alignments, and potential new corridors for HVTL and natural gas lines with adjacent and surrounding land uses.
- Utility and transportation infrastructure requirements for delivery of feedstocks and process chemicals to the facility.
- Health and safety impacts: Construction-related safety and process-related safety associated with handling and management of process chemicals.
- Noise: Potential impacts resulting from construction and operation of the proposed plant and from transportation of feedstocks, process materials, and plant by-products.
- Community resources: Potential impacts on local traffic patterns, socioeconomic impacts of plant construction and operation, including effects on public services and infrastructure resulting from the influx of construction personnel and plant operating staff, and environmental justice issues.
- Aesthetic and scenic resources: Potential visual effects associated with plant structures and operations.
- Cumulative effects that result from the incremental impacts of the proposed plant when added to the other past, present, and reasonably foreseeable future activities in the Iron Range area.
- Connected actions: Effects of construction and operation of the second phase of the Mesaba Generating Station resulting in a combined, nominal, **1,200** $MWe_{(net)}$ power generating facility on the selected site.

1.6.1.2 Coordination with Federal and State Agencies

DOE contacted the following agencies by letter to initiate consultation with respect to particular environmental resources and/or to invite them to become cooperating agencies under NEPA. The agency contacts have also been included in the distribution list for the EIS.

- Regional Environmental Officer, U. S. Department of the Interior
- Regional Director, National Park Service
- Regional Director, Bureau of Indian Affairs
- Director, Water Division, U. S. Environmental Protection Agency, Region 5
- Director, Federal Energy Regulatory Commission, Division of Gas – Environment & Engineering
- U.S. Army Corps of Engineers, St. Paul District Office (District Engineer, NEPA Coordinator, Regulatory Branch Chief, and Archaeologist)
- U.S. Forest Service (Superior National Forest Supervisor and Laurentian District Ranger)
- Field Supervisor, U.S. Fish and Wildlife Service, Twin Cities Ecological Services Field Office
- U.S. Department of Transportation, Federal Highway Administration

- State Historic Preservation Office, Minnesota Historical Society
- Minnesota Department of Natural Resources, Natural Heritage and Nongame Research Program

In response to the coordination letters, the USACE (St. Paul District, Brainerd Office) and the USDA Forest Service (Superior National Forest, Laurentian District) agreed to participate as cooperating agencies for the EIS.

1.6.1.3 Outreach to Native American Tribes

During scoping, it was and remains DOE's goal that all Federally recognized tribes with historic or current affiliation to Minnesota and the project area would be invited to participate in the consultation process. DOE contacted **the Minnesota Indian Affairs Council to inform the council of the project and elicit any support that it might provide in facilitating consultation with tribal organizations. In September 2005, DOE contacted the following** representatives of **local** Native American tribes and reservations **by letter** to inform them **of** the project and initiate formal consultation.

- Leech Lake Reservation
- Mille Lacs Band of Ojibwe
- White Earth Reservation
- Minnesota Chippewa Tribe
- Grand Portage Reservation
- Bois Forte Reservation
- Fond du Lac Reservation
- Red Lake Band of Chippewa
- Lower Sioux Community
- Upper Sioux Community
- Prairie Island Indian Community
- Shakopee Mdewakanton Dakota Community
- Bad River Band of Lake Superior Chippewa
- Keweenaw Bay Indian Community
- Lac Courte Oreilles Band of Lake Superior Chippewa Indians of Wisconsin
- Lac Vieux Desert Band of Lake Superior Chippewa Indians
- Lac du Flambeau Band of Lake Superior Chippewa Indians of Wisconsin
- Red Cliff Band of Lake Superior Chippewa Indians
- Sisseton-Wahpeton Oyate of the Lake Traverse Reservation
- Sokaogon Chippewa (Mole Lake) Community of Wisconsin
- Spirit Lake Tribal Council
- St. Croix Chippewa Indians of Wisconsin
- Turtle Mountain Band of Chippewa
- Flandreau Santee Sioux
- Santee Sioux Nation
- Iron Range Area Council, White Earth Band

DOE received responses from the Tribal Historic Preservation Offices (THPOs) of the Keweenaw Bay Indian Community, Flandreau Santee Sioux Tribe, the Lac Vieux Desert Band of Lake Superior Chippewa Indians, the Mille Lacs Band of the Ojibwe Indians, and the Leech Lake Band of Ojibwe Indians. Because not all tribes responded to the initial consultation letters sent in

September 2005, follow-up consultation letters were sent to the tribes listed above in May 2006 inviting them again to submit any concerns they might have that had not as yet been submitted. Copies of the responses from the tribes to both letters are included in Appendix E and entered into the Administrative Record for the project. Also included in Appendix E are copies of responses from the 1854 Authority, an intra-tribal natural resource management organization, and correspondence from James Merhar, representing the Iron Range Council for Native Americans.

Section 1.8, Continuing Outreach to Native American Tribes, provides a summary of DOE's efforts beyond scoping, with respect to tribal consultation.

1.6.1.4 NEPA Public Scoping Meeting

The NOI invited public participation in the NEPA process and announced two scoping meetings, one held on October 25, 2005, at the Taconite Community Center in Taconite, Minnesota and one held on October 26, 2005, at the Hoyt Lakes Arena, in Hoyt Lakes, Minnesota. These locations were selected for their close proximity to Excelsior's respective preferred and alternative sites for the Mesaba Energy Project. DOE announced the public scoping meetings in local newspapers, including the *Eastern Itascan* on October 20; *Duluth News Tribune*, *Hibbing Daily Tribune*, *Mesabi Daily News*, and *Grand Rapids Herald-Review* on October 23; and *East Range Shopper* and *Grand Rapids Manney's Shopper* on October 24.

DOE also notified Federal, state, and local agencies, public officials, Native American tribes, and non-governmental organizations about the meetings. The public was encouraged to provide oral comments at the meeting and to submit comments to DOE by the close of the EIS scoping period. The NOI and announcements provided appropriate addresses and phone numbers where comments could be communicated to DOE by U.S. Mail, e-mail, toll-free telephone, or facsimile.

DOE led the presentations and presided over both formal meetings. Both meetings began at 7:00 pm Central Daylight Time (CDT) on the respective nights. The Taconite meeting adjourned at 8:57 pm, and the Hoyt Lakes meeting adjourned at 8:00 pm. Each scoping meeting was preceded by an open house from 4:00 pm to 7:00 pm, during which DOE and Mesaba Energy Project personnel were available to answer questions. Information packages were available to attendees that included background information about the project, the CCPI Program, and the NEPA process. Also, Excelsior exhibited approximately 15 mounted graphic displays illustrating various features of the proposed project. A court recorder was present at each meeting to ensure that all oral comments were recorded and legally transcribed.

Collectively, 157 individuals attended the public scoping meetings, (111 signed the Taconite attendance list and 46 signed the Hoyt Lakes attendance list) including several who attended both meetings. All attendees were invited to provide comments, either written or oral, on the proposed project. Those attendees wishing to speak were given an opportunity to sign up. Comment sheets were made available for all attendees wishing to provide written comments. Twenty-nine individuals presented oral comments and six comment sheets were submitted at the meetings. In all, 18 comments were submitted by e-mail, five letters were received by mail, four comments were received by facsimile, and two comments were received by telephone. Comments were posted on the PUC website for the project (http://energyfacilities.puc.state.mn.us/Docket.html?Id=16573) and all submissions are maintained as part of the DOE Administrative Record.

1.6.1.5 Comments Received During the Federal Public Scoping Period

As discussed in the following sections, comments received by DOE during the public scoping period generally aligned according to major groupings, including:

- General comments about the project, the EIS, and the scoping process;
- Purpose and Need (including comments about the DOE decision);
- Proposed Action (including comments about project components and features);
- Alternatives (including comments on alternative sites and other alternatives); and
- Resource-specific concerns (comments related to specific environmental resources).

General Comments

Among the general comments received, respondents raised concerns about the absence of direct notification to all adjacent landowners about the meeting, the limited amount of material available about the project before the meetings, the desire for more written information to be available about the project that could be taken home from the meetings, and questions about how the process would proceed after the meetings. Other comments emphasized that the project should meet all regulatory requirements, expressed concerns regarding the project's emission of greenhouse gases, and raised concerns about the protection of Native American tribal interests.

Comments on the Purpose and Need

Respondents expressed concerns about the need for the proposed facility, both from the perspective of electricity demand (e.g., exemption from the Certificate of Need) and from the perspective of whether coal use is the best choice to meet that demand. Others conveyed concerns about the long-term operation and viability of the demonstration plant. Respondents questioned whether the envisioned economic benefits of the proposed facility are valid, and whether economics should outweigh the potentially adverse environmental and human effects.

Comments on the Proposed Action (Project Features)

Respondents recommended project information and details to be included in the EIS, including process information, information about the expected efficiency and reliability of the plant, feedstocks, utility, and resource requirements, emissions, and controls. Other comments addressed the size of the plant and the expected "footprint," rail alignments, transmission corridors, and various other features.

Comments on the Alternatives

Respondents expressed concerns about the range of alternatives to be considered in the EIS. Specific comments were made regarding **the** DOE "No Fund" Alternative, as well as alternative site and technology selection (e.g., greenfield versus brownfield sites and the applicability of carbon sequestration technologies). Other respondents indicated that the project should include alternatives for renewable energy sources, such as wind and solar power that would reduce air pollutants, greenhouse gas emissions, and impacts on global climate change, or that the alternative of avoiding plant construction through increased energy efficiency and conservation should be considered.

Comments Related to Specific Environmental Resources

Numerous comments were received with respect to specific natural and human environmental resources. The majority of the comments were related to the use of natural resources (e.g., coal, land, and

water), the discharge of pollutants to the natural environment (e.g., air, water, and national parks), and the socioeconomic impacts of the project (e.g., jobs, taxes, and property values). Comments were also received relating to eminent domain, wetlands destruction, increased vehicular and rail traffic, the potential for adverse health effects, and demands on local community services (e.g., emergency responders, local water and sewer systems, and tourism/recreation). Native American tribal issues that were raised related to the following areas: surveys to identify cultural resources; protection of treaty rights to hunt, fish, and gather (i.e., potential impacts to wild game species, fisheries, and wild rice); avoidance or minimization of negative impacts to natural resources such as air quality, water quality, and wetlands; and cumulative effects. Concerns were also expressed by the general public about connected actions and the cumulative effects of current industrial activities and future projects planned within the vicinity of the Mesaba Energy Project.

1.6.2 Minnesota EIS Scoping Process

1.6.2.1 MDOC Scoping Meetings

Upon acceptance of an application for a site or route permit, the PUC must provide the public with an opportunity to participate in developing the scope of the EIS by holding a public meeting and by soliciting public comments. Excelsior filed a Joint Permit Application for a LEPGP site permit, a HVTL routing permit, and a pipeline (partial exemption) routing permit on June 16, 2006. In an Order dated July 28, 2006, the PUC accepted the Joint Permit Application submitted by Excelsior for the Mesaba Energy Project. The MDOC held two public scoping meetings for the Mesaba Energy Project on consecutive nights in the vicinities of the West and East Range Sites in northeastern Minnesota. The first meeting was held on August 22, 2006, at the Taconite Community Center in Taconite. The second was held on August 23, 2006, at the Hoyt Lakes Arena in Hoyt Lakes.

In satisfying the notification requirements within Minnesota Rules **7849.5240**, the public informational and EIS scoping meetings were announced in the EQB Monitor on July 31, 2006, and notices were published in local newspapers, including the *Scenic Range News* on July 6; *Duluth News Tribune*, *Hibbing Daily Tribune*, and *Mesabi Daily News* on July 5; *Grand Rapids Herald-Review* on July 7; and *East Range Shopper* on July 3. Additionally, notice was sent to those persons whose names are on the EQB general notification list, regional and local governments, and each person whose property is adjacent to any of the proposed sites or routes.

Both meetings began at 7:00 pm CDT on the respective nights. The Taconite meeting adjourned at approximately 10:45 pm, and the Hoyt Lakes meeting adjourned at approximately 9:30 pm. Each scoping meeting was preceded by an open house from 4:00 pm to 7:00 pm, during which MDOC, DOE-National Energy Technology Laboratory (NETL), and Excelsior personnel were available to answer questions.

Information packages were available to attendees that included a fact sheet on the state siting and routing process, and the Draft EIS Scoping Document. Also, Excelsior exhibited approximately 25 mounted graphic displays illustrating various features of the proposed project.

Collectively, approximately 300 individuals attended the public scoping meetings, (159 signed the Taconite attendance list and 123 signed the Hoyt Lakes attendance list) including several who attended both meetings. All attendees were invited to provide comments, either written or oral, on the proposed project. Those attendees wishing to speak were given an opportunity to do so. Comment sheets were made available for all attendees wishing to provide written comments.

The MDOC Energy Facility Permitting staff led the presentations and presided over both formal meetings. A court recorder was present at each meeting to ensure that all oral comments were recorded and legally transcribed. Oral comments from 50 individuals were presented at the meetings.

In addition, the MDOC-Energy Facility Permitting staff provided an e-mail address for members of the public who preferred to submit their comments electronically, a postal address for those who preferred to mail their comments, a telephone fax number for those who preferred to fax their comments, and a toll-free telephone number for those who preferred to speak their comments. In all, 49 comments were submitted via e-mail, U.S. Mail, or facsimile. All of the various comment submissions were reviewed to characterize specific issues, concerns, and questions to ensure the consideration of all substantive concerns. The Commissioner of MDOC issued the EIS Scoping Decision on September 13, 2006 (see Appendix G). Comments received during the public scoping period are intended to help direct and focus the analysis and contents of the EIS.

Comments on Operational Information and Design

Several respondents recommended that project operational information and design details be included in the EIS, including process information, information about the expected efficiency and reliability of the plant, feedstocks, utilities and resource requirements, emissions, and controls. Other comments addressed the physical size of the plant and the expected "footprint," rail alignments, transmission corridors, and various other features. This information has been incorporated into the project/process description sections of the EIS.

Opinions

A number of comments contained statements of opinion and rhetorical questions, such as the desirability of a particular site. Such comments have not been assimilated into the Scoping Decision in all cases; however, the EIS has attempted to address the subjects raised to the extent appropriate.

Comments on Need

Many respondents expressed concerns about the need for the proposed facility, both from the perspective of electricity demand (e.g., exemption from Certificate of Need) and from the perspective of whether coal use is the best choice to meet that demand. Because Minnesota Statutes § 216B.1694, Subdivision 2, item 1 has exempted this facility from demonstrating need and that this facility qualifies as an "innovative energy project," issues related to the need, size, or type of the facility are excluded from consideration by the MDOC-Energy Facility Permitting staff. Such issues are not within the scope of the EIS. The MDOC will not, as part of this environmental review, consider whether a different size or different type of plant should be built instead, nor will the MDOC consider the "No Build" option.

Comments on Viability

Additionally, some of the comments conveyed concern over the long-term operation and viability of the project. Respondents questioned whether the envisioned economic benefits of the proposed facility are valid, and whether economics should outweigh the potentially adverse environmental and human effects of construction and operation of the facility. There is currently a docket before the PUC pertaining to Excelsior's proposed power purchase agreement (Docket E6472/M-05-1993) that will evaluate many of these concerns.

Comments on Overall Environmental Impacts

Numerous comments were received with respect to specific natural resources, environmental welfare, and human health issues. The majority of the comments were related to the use of natural resources (e.g., coal, land, water, and national parks), the discharge of pollutants to the natural environment (e.g., air, water, wetlands, and CO_2 emissions) and adverse health effects, and the socioeconomic impacts of the project (e.g., jobs, taxes, and property values). Comments were also received relating to eminent domain, increased vehicular and rail traffic, and demands on local community services (e.g., emergency responders, local water and sewer systems, and tourism/recreation). Concerns were also expressed about connected actions and the cumulative effects of current industrial activities and future projects planned within the vicinity of the Mesaba Energy Project.

These issues, along with the typical LEPGP, HVTL, and pipeline routing and siting impacts, were incorporated into the proposed Order on the EIS Scoping Decision.

1.6.2.2 Citizens Advisory Task Force

A Citizens Advisory Task Force was established by the PUC to provide input to the scope of the EIS for the Mesaba Energy Project. The Task Force was charged with the following three tasks:

- Determine whether local site or route specific information as presented within the Joint Permit Application is inaccurate or has missing information;
- Recommend which site- or route-specific impacts and issues of local concern should be assessed in the EIS; and
- Express a preference for either the preferred or alternative site contained within the Joint Permit Application if a consensus can be reached.

Task Force members were selected by the MDOC based on the responses to a solicitation letter, and the Task Force met three times during August 2006 at locations near the West and East Range Sites. The final comments and recommendations of the Task Force were posted on the PUC website (see Section 1.6.1.4). Due to the time constraints, there was not an opportunity for the Task Force to discuss individual comments and reach a consensus as to whether or not the comment represented the view of all members. Consequently, some of the comments provided may present views that are not necessarily shared by all Task Force members.

In an attempt to facilitate the discussion of which site should be indicated as the preferred site, a number of evaluation criteria were considered to provide a quantitative evaluation of the two sites. During the second meeting, the evaluation criteria and weightings were selected by the task force members, and a consensus was reached on both the evaluation criteria and the weighting of each of those criteria. These criteria included many of the environmental issues addressed in this EIS (such as noise, aesthetics, air, and water quality) and impacts from construction on residences, rail traffic, and tourism/recreation. The evaluation matrices were then provided to each member to fill out the rankings of each evaluation criterion for each site prior to the third meeting.

Thirteen members submitted completed evaluations matrices. Seven members scored the East Range Site as having a lower impact, while five members scored the West Range Site as having a lower impact. One member determined that the impact between the two sites was essentially equal. From both the scores and comments received from individual members, it was clear that the Task Force would not be able to reach a consensus on a preferred site.

During the final meeting of the Task Force, several members expressed an interest in developing statements related to the project that could be supported by all members. A unanimous consensus was not reached on any of the proposed statements, but a majority of the members voted affirmatively on the following statements (note that the recommendations of the Task Force on limitations to the scope are not binding on DOE):

- *This Task Force recommends that a site or sites be permitted and built on the Iron Range, assuming that all environmental concerns are considered and adequately addressed in the Environmental Impact Statement.*
- *This Task Force recommends that any analysis of cumulative impacts only be conducted on projects that have the necessary permits in place to proceed with the construction of the facility.*

1.6.3 Special CCPI Program Considerations under NEPA

DOE does not possess permitting and regulatory authority for the proposed project. Furthermore, by providing financial assistance to private sector investments in energy systems, DOE has a more limited role than if the Federal government were the owner and operator of the energy systems. In the latter case, DOE would be responsible for a comprehensive review of reasonable alternatives for power generation, as well as for the siting of proposed facilities. However, when dealing with applicants under the CCPI Program, the alternatives available to DOE are necessarily more restrictive. Once DOE selects a prospective applicant and project, the department's decision is bounded by the reasonable alternatives available to the applicant within the constraints of the application and the applicant's needs for the project. **The same is true of DOE's role with respect to applications under the loan guarantee program.**

This relationship creates an important distinction between alternatives that might be available to Excelsior as a project proponent, alternatives available to the PUC as a state regulatory agency, and alternatives that are available to DOE as the Federal sponsor of an energy program initiative. The reasonable alternatives available to DOE in this case are either to enter into a cooperative agreement to provide co-shared funding **and possibly a loan guarantee** for the applicant's project or to decline to participate in the project. However, alternatives considered by Excelsior and incorporated into the Federal Proposed Action are described in Section 2.1 of this EIS. At the request of USACE staff, Excelsior has prepared an analysis of alternatives intended to satisfy USACE NEPA and CWA Section 404 requirements. This supplemental alternatives analysis is provided in Appendix F1.

> It is important to note that in the absence of DOE co-funding **or loan guarantee**, Excelsior may still elect to construct and operate the IGCC power plant.

The evaluations of potential impacts included in this EIS are intended to enable the Federal decision-makers to choose the appropriate alternative. If DOE elects to provide financial assistance for the Mesaba Energy Project under a cooperative agreement (beyond those activities that are appropriate and necessary to complete the NEPA evaluation and documentation), the agency may also specify measures to mitigate potential significant impacts as identified in the EIS. See Section 5.3 for discussion of the mitigation measures that Excelsior would implement for the proposed project. All mitigation measures imposed by DOE would be announced in the ROD.

If DOE declines to provide financial assistance for the Mesaba Energy Project beyond those activities that are appropriate and necessary to complete the NEPA evaluation and documentation, the co-funding withdrawn may be made available for other current or future CCPI projects. In the absence of DOE co-

funding **or a loan guarantee** (the Federal No Action Alternative), Excelsior may still elect to construct and operate the proposed IGCC power plant provided it can obtain all required state and Federal permits.

1.6.4 Connected Actions

Although DOE's CCPI Program co-funding will apply only to Phase I of the Mesaba Energy Project, Phase II, which is a duplicate of the Phase I facility, is considered a connected action. MDOC's state EIS must address the project as submitted in the joint permit application, which includes both phases of the Mesaba Energy Project. Because Phase II is inextricably linked to the successful performance of Phase I, the impacts of both phases are assessed as a whole in this EIS. **However, at the request of USACE, the Final EIS has been revised as appropriate to describe the potential impacts of Phase I separately from the impacts of the combined two-phased project.**

In association with the proposed Mesaba Energy Project at Excelsior's preferred site near Taconite, the Itasca County Engineer indicated that the county has an interest in rerouting County Road (CR) 7 near its intersection with U.S. Highway (US) 169. Therefore, although this action would be undertaken independently of the proposed Mesaba Energy Project as a road improvement project by Itasca County, it has been addressed in this EIS as a connected action, because the construction of the Mesaba Generating Station would provide substantial impetus for the road realignment. **Since publication of the Mesaba Draft EIS, Itasca County has deferred action on the realignment and improvement of CR 7. Therefore, although the potential impacts of that project are addressed in this Final EIS, appropriate sections have been revised to describe the anticipated impacts of providing road access to the Mesaba power plant in the absence of the CR 7 realignment.**

Also, following publication of the Mesaba Draft EIS, the PUC issued a Pipeline Route Permit dated April 16, 2008 for Nashwauk Public Utilities Commission to construct approximately 23 miles of 24-inch natural gas pipeline along a route from Blackberry Township to Nashwauk (Docket No. PL,E-280/GP-06-1481; http://energyfacilities.puc.state.mn.us/Docket.html?Id=19035). The Nashwauk PUC intends to supply natural gas to the proposed Minnesota Steel project (renamed Essar Steel Minnesota) and other potential customers. Excelsior intends to enter into negotiations with Nashwauk PUC to purchase natural gas from the pipeline in the event that the pipeline can be constructed in sufficient time to be available for use by Mesaba. The Mesaba Draft EIS described the potential impacts of alternative natural gas pipeline alignments to supply the power plant during start-up and back-up conditions, and Nashwauk's approved pipeline route would follow an alignment consistent with one of the alignments proposed by Excelsior. Although the discussion of these impacts has been retained in the Final EIS, the impacts of construction of a natural gas pipeline would not be attributable directly to the Mesaba project if Excelsior were to purchase natural gas from the Nashwauk PUC instead of building its own pipeline.

1.7 COMMENTS ON THE DRAFT EIS

The Draft EIS for the Mesaba Energy Project was published in November 2007. DOE and MDOC distributed copies of the Draft EIS to officials, agencies, Native American tribes, organizations, libraries and members of the public identified in the distribution list (Chapter 8). MDOC announced the availability of the Draft EIS in the *EQB Monitor* on November 5, 2007 (Volume 31, Number 23, Page 9); DOE announced the Notice of Availability of the Draft EIS in the *Federal Register* on November 8, 2007 (72 *FR* 63169); and EPA published the Notice of Availability in the *Federal Register* on November 9, 2007 (72 *FR* 63579).

DOE and MDOC jointly held two public hearings for the Draft EIS at the same locations as the scoping meetings. The hearings were held in Taconite, Minnesota on November 27, 2007 and in Hoyt Lakes, Minnesota on November 28, 2007. DOE and MDOC advertised the hearings in the *Hibbing Daily Tribune*, *Grand Rapids Herald-Review*, and *Mesabi Daily News* on November 14 and 18, 2007, and in the *Duluth News Tribune* on November 18, 2007. Informal information sessions were held at the same locations prior to both hearings from 4:00 to 7:00 pm, during which time attendees were given information about the project and were able to view project-related informational displays.

Based on sign-in sheets, 107 individuals attended the Taconite hearing, and 34 individuals attended the Hoyt Lakes hearing. MDOC and DOE led the presentations and presided over the public hearings. The public was encouraged to provide oral comments at the hearings and to submit written comments to DOE or MDOC by January 11, 2008. A court reporter was present at each hearing to ensure that all oral comments were recorded and legally transcribed.

Volume 3 of this EIS describes the process DOE and MDOC followed for cataloging and responding to comments. Oral comments were given by 28 individuals at the Taconite hearing and by six individuals at the Hoyt Lakes hearing. In addition, DOE and MDOC received 88 written comments, including five from Federal agencies, four from state agencies, five from Native American tribal organizations, and several from national and regional non-governmental organizations and other affiliations. Volume 3 includes scanned images of the comment documents, beginning with the transcripts from both public hearings, and provides responses to all comments. DOE and MDOC considered all comments to the extent practicable in preparing the Final EIS.

1.8 CONTINUING OUTREACH TO NATIVE AMERICAN TRIBES

Following scoping and before issuing the Draft EIS, DOE had discussions with representatives of the following tribes and organization by telephone in May and June of 2007.

- **Grand Portage Reservation**
- **Red Lake Band of Chippewa**
- **Fond du Lac Reservation**
- **Lower Sioux Community**
- **Bois Forte Reservation**
- **Leech Lake Band of Ojibwe**
- **Mille Lacs Band of Ojibwe**
- **White Earth Reservation**
- **Fort Peck Tribes**
- **Wahpekute Band**
- **Spirit Lake Tribe**
- **Standing Rock Tribe**
- **1854 Treaty Authority**

DOE offered to personally meet with the tribes for consultation. DOE also invited these tribes to consider participation in a possible Programmatic Agreement (PA) between DOE and the Minnesota State Historic Preservation Office that would be necessary to satisfy DOE's responsibilities under Section 106 of the National Historic Preservation Act [see Sections 4.9.3.1 and 4.9.4.1]). At that time, the following tribes requested that they be included as signatories to any

such agreement: Bois Forte Band of Chippewa; Grand Portage Band of Chippewa; and Leech Lake Band of Ojibwe.

The initial meeting with Native American tribes was held on February 27-28, 2008, at the Fond du Lac Reservation in Carlton, MN. Representatives of the following tribes and organizations attended.

- **Grand Portage Reservation**
- **Red Lake Band of Chippewa**
- **Fond du Lac Reservation**
- **Lower Sioux Community**
- **Bois Forte Reservation**
- **Leech Lake Band of Ojibwe**
- **Fort Peck Tribes**
- **Wahpekute Band**
- **Spirit Lake Tribe**
- **Standing Rock Tribe**
- **1854 Treaty Authority**

After presentations by DOE, Excelsior, and Excelsior's cultural resources consultant on the status of the project, DOE provided a draft PA for consideration by the tribes. The response of the tribes was twofold. First, the tribes stated that not all tribes with potential interest in the project had been identified and contacted by DOE. Second, the tribes sought a separate Memorandum of Agreement among DOE, Excelsior and the tribes to address certain issues. The tribes provided suggestions on resources to consult (e.g., Tribal Leaders Directory, June 2007, Bureau of Indian Affairs, U.S. Department of the Interior) in identifying additional tribes to contact, as well as a draft MOA for DOE consideration. DOE staff agreed to make a more thorough effort to identify potentially interested tribes, to consider the draft MOA, and to arrange for a subsequent consultation meeting.

In preparation for the next meeting, DOE identified and contacted the following additional tribes.

- **Flandreau Santee Sioux Tribe**
- **Three Affiliated Tribes**
- **Sisseton Wahpeton Oyate**
- **Northern Cheyenne Tribe**
- **Turtle Mountain Band of Chippewa**
- **Santee Sioux Nation; Lower Brule Sioux Tribe**
- **Upper Sioux Community**
- **Cheyenne River Sioux Tribe**
- **Winnebago Tribe**
- **Shakopee Mdewakanton Sioux Community**
- **Yankton Sioux Tribe**
- **Crow Creek Sioux Tribe**
- **Northern Arapaho Tribe**
- **Northern Cheyenne Tribe**
- **Oglala Sioux Tribe**

DOE also considered the draft MOA provided at the first meeting but decided to propose that relevant portions of the MOA be incorporated into the PA. This revised PA was then sent to the

tribes prior to the second meeting which was held at the White Earth Reservation in Mahnomen, MN, on June 23-24, 2008. Attending this meeting were representatives of Excelsior, DOE, the Army Corps of Engineers, the Minnesota Deputy SHPO, and the following tribes.

- **Grand Portage Reservation**
- **Red Lake Band of Chippewa**
- **Fond du Lac Reservation**
- **Lower Sioux Community**
- **Bois Forte Reservation**
- **Leech Lake Band of Ojibwe**
- **Fort Peck Tribes**
- **Wahpekute Band**
- **Spirit Lake Tribe**
- **Standing Rock Tribe**
- **Mille Lacs Band of Ojibwe**
- **White Earth Reservation**
- **Sisseton Wahpeton Oyate**
- **Turtle Mountain Band of Chippewa**
- **Shakopee Mdewakanton Sioux Community**

The tribes insisted on an MOA as a prerequisite to a PA. They also requested that in conjunction with the next meeting that DOE and Excelsior arrange for a site visit for interested Tribal representatives and that DOE, Army Corps, and Excelsior staff participate in a cultural sensitivity training session.

A series of events was scheduled for October 7-9, 2008. On October 7, 2008, a representative of the Lac du Flambeau, Fort Peck Assiniboine, and Sioux Tribes conducted sensitivity training at the Fond du Lac Reservation for DOE, Army Corps, and Excelsior staff. On October 8, 2008, Excelsior conducted a site tour of both sites, during which aerial videos of the utility corridors were shown to interested tribal representatives. The third consultation meeting was held on October 9, 2008, at the Fond du Lac Reservation. Attending this meeting were representatives of Excelsior, DOE, and the following tribes and tribal organization.

- **Grand Portage Reservation**
- **Red Lake Band of Chippewa**
- **Fond du Lac Reservation**
- **Bois Forte Reservation**
- **Fort Peck Tribes**
- **Mille Lacs Band of Ojibwe**
- **White Earth Reservation**
- **Shakopee Mdewakanton Sioux Community**
- **Northern Cheyenne Tribe**
- **Yankton Sioux Tribe**
- **1854 Treaty Authority**

Most of the meeting was spent discussing modifications to the MOA. Based on the discussions, the tribes agreed to prepare a revised MOA for consideration.

The fourth meeting was held at the White Earth Reservation on November 13-14, 2008. Attendees at the meeting included staff from DOE, Excelsior, and the Army Corps and representatives from the following tribes.

- **Grand Portage Reservation**
- **Red Lake Band of Chippewa**
- **Lower Sioux Community, Bois Forte Reservation**
- **Fort Peck Tribes**
- **Mille Lacs Band of Ojibwe**
- **White Earth Reservation**
- **Yankton Sioux Tribe**
- **Leech Lake Band of Ojibwe**
- **Wahpekute Band**
- **Sisseton Wahpeton Oyate**

Before the meeting began, the tribes provided a copy of the revised MOA. The meeting entailed a group discussion of each element of the MOA to identify any remaining issues, and editing the MOA.

In parallel with the process described above, DOE also had separate meetings with the Upper Sioux Community, as they had requested. These meetings were held at the Upper Sioux Community, in Granite Falls, MN, on September 9, 2008 and October 28, 2008. At the first meeting the Upper Sioux stated that it was important to recognize the cultural value of properties and not just the archaeological aspects. There was also discussion on various elements in a glossary of terms/acronyms to a PA that should be more clearly defined. At the follow-up meeting the tribe stated that it was important that a tribal cultural resource specialist be included in cultural resource surveys and that the specialist be appointed or designated in accordance with Tribal law and, hence, be an official representative of an Indian tribe. Other topics discussed were the environmental effects of the new transmission routes, monitoring and mitigation of potential biota transfer between surface water bodies, and a management plan to ensure that the current recreational status of the Canisteo Mine Pit is retained.

A conference call was held on February 3, 2009, to discuss the results of the legal reviews of the MOA by the tribes. Participating in the call were staff of Excelsior, DOE, and representatives of the Bois Forte Reservation, the Upper Sioux Community, the Red Lake Band of Chippewa, and White Earth Reservation tribes. On March 13, 2009, DOE sent the revised version of the MOA to the tribes with a request that this version be submitted for Tribal Council review.

The fifth meeting was held on May 12-14, 2009 at the Fond du Lac Reservation in Carlton, MN. Attending this meeting were representatives of Excelsior, DOE, the Army Corps of Engineers, the Minnesota SHPO's office and the following tribes and tribal organization:

- **Yankton Sioux Tribe**
- **Wahpekute Band**
- **Lower Sioux Community**
- **Sisseton Wahpeton Oyate**
- **White Earth Reservation**
- **Red Lake Nation**
- **Bois Forte Reservation**

- **Northern Cheyenne Tribe**
- **Fort Peck Tribes**
- **Mille Lacs Band of Ojibwe**
- **Fond du Lac Reservation**
- **1854 Treaty Authority**

The consulting parties discussed a signing ceremony for the MOA. Efforts continued on the development of a PA. The tribes requested that representatives from the Fish and Wildlife Service and Army Corps of Engineers be available for the next meeting.

The sixth meeting was held on June 23-25, 2009 at the Bois Forte Reservation in Tower, MN. Participating in this meeting were representatives of Excelsior, DOE, the Army Corps of Engineers, the Fish and Wildlife Service and the following tribes:

- **Yankton Sioux Tribe**
- **White Earth Reservation**
- **Bois Forte Reservation**
- **Northern Cheyenne Tribe**
- **Fort Peck Tribes**
- **Mille Lacs Band of Ojibwe**
- **Leech Lake Band of Ojibwe**
- **Grand Portage Reservation**

The tribal members asked questions of the representatives from the Army Corps of Engineers and the Fish and Wildlife Service regarding participation in the Section 106 process and impacts of the Mesaba Energy Project. Efforts continued on the development of the PA with the majority of sections being developed. The tribal members stated that it would be best to complete development of the PA before signing the MOA.

The seventh meeting was held on July 21-23, 2009 at the Bois Forte Reservation in Tower, MN. Attending this meeting were representatives of Excelsior, DOE, and the following tribes:

- **Yankton Sioux Tribe**
- **Bois Forte Reservation**
- **Northern Cheyenne Tribe**
- **Fort Peck Tribes**
- **Mille Lacs Band of Ojibwe**
- **Grand Portage Reservation**
- **Sisseton Wahpeton Oyate**
- **Wahpekute Band**
- **Lower Sioux Community**

Efforts at this meeting continued on the development of the PA. Considerable time was spent on sections of the agreement addressing the area of potential effects, inadvertent discoveries, and the discovery of human remains. The tribes requested that a plan of action be developed that would address inadvertent discovery of human remains and other inadvertent discoveries. DOE, Excelsior and the tribes made progress on the development of this plan, which would be incorporated as an attachment to the PA. Other potential plans (such as an identification plan, historic property treatment plan, historic property survey plan, and a safety plan for tribal monitors) were also discussed.

On September 16, 2009, DOE and Excelsior representatives met with members of the Tribal Council for the Upper Sioux Community. All members of the Tribal Council and the project coordinator for the Board of Trustees were present. DOE and Excelsior presented an overview of the Project's integrated historic properties management plan, the decision making process to be followed in identifying historic properties, and the plans to be used within that process. A draft of the PA was then discussed in detail. Final comments from the Upper Sioux are pending.

DOE, Excelsior and the tribes met on October 6-8, 2009 in Carlton, Minnesota on the Fond du Lac Indian Reservation to conduct the eighth consultation among the parties. Prior to the meeting, DOE distributed a complete draft of the PA with changes requested by the ACHP. The draft PA contained exhibits detailing the historic property survey plan, historic property treatment plan and inadvertent discovery plan. Also attached to the draft PA, for reference purposes rather than as an integral part of the PA, was a Cultural Resource Preservation Plan to deal with cultural resources not eligible for listing on the NRHP and therefore outside of the Section 106 process.

Much of the discussion at the meeting focused on preservation of cultural resources. The ACHP participated in a portion of the discussion by telephone. Preservation of cultural resources, including resources not eligible for the NRHP, is a significant concern for the tribes. Although not required by Section 106, Excelsior had previously expressed a good faith intention to identify and preserve such resources. Hence, DOE and Excelsior proposed the Cultural Resource Preservation Plan, which together with the PA, would constitute a comprehensive, approach to the preservation of all cultural resources important to the tribes.

The status of the tribal consultation as of October 15, 2009, is such that consultation with the tribes regarding the PA will continue beyond the distribution of this Final EIS. The DOE Record of Decision will be contingent upon satisfactory completion of the PA signed – at a minimum – by DOE, Excelsior, the ACHP, and the Minnesota SHPO to satisfy DOE's requirements under Section 106 of the National Historic Preservation Act. Although signing of the agreement by the tribes is not specifically required under Section 106, DOE expects that the efforts made in the consultation process described in this section will result in execution of the agreement by tribes involved in the process.

INTENTIONALLY LEFT BLANK

2. PROPOSED ACTION AND ALTERNATIVES

2.1 INTRODUCTION

This chapter describes the Proposed Action and alternatives for the Mesaba Energy Project from the perspectives of DOE, the project proponent (Excelsior), and the Minnesota PUC. These perspectives and respective decisions are discussed in the balance of Section 2.1. Section 2.2 describes the technology and principal features of Excelsior's proposed IGCC power plant, including the process equipment; plant utility systems, resource requirements (inputs); discharges, wastes and products (outputs); construction plans; and operational plans, which would be common features of the project irrespective of siting. Finally, Section 2.3 describes the siting and routing alternatives considered by Excelsior for the components of the proposed project, as well as site-specific considerations relating to the respective inputs and outputs at alternative sites.

2.1.1 Agency Action and Alternatives Considered by DOE

2.1.1.1 DOE Proposed Action

As described in Section 1.2.1, DOE identified the Mesaba Energy Project in Round 2 of CCPI funding opportunity announcements as one of four applications selected. The project is one of two applications that proposed archetypal IGCC technologies, both of which were selected in Round 2. Accordingly, the DOE Proposed Action is to provide a total of $36 million in co-funding, through a cooperative agreement with Excelsior, for the **definition and preliminary** design and one-year operational demonstration-testing period for Phase I of the proposed two-phased Mesaba Energy Project. **In addition, DOE may provide a loan guarantee to Excelsior pursuant to EPAct05 Section 1703 for Phase I of the proposed project.** This first phase would be a nominal **600** $MWe_{(net)}$ IGCC power plant with an estimated cost **in the cooperative agreement** of $2.16 billion (NETL, 2006a). Phase II, which would be an identical, co-located **600** MWe plant, would be privately financed and not involve co-funding **or a loan guarantee from** DOE.

A portion ($22,245,505) of the total funding has been made available for cost sharing in the first budget period under the cooperative agreement, prior to completion of the NEPA process. The activities eligible for cost sharing during the first period allow for the development of information (such as project definition, preliminary design, and environmental studies and permitting) that provide the basis for this EIS. This is typical both in the amount of funding and the types of allowable activities for a CCPI project of this scope. Making these funds available does not prejudice DOE's ultimate decision on the proposed action and is consistent with DOE and CEQ regulations (10 CFR 1021.211 and 40 CFR 1506.1, respectively), which restrict DOE from taking action that would have an adverse environmental impact or limit the choice of reasonable alternatives until the ROD has been issued.

This EIS considers the impacts of both phases of the Mesaba Energy Project as connected actions, consistent with NEPA policy **(see Section 1.5.1)**, even though only Phase I would be co-funded under the CCPI Program. **However, at the request of USACE, the Final EIS has been revised as appropriate to describe the potential impacts of Phase I separately from the impacts of the combined two-phased project.**

2.1.1.2 Alternatives Determined to be Reasonable by DOE

Section 102 of NEPA requires that agencies discuss the reasonable alternatives to the proposed action in an EIS. The term "reasonable alternatives" is not self-defining, but rather must be determined in the context of the statutory purpose expressed by the underlying legislation.

Congress established the CCPI Program with a specific goal—to accelerate commercial deployment of advanced coal-based technologies that can generate clean, reliable, and affordable electricity in the United States. The CCPI legislation (Pubic Law No. 107-63) has a narrow focus in directing DOE to demonstrate **the commercial viability of** technology advancements related to coal-based power generation designed to reduce the barriers to continued and expanded use of coal. Technologies capable of producing any combination of heat, fuels, chemicals, or other use byproducts in conjunction with power generation were considered; however, coal is required to provide at least 75 percent of the fuel for power generation. The DOE purpose in considering the **agency action** (to provide cost-shared funding) is to meet the goal of the program by demonstrating the commercial readiness of the Conoco-Phillips E-Gas™ gasification technology in a fully integrated and quintessential IGCC utility-scale application. Other technologies that cannot serve to carry out the goal of the CCPI Program (e.g., natural gas, wind power, conservation) are not relevant to the DOE decision whether to provide cost-shared funding support for the Mesaba Energy Project, and therefore, are not reasonable alternatives.

CCPI only allows for Federal co-funding of proposed industry projects for which an application has been prepared, submitted, and selected in response to a formal funding opportunity announcement issued by the Department. In 2004, DOE issued the CCPI Round 2 funding opportunity announcement. This announcement was open to any interested potential applicant nationwide and solicited applicants for co-funding that were consistent with one or more of the DOE priority need areas of interest established in the announcement. Two technology priorities for the announcement were gasification-based power generation systems and mercury control technologies. Further, applications submitted for co-funding must have been integrated within existing or planned new power plant facilities that use coal for at least 75 percent of the energy input and that produced at least 50 percent of the energy-equivalent output in the form of electric power. Applications for co-funding must also have identified a site or sites.

Thirteen applications for co-funding of proposed industry project demonstrations from across the nation were received and evaluated in response to the CCPI Round 2 announcement. These applications represented diverse technologies and utilized a variety of coals consistent with the requirements embodied in the announcement. Two of the 13 applications were for co-funding of proposed archetypal IGCC projects. Pursuant to Federal regulations, the choices available to DOE were limited to those applications submitted in response to the funding opportunity announcement. In all, four of the 13 applications were selected, including both of the proposed archetypal IGCC projects, one of which was the Mesaba Energy Project (NETL, 2006a). The two IGCC projects that were selected for co-funding involved the demonstration of different gasifier types, which is important in achieving a diversity of technology approaches and methods in the CCPI program. They also involve different coals, operating environments, and environmental considerations, all of which enhance the potential for widespread commercialization of IGCC technology in a competitive marketplace. The Mesaba Energy Project was selected because of the opportunity to demonstrate the specific technology proposed—the Conoco-Phillips E-Gas™ gasification technology—in a fully integrated and quintessential large commercial utility-scale IGCC setting. No other applicants proposed this specific IGCC technology. Other projects that proposed to demonstrate other technologies are not alternatives to the proposed project for NEPA purposes.

Congress not only prescribed a narrow goal for the CCPI Program, but also directed DOE to use a process to accomplish that goal that would involve a more limited role for the Federal government. Instead of requiring government ownership of **CCPI** demonstration**s**, Congress provided for cost-sharing in a project sponsored by the private parties **as a means to provide incentive for accelerated deployment**, with the provision for repayment of the public funds invested. Therefore, rather than being responsible for the siting, construction and operation of the projects, DOE is in the more limited role of evaluating CCPI project applications to determine if they meet the CCPI Program's goal. **The same is true of the DOE role with regard to applications under the Federal loan guarantee program.** It is well established that an agency should take into account the needs and goals of the applicant in determining the scope of the EIS for the applicant's project. When an applicant's needs and goals are factored into the deliberations, a narrower scope of alternatives may emerge than would be the case if the agency is the proprietor responsible for all project-related decisions.

DOE's preferred alternative is to provide financial assistance in the form of co-funding under the CCPI cooperative agreement and possibly a loan guarantee under Title XVII of the EPAct 05 to the Mesaba Energy Project, assuming that one of the two sites proposed by Excelsior (see below) would be found acceptable and granted a site permit by the Minnesota PUC. DOE tentatively finds both sites to be acceptable. DOE does not have a preference among the alternatives considered for utility and transportation infrastructure necessary to support the project. These routing decisions are also under the jurisdiction of the PUC in its permitting process. If DOE ultimately selects the preferred alternative, DOE would then determine for each site whether mitigation of specified potential impacts would be required. DOE is also free, however, to ultimately determine in the ROD that only one of the two sites is acceptable, or to select no action.

No Action Alternative

Under the No-Action Alternative, DOE would not provide cost-shared funding **or a loan guarantee** to **the Mesaba Energy Project to** demonstrate the commercial readiness of the Conoco-Phillips E-Gas™ gasification technology in a fully integrated and quintessential IGCC utility-scale application (beyond funding required to complete the NEPA process). In this case, the remaining funding withheld from the Mesaba Energy Project may be made available for other current or future CCPI projects. In the absence of DOE funding **or loan guarantee**, Excelsior could still elect to construct and operate the proposed power plant provided that it could replace the Federal financing component and obtain required permits from state and Federal agencies. Therefore, the DOE No-Action Alternative could result in one of two potential scenarios:

(1) The Mesaba Energy Project would not be built.

(2) The Mesaba Energy Project would be built by Excelsior **without benefit of CCPI co-funding or a loan guarantee**.

DOE assumes that if Excelsior were to proceed with development in the absence of DOE funding, the project would include all of the features, attributes, and impacts as described for the Proposed Action. However, without DOE participation, it is possible that the proposed project would be canceled. Therefore, for the purposes of analysis in this EIS, the DOE No Action Alternative is assumed equivalent to a "No Build" Alternative, meaning that environmental conditions would remain in the status quo (no new construction, resource utilization, emissions, discharges, or wastes generated).

If the project were canceled, the proposed technology may not be demonstrated elsewhere. Consequently, eventual commercialization of the integrated technologies would probably not occur because utilities and industries tend to use known and demonstrated technologies rather than unproven

technologies. This scenario would not contribute to the CCPI Program goal of accelerating commercial deployment of advanced coal-based technologies that can generate clean, reliable, and affordable electricity in the United States. **Similarly, the No Action Alternative would not contribute to the Federal loan guarantee program goals to make loan guarantees for energy projects that "avoid, reduce, or sequester air pollutants or anthropogenic emissions of greenhouse gases; and employ new or significantly improved technologies."**

Alternative Sites

The DOE Proposed Action to co-fund the Mesaba Energy Project as an application selected under CCPI Round 2 constitutes a decision only to select a specific technology for demonstration. DOE has not participated in the identification or selection of alternative sites or alignments for the Mesaba Energy Project. Excelsior Energy was founded in the State of Minnesota because of the experience of the firm's leadership team with the electric power industry in Minnesota, as well as the support of the Minnesota Legislature and administration. Therefore, the initial consideration of potential sites by the project proponent (Excelsior) was limited to the State of Minnesota.

As described in Section 1.2.2, Excelsior decided to locate the Mesaba Energy Project within the TTRA—in advance of submitting an application to DOE for co-funding in response to the CCPI Round 2 funding opportunity announcement—because the funding provided by the Iron Range Resources Rehabilitation Board required that the project be located within the TTRA and because the incentives created by the Minnesota Legislature in the Innovative Energy Project statute are necessary for project viability. Excelsior has stated that it has no intention to locate the Mesaba Energy Project elsewhere in the State of Minnesota or anywhere other than the TTRA, because without those incentives the project would not be viable; the financial value of the incentives far outweighs any potential mitigation costs associated with sites in the TTRA. Excelsior has further stated that it would not have submitted an application in response to the CCPI Round 2 announcement if it did not intend to locate the Mesaba Energy Project in the TTRA. Therefore, if the project would not be located in the TTRA, the project would not exist, since no other applicants to CCPI Round 2 proposed the same technology in any other location. From the DOE perspective, any consideration of an alternative location outside of the TTRA would be the equivalent of the No Action Alternative for this EIS.

As described in Section 1.5, Excelsior is required by state regulations to consider at least two potential sites for the proposed plant and two potential alignments for HVTLs. Excelsior's preferred and alternative sites and alignments are described in Section 2.3. **At the specific request of USACE in its role as a cooperating agency under NEPA and as the Federal agency responsible for compliance with Section 404 of the CWA,** Excelsior **provided an** analysis of **the range of** alternative sites **it considered** within the TTRA (see Appendix F1). **Excelsior concluded from the analysis** that the West Range and East Range sites are the only practicable alternative sites **available to Excelsior**. DOE has reviewed Excelsior's siting analysis and found it to be adequate for purposes of determining reasonable site alternatives for this EIS. Accordingly, DOE has evaluated the West and East Range sites in detail as reasonable alternatives **in this EIS**. Figure 2.1-1 shows the boundary of the TTRA and the two alternative locations (West Range Site and East Range Site) for the proposed project.

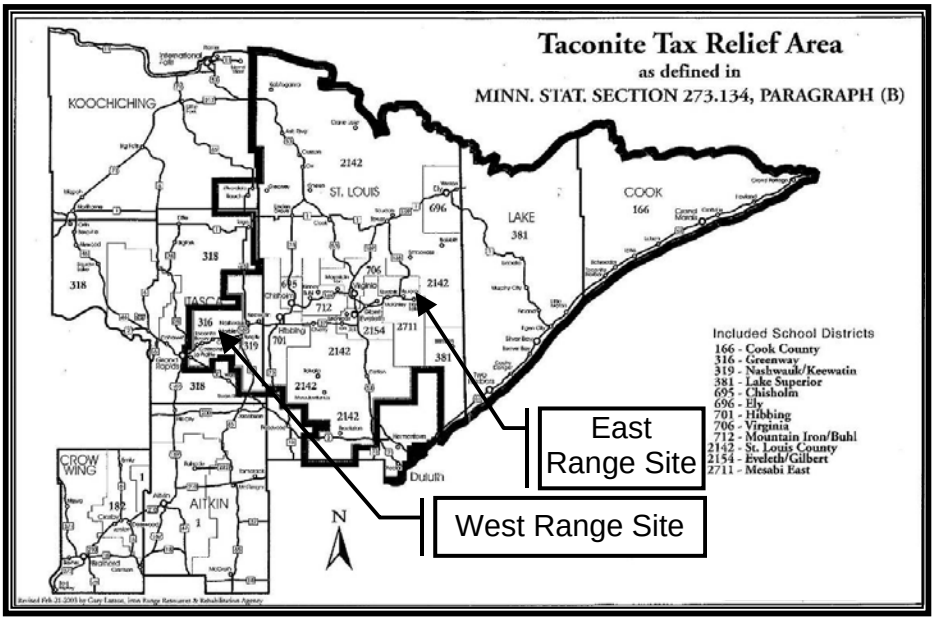


Figure 2.1-1. West and East Range Sites in Taconite Tax Relief Area

Alternatives Eliminated from Further Consideration

DOE considered the following alternatives in addition to the Proposed Action and No Action Alternative.

Alternative Sizes

The proposed project could be demonstrated using a smaller-sized plant; however, **no other applicant proposed** a smaller-sized plant **using this specific technology. Further, a smaller plant** would not be sufficiently large to demonstrate the large utility-scale commercial viability of the IGCC technology advancements, which is the central purpose of this CCPI project. The smaller-sized, single process system IGCC plant was successfully demonstrated as part of the predecessor Clean Coal Technology (CCT) program at the Wabash River Plant located in Terre Haute, Indiana. Following the Wabash River Plant demonstration, a Value Improving Practices (VIP) process – a formal industry process applying nine separate practices – was applied to examine lessons learned, identify options to improve cost and performance, and optimize the design for application to large utility-scale commercial plant configurations. An availability target above 85 percent would be needed to successfully compete against older technology base load facilities in the power generation industry. Multiple process systems would be required to meet this availability requirement, including a more cost-effective redundancy within the plant, low-cost back-up systems of conventional technologies, and the integration of these features throughout the plant. The proposed project would demonstrate the large utility-scale commercial design configuration resultant from the Wabash River Plant VIP process and subsequent research and development consistent with the DOE IGCC Roadmap.

Alternative Technologies

DOE could demonstrate other coal gasification technologies instead of the Proposed Action; however, such alternatives would not demonstrate the commercial readiness of the Conoco-Phillips E-Gas™ gasification technology, which is DOE's purpose for this demonstration project. **As already stated, DOE**

selected both applications proposing IGCC technology under the CCPI Round 2 funding opportunity announcement, but only the Mesaba Energy Project proposed the E-Gas™ technology.

Other Alternatives

CCPI legislation specifically directs DOE to demonstrate technology advancements related to coal-based power generation. Other technologies that cannot serve to carry out the goal of the CCPI Program (e.g., natural gas, wind power, solar energy, and conservation) are not reasonable alternatives in this EIS. However, DOE conducts various other programs that support those technologies.

The alternative of incorporating technologies to reduce the "carbon footprint" of the Mesaba Energy Project was also considered. DOE recognizes that fossil fuel burning is **a** primary contributor to increasing carbon dioxide (CO_2) concentrations in the atmosphere (IPCC, **2007**). CO_2 is a significant greenhouse gas, and increasing concentrations of greenhouse gases show correlation with global warming. DOE recognizes that there are concerns about the effects of fossil fuel use on global climate change. Therefore, DOE oversees other research programs aimed at reducing the cost of electricity associated with power production and proving the viability of technologies for carbon capture and **storage** (CCS)**, or beneficial reuse,** to reduce CO_2 emissions from fossil fuel use. DOE expects that the combined efforts of these programs will enable large-scale plants to come on-line by 2020 that offer 90 percent carbon capture with 99 percent storage permanence at less than a 10 percent increase in the cost of energy services (NETL, 2007). The planned in-service date for the Mesaba Energy Project is well in advance of the timeline for achieving the DOE CCS goal.

Based on an analysis of the current feasibility of carbon capture and **storage (geologic** sequestration**)** provided in Appendix A2, CCS is not considered a reasonable alternative to **the** DOE Proposed Action. However, because CCS could become feasible during the commercial lifetime (at least 20 years) of the facility, DOE has evaluated the impacts of implementing CCS during commercial operation of the project in Section 5.1.2.1 of this EIS based on the most current and representative information about available technologies.

2.1.2 Proposed Project and Alternatives Considered by Excelsior

Excelsior proposes to construct and operate the **1,200**-$MWe_{(net)}$ Mesaba Generating Station at one of two sites in **the TTRA of** northeastern Minnesota, along with its associated support structures and utility lines. The Mesaba Generating Station would consist of the Mesaba Energy Project (Phase I) and an identical facility (Phase II) on the same site. Phases I and II combined are referred to as the Mesaba Generating Station. Each phase would be rated nominally at peak to deliver **600** $MWe_{(net)}$ to the **point of interconnection with the regional electric grid**. Section 2.2 describes the technology and principal features, resource requirements, emissions, effluents, and wastes of the proposed generating station as summarized in Table 2.1-1 **(which has been updated for the Final EIS)**.

In accordance with the Proposed Action, Excelsior has entered into a cooperative agreement with DOE under the CCPI Program to demonstrate features and technologies in the Mesaba Energy Project (Phase I) to improve and advance IGCC processes toward commercial acceptance as described in Section 1.4.

Table 2.1-1. Expected Operating Characteristics – Mesaba Energy Project (Values for West and East Range Sites are equal except where noted)

Operating Characteristics	Phase I	Phase I & II
Generating capacity **(net)** - megawatts electricity (MWe)[1]		
West Range (WR)	605	1,210
East Range (ER)	604	1,208
Load output		
Capacity Factor - percent	92	92
Coal consumption[2] - tons per day (tpd)		
Sub-bituminous (SB)	8,550	17,100
Bituminous (B)	6,120	12,240
Sub-bituminous/petroleum coke (50:50 blend)	6,450	12,900
Water requirements - gallons per minute (gpm)		
Average water use	3,500	7,000
Peak water use	5,000	10,000
Air emissions - tons per year (except CO_2)		
Sulfur dioxide (SO_2)	695	1,390
Oxides of nitrogen (NO_x)	1,436	2,872
Particulate matter $\leq$10 microns (PM_{10}) – WR[3]	266	532
Particulate matter $\leq$10 microns (PM_{10}) – ER[3]	355	709
Carbon monoxide (CO)	1,270	2,539
Mercury (Hg)	0.014	0.027
Lead (Pb)	0.015	0.030
Volatile organic compounds (VOCs)	99	197
Carbon dioxide[4] (CO_2) - million tons per year	5.3(SB)/4.7(B)	10.6(SB)/9.4(B)
Effluent discharges		
Sanitary wastewater[5] in gallons per day	3,750	7,500
Cooling tower blowdown discharge (gpm)	0	0
Solid wastes[6] - tons per year		
Mercury removal carbon (hazardous [H])	7	14
Sour water sludge (H)	15	30
Sour water carbon (H)	24	48
Syngas treatment carbon (H)	30	60
Waste char and ash (non-hazardous)	80	160
Zero Liquid Discharge (ZLD) filter cake – WR[7]	~2,200(GI)[H]/<2,500(PB)	~4,400(GI)[H]/<5,000(PB)
Zero Liquid Discharge (ZLD) filter cake (H) – ER[7]	~2,200(GI)[H]/<12,250(PB)	~4,400(GI)[H]/<24,500(PB)
Marketable byproducts – tons per day		
Slag	500 – 800	1,000 – 1,600
Sulfur	30 – 165	60 – 330

[1] The generating capacity at the East Range Site is expected to be approximately 1 MWe less than the West Range Site per phase because the lower source water quality at the East Range Site increases the load from the enhanced zero liquid discharge system.
[2] Peak use of alternative feedstocks in partial slurry quench mode. Fuel flexibility allows the IGCC power plant to operate on sub-bituminous coal, bituminous coal, or a coal/petroleum coke blend.
[3] Because of the lower quality of water used for cooling at the East Range Site, PM_{10} emissions from cooling towers would be greater than for the West Range Site.
[4] CO_2 emissions are a function of the feedstock consumed and of the Mesaba Generating Station's net heat rate. SB - Sub-bituminous coal, such as Power River Basin Coal; B - Bituminous coal, such as Illinois Basin Coal
[5] Discharged to publicly owned treatment works; the discharge rate shown is conservatively assumed to equal the expected use of water for domestic purposes
[6] Fuel dependent; highest values listed.
[7] Because of the lower quality of water used for cooling at the East Range Site, solid waste production of ZLD filter cake from the power block would be greater than for the West Range Site; GI - Gasification Island; PB - Power Block.

2.1.2.1 West Range Site and Corridors

Excelsior's preferred site for the Mesaba Generating Station is an approximately 1,**708-**acre property just north of the downtown area of Taconite in Itasca County. The project's generating facilities would connect to the power grid via new and existing HVTL corridors to a substation near the unincorporated community of Blackberry. Excelsior **plans to enter into negotiations with Nashwauk PUC to purchase natural gas from a proposed pipeline that would provide start-up and backup fuel for the station (see Section 2.3.1.4). In the event that natural gas would not be available from that pipeline in accordance with the schedule for the Mesaba Energy Project, Excelsior** would construct, own, and operate a new natural gas pipeline connecting to an existing 36-inch pipeline owned by Great Lakes Gas Transmission Company (GLG). Section 2.3 provides a discussion of the site layout and alternative alignments considered for HVTL and gas pipeline corridors, as well as features for water supply, rail and road access. Key features of the West Range Site and corridors are illustrated in Figure 2.1-2.

Excelsior **stated the company's preference for** the West Range Site for the location of the Mesaba Generating Station because of its abundant supply of water, greater distance from Class I areas, immediate proximity to two competing rail service providers, reduced electrical losses (shorter power transmission distances than the East Range Site), closer proximity to an abundant supply of natural gas, shorter distance via rail to the base case fuel source, and location outside the Lake Superior Basin watershed. In addition, Excelsior holds an option agreement for the West Range Site from a land owner having significant real estate holdings abutting the site and across which easements for the station's associated facilities would be required. The agreement allows for purchase of mineral rights extending beyond the station footprint and acquisition of easements for the associated facilities under commercially reasonable terms. Excelsior believes that the combination of the above considerations would translate to reduced environmental impacts and project costs.

2.1.2.2 East Range Site and Corridors

Excelsior's alternative East Range Site for the proposed Mesaba Generating Station is an approximately **1,322-**acre site in Hoyt Lakes, St. Louis County, approximately 1 mile north of the downtown area. The project's generating facilities would connect to the grid via existing HVTL corridors that lead to a substation near the unincorporated community of Forbes. Northern Natural Gas (NNG) would construct, own, and operate a gas pipeline as an extension of the company's interstate pipeline system to provide start-up and backup fuel for the station. Section 2.3 provides a discussion of the site layout and alternative alignments considered for HVTL and gas pipeline corridors, as well as features for water supply, rail and road access. Key features are shown in Figure 2.1-3.

2.1.2.3 Site Selection Process and Other Alternatives Considered by Excelsior

The site selection process required several years of study that included a three-tiered siting process to identify the most favorable location for the Mesaba Generating Station. The first tier was guided by Minnesota Statutes § 216B.1694, Subdivision 1(3), which provides incentives for up to three "innovative energy projects" to be located in the TTRA. Excelsior then determined which regions throughout the TTRA have the necessary minimum infrastructure (i.e., HVTL, water, gas, etc.), rail access, road access, and other necessary components to support the project. Once the initial candidate areas of the TTRA were identified, a second tier of evaluation was performed that included review of engineering feasibility, environmental compatibility, community support and acceptance, **constructability, size,** and other criteria. The third tier of evaluation consisted of a detailed analysis of the candidate project sites in Excelsior's Joint Permit Application.

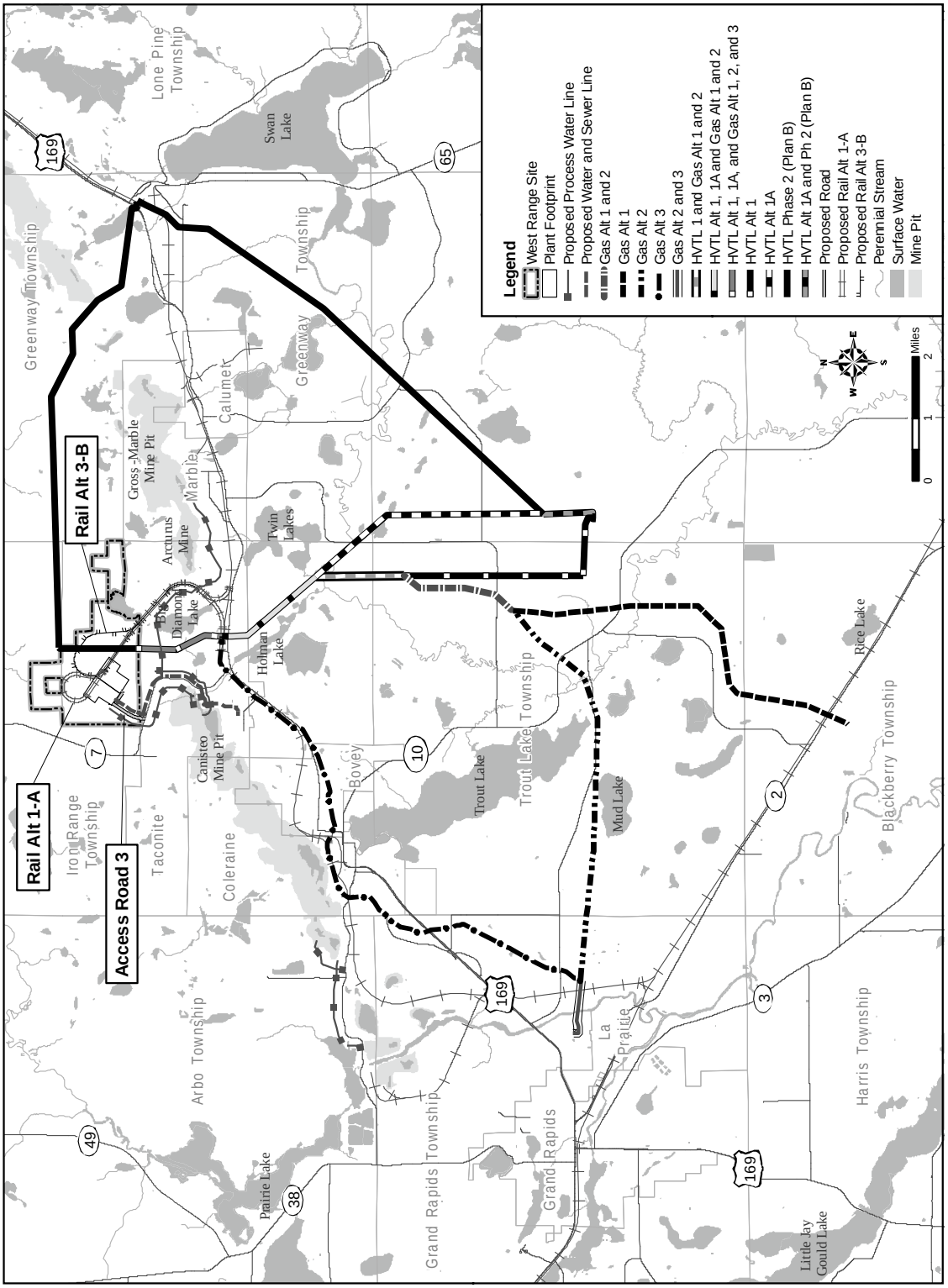


Figure 2.1-2. West Range Site and Corridors

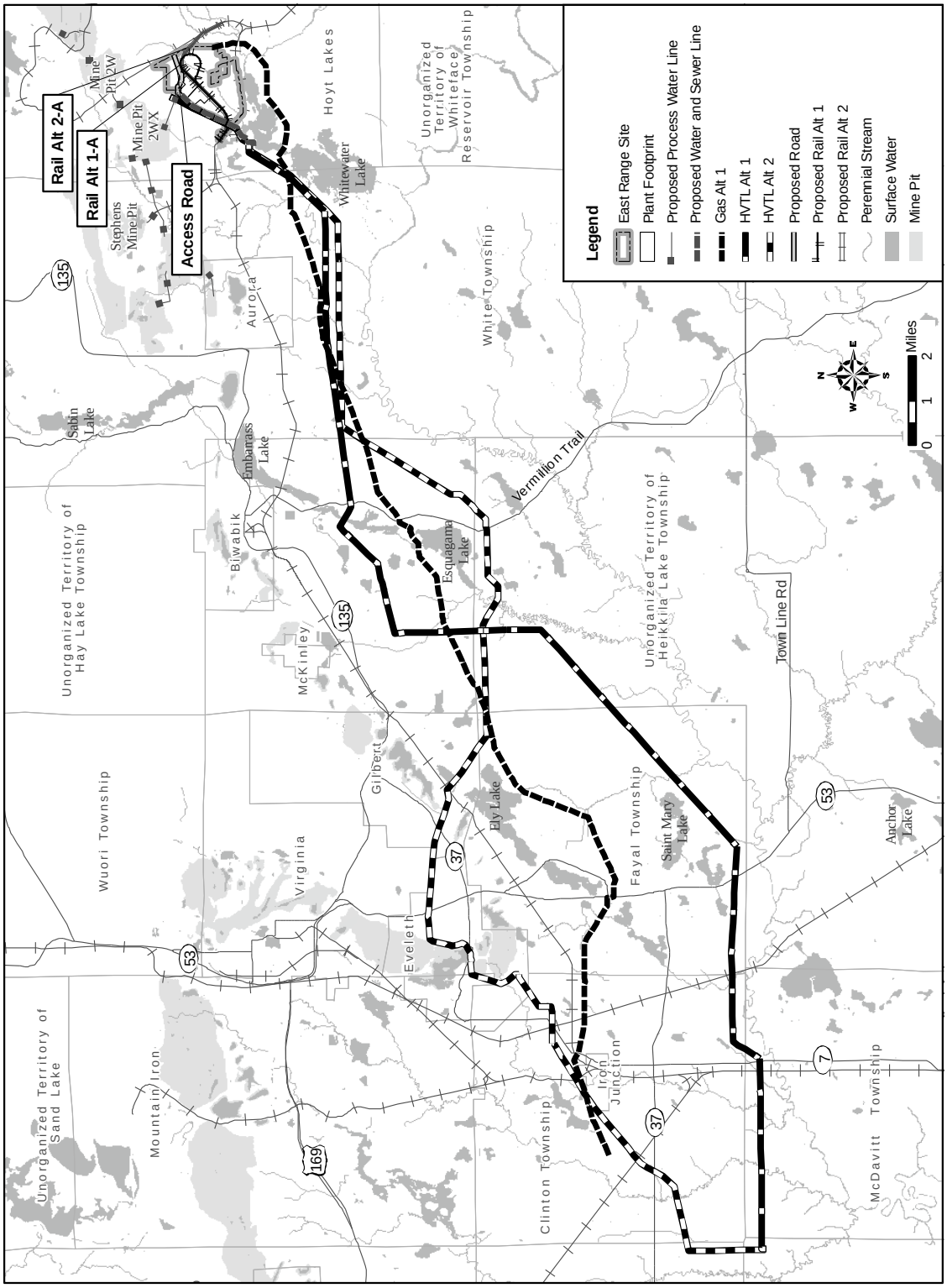


Figure 2.1-3. East Range Site and Corridors

Excelsior documented the site screening and selection process (see revised Appendix F1) in support of its application to USACE for a CWA Section 404 wetlands permit. Based on incentives described in Section 1.2.2, Excelsior focused its search on areas within the TTRA that provide access to transmission lines, availability of fuel; and availability of water. Excelsior used a four-step process in its site selection effort that included: (1) developing site selection criteria; (2) identifying potential sites; (3) establishing a short list of sites having the greatest likelihood of licensing success; and (4) specifying at least two licensable sites for consideration under rules implementing the Minnesota Power Plant Siting Act. In selecting candidate sites, Excelsior took into consideration: permitting criteria, which focused on issues related to the relative feasibility of obtaining preconstruction permits necessary to construct and operate the IGCC Power Station; technical criteria that focused on the feasibility of constructing and operating the station; and site control criteria, which considered the likelihood of obtaining site ownership and control in a timely manner with landowner cooperation.

Using the selection process, Excelsior identified 17 candidate sites within the TTRA. As explained in Appendix F1, Excelsior eliminated 14 sites from further consideration based on issues relating to water availability, constructability, rail access, nearby residences, wetland acreage, and property size and availability. Of the three remaining sites, one was subsequently eliminated by Excelsior, because it was deemed unavailable due to conflicting development plans for the property. Excelsior thus identified its preferred (West Range) and alternative (East Range) sites from the two remaining properties.

2.1.3 Alternatives Available to the Minnesota Public Utilities Commission

As described in Section **1.2.2**, the Mesaba Energy Project is subject to the siting and permitting process of the Minnesota PUC. Section 1.5.2 outlines the state regulations and requirements applicable to this process. In accordance with these requirements, and after considering the potential impacts of the Mesaba Project, the PUC has the responsibility for taking one of the following actions:

(1) PUC may approve and issue permits for Excelsior's preferred West Range Site and corridors.
(2) PUC may approve and issue permits for Excelsior's alternative East Range Site and corridors.
(3) PUC may disapprove the joint permit application submitted by Excelsior.

2.2 DESCRIPTION OF THE PROPOSED PROJECT

DOE would provide a total of $36 million in cost-shared funding (see Section **1.3.1**) to Excelsior for the demonstration of advanced IGCC technologies to produce electricity at commercial scale **(specifically, project definition and preliminary design, and 1-year operational demonstration)**. The proposed IGCC demonstration plant would be designed for long-term commercial operation following the completion of an anticipated 12-month minimum demonstration period under a cooperative agreement between DOE and Excelsior. The project would represent Phase I of the proposed two-phased Mesaba Generating Station. As planned by Excelsior, Phase I would begin service in **2014** and Phase II would begin service in **2016**. This EIS considers the impacts of both phases as connected actions, even though only Phase I would be co-funded under DOE's CCPI Program. **However, at the request of USACE, the Final EIS has been revised as appropriate to describe the potential impacts of Phase I separately from the impacts of the combined two-phased project.**

The balance of this section describes the project as proposed by Excelsior. Information contained in this chapter of the EIS has been obtained from documents prepared by Excelsior and its contractors,

including the "Mesaba Energy Project, Joint Application to the Minnesota Public Utilities Commission for the Following Pre-Construction Permits: Large Electric Generating Plant Site Permit, High Voltage Transmission Line Route Permit And Natural Gas Pipeline Routing Permit" (Excelsior, 2006a) and "Mesaba Energy Project, Environmental Supplement" (Excelsior, 2006b).

The subsections of Section 2.2 provide the following information:

- Section 2.2.1 describes the technology selected for the Mesaba Energy Project and the various processes included in the technology.
- Section 2.2.2 describes resource requirements and inputs to the facility.
- Section 2.2.3 describes discharges, wastes, and products from the facility.
- Section 2.2.4 describes plans for facility construction.
- Section 2.2.5 describes plans for facility operation.

2.2.1 Technology Selection and Process Description

The Mesaba Energy Project would demonstrate advanced IGCC technologies to produce electricity, including advanced gasification and air separation systems, feedstock flexibility, improved environmental performance characteristics, and improved thermal efficiency as described in Section 1.4.1. The technologies would be more efficient, economical, reliable, and environmentally favorable than conventional coal-fueled steam electric generating plants.

2.2.1.1 Technology Selection

Excelsior evaluated proposals from three companies to provide gasification technology licenses for the project before selecting the ConocoPhillips E-Gas™ technology in the spring of 2004. Based upon optimization analyses, Excelsior determined that the project should be designed as a "fuel-flexible" facility capable of utilizing petroleum coke, bituminous coal, sub-bituminous coal, and certain combinations of these feedstocks. With such capability, Excelsior determined that the design would minimize energy costs and provide significant long-term benefits to consumers.

The gasification process for the project is based upon ConocoPhillips E-Gas™ technology for gasification of solid feedstocks. The starting point for the design is the 262 $MWe_{(net)}$ Wabash River Plant in Terre Haute, Indiana. The Wabash River Plant was built with Federal co-funding under the DOE Clean Coal Technology Program (predecessor to the CCPI) and has been in commercial operation since 1995. Following construction of the Wabash River Plant, the DOE funded studies of potential performance and technological upgrades, which resulted in numerous recommendations for design and operational improvements. Based in part on the DOE studies and the lessons learned from the Wabash River Plant, the Mesaba Energy Project would incorporate several features and technologies for an advanced IGCC process. The substantial advancements being incorporated within the E-Gas™ technology and other plant systems to be integrated and demonstrated in the Mesaba Energy Project would constitute a third generation IGCC facility.

2.2.1.2 Integrated Gasification Combined-Cycle Technology

The project would employ integrated gasification combined-cycle technology. Gasification is the process of converting coal, petroleum coke, or blends of these resources to a gaseous fuel called synthesis gas (syngas). A combined-cycle electric power plant is one that uses both a steam turbine generator and a combustion turbine generator at one location to produce electricity. Combining (integrating) the

gasification process with the combined-cycle power plant is known as IGCC, which is an inherently lower-polluting technology to produce electricity from solid feedstocks.

Electric power for each phase of the Mesaba Energy Project would be produced in two CTGs (about 220 $MWe_{(gross)}$ each) and in one STG (up to 300 $MWe_{(gross)}$). The combined power generation for Phases I and II would be up to 1480 $MWe_{(gross)}$. The power generated would be interconnected to the regional electrical grid by a HVTL system. Natural gas would be used to start up the IGCC power plant and as a backup fuel.

In the E-Gas™ process, coal, petroleum coke, or blends of coal and petroleum coke would be crushed, slurried with water, and pumped into a pressurized vessel (the gasifier) along with purified oxygen. In the gasifier, controlled reactions take place, thermally converting feedstock materials into syngas. The syngas is cooled, cleaned of contaminants, and then combusted in a combustion turbine, which is directly connected to an electric generator. The assembly of the combustion turbine and generator is known as a CTG. The expansion of hot combustion gases inside the combustion turbine creates rotational energy that spins the generator and produces electricity. The hot exhaust gases exiting the CTG would pass through a heat recovery steam generator (HRSG), which is a type of boiler, where steam is produced. The resulting steam is piped to a steam turbine that is connected to an electric generator. The expansion of steam inside the steam turbine spins the generator to produce an additional source of electricity.

2.2.1.3 Process Components and Major Equipment

The principal buildings associated with Phase I of the project are listed in Table 2.2-1. The major process equipment is listed in Table 2.2-2. Figure 2.2-1 **(updated for the Final EIS)** provides a block diagram showing processes and emission sources for Phase I (Phase II essentially would be the same). Figure 2.2-2 illustrates the principal features of the E-Gas™ process, which are described in the balance of this section.

Table 2.2-1. Principal Buildings Associated with Phase I of the Mesaba Generating Station

Structure	Size
Combustion Turbine Generator Building	230 ft. x 180 ft. x 75 ft. high
Steam Turbine Generator Building	170 ft. x 140 ft. x 90 ft. high
Air Separation Unit Building	375 ft. x 140 ft. x 70 ft. high
Heat Recovery Steam Generator	110 ft. x 55 ft. x 90 ft. high
Rod Mill Feed Bins	155 ft. x 25 ft. x 150 ft. high
Gasification Structure (Open Frame)	**100 ft. x 50 ft. x 200 ft. high**

Table 2.2-2. Major Process Equipment

Equipment	Component Capacity	Ancillary Facilities/Processes
Air Separation Unit (ASU) (2 units at 50% capacity each)	• 2,507 tons per day per train, based on Powder River Basin No. 1 (PRB1) coal operation.	• Nitrogen Booster Compressor for Combustion Turbine Generator (CTG) Injection • Liquid Oxygen and Liquid Nitrogen storage
Feedstock Handling and Storage (Coal/Petroleum Coke) (1 unit at 100% capacity)	• Active storage - 20 days based on PRB1 coal • Conveying/Reclaiming based on 8,550 tons per day, as received • Feedstock inactive storage – 45 days based on PRB1 coal • Flux storage (silos)/conveying/reclaiming (250 tons per day based on 50:50 blend of PRB2:PRB3 coals)	• Rotary Railcar Unloading Facilities and Thaw Shed (Feedstock) • Dust collectors for enclosed feedstock storage areas • Truck unloading facilities (Flux)
Gasification Island (3 units at 50% capacity each)	• Coal Grinding and Slurry Preparation (2 units at 60% capacity each) • Gasification (4,275 tons per day design coal, as received, per gasifier, based on PRB1 coal) • Slag Storage and Loading System (1 at 100% capacity) (800 tons per day (wet basis), based on 50:50 blend of PRB2:PRB3 coals)	• High Temperature Heat Recovery • Dry Char Removal • Slag Grinding (1 at 100% capacity) • Slag Dewatering (1 at 100% capacity)
Syngas Treating (2 units at 50% capacity each)		• Syngas Scrubbing • Low Temperature Syngas Cooling • Carbonyl Sulfide (COS) Hydrolysis • Recycle Gas Compression • Acid Gas Removal • Acid Gas Enrichment (1 at 100% capacity) • Mercury Removal • Syngas Moisturization • Sour Water System (1 at 100% capacity)

Table 2.2-2. Major Process Equipment (continued)

Equipment	Component Capacity	Ancillary Facilities/Processes
Sulfur Recovery and Tail Gas Recycle (2 units at 50% capacity each)	• Claus Plant Sulfur Recovery (Oxygen-Blown), (Up to 83 tons per day per train, based on high sulfur Illinois No. 6 coal operation)	• Molten Sulfur Storage • Molten Sulfur Truck/Rail Loading Facilities (1 at 100% capacity) • Tail Gas Recycle (1 at 100% capacity) • Tank Vent Gas Incineration (1 x 100%)
Power Block	• CTG (2 units at 50% capacity each) (220 MWe nominal each, based on Siemens-Westinghouse SGT6-5000F combustion turbine assumed for environmental permitting) • Heat Recovery Steam Generator (HRSG) & Exhaust Stack (2 units at 50% capacity each) • Steam Turbine Generator (STG) (1 at 100% capacity) (Up to 300 MWe nominal)	• Surface Condenser (1 at 100% capacity) • Vacuum, Condensate and Boiler Feedwater Systems (1 at 100% capacity) • Power Block Circulating Water System • Raw Water/Demineralizer Water Tankage/Pumps • Demineralizer System • Filtered Raw Water, Firewater/Tankage/Pumps • Wastewater Collection/Wastewater Separation • Plant & Instrument Air • Step-up Transformers
General Facilities (1 at 100% capacity)		• Gasification/ASU Cooling Water/Tower System • Zero Liquid Discharge (ZLD) System for Gasification Island Process Waters • ZLD System for Process Condensate Blowdown • Process Condensate Blowdown Holding Tank • Gasification Unit Flare • Emergency Diesel Generators • Natural Gas Distribution • Drains and Blowdowns • Nitrogen Distribution • Potable & Utility Water • Sanitary Sewage System • Stormwater Collection and Treatment

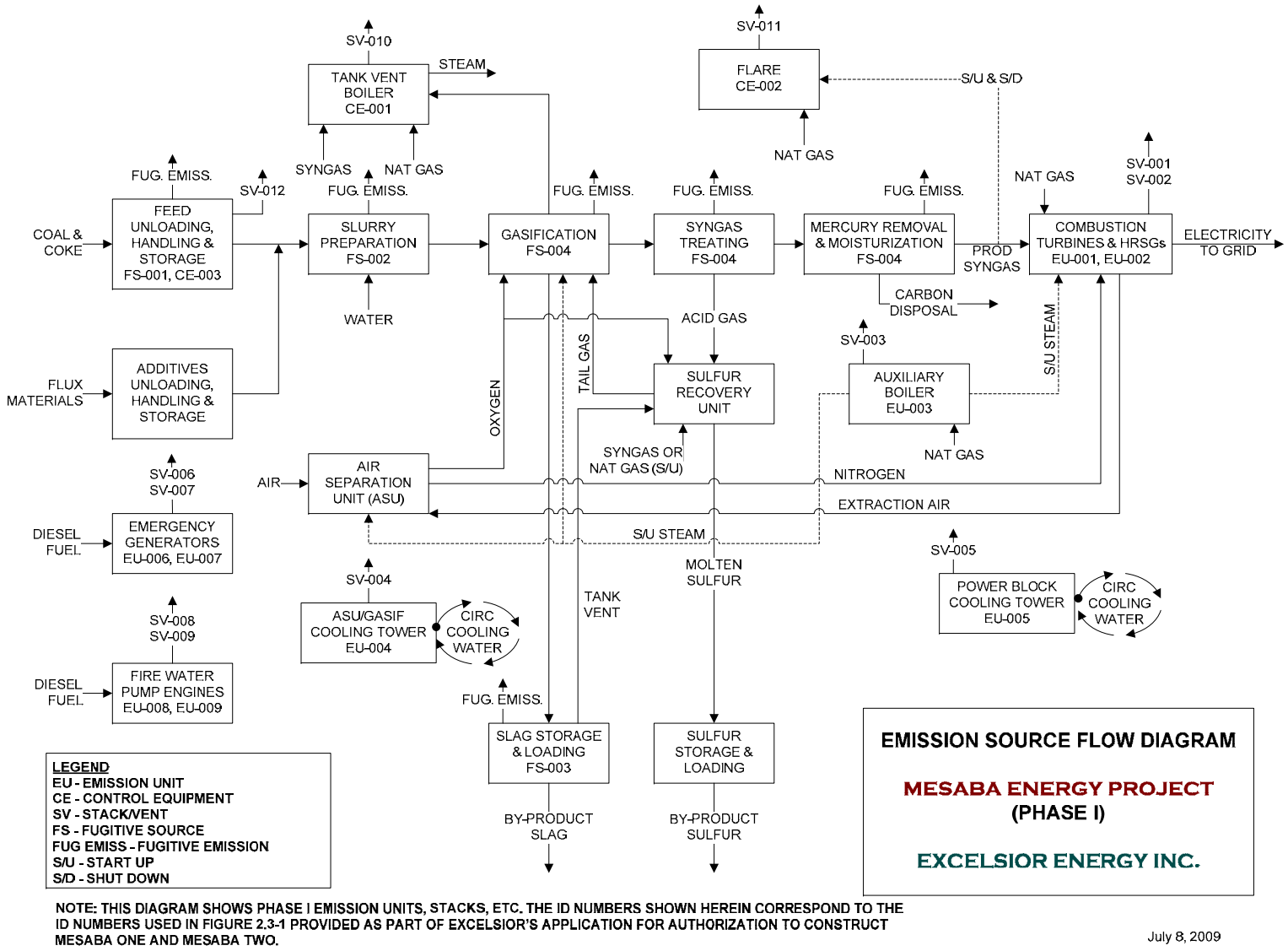


Figure 2.2-1. Process Block Diagram, Mesaba Energy Project

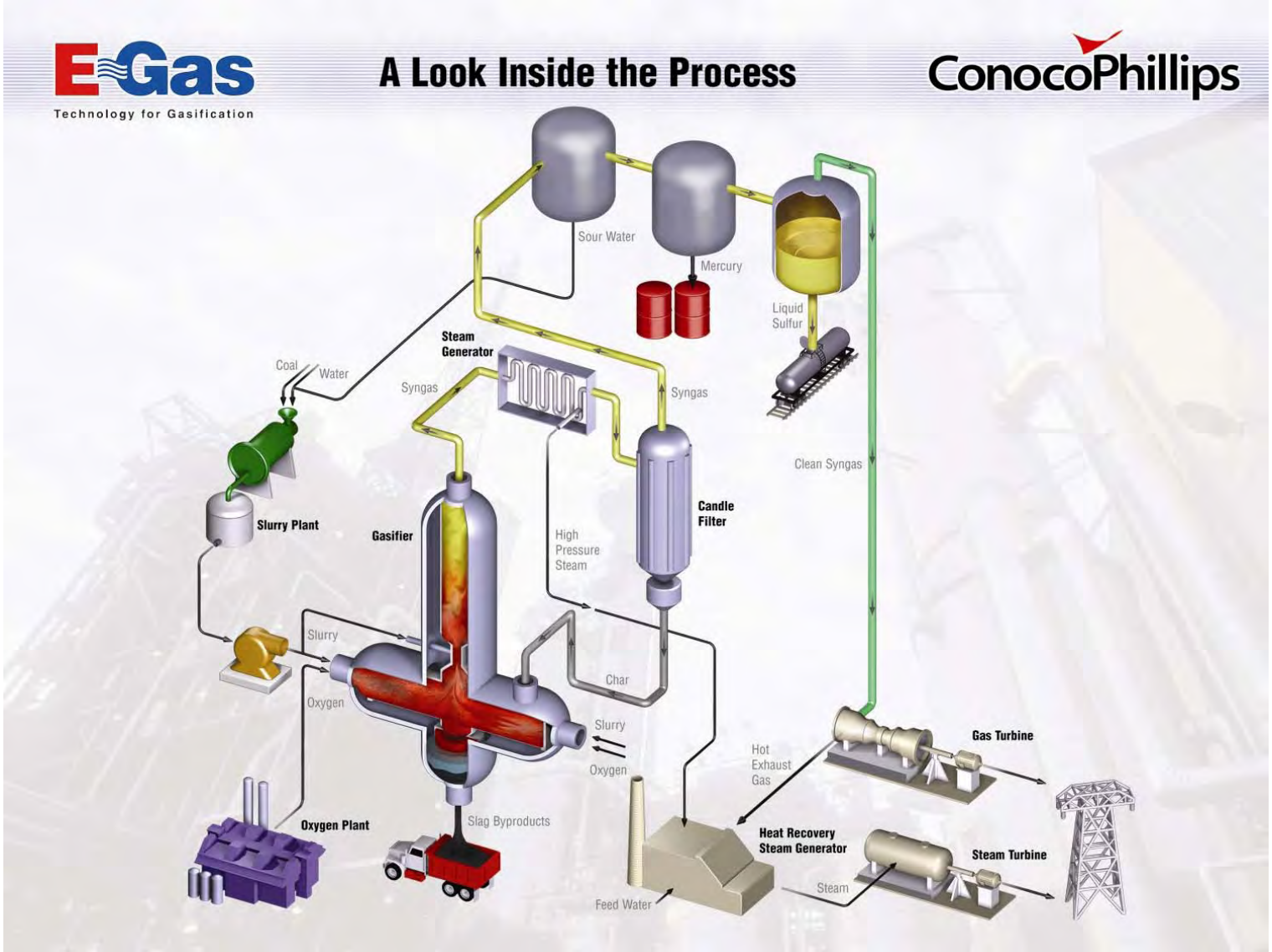


Figure 2.2-2. E-Gas™ Process for IGCC Power Generation

Other buildings associated with Phase I include the control room, administration building, warehouse/maintenance shop, combustion turbine and steam turbine buildings, weather enclosures for the air separation unit (ASU) compressors, slurry preparation, water treatment/laboratory, railcar thaw shed, switchyard control room, several power distribution centers, and a visitor's center. Phase II would consist of a duplicate facility and would require the same structures as described for Phase I.

Feedstock Slurry Preparation

To produce slurry feedstock for the gasifier, the solid fuel would be mixed and ground with treated recycled water and slag fines that are recycled from other areas of the plant producing slurry with a paste-like consistency. The process is illustrated in Figure 2.2-3.

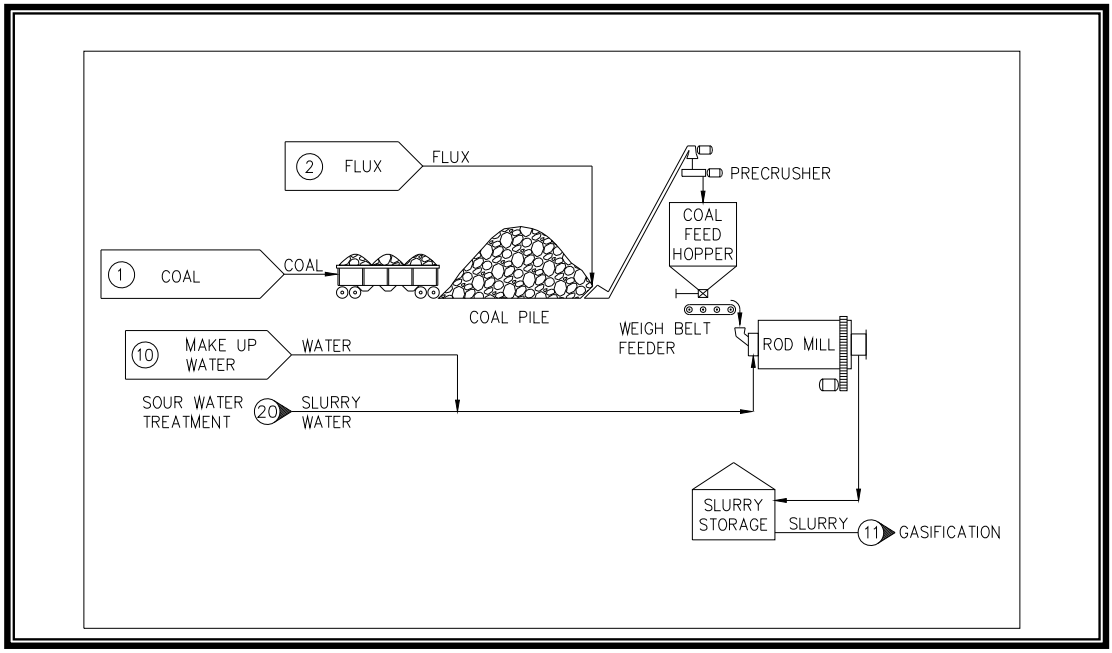


Figure 2.2-3. Feedstock Grinding and Slurry Preparation

Tanks, drums, and other areas of potential atmospheric exposure of the slurry or recycle water would be covered and vented into the tank vent collection system for vapor emission control. The entire feedstock grinding and slurry preparation facility would be paved and curbed to contain spills, leaks, wash down, and stormwater runoff. A trench system would carry this water to a sump where it would be pumped into the recycle water storage tank.

Gasification and Slag Handling

The gasifier consists of two stages: a slagging first stage, and an entrained flow, non-slagging second stage. Unlike traditional pulverized coal power plants, where fuel is actually combusted, in an IGCC power plant, slurry is fed to the gasifier along with sub-stoichiometric oxygen (O_2) at an elevated temperature and pressure. The feedstock would be almost totally gasified in this environment to form syngas consisting principally of H_2, carbon monoxide (CO), carbon dioxide (CO_2), and water (H_2O). Figure 2.2-4 illustrates the process. Each phase of the Mesaba Energy Project would include three gasification systems.

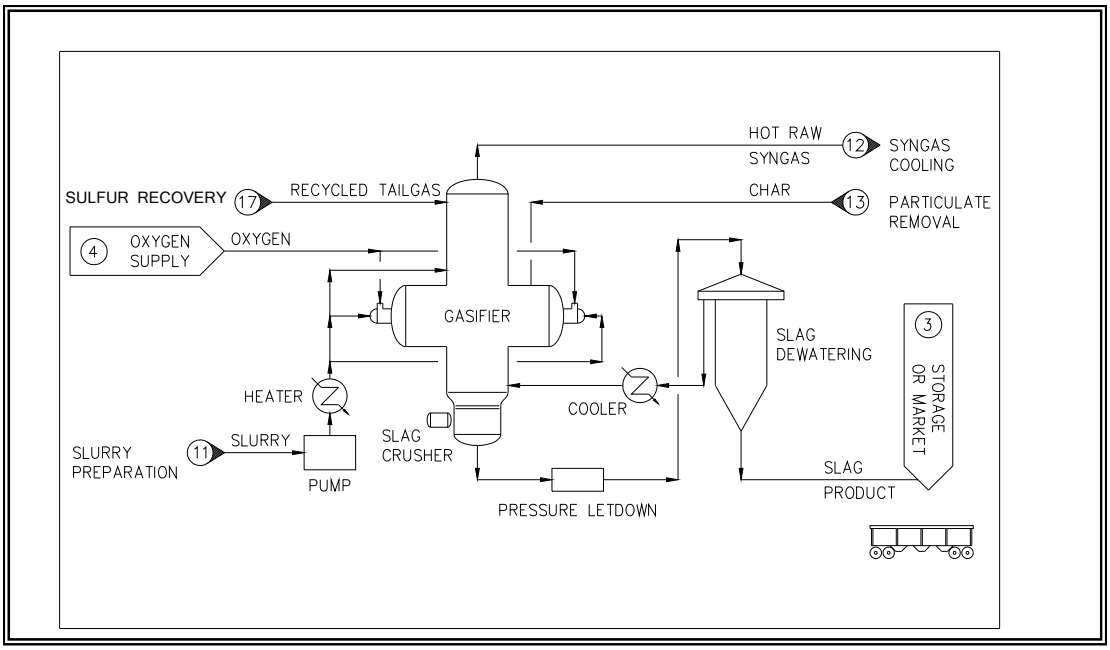


Figure 2.2-4. Gasification and Slag Handling

Most of the sulfur in the feedstock is converted to hydrogen sulfide (H_2S) during gasification, although a small portion of the sulfur is converted into carbonyl sulfide (COS). Most of the nitrogen in the feedstock is converted to ammonia (NH_3). The energy in the feedstock is ultimately converted into CO and H_2 with a small amount of methane (CH_4). Low-grade coals with lower heating values and higher moisture contents would generate a syngas with more CO_2 and H_2. Higher quality coals and petroleum coke would result in a syngas that has a much higher CO content. Further processing of the syngas would remove over 99 percent of the sulfur from high-sulfur feedstocks and over 97 percent of the sulfur from low-sulfur, sub-bituminous coal feedstocks. The lower removal rate from low-sulfur coal would result in approximately equal sulfur emissions rates as the higher removal rate from higher sulfur coal. Hence, the final SO_2 emission rate achieved using E-Gas™ technology would be independent of the starting sulfur concentration in the feedstock.

Mineral matter in the feedstock and any added flux forms a molten slag, which flows continuously into a water-quench bath. The characteristics of the slag produced in the gasifier would vary with the mineral matter content of the feedstock. The slag/water slurry would then be directed to a dewatering and handling area. Slag production at full load would vary from about 500 tons per day up to a maximum of about 800 tons per day per phase depending upon the ash content of the coal or petroleum coke received. The slag would be dewatered at the facility and transported via rail or truck to market or storage. Section 2.2.3.4 discusses the marketable byproducts of the Mesaba Energy Project, including slag. The impacts associated with materials and waste management during plant operations are described in Section 4.16.2.2.

The raw syngas generated in the first stage flows into the second stage of the gasifier. The gasifier second stage is a vertical refractory-lined vessel in which additional slurry would be reacted with the hot syngas stream exiting the first stage. The feedstock undergoes devolatilization (separation of organic components) and pyrolysis (high temperature decomposition), thereby generating more syngas with higher heat content (less carbon being converted to CO_2), because no additional O_2 would be introduced into the second stage. This additional slurry lowers the temperature of the syngas exiting the first stage by the endothermic nature of the devolatilization and pyrolysis reactions. Also, water reacts with a

portion of the carbon to produce additional CO, CO_2, and H_2 for subsequent use as syngas fuel for power generation. Unreacted solid fuel (char) would be carried out of the second stage with the syngas. Certain metals present in the feedstocks in trace quantities and volatile at the temperatures typical of the gasifier would be carried out in their gaseous state as components of the syngas and removed in the cleanup stage. The slag/water slurry would flow continuously into a dewatering bin. The bulk of the slag would settle out in the bin while water overflows into a basin in which the remaining slag fines would settle. The clear water from the settler would pass through heat exchangers where it would be cooled as the final step before being returned to the gasifier quench section. Dewatered slag would be transferred to the slag storage area to be loaded into trucks or rail cars for transport to market or storage. The slurry of fine slag particles from the bottom of the settler would be recycled to the slurry preparation area to be fed back into the gasifier to maximize carbon utilization.

Syngas Cleanup and Desulfurization

The syngas cleanup and desulfurization systems include the processes for syngas cooling, particulate matter removal, syngas scrubbing, acid gas removal, mercury removal, and potential future retrofit for carbon capture as described in the following paragraphs. In syngas cooling, the hot raw syngas exiting the gasifier system would be cooled converting a significant portion of the heat from the gasifier to high-pressure steam via heat exchangers for use in power generation. After cooling, the syngas (including entrained particulate matter containing carbon that remains available for gasification) would be directed to the particulate matter removal system, as shown in Figure 2.2-5. The gas flows first through a hot gas cyclone for removal of relatively large particles and then passes to the particulate matter filter. The filter vessel contains numerous porous filter elements to remove particulate matter from the syngas (>99.9 percent removal efficiency). Removed particulate matter from both the hot gas cyclone and the dry filter vessel would be recycled to the first stage of the gasifier to further convert particle-bound carbon to syngas and thereby improve carbon conversion efficiency. Continually recycling captured particulate matter to the gasifier promotes higher thermal efficiencies and lowers the carbon content of the slag, making the slag more marketable. Generally, less than 1 percent of the carbon originally present in the feedstock would be expected to end up in the slag confirming that near complete gasification of the carbon content of the feedstock would be obtained. The particle-free syngas would then proceed to the low temperature heat recovery system.

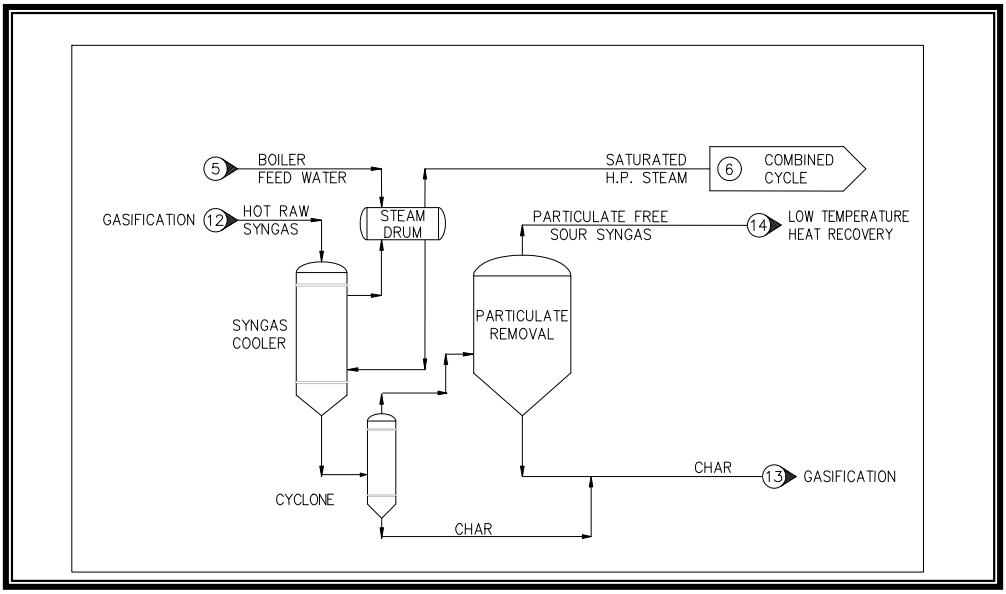


Figure 2.2-5. Particulate Matter Removal

Next, the syngas would be scrubbed with recycled sour water (water with dissolved sulfur compounds and other contaminants condensed from the syngas) to remove chlorides and trace metals and to reduce the potential for equipment corrosion and formation of undesirable products in the acid gas removal (AGR) system. A COS hydrolysis unit would be incorporated to achieve a high level of sulfur removal, which would convert the small amount of COS in the syngas to H_2S that could then be efficiently removed in the AGR system.

After hydrolysis, the syngas would be cooled in process heat exchangers to efficiently utilize the relatively low-temperature heat available. Most of the NH_3 and a small portion of the CO_2 and H_2S present in the syngas would be absorbed in the water condensed by this cooling step. Additionally, some of the trace metals that remained in their gaseous state during the particulate matter removal process would condense. The water would be collected and sent to the sour water treatment unit. The cooled sour syngas would be fed to the AGR system, where the sulfur compounds would be removed to produce a low-sulfur product syngas. The syngas scrubbing process is illustrated in Figure 2.2-6. Each phase of the Mesaba Energy Project would include two gas treatment systems.

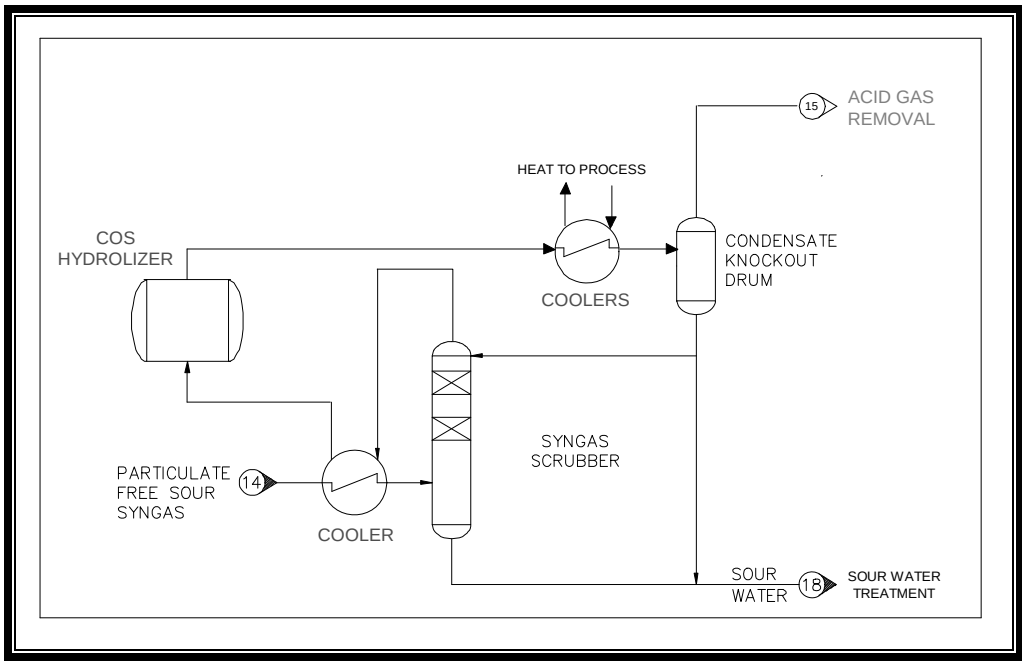


Figure 2.2-6. Syngas Scrubbing

The AGR system (Figure 2.2-7) would cause the cool sour syngas to contact an aqueous solution of methyl-diethanolamine (MDEA), which is an amine absorbent that would remove the H_2S to produce a clean product syngas. The H_2S-rich MDEA from the bottom of the absorber would flow to a cross heat exchanger to recover heat. The heated rich MDEA would then be directed to the H_2S stripper where the H_2S and CO_2 are removed at near atmospheric pressure. A concentrated stream of H_2S and CO_2 would exit the top of the H_2S stripper and flow either to the carbon-capture system or directly to the sulfur recovery unit. The lean MDEA would be pumped from the bottom of the stripper to the heat exchanger. The lean MDEA would be further cooled before being stored and then recirculated to the absorber. This unit is a totally enclosed process with no discharges to the atmosphere.

Mercury Removal and Moisturization

After removal of sulfur, the syngas would pass through fixed beds of activated carbon prepared with a special impregnate to remove mercury (Figure 2.2-7). Each phase of the Mesaba Energy Project would have two mercury removal units. Multiple beds would be used to obtain optimized adsorption. The lower temperature and lower moisture content of the syngas after the AGR would allow the carbon beds to operate at high efficiencies. The activated carbon capacity for mercury ranges up to 20 percent by weight of the carbon (Parsons, 2002). The mercury removal system would remove enough mercury from the syngas so that the mercury content of the syngas fuel would be no more than 10 percent of the mercury contained in the solid IGCC feedstock. After mercury removal, the product syngas would be moisturized, heated, and diluted with nitrogen for control of nitrogen oxides (NO_x) before being used as fuel for power generation in the CTGs.

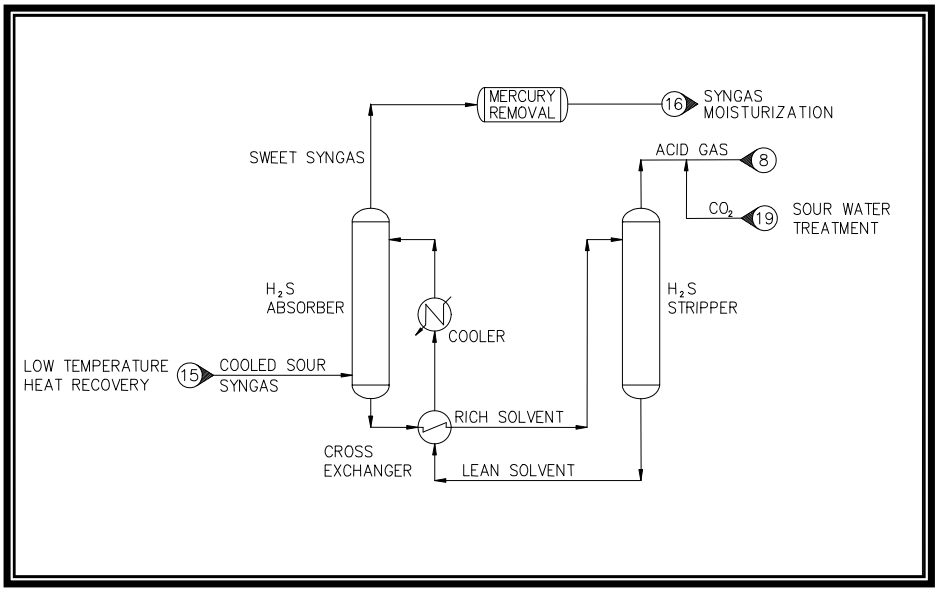


Figure 2.2-7. Acid Gas Removal and Mercury Removal

Potential Carbon Capture Retrofit

> The Mesaba Energy Project design would enable a potential carbon capture retrofit if reductions in CO_2 emissions become regulated or economically favorable in the future.

Global emissions of CO_2 resulting from fuel combustion have increased from 16 billion tons in 1973 to 27 billion tons in 2005 (IEA, 2007). Another study estimated global emissions of CO_2 from fuel combustion to be 28 billion tons in 2003 (Marland et al., 2006). Although CO_2 emissions from power plants are not currently regulated under the Clean Air Act (CAA), concerns about global warming may result in future controls on emissions of this greenhouse gas. Therefore, the plant would be designed so that it could be modified to allow for the capture of CO_2 in the event that reductions in these emissions are required by regulation or encouraged by economic incentives at some time. Because the implementation of carbon dioxide capture and storage technologies for the Mesaba Energy Project is not included in the DOE demonstration project for the CCPI Program (as explained in Section 2.1.1.2), the potential impacts from implementing these technologies are addressed within Section 5.1.2.1 as aspects of the commercial operation of the power station.

There are two primary options for the capture of CO_2 in this power plant: (1) removal of CO_2 present in the syngas itself, prior to combustion; and (2) converting CO in the syngas to CO_2 by catalyzing CO and water into CO_2 and H_2. Under the first option, the removal of CO_2 from the syngas would result in roughly a 30 percent reduction in overall CO_2 emissions from the power plant **if sub-bituminous coal is used as feedstock**. This would be accomplished by the installation of amine scrubbers upstream or downstream of the acid gas removal system in the IGCC. This approach would remove up to 85 percent of the CO_2 in the syngas that fuels the plant and result in an overall CO_2 capture rate of 30 percent from the plant. The technology for this option is currently available and could be implemented as early as **2016**, following the commercial operation date of Mesaba Phase I, if required by regulation or encouraged by economic incentives. The CO_2 capture facilities would likely be located within the existing site requiring an area of approximately 100 by 150 feet to accommodate necessary equipment.

For the second CO_2 removal option, the technology to remove the CO_2 from the combustion gases is not currently available commercially, but will be demonstrated in the future as part of **the** DOE **Carbon Sequestration Program.** This technology would likely increase the capital cost and reduce overall efficiency of the plant, making it more expensive than the first option (30 percent removal). However, the implementation of the first option does not preclude the potential implementation of the second option at some point in the future. Additionally, the project proponent has performed a preliminary study of potential storage (or sequestration) of the carbon dioxide emissions (see Appendix A1). Excelsior has contracted with the Plains CO_2 Reduction Partnership (one of seven regional partnerships funded by DOE's Regional Carbon Sequestration Partnership Program) to investigate and, if possible, produce a CO_2 sequestration/mitigation plan. As a part of its 4-year Phase II Studies initiated in 2005, the Plains CO_2 Reduction Partnership would seek to produce a CO_2 management plan specifying conditions required by potential purchasers of CO_2.

There are two basic carbon sequestration options: (1) use the captured CO_2 for enhanced oil recovery (EOR); and (2) store the captured CO_2 within a compatible geologic formation. Both of these options would require the construction of a CO_2 pipeline system to convey the pressurized gas from the Mesaba Energy Project to the sequestration site(s). CO_2 has proven to be very effective for secondary and tertiary oil recovery by both displacing and decreasing the viscosity of otherwise unrecoverable oil. Under the first carbon sequestration option, the captured CO_2 would be pressurized and transported to existing oil fields in north central North Dakota and southwestern Manitoba. This option would require the construction of at least 405 miles of pipeline to convey the gas to sequestration sites required to accommodate the CO_2. The captured CO_2 could also be stored in geologic formations that act as CO_2 sinks, which are typically saline formations. Under the second sequestration option, the captured CO_2 would be conveyed via pipeline, to a suitable saline formation located approximately 265 miles from the Mesaba Energy Project area in eastern North Dakota.

All of the CCS options presented above are based on a potential future requirement to reduce CO_2 emissions from the Mesaba Energy Project, along with the potential for financial incentives (such as carbon removal credits) that would limit the costs of capture/sequestration from being entirely borne by the utility customers. See Appendix A1 "Excelsior's Plan for Carbon Capture and Sequestration" and Appendix A2 "DOE Analysis of Feasibility of Carbon Capture and Sequestration for the Mesaba Energy Project."

Based on an analysis of the commercial readiness of carbon capture and sequestration presented in Appendix A2, CCS is not considered technically or economically feasible for the Mesaba Energy Project **during the DOE demonstration period**. While both carbon capture and carbon dioxide transport are technically feasible, the technical feasibility of carbon sequestration for the Mesaba Energy Project cannot be validated in the near-term until extensive field tests are conducted to fully characterize potential storage sites and the long-term storage of sequestered carbon has been demonstrated and verified through ongoing efforts conducted under the DOE Carbon Sequestration Program.

Furthermore, commercially available combustion gas turbines envisioned for this project cannot operate on carbon monoxide-depleted syngas where the hydrogen concentration approaches 100 percent. With regard to economic feasibility, imposition of CCS on the project would increase the cost of electricity such that the Mesaba Energy Project would not be economically viable without an order from the PUC that incorporates the costs associated with CCS within the power purchase agreement. However, the design and construction of the facility would be compatible with future implementation of carbon capture and sequestration options.

Sulfur Recovery

The H_2S carried along in the acid-gas from the AGR system would be converted to elemental sulfur in the sulfur recovery unit (SRU) as illustrated in Figure 2.2-8. Each phase of the Mesaba Energy Project would include two SRUs. The sulfur would be condensed and collected in molten form and could be sold as a by-product raw material for fertilizer or other beneficial uses. The tail gas from the SRU is composed mostly of CO_2 and nitrogen with trace amounts of H_2S and SO_2 as it exits the last condenser. The liquid sulfur would be pumped from the sulfur pit to a sulfur-degassing unit. The sulfur-degassing unit strips dissolved H_2S out of the liquid sulfur. The degassed sulfur would be pumped from the degassing unit to the sulfur storage tank. The stripped H_2S stream is routed to the tail gas recycle stream to the gasifier. Liquid sulfur from the sulfur storage would be pumped to trucks or rail cars. The sulfur loading equipment would include vapor recovery systems to control fugitive emissions by returning displaced vapors to the storage tank. The SRU is a totally enclosed process with no discharges to the atmosphere.

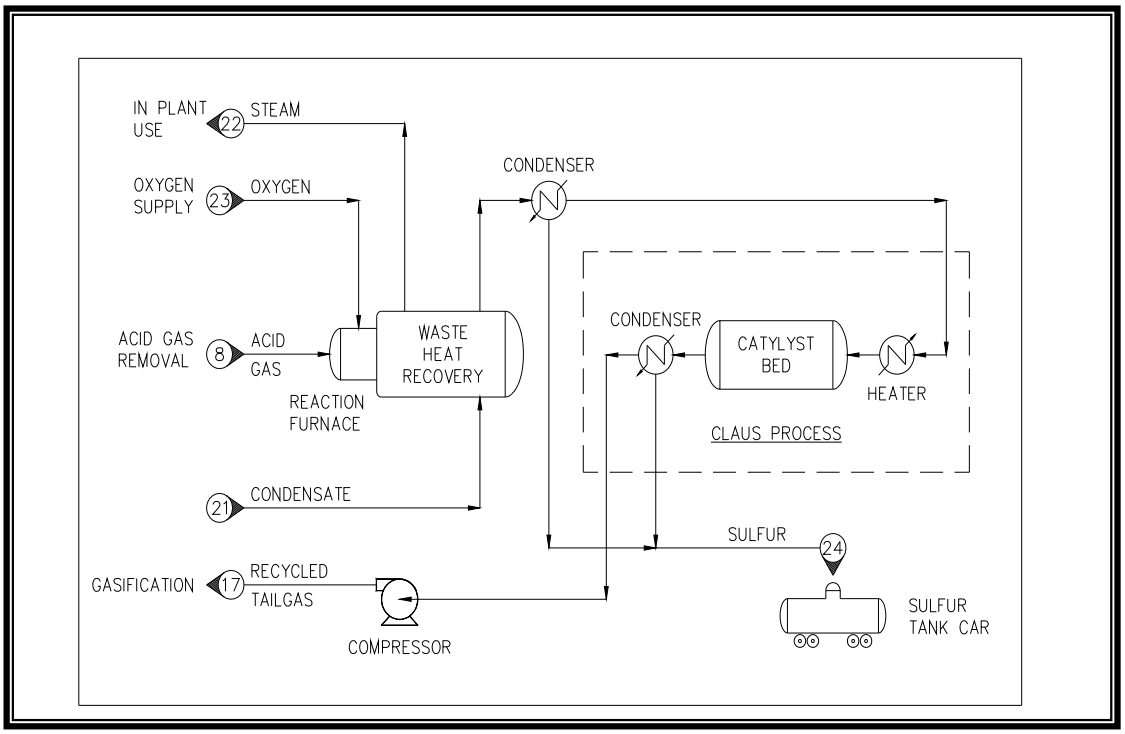


Figure 2.2-8. Sulfur Recovery Unit

Air Separation

The ASU would provide oxygen for the gasification process and nitrogen for CTG NO_x control and for purging. The ASU contains an air compression system, an air separation cryogenic distillation system ("cold box"), an oxygen pump system, and a nitrogen compression system. Two ASU equipment trains would be provided for each phase of the facility. A multi-stage, electric motor-driven centrifugal compressor would compress filtered atmospheric air that may be combined with additional compressed air extracted from the gas turbines in the power block. The combined air stream would be cooled and directed to the molecular sieve absorbers where moisture, CO_2 and atmospheric contaminants are removed to prevent them from freezing in the colder sections of the plant. The dry CO_2-free air would be separated into O_2 and nitrogen gas (N_2) in the cryogenic distillation system. A stream containing mostly oxygen would be discharged from the cold box as a liquid and stored in an intermediate oxygen storage tank, from which it would be fed to the gasifier.

The remaining portion of air mainly containing nitrogen would leave the ASU in three separate nitrogen streams. A small portion of high-purity nitrogen would be used in the gasification plant for purging and inert blanketing of vessels and tanks. The largest, but less-pure, portion of the nitrogen would be compressed and sent to the combustion turbines for NO_x emission control. A waste/excess nitrogen stream would be vented to the atmosphere. There would be no emission of regulated air pollutants from the ASU.

Slag Handling, Storage & Loading

The slag/water slurry from the gasifier (see Figure 2.2-4) would flow continuously into a dewatering system where slag would be removed in a two-phased settling process. The clear water from the settler would be passed through heat exchangers where it would be cooled as the final step before being returned to the gasifier quench section. Dewatered slag would be transferred by in-plant trucks to the slag storage area to be loaded into on-road trucks or rail cars for transport to market or storage. The dewatered slag would be relatively inert and very moist, and it would not be a source of fugitive emissions.

Combined-Cycle Power Block

The power generation portion of the Mesaba Generating Station would be similar to a conventional natural gas combined-cycle plant, which is one of the most efficient commercial electricity generation technologies currently available. Each phase of the station (Phase I and Phase II) would include two advanced (F Class) CTGs configured to utilize syngas, two HRSGs, and a single STG. Each plant phase would convert the chemical energy contained in the syngas fuel to electricity both directly, through combustion, and indirectly, through steam generation.

In the process, preheated syngas from the gasification section would be mixed with compressed air and supplied to the combustor of the CTG. Diluent nitrogen added to the syngas fuel would reduce the flame temperature in the combustor and thereby reduce the production of nitrogen oxides. The hot exhaust gas exiting the combustor would flow to the expander turbine driving the generator to produce electricity and turning the air compressor section of the combustion turbine. Hot exhaust gas from the expander would be ducted through the HRSG to generate high-energy steam used to produce additional electricity in the STG. The HRSG would generate three pressure levels of steam and heat boiler feed water for the syngas cooler in the gasification section. Following heat recovery, the cooled exhaust gas would be discharged to the atmosphere through the HRSG stacks. The HRSG stacks would include emission monitoring instruments as required to verify compliance with applicable emission standards and permit conditions.

2.2.1.4 Plant Utility Systems

Tank Vent Boiler System

A tank vent system would be used to convert each off-gas component in the tank vents to its oxidized form (SO_2, NO_x, H_2O, and CO_2) before venting them to the atmosphere. The tank vent streams would be composed primarily of air purged through various in-process storage tanks and, with the exception of the off-gas from the slag handling dewatering system, would be routed to the tank vent boiler (TVB). The tank purge gas may contain very small amounts of sulfur-bearing components. The high temperature produced in the TVB would thermally convert any H_2S present in the tank vents to SO_2. Heat recovery (in the form of steam generation) would be provided for the hot exhaust gas from the TVB before it is directed to a stack and emitted. Since the slag handling dewatering system off-gas contains high H_2S concentrations, it would be recycled to the gasifier to eliminate a potential source of SO_2 emissions if released to the tank vent system.

Sour Water Treatment

Water reuse within the gasification plant would minimize water consumption and discharge. Process water containing dissolved contaminant gases produced within the gasification process must be treated to remove dissolved gases before being recycled to the coal grinding and slurry preparation area or being diverted to the Zero Liquid Discharge (ZLD) system.

The dissolved gases would be driven from the water by steam-stripping. Water condensed during cooling of the sour syngas would contain small amounts of dissolved gases (CO_2, NH_3, and H_2S) and other trace contaminants, which would be stripped from the sour water in a two-step process as illustrated in Figure 2.2-9. The CO_2 and most of the H_2S would be removed in the CO_2 stripper and directed to the SRU. The water exiting the bottom of this column would be cooled, and most would be recycled in the feedstock grinding and slurry preparation. The remaining water would be treated in the NH_3 stripper to remove the ammonia and remaining trace components. The stripped ammonia would be combined with the recycled slurry water. A portion of the treated water from the NH_3 stripper would be blown down to the ZLD system; the rest would be reused within the plant. The sour water treatment system would be a totally enclosed process with no discharges to the atmosphere.

Zero Liquid Discharge System

At either the West Range or East Range location for the generating station, treated water from the NH_3 stripper in the gasification process would be released to a ZLD system. The blowdown stream would be pumped to a brine concentrator that uses steam to indirectly heat and evaporate water from the wastewater stream. Resulting water vapor would be compressed and condensed, and the high quality distillate would be recycled to the syngas moisturization system. The concentrated brine would be further processed in a heated rotary drum dryer. There the remaining water would be vaporized and a solid filter cake material collected for appropriate disposal. The use of the ZLD system would prevent the contaminants in the feedstocks from being discharged to receiving waters.

For the East Range Site, an enhanced ZLD system would also treat cooling tower blowdown to eliminate all direct wastewater discharges to receiving waters as necessitated by the stringent requirements applying to discharges of mercury in the Lake Superior Basin watershed. **After the publication of the Draft EIS, Excelsior announced its commitment on January 21, 2008 to implement an enhanced ZLD system for the West Range Site. Therefore, ZLD systems employed at either site would eliminate all direct wastewater discharges to receiving waters.**

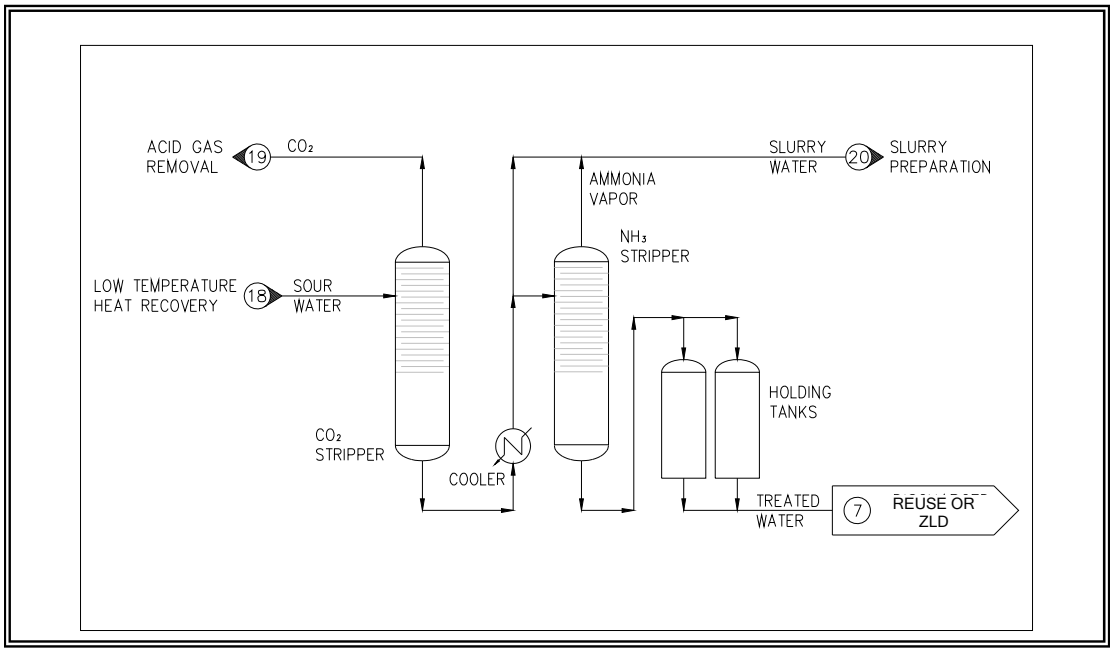


Figure 2.2-9. Sour Water Treatment System

Auxiliary Boilers

Two auxiliary boilers, one for each phase of the Mesaba Generating Station, would provide steam for pre-startup equipment warm up and for other miscellaneous purposes when steam from the gasifiers or HRSGs is not available. The boilers would provide steam in addition to, or in lieu of, the steam that would be generated from the TVBs. Each boiler would produce a maximum of about 100,000 pounds per hour of steam and would be fueled by natural gas. Annual operation of each boiler would be equivalent to or less than 25 percent of the year at maximum capacity. Boilers would be equipped with low NO_x burners to minimize emissions.

Flare

During unit startup or during short-term combustion turbine outages, an elevated flare at the gasification island would be used to burn off partially combusted natural gas and scrubbed/desulfurized off-specification syngas. Syngas sent to the flare during normal planned flaring events would be filtered, water-scrubbed, and further treated in the AGR and mercury removal systems to remove **air** contaminants prior to flaring. Flaring of untreated syngas or other streams would only occur as an emergency safety measure during unplanned plant upsets or equipment failures.

Emergency Diesel Engines

A 2-MWe emergency diesel generator would be used for the gasification island and a 350-kW emergency diesel generator would be used for the power block. One or two nominal 300-horsepower diesel-driven firewater pumps would be provided for each plant phase. These engines would burn very low sulfur distillate oil. Other than for plant emergency situations, each engine would be operated less than 5 hours per month for routine testing, maintenance, and inspection purposes.

2.2.2 Resource Requirements (and Inputs)

The primary resource requirements for the Mesaba Generating Station (Phases I and II) would include feedstock, natural gas, process water, infrastructure, transportation facilities, and land area. Each resource is discussed in general terms below. Specific sources for these inputs for the West Range Site and the East Range Site are described in Sections 2.3.1 and 2.3.2, respectively. Resources required for construction of the Mesaba Generating Station are discussed in Section 2.2.4, Construction Plans.

2.2.2.1 Feedstock Requirements

The Mesaba Generating Station would be designed to be "fuel flexible," which means it could operate at or near maximum capacity using various fuels or blends of fuels. This would provide future cost benefits, because it would allow the station to adapt its fuel mix over the life of the facility thereby minimizing the cost of power. Fuel flexibility would also reduce the dependence on a single fuel supplier or transportation provider.

> The Mesaba Generating Station could operate using bituminous coal, sub-bituminous coal, coal/petroleum coke blends, or other blends of these fuels. This fuel flexibility would allow the facility to minimize the cost of power.

The facility would be designed to utilize the following fuels:

- Bituminous coal (e.g., Illinois No. 6) up to 100 percent;
- Sub-bituminous coal (e.g., Powder River Basin [PRB]) up to 100 percent;
- Petroleum coke blended up to 50 percent with coal; or
- Blends of these fuels.

Coal and petroleum coke are typically characterized by their heating value, elemental analysis (percent carbon, hydrogen, nitrogen and sulfur by weight), mineral matter (known as ash), and moisture content.

Phase I would utilize approximately 2.7 million tons of feedstock annually assuming operation at 90 percent capacity. Under maximum feedstock input, and assuming the gasifiers operated in full slurry quench mode, each phase would require a maximum of 8,230 tons of coal (sub-bituminous) per day on an as-received basis. Assuming partial slurry quench operation of the gasifiers, the daily maximum would increase to 8,550 tons on an as-received basis, or about 3 million tons of feedstock per year. With Phase I and Phase II operating at full load with the gasifiers in full slurry quench mode, a maximum 16,460 tons of coal feedstock per day would be consumed. With the gasifiers operating in partial slurry quench mode at full load, Phase I and Phase II would require a maximum of about 17,100 tons of sub-bituminous coal per day.

Operating in full slurry quench mode would result in reduced fuel use and, consequently, reduced pollutant emissions/discharges, and Excelsior intends to operate the Mesaba Energy Project in the more-efficient full slurry quench mode to the extent feasible. However, full slurry quench is an IGCC design improvement that is subject to further engineering and verification by experience at Wabash River Plant. Therefore, to avoid unrealistic expectations, neither the maximum resource requirements nor maximum pollutant emissions/discharges operating under full slurry quench are considered in this EIS.

Coal and petroleum coke feedstocks would normally be received by rail in dedicated unit trains from a mine (or refinery). The proposed on site rail line would be designed based on the following assumptions:

- Unit trains would include up to 135 cars (the average unit train shipment would be comprised of 115 cars).
- Each unit train car would carry an average of 119 tons of feedstock.
- A maximum of three unit trains per day (midnight to midnight) **would** be received and unloaded based on an unloading rate of 4 hours per train.

Unloading facilities would include a thawing shed to loosen frozen cargo during the winter season, and a partially enclosed rotary car dumping system with an automatic electro-hydraulic positioning system, which would reduce the run time and associated emissions of the locomotive or switch engine during the entire unloading process. Feedstock materials would fall from the rotated cars into an enclosed unloading pit and would be transferred via a feeder/conveyor system to active storage pile stackers. Four active storage piles for each phase (a total of eight for the Mesaba Generating Station) would provide working feedstock storage. Reclaimers and conveyors would move coal/coke from the active piles to the slurry feed preparation area. Additional inactive storage would be located on the opposite side of the rail sidings to provide a reserve source of feedstock material in the event normal deliveries of unit trains are interrupted. If needed, feedstock from the inactive pile would be moved by mobile equipment (bulldozers, scrapers, and/or front-end loaders) to the unloading pit.

The feedstock handling system would include facilities necessary to unload solid feedstock materials, convey them to storage areas, store them until required, reclaim them from storage, blend them as necessary, and convey the blended materials to the slurry preparation system. On-site storage facilities would be provided for two feedstock materials: coal and petroleum coke. Storage facilities would also be provided for flux, which is a feedstock-conditioning material, described below. The feedstock storage facilities would include, for each phase of the generating station, approximately 20 days of active storage and approximately 25 days of inactive storage. The storage areas would incorporate dust suppression systems (including covered conveyers and other enclosures, dust suppression sprays, and vent filters) and would be paved, lined, or otherwise controlled to enable collection and treatment of stormwater runoff and prevent infiltration of chemical species leached from feedstock materials and/or flux to groundwater.

At the high operating temperatures of the E-Gas™ gasifier, ash in feedstock material would normally melt and drain to the bottom of the gasifier where it would be removed as molten slag and cooled in a water bath until it solidified. Mineral matter in the ash determines the melting temperature of the slag and its viscosity at a specific operating temperature. If too viscous, the slag would not easily flow from the gasifier and could potentially plug the bottom. If too fluid, the slag could be excessively erosive to the refractory in the gasifier. Flux, typically silica/sand, limestone, iron oxide, or a mixture of these materials, would be blended with the feedstock under carefully monitored conditions to control the slag melting point and viscosity.

Flux would be received by truck (or railcar) and pneumatically conveyed to enclosed storage silos equipped with fabric filters for dust control. Flux from storage silos would be automatically blended with feedstock by a weigh belt feeder system. The required quantity of flux would be a small fraction of the total feed, typically less than 250 tons per day per phase.

2.2.2.2 Natural Gas Requirements

Although the primary fuel source for electric power production would be coal-derived syngas, the Mesaba Generating Station would also be capable of operating on natural gas. Natural gas would be used during startup of the facility and as a backup fuel. This ability to operate on natural gas would provide an additional source of available generating capacity (and reliability for periods when the gasification island is unavailable). In addition, it would offer the option of installing the combined-cycle power island early in the construction process (that is, ahead of the gasification island), thereby allowing for electricity

production from natural gas until the gasification island could be installed and the unit would begin full baseload operation on coal-derived syngas. Although not currently planned for the Mesaba Energy Project (Phase I), the ability to come online early using natural gas would be a very useful resource planning option for Phase II. Excelsior has proposed permits to allow for natural gas firing at capacity factors of 30 percent, 20 percent, 10 percent, and 5 percent for years 1, 2, 3, and thereafter, respectively. The expected maximum natural gas flow would be about 105 million standard cubic feet of gas per day per phase of the Mesaba Generating Station.

Two major natural gas pipeline transmission companies serve Minnesota's Iron Range: GLG and NNG. The GLG natural gas pipeline system interconnects with NNG's natural gas pipeline system near Carlton, Minnesota. Section 2.3 describes the gas pipeline interconnection alternatives for the West Range and East Range Sites.

2.2.2.3 Process Water Requirements

The Mesaba Generating Station would require process water for the following purposes:

- As the prime mover in the steam cycle (Raw water must be treated to ultra purity standards to be used in the HRSG for steam production. The steam produced in the HRSGs is delivered to the steam turbine and condensed for reuse.);
- To condense steam used in the power cycle (Water used for steam production in the HRSGs would be of very high quality and, for economic reasons, would not simply be vented to the atmosphere as low grade steam.);
- To slurry coal for feed to the gasifier; and
- For various other contact/non-contact cooling purposes.

As described in Section 2.2.1.4, Excelsior announced its decision to implement an enhanced ZLD system for the West Range Site, after the publication of the Draft EIS, which would be the same as proposed for the East Range Site. The enhanced ZLD system is made up of two separate ZLD units to treat two different wastewater streams—contact wastewater (process water from the gasification that has been through sour water treatment) and non-contact wastewater (primarily cooling tower blowdown). As previously discussed in Section 2.2.1.4, in the gasification process, a portion of the treated water from the NH_3 stripper would be released to a ZLD unit. This ZLD unit would recover distilled water for reuse in the power plant, reducing fresh water consumption and would prevent the contaminants in the feedstocks from being discharged to receiving waters. Figure 2.2-10 (shown later in this chapter) illustrates integration of this ZLD unit treating the contact wastewater. All other industrial wastewaters (i.e., non-domestic wastewaters) generated beyond those already used in the gasification and slag processing operations would be processed through a separate ZLD unit such that there would be no process-related wastewaters (including non-contact cooling tower blowdown) discharged from the Mesaba Generating Station.

Without the enhanced ZLD system at the West Range Site, the cycles of concentrations (COCs) would have been reduced from five for the Mesaba Energy Project (Phase I only) to three for the Mesaba Generating Station (both Phases I and II) to meet state water quality standards. The reduction of COCs would have resulted in a more than doubling of water requirements for the combined phases. By using the enhanced ZLD system, the average annual water appropriation rate can be reduced by 900 gallons per minute per phase (1,800 gallons per minute total) in comparison to operating at five cycles of concentration with discharge of cooling tower blowdown. The average and peak water requirements are indicated in **revised** Table 2.2-3. Peak rates would occur on hot, humid days.

Table 2.2-3. Process Water Requirements

Phase	West Range Site[1]		East Range Site	
	Average Annual Demand (gpm [cfs])[2]	Peak Demand (gpm [cfs])	Average Annual Demand[3] (gpm [cfs])	Peak Demand (gpm [cfs])
Mesaba Energy Project (Phase I)	**3,500** (**7.8**)	**5,000** (**11.1**)	**3,500** (**7.8**)	5,000 (11.1)
Mesaba Generating Station (Phases I & II)	**7,000** (**15.6**)	**10,000** (**22.3**)	**7,000** (**15.6**)	10,000 (22.3)

[1] **Revised from Draft EIS to reflect implementation of an enhanced ZLD system at the West Range Site.**[2] gpm – gallons per minute; cfs – cubic feet per second
[3]**Correction from values presented in the Draft EIS.**

The maximum process water requirement would be dependent upon many factors including, but not limited to, the cycles of concentration in the cooling towers, fuel consumed, ambient conditions, extent to which cooling tower blowdown is treated to remove total dissolved solids, chemistry of the receiving waters, and water quality criteria standards applied to those waters. The cycles of concentration in the cooling towers would be dependent upon source water chemistry, specifically the concentrations of mercury, total dissolved solids; and hardness. In general, if the source water is relatively low in total dissolved solids the cycles of concentration in the Mesaba Generating Station's cooling towers could be increased, resulting in lower make-up rates.

Abandoned mine pits would be the primary source of water at the West Range Site. At the East Range Site, the primary sources of water would come from: i) dewatering nearby lands for purposes of mining them, ii) nearby abandoned mine pits (e.g., the Stephens and Knox Mine Pits), and iii) Colby Lake. Water would be conveyed to the Mesaba Generating Station at the West Range Site via a single pipeline from the Canisteo Mine Pit. Water would be conveyed to the generating station at the East Range Site via a pipeline from an unutilized mine pit that would receive additional water from sources described in Section 4.5.4.1. If needed, water from Colby Lake could be conveyed directly to the generating station. At either site, water conveyed to the Mesaba Generating Station would be filtered prior to use and softened, if necessary. Solids from the raw water treatment process would be taken to a local non-hazardous landfill for disposal.

2.2.2.4 Infrastructure Requirements

The project's generating facilities would connect to the power grid via new and existing HVTL corridors to substations located near the unincorporated communities of Blackberry (West Range Site) or Forbes (East Range Site). The HVTL infrastructure would need to be reconstructed and/or reinforced under the Proposed Action for either the West Range Site or the East Range Site as described in Section 2.3.

Electric power would be produced in two CTGs (about 220 MWe each) and in one STG (up to 300 MWe). The electrical output of the CTG and STG at 16.5-kV and 18-kV, respectively, would be below the level needed for electrical transmission to the grid; hence, transformation to the appropriate voltage would occur prior to the Mesaba Generating Station's switchyard. Excelsior's design and cost for the power plant have been based on such transformation delivering electric power to the switchyard at a voltage of 230-kV.

Based on a nominal net electric output of **600** MWe at a 0.90 power factor, one bundled conductor 230-kV transmission line rated at 1,585 Amperes would be sufficient to carry the peak electrical output of either plant phase. A single 345-kV bundled conductor rated at 2,113 Amperes could carry the full **1,200** $MWe_{(net)}$ output from both phases. However, a single transmission line interconnecting the plant to the point of interconnection (POI) would not meet the single failure (n-1) criterion and would result in a total loss of output from the plant in the event of a forced line outage or when line maintenance is required. Therefore, a minimum of three 230-kV HVTLs, two 345-kV HVTLs, or a combination of two 230-kV HVTLs and one 345-kV HVTL would be required to satisfy the single failure criterion design element.

The choice of transforming voltage level for the Mesaba Energy Project between 230 and 345-kV is not solely dependent on the plant site and length of transmission lines. This choice is also dependent on the voltage levels at which the substation currently operates as well as existing "downstream" power flow constraints. Presently, there is no 345-kV voltage transmission infrastructure at either the Blackberry Substation or the Forbes Substation. Efforts to bolster Minnesota Power's (MP) ability to exchange power between regions with fewer attendant losses would dictate that new transmission developments in the region operate at higher voltages. Excelsior believes that 345-kV would be the future standard on which such transmission developments on the Iron Range will be focused and has based its decision for the interconnection voltage on that premise. The results of the Midwest Independent System Operator's (MISO) Interconnection Studies will confirm whether Excelsior's decision regarding the likelihood of future 345-kV development at the two substations is appropriate.

Because of pending MISO decisions that could affect the interconnection voltage for Phases I and II, Excelsior has requested an HVTL Route Permit that allows flexibility to change its West Range Site interconnection voltage plans. The use of 345 kV at the East Range Site is dictated by the increased power losses that would otherwise occur if the system were operated at 230 kV. Section 2.3 summarizes Excelsior's plans to deal with uncertainties related to MISO's ongoing studies and pending decisions.

Based upon the results of studies completed to date, MISO has determined that the output of Mesaba Phase I would be fully deliverable within the MISO footprint**, and that no network upgrades would be required for either the West or East Range Sites. For the West Range Site, the original June 2006 System Impact Study indicated a need for network upgrades between the Boswell and Riverton substations. More recently, an Optional System Impact Study conducted for Mesaba Phase I on behalf of MISO (Siemens PTI, 2008) confirmed that no network upgrades would be required to interconnect and inject 600 MWe of power from Mesaba Phase I to the regional electric grid at the Blackberry Substation. The Optional System Impact Study was justified (1) by the addition of MISO Transmission Expansion Plan Projects to the regional electric grid after the original June 2006 System Impact Study for Mesaba Phase I had been completed, and (2) by the commencement of construction of energy-intensive projects in the immediate vicinity of the IGCC Power Station.**

Since the completion and final posting of the Optional Study results, a new concern was raised by Minnesota Power, the local transmission owner, about potential adverse impacts that the Mesaba Phase I output would have on one of their existing 115kV lines (the 11 Line). Upon further evaluation and through additional System Impact Studies conducted since then (but not yet posted) to reflect a rating limitation imposed on the existing 11 Line 115-kV HVTL between Minnesota Power's Grand Rapids and Riverton Substations, it appears that there are some adverse network impacts on the 11 Line that will require mitigation. However, it is believed that the adverse impacts can be overcome by relatively simple changes to the existing infrastructure (e.g., raising selected tower heights on the 11 Line) and MISO has proposed a Facility Study to determine the costs to implement such changes.

For the East Range Site, the System Impact Study (Siemens PTI, 2006a) also concluded that no network upgrades are required; however, the study was based on a maximum winter output of 552 MWe. A sensitivity analysis conducted by the same contractor that performed the East Range Site System Impact Study, and using the same base models and methodology as that study, demonstrated that no injection limits requiring network upgrades were identified if the East Range IGCC Power Station would distribute 600 MWe (Siemens PTI, 2006b and Sherner, 2006).

MISO studies are underway to identify network upgrades required to ensure that Mesaba Phase II would be deliverable within the MISO footprint at the West Range Site. **A Feasibility Study Report prepared by MISO's Transmission Asset Management (MISO, 2006) provided the starting point for such efforts by identifying the potential number and location of HVTLs that would exceed their rated capacity if the total electric power output of Mesaba Phase II (i.e., nominally 600 MWe) was injected at the Blackberry Substation. Since completion of the Feasibility Study Report, MISO has completed System Impact Studies for Mesaba Phase II, but each time the results of such studies have been rendered useless due to changes in the status of projects queued ahead of it (Sherner, 2009). Regardless of the uncertainties,** it is likely that additional 230-kV and/or 345-kV network upgrades would be required to resolve local injection issues **at the West Range Site** and to ensure the full power deliverability **of Mesaba Phase II to the regional grid. The same general conclusion can be reached for Phase II at the East Range Site (Siemens PTI, 2007).**

DOE considers the possible network upgrades that may be required for Mesaba Phase II to be unavailable information that is not essential for a reasoned choice among alternatives available to DOE (see 40 CFR 1502.22). Furthermore, if network upgrades or new HVTL's were to be required for Mesaba Phase II, the potential environmental impacts would be evaluated and disclosed to the public through the MDOC environmental review process.

Easements across public and private lands would be required to provide HVTLs, pipelines, rail, and highway access to the Mesaba Generating Station. Two HVTL corridors traverse the West Range Site and one HVTL corridor traverses the East Range Site. Easements would also be required for infrastructure associated with the Phase I and Phase II developments, construction of such infrastructure, and operation of the Mesaba Generating Station. Water pipelines would require access from RGGS Land & Minerals, LTD., L.P. (RGGS) for the West Range Site, and from Cliffs-Erie, LLC (CE) and the USDA Forest Service for the East Range Site.

Potable water demand would be generated by construction and operational personnel. Approximately 30 gallons per day per person would be required. During construction, peak water demand would be 45,000 gallons per day based on 1,500 construction workers. Once operational, water demand would decrease to 7,500 gallons per day based on 250 workers on site. Use of city water would be anticipated, although on-site treatment of water from abandoned mine pits through filtration and clarification could also be performed to meet potable water standards.

2.2.2.5 Transportation Requirements

Coal and other materials would be delivered to the Mesaba Generating Station primarily by rail, with some materials delivered by truck. The BNSF Railway (BNSF) and the Canadian National Railroad (CN) are the two principal rail providers in the region. Rail loop access to either site would be required, and potential rail alignments are described in Section 2.3. The plans for connecting the BNSF and/or CN with the Mesaba Generating Station on the West or East Range Sites would require plan approvals from the respective companies. **No other public approvals would be required for the interconnection itself;**

however, the construction of the rail line would require permits, such as a Section 404 permit from the USACE for dredging or filling *waters of the U.S*.

Rail cars arriving via unit trains would be unloaded using a state-of-the-art rapid discharge rotary dumper with an automatic railcar positioning system. The rail loop and system would allow a full-length 8,000-foot long coal train (i.e., 135-car unit train) to be pulled through the site without uncoupling any of the cars. Each rail car would be rotated upside down inside the rotary dumper building to unload the coal contained therein. The dumper building would be enclosed and maintained under negative pressure during the unloading process to minimize fugitive emissions. Each unit train would take approximately 3 to 4 hours to unload.

Other incoming materials delivered via rail could include petroleum coke, flux, and construction materials and equipment. Construction deliveries would require two trains per week. Depending upon the fuel being used, Phase I would produce between 500 and 800 tons per day of slag, which is a black, non-hazardous, glass-like material that has broad industrial uses. Also, depending upon the fuel being used, approximately 30 to **165** tons per day of elemental sulfur would be produced that would be sold and transported off site. Sulfur would be transported off site by rail. Excelsior expects that slag would be sold to local markets and transported off site by truck; however, the project would provide the capability to load slag onto rail cars for transport to more distant markets depending upon economics.

An access road would also be required at either site for the plant. Roadway access would be required for personnel and for deliveries by truck during construction and operation of the plant. Potential access road alignments for the West Range and East Range Sites are described in Section 2.3.

2.2.2.6 Land Area Requirements

The Phase I site layout would encompass approximately 100 acres. An additional 80 acres of land would be required for a temporary construction staging and lay-down area for the Phase I equipment and 5 acres for a concrete batch plant. Since Phase II would be similar to Phase I with respect to its balance of plant equipment, a total of approximately 200 acres would be required for Phases I and II, excluding construction staging and lay-down areas. Phase I would use the footprint reserved for Phase II as the construction staging and lay-down area**. For Phase II construction, a total of 85 acres of land would be acquired temporarily at off-site locations (see further discussion in Section 2.2.4.1).** On-site rail alignments, access roads, and utility corridors would also affect the amount of acreage required for project components. The balance of land area on the West or East Range Site would remain wooded to the extent practicable to maintain a buffer area (for visual screening and noise reduction) between the power plant footprint and surrounding land uses. The site layout plans would be developed to reduce the extent of impact on environmental resources as practicable within design constraints for the generating station components.

Construction of the proposed rail line to accommodate Phase I and Phase II would require additional off-site ROWs to be obtained. The proposed ROW would be 100 feet wide with additional width needed in some of the cuts or fill sections. The track work would begin immediately after construction approval was received to allow for delivery of construction materials. Rail line construction would require approximately 15 months.

The rail line would be constructed on a 32-foot wide prepared roadbed within the 100-foot wide right-of-way. Permanent or temporary easements may be required in some areas. The side slopes would be 1:3 with a 5-foot wide flat bottom ditch for drainage. **During detailed design, 1:2 side slopes** would **be studied and specified in areas where steeper slopes would reduce wetland impacts, provided the detailed geotechnical and soil survey data indicate that construction of those slopes c**ould **be**

supported. The prepared roadbed would have the track offset to one side of centerline to allow for a 12-foot railroad inspection road alongside. The coal unloading process would require the final track elevation to be level; therefore, the approach grades would be limited to 0.3 percent. The grading and track work would conform to the American Railway Engineering and Maintenance of Way Association standards.

Storage requirements for the major process feedstocks and byproducts are shown in Table 2.2-4. The volumes of material storage requirements are for each phase; total storage for both phases would be double the amounts shown.

Table 2.2-4. Feedstock and Byproduct Storage Requirements for Each Phase

Material	Storage Requirements
Coal Pile	385,000 tons (20/25 days active/inactive storage based on maximum PRB1 coal usage); Dust control; Water runoff control
Pet Coke Pile (Storage would be subset of total coal storage)	105,000 tons (20/25 days active/inactive storage); Dust control; Water runoff control
Flux Silo	4,660 tons (20 days active storage)
Sulfur Tanks	Max 162 tons/day generated, based on Illinois No.6 coal (7 days on-site storage; 30 rail cars parked on site)
Slag Pile	34,800 tons (45 day storage, wet basis, using PRB2:PRB3 coal blend)

2.2.3 Discharges, Wastes, and Products (Outputs)

2.2.3.1 Air Emissions

Air emissions by the Mesaba Generating Station would be largely independent of the project site. The block flow diagram in Figure 2.2-1 shows air emission sources and their associated control equipment for the Mesaba Energy Project (Phase I); the Phase II plant would be identical. Refer to Table 2.1-1 for estimated air emissions. Excelsior's design team estimated the maximum and average emission quantities from each emission point using:

- Equipment supplier data;
- Best available control technology (BACT) as proposed for the Mesaba Generating Station in the **company's application for a** New Source Review Construction Authorization Permit (Air Permit application);
- Test results for similar equipment at other IGCC facilities, especially the existing Wabash River Plant (which also uses E-Gas™ gasification technology);
- Engineering calculations, experience, and professional judgment; and
- Published and accepted average emission factors, such as the EPA Compilation of Air Pollutant Emission Factors (AP-42).

Criteria Pollutants

Emissions of criteria pollutants would occur from the operation of the combustion turbines; TVBs; flares; auxiliary boilers; cooling towers; fugitive emissions from handling, preparation, and storage of coal/coke and slag during the operational phase; and emergency generators and emergency fire and water pump engines. **Additionally, emissions from trains and trucks would occur as a result of feedstock delivery and sulfur and slag transport to and from the power plant. The six criteria air pollutants**

are SO_2, CO, ozone, NO_x, lead (Pb), and inhalable particles, which are also known as respirable particulate matter (PM). The PM_{10} standard covers particles with an aerodynamic diameter of 10 micrometers or less and the $PM_{2.5}$ standard covers particles with an aerodynamic diameter of 2.5 micrometers or less. Ozone is not emitted directly from a combustion source. It is formed from photochemical reactions involving emitted VOCs and NO_X.

IGCC power plants that are currently in operation have achieved the lowest levels of criteria air pollutants, mercury and other HAPs emissions of any coal-fueled power plant technologies (DOE, 2002). Similarly, the Mesaba Energy Project's goal is to improve power plant technology and reduce emission levels. Table 2.2-5 (new in Final EIS) provides baseline emissions to show the differences in air emissions between the Mesaba Energy Project performance targets for air emissions and existing IGCC power plants and non-IGCC state-of-the-art conventional pulverized coal-fueled power plants.

Table 2.2-5. Comparison of Mesaba Energy Project Performance Target to Other IGCC and state-of-the-art Power Plant Technologies

Air Emissions (tons per year/MWe)	2016 Mesaba Energy Project-Phase 1 (600 MWe)[1]	1996 Polk IGCC (275 MWe)[1,2]	2000 SOTA (275 MWe)[1,3,4]	1990 SOTA (275 MWe)[1,3,5]
SO_2	**1.158**	**2.985**	**10.513**	**65.502**
NO_x	**2.393**	**2.255**	**23.771**	**28.171**
PM_{10} (WR/ER)	**0.443/0.592**	**0.273**	**2.375**	**2.756**
Hg	**0.00002**	**0.00006**	**0.00041**	**0.00037**

[1] Dates represent the construction date for the respective power plant.
[2] Polk is the Tampa Electric Company Polk Power Station, which is an operating IGCC power plant. SO_2 emissions for this power plant are actual rates reported for Acid Rain Program (EPA, 2007a). Hg emissions are from limiting conditions in Title V permit (FLDEP, 2007c). NO_2 and PM_{10} emissions from limiting conditions in Title V permit modification (FLDEP, 2007d). **PM_{10} emissions do not include sulfuric acid mist.**
[3] The SOTA facilities are conventional coal-fueled power plants.
[4] SO_2 emissions are actual rates reported for Acid Rain Program from Hayden, Routt, CO facility. NO_X are actual rates reported for Acid Rain Program from E.D. Edwards, Peoria, IL facility. PM_{10} emissions calculated from rates obtained from DOE database for Hayden, Routt, CO facility. Hg emission factors and heat value as reported in EPA's Locating and Estimating Air Emissions from Sources of Mercury and Mercury Compounds (EPA, 1997).
[5] SO_2 and NO_2 emissions are actual rates reported for Acid Rain Program from Meramac, St. Louis, MO facility. Hg emissions for 2005 as reported in EPA Envirofacts website from Cholla, Navajo, AZ facility. PM_{10} emissions calculated from rates obtained from DOE database for C G Allen, Gaston, NC facility (275 MWe) that made modification in 1996.
MWe = megawatt electricity; SOTA=State-of-the-art; SO_2 = sulfur dioxide; NO_x = nitrogen oxides; PM_{10} = particulate matter $\leq$ 10 microns; Hg = mercury.

Emissions of Greenhouse Gases

The Mesaba Generating Station would emit significant quantities of CO_2; it would emit other greenhouse gases as well. The amount of CO_2 emitted by the power plant would vary depending on the feedstock, as indicated in Table 2.1-1, and the net heat rate. When both phases of the Mesaba Generating Station are operating at a 100 percent capacity factor (i.e., at full capacity), the station would emit approximately 10.6 million tons of CO_2 per year burning sub-bituminous coal. Based on a study of life cycle greenhouse gas emissions from IGCC power systems (Ruether et al., 2004), DOE estimates that plant operations support, maintenance, coal mining, and coal transportation could increase annual CO_2 emissions attributable to the operation of the generating

CO_2- equivalent is a measure used to compare greenhouse gases based on their global warming potential, using the functionally equivalent amount or concentration of CO_2 as the reference. The CO_2-equivalent for a gas is derived by multiplying the amount of the gas by its global warming potential; this potential is a function of the gas's ability to absorb infrared radiation and its persistence in the atmosphere after it is released.

station by about 300,000 tons (for a total of 10.9 million tons annually). DOE estimates that annual emissions of other greenhouse gases (methane and nitrous oxide) from the station and its associated activities would total about 272,000 tons of CO_2-equivalents per year.[1] Total emissions of greenhouse gases caused by construction activities would be about 900,000 tons of CO_2-equivalents (less than 10 percent of one year's operating emissions).

Operating at full capacity and without CCS, Phases I and II of the station would constitute the second largest point source of CO_2 emissions in Minnesota (Excelsior, 2006e and 2006g). Neither Federal law nor state law in Minnesota place limits on CO_2 emissions from the Mesaba Generating Station, and generally there are few economic incentives or regulatory requirements for utilities to reduce emissions of greenhouse gases from their power plants at this time. However, as discussed in Section 3.3.4, the Federal government is considering several approaches to addressing global warming by limiting emissions of greenhouse gases, including regulating them under the CAA. As described in the *Potential Carbon Capture Retrofit* subsection of Section 2.2.1.3, the plant would be designed to allow for the future addition of CO_2 capture technology, and the project proponent has performed a preliminary study of the potential for geologic sequestration of CO_2 emissions from the plant.

The greenhouse gases emitted by the Mesaba Generating Station would add a relatively small increment to emissions of these gases in the United States and the world. Overall greenhouse gas emissions in the United States during 2007 totaled about 8,026 million tons (7,282 million metric tonnes) of CO_2-equivalents, including about 6,638 million tons (6,022 million metric tonnes) of CO_2. These emissions resulted primarily from fossil fuel combustion and industrial processes. About 40 percent of CO_2emissions came from the generation of electrical power (EIA, 2007b). By way of comparison, annual operational emissions of greenhouse gases from the proposed generating station would equal about 0.14 percent of the United States' total emissions in 2007.

The release of anthropogenic greenhouse gases and their potential contribution to global warming are inherently cumulative phenomena. That is, emissions of greenhouse gases from the proposed power plant by themselves would not have a direct impact on the global, regional, or local environment. Similarly, current scientific methods do not allow one to correlate emissions from a specific source with a particular change in either local or global climates. Accordingly, the potential impacts of the Mesaba Energy Project are analyzed as cumulative impacts in Section 5.2.8.

Combustion Turbine Generators

The production of syngas at relatively high pressure allows efficient and cost-effective syngas cleanup prior to combustion in the CTGs to produce electricity. Air emissions would be controlled using the following treatment steps applied to the syngas:

- Hot gas particulate matter filtration via cyclone and ceramic filter to achieve more than 99.9 percent removal of particulate matter;
- Water scrubbing to remove soluble contaminants, condensable materials, and suspended particulate matter;
- Amine treatment combined with COS hydrolysis;
- Carbon adsorption for removal of mercury and other trace contaminants; and
- Moisturization (water saturation) for NO_x control and improved power production.

[1] These other greenhouse gases would be released by combustion of syngas to generate electricity; combustion of fuels (diesel and gasoline) for transportation and coal mining activities; and combustion of fuels to produce energy needed for operations and maintenance.

In addition to the syngas treatment, the moisturized product syngas fuel would be diluted approximately 100 percent (1:1) with ASU nitrogen for additional NO_x reduction. Steam injection, in lieu of nitrogen dilution and moisturization, would be used for NO_x control when operating on natural gas. Finally, each CTG would be equipped with inlet air filters to minimize particulate matter emissions potentially caused by advection of suspended atmospheric materials contained in the combustion air.

Emissions from the CTGs are based on the following gas concentrations as emitted at the HRSG stack (or, in the case of particulate matter, the stack emission rate):

Syngas

- SO_2, based on 50 parts per million, volumetric dry (ppmvd) as H_2S in the undiluted syngas, rolling 30-day average and assuming 100 percent conversion of H_2S to SO_2
- NO_x, 15 ppmvd (at 15 percent O_2)
- CO, 15 ppmvd (at 15 percent O_2)
- PM_{10}, 25 lb/hr/CTG
- Volatile Organic Compounds (VOC), 2.4 ppmvd (at 15 percent O_2)

Natural Gas

- SO_2, pipeline-quality natural gas (assumed 1.0 grain/100 standard cubic feet (scf) total sulfur) and assuming 100 percent conversion of sulfur to SO_2
- NO_x, 25 ppmvd (at 15 percent O_2)
- Other criteria pollutants, equal to or less than syngas emission rates

Tank Vent Boilers

Two TVBs, one for each phase, would be designed to safely and efficiently dispose of recovered process vapors from various process tanks and vessels associated with the gasification process. The TVBs would prevent the atmospheric emission of reduced sulfur compounds and other gaseous constituents to the atmosphere that could cause nuisance odors and other undesirable environmental consequences. The TVBs may also be operated on natural gas to produce steam for the Mesaba Generating Station during gasifier shutdowns.

Flares

The elevated flares for each phase would be designed for a minimum 99 percent destruction efficiency for CO and H_2S. The flares would normally be used only to oxidize treated syngas and natural gas combustion products during gasifier startup operations. The flares would also be available to safely dispose of emergency releases from the Mesaba Generating Station during unplanned upset events.

Fugitive Emissions

Fugitive emissions are those emissions not caught by a capture system, and that are often due to equipment leaks, evaporative processes, or wind. Such fugitive emissions for the proposed IGCC facility would likely occur based on normal equipment leakage, and were estimated using standard U.S. EPA fugitive emissions factors for valve seals, pump and compressor seals, pressure relief valves, flanges, and similar equipment. **These emissions are likely to occur from gasification, syngas treatment, and mercury removal. A Leak Detection and Repair Plan has been developed for the Mesaba Energy Project to monitor leaks from valves and components in the equipment train with modification for coal and/or petroleum-coke derived syngas. Because syngas does not have a significant level of**

VOC, the traditional Leak Detection and Repair Plan, which focuses on the detection and measurements of VOC leaks, will be modified. The plan will utilize the measurement of CO to estimate the leak rate from valves and components, which is consistent with the EPA 1995 Protocol for Equipment Leak Emission Estimates (EPA Protocol), Section 2.4.7. CO is the highest expected gas constituent and is most readily analyzed with current portable analyzers.

The sampling and analysis method for CO will follow the general requirements of EPA Method 21. The leak rate of hazardous air pollutant (HAP) emissions will be calculated assuming the leak composition is identical to the expected composition of the syngas at the specific stage of clean up. This is consistent with the EPA Protocol, Section 2.4.1, which states that this assumption is accurate for single phase streams containing any gas/vapor material. A sample from each of the syngas process areas will be taken one time for each general feedstock to establish the composition of the syngas, including hydrogen, carbon monoxide, carbon dioxide, methane, nitrogen plus argon; and the HAP emissions of primary interest, including carbon disulfide (CS_2), carbonyl sulfide (COS), hydrochloric acid (HCl), and hydrogen cyanide; as well as hydrogen sulfide (H_2S), which is not a HAP but a compound of interest. The appropriate EPA Reference Test Methods would be used for measuring the gas composition characteristic at each stage for each general feedstock. Each valve and component in syngas service would be tested. The default frequency of component testing would be once per permit cycle, with an additional test within the first twelve months of operation. If the results indicate a level of fugitive emissions that would alter the Mesaba Energy Project's classification as a non-major source of HAP emissions (i.e., annual emissions of less than 25 tons of total HAPs or less than 10 tons of any individual HAP), the results would be verified through a repetition of the testing program, followed by repair of the leaking component(s) or taking the necessary compliance steps required for a major source classification. Because the organic HAPs concentration in the syngas would be less than 5 percent by weight, the Mesaba Energy Project is not subject to leak detection and repair regulations (see 40 CFR 180 (d)(1)).

Material Handling Systems

Fugitive particulate matter emissions (fugitive dust) would be generated by coal/coke and slag handling, preparation, and storage during the operation of the Mesaba Generating Station. Sources of these emissions would include the active and inactive coal/coke storage piles, conveyors/transfer points, slurry preparation area, and the slag storage area. Estimated fugitive emissions are provided in Section 4.3, Air Quality and Climate.

Wet spray dust-suppression systems would be employed at various points in the coal handling and storage and coal slurry processes, which would require that water be supplied to the various injection points. This water could be blended with glycol for freeze point suppression, and/or surfactants (wetting agents) or chemical binding or encrusting agents. Because of the glycol addition, any free water draining from the solids would be captured and treated as required before re-use on site or disposal off site.

Fugitive dust would be generated from in-plant trucks hauling slag from the gasifier slag handling area to the slag storage pile or bins to await shipment by rail or truck to off-site users. Watering of the roadway near the pile to suppress dust and periodic removal/cleanup of dust-producing material would minimize potential emissions from this source. **Additionally, for the rail unloading building a bag filter dust collection system would be used to control fugitive dust.**

Train and Truck Emissions

Train emissions (new Table 2.2-6) would predominantly result from delivery of feedstock to operate the power station.

Table 2.2-6. Emissions (tons per year) from Trains Delivering Feedstock for Phases I and II of the Mesaba Energy Project

Site	CO_2	SO_2	NO_X	PM	CO
West Range	150,000	1.5	2,300	80	410
East Range	170,000	1.7	2,600	90	460

These emissions are calculated based on the worst-case scenarios of the maximum annual tonnage of feedstock delivery (i.e., partial slurry quench on 100 **percent subbitumimous coal) from the farthest distance source (i.e., Powder River Basin).**

Truck emissions (new Table 2.2-7) would predominantly result from transporting slag and ZLD salt from the power station assuming the greatest distance of truck transportation. Slag production at the power station would depend on the amount of feedstock used. Total ZLD salt production would depend on the water quality of the water source, which is lower at the East Range Site.

Table 2.2-7. Emissions (tons per year) from Trucks Transporting Solid Byproducts and Waste from Phases I and II of the Mesaba Energy Project

Site	CO_2	SO_2	NO_X	PM	CO
West Range	7,700	0.1	60	0.8	7
East Range	8,100	0.1	61	0.8	7

The worst-case scenario of feedstock use and ZLD salt production were used to calculate truck emissions. Detailed discussion of the worst-case situation used in the Mesaba Energy Project's NEPA analysis is provided in Table 2.1-1 of this **EIS.**

Except for NO_X, emissions from the trains and trucks would be much smaller than those from operation of the power plant; therefore, impacts would be considered negligible. T**hough NO_X emission rates would be comparable to those from power plant operations, the impacts from the train and truck emissions would be far less than those of the power plant, because the trains and trucks are mobile. Unlike a stationary source** with localized **emissions, emissions from trains and trucks would be dispersed over a large area and distance**. Therefore**, depending on the train or truck** speed and **wind and other meteorological factors, localized impacts would be negligible.**

Cooling Tower Drift

Particulate emissions would also occur from the cooling towers as a result of drift. The total dissolved solids (TDS) content of the drift is the maximum value estimated from water quality measurement data for the makeup water.

The high concentration of TDS found in process water from mine pits at the East Range Site would be the source of increased PM_{10} emissions from the East Range Site cooling towers relative to such emissions from the West Range Site. TDS in process waters for the East Range Site have been shown to be present at concentrations up to 1,800 milligrams per liter, whereas peak concentrations of TDS in mine pits associated with the West Range Site are about 340 milligrams per liter.

Auxiliary Boilers

The auxiliary boilers would normally operate only when no steam would be available from the gasifiers or HRSGs. The annual capacity factor for these boilers would be 25 percent or less. The auxiliary boilers would include low-NO_x burners for emission control.

Emergency Diesel Engines

Diesel engines driving the emergency generators and fire protection pumps would be operated for emergency purposes only and would not operate otherwise for more than 100 hours per year each. The operation of these engines would be an additional although minor source of overall operational air emissions.

2.2.3.2 Wastewater Effluents

Process Water Effluents

[Text relating to process water discharges in this section of the Draft EIS has been deleted]

A generalized water balance diagram that applies to both potential sites is shown in Figure 2.2-10. Wastewater generated from gasification and slag processing operations containing levels of heavy metals and other contaminants from the feedstocks would be treated in a ZLD system. This system would recover distilled water for reuse in the power plant, thereby reducing fresh water consumption, and it would concentrate heavy metals **(e.g., arsenic and selenium based on results from the Wabash River plant)** and other contaminants of concern into a solid waste stream. The solid waste, which is likely to be classified as a hazardous waste **based on the results of toxicity testing conducted in accordance with Method 1311 in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," EPA Publication SW–846, as incorporated by reference in 40 CFR §260.11 (the Toxicity Characteristic Leaching Procedure)**, would be disposed of at off-site waste management facilities. Therefore, no wastewater streams from the ZLD system serving the gasification island would require disposal at either site. **Also, as described in Section 2.2.1.4, an enhanced ZLD system would treat cooling tower blowdown at either site to eliminate all direct wastewater discharges to receiving waters. Hence, all process wastewater and cooling tower blowdown would be reused in the plant.**

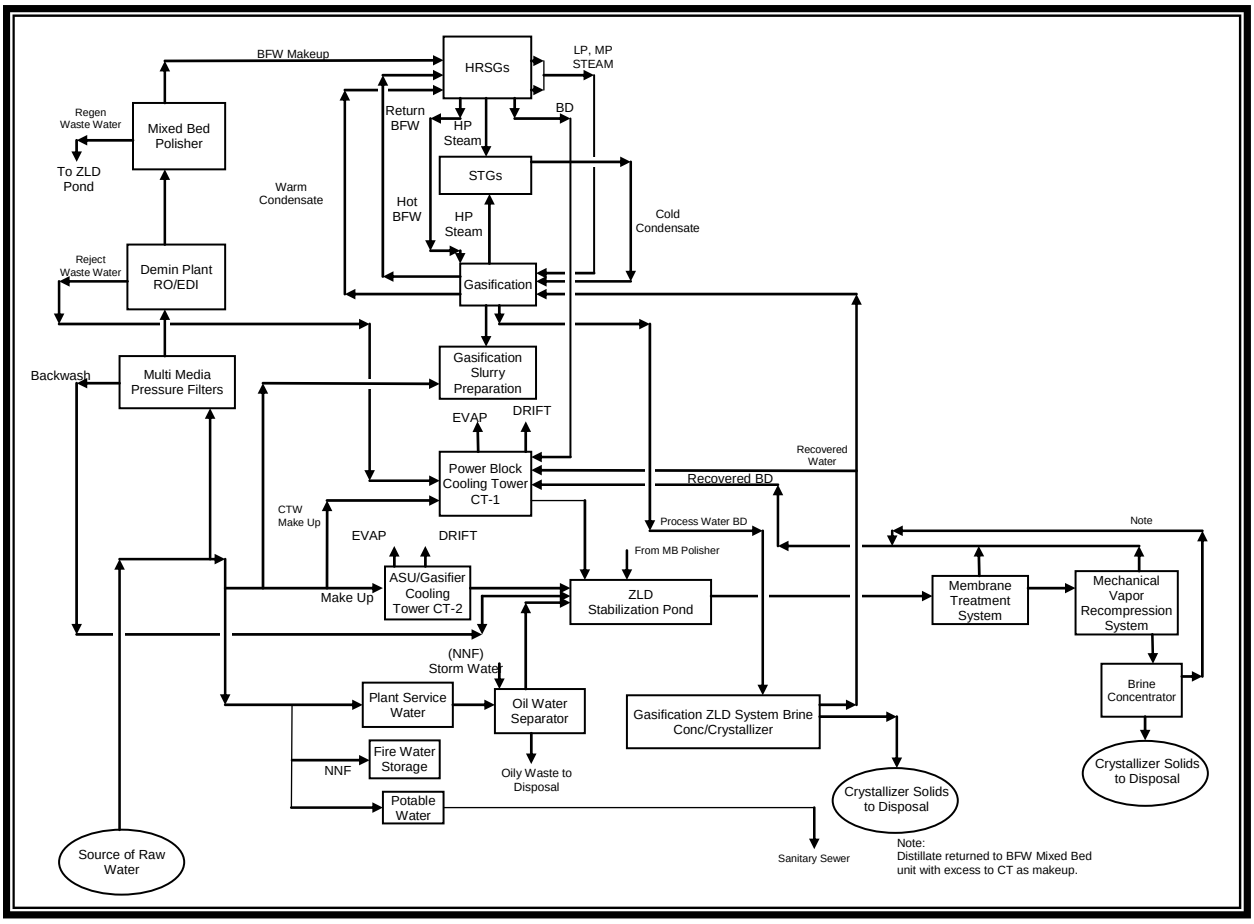


Figure 2.2-10. Water Balance Diagram Applicable to Phases I & II

Stormwater Management

Stormwater runoff from the plant site during operation of the Mesaba Generating Station would be **collected in the stabilization pond for the ZLD system. Stormwater that could become contaminated with oil (such as water runoff from parking lots) would be routed through an oil/water separator before entering the ZLD pond.** The ZLD system would treat t**he stormwater (along with blowdown from cooling towers)**, **allowing it to be reclaimed and reused within the plant. The ZLD stabilization pond and on-site storage areas would be designed with adequate capacity to accommodate the 24-hour, 100-year storm event, even if that event were to occur during a plant outage. Therefore, the plant would be designed such that all stormwater from the plant footprint would be captured and reused, excluding scenarios exceeding a 100-year storm. [Text relating to stormwater discharges in this section of the Draft EIS has been deleted]**

Sanitary Wastewater

Alternatives for treating sanitary (domestic) wastewater produced by plant employees include connecting to the local/regional publicly owned treatment works (POTW) or providing an on-site septic system with leach field. Excelsior's preferred alternative would be to discharge sanitary wastewater to a local POTW.

Based on the number of personnel required for the operation of Phase I and Phase II (see Section 2.2.5), and using an estimate of 30 gallons per day generated per person, the expected sanitary wastewater discharge would total approximately 3,300 gallons per day for Phase I and 5,500 gallons per day for both phases combined. These flows are based on the generating station having restrooms, locker rooms, showers, and break room facilities. To accommodate flows when additional people would be on site during tours, special maintenance activities, and outages, the capacity of the system would be based on 7,500 gallons per day of sanitary wastewater.

2.2.3.3 Solid Wastes

Solid wastes produced during plant operations would include spent catalyst materials (associated with the COS hydrolysis and SRU systems), spent activated carbon beds associated with mercury removal processes, spent activated carbon beds and char sludge associated with the sour water treatment system, the solid waste stream produced by the ZLD system, commercial waste paper, and miscellaneous janitorial streams.

The use of a ZLD process would prevent the discharge of heavy metals and other gasification wastes with the plant wastewater effluent. The solid waste stream from this process, consisting mainly of crystallized solids in a "filter cake," would likely be classified as a hazardous waste **based on the results of toxicity testing conducted in accordance with Method 1311 in EPA's "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods." For example, the ZLD waste from the Wabash River plant contact process water has exceeded limitations for arsenic and selenium in past testing. Solid waste from the Mesaba Energy Project classified as hazardous waste** would be disposed in an approved hazardous waste landfill or other licensed facility **designed to contain the wastes and prevent their release to the environment**.

Excelsior would manage operational wastes in accordance with applicable regulations, good industry practices and established internal company procedures. Hazardous and non-hazardous wastes would be properly collected, segregated, and recycled or disposed at approved waste management facilities within regulatory time limits and in accordance with requirements. Plant staff would be adequately trained in proper waste handling procedures. Waste manifests and other records and reporting would be maintained as required by regulations and company procedures.

Typically, the ash content of coal would be in the range of 5 to 11 percent as received, and ash in petroleum coke would average about 0.6 percent as received. However, the advanced features of E-Gas™ technology avoid two significant solid waste streams associated with some other types of coal-based power generation: flue gas desulfurization solids and ash. Removal of sulfur from IGCC syngas in a relatively concentrated form and the subsequent production of elemental sulfur eliminate these significant solid wastes. Slag production at full load would vary from about 500 tons per day up to a maximum of about 800 tons per day per phase. Slag and elemental sulfur are considered potential revenue-producing streams that would be actively marketed by Excelsior. **Minnesota Rules 7035.2860 (Beneficial Use of Solid Waste) addresses standing beneficial use determinations in Subparagraph 4. Item K applies to the use of coal combustion slag as a component in manufactured products such as roofing shingles, ceiling tiles, or asphalt products. Item L applies to the use of coal combustion slag as a sand blast abrasive. The rules permit these uses as specified without contacting the Minnesota Pollution Control Agency (MPCA).**

2.2.3.4 Marketable Products

Although the primary product of the Mesaba Generating Station would be electric power, the plant would also produce elemental sulfur and a glass-like, inert slag. A worldwide market exists for elemental sulfur, although its value varies considerably with location, purity, and end use. The sulfur recovered from the SRU would be stored in molten form and could be sold as a raw material for fertilizer and other beneficial uses. No large-scale market exists for slag at this time; however, it is expected that slag can be marketed for asphalt aggregate, construction backfill or landfill cover applications. Slag with a carbon content of less than 5 percent by weight should be marketable as a higher value product such as roofing shingle applications. There is also a potential to market the slag produced from petroleum coke gasification for metals recovery. **Refer to Section 2.2.3.3 regarding the beneficial use of solid waste rule.**

The plant also would be designed to be retrofit for carbon-capture technology. Studies for Excelsior to be undertaken as part of the Phase II Plains CO_2 Partnership (one of seven regional partnerships funded by the DOE Regional Carbon Sequestration Partnership Program) would produce a CO_2 management plan that would specify conditions required by potential purchasers of CO_2. The carbon capture system may be added after the generating station is in operation. For PRB coal, Excelsior would expect to capture approximately one third of the carbon (as CO_2) in the solid IGCC feedstock. This capture would come at a reduction in capacity and an increase in heat rate.

2.2.3.5 Toxic and Hazardous Materials

Hazardous materials that would be used or stored for project operations include relatively small quantities of petroleum products, liquid oxygen and nitrogen, molten sulfur, catalysts, flammable and compressed gases, amine replacement and reclamation chemicals, water treatment chemicals, and minor amounts of solvents and paints (Table 2.2-8). Materials and estimated quantities for the gasification/ASU blocks were based on experience at the Wabash River Plant.

Natural gas and syngas, which are flammable fuels, would be used in the Mesaba Generating Station, specifically for the power block. Natural gas would be used as a startup or auxiliary fuel; it would be utilized directly from the on-site pipeline (connecting to the off-site main pipeline) and would not be stored on site. Syngas, which is a mixture of CO, H_2, CO_2, and water vapor, would be the primary fuel for the combustion turbines generated on site and not stored. H_2 would be used as a generator coolant. The H_2 would be stored in pressurized gas tubes on a multi-tube trailer. The tube trailer would be stored outside near the turbine-generators and would meet required building and fire codes. CO_2 would be stored and utilized for purging the generators after normal and emergency shutdowns.

Bulk quantities of liquid oxygen and nitrogen would be stored in tanks in the ASU to provide capacity for startups and continued plant operation during short-duration ASU system outages. Other gases stored and used at the facility would include those typically used for maintenance activities, such as shop welding, and emission monitoring and laboratory instrument calibration. These gases would be stored in approved standard-sized portable cylinders, and in appropriate locations.

Water treatment chemicals would be required and stored on site. Bulk chemicals, such as acids and bases for pH control would require storage in appropriately designed tanks, with secondary containment and monitoring. Gaseous chlorine (used/stored in compliance with all applicable regulatory requirements) or hypochlorite bleach may be used for biological control of the various circulating and cooling tower streams. Other water treatment chemicals would be required and used as biocides, pH control, dissolved oxygen removal, and corrosion control for boiler feed water, cooling tower and cooling water treatment. For raw water treatment, coagulants and polymers may also be used. Chemicals used

for these purposes are generally specified by the water treatment provider, and are available under a number of trade names. Stored quantities of these materials would be small, ranging from 55-gallon drums to 500-gallon tanks.

Table 2.2-8. On site Toxic and Hazardous Materials (Totals for Phase I and II)

Material	Form	Quantity (Phases I and II)	General Location On Site	Use
GASIFICATION/AIR SEPARATION UNIT AREAS				
BULK CHEMICALS				
Chlorine or Sodium Hypochlorite	Gas or Liquid	TBD*		Cooling Towers
Sodium Hydroxide	Liquid	60,000 gallons	Outdoors	Amine Reclamation and Sour Water Treatment
Potassium Hydroxide	Liquid	2,000 gallons	Indoors	Dry Char Filter Cleaning
Water Treatment Chemicals	Liquid	Typically 55-gallon drums to less than 500-gallon tank	Indoors	Pump Bldg, Slurry Prep Bldg, Cooling Towers
Oxygen (95%)	Liquid	1,800 tons	Outdoors (Tanks)	ASU* Backup Supply
Nitrogen	Liquid	5,000 tons	Outdoors (Tanks)	ASU Backup Supply
Molten sulfur	Liquid	200,000 gallons	Outdoors	By-product for Sale
Ammonium lignosulfonate	Liquid	TBD	Indoors	Slurry Prep Bldg for maintaining % solids in slurry
MISCELLANEOUS/DISTRIBUTED MATERIALS				
Paint/Thinners/etc.	Liquid	Minimal	Indoors	Shop/Warehouse
Lubrication Grease/Oils	Solid/Liquid	Minimal	Indoors	Pump Bldg, Slurry Prep Bldg., Shop/Warehouse
Compressed Gases (Ar, He, H_2)*	Pressurized Gas	Minimal	Indoors	Lab
Chemical Reagents (acids/bases/standards)	Liquid	Minimal	Indoors	Lab
OTHER HAZARDOUS MATERIALS				
Flammable/Toxic Gases (H_2, CO, H_2S, SO_2)*	Pressurized Syngas Mixture	TBD	Outdoors	Process Piping/Vessels
Acetylene, Oxygen, other welding gases	Gas	Minimal (approved cylinders)	Indoors	Welding
Natural Gas	Gas (high pressure)	Gas Pipeline	Supply piping only	Startup/Backup Fuel
Diesel Fuel	Liquid	2,000 gallons	Outdoors	Emergency generator/fire water pump fuel

Table 2.2-8. On site Toxic and Hazardous Materials (Totals for Phase I and II)

Material	Form	Quantity (Phases I and II)	General Location On Site	Use
POWER BLOCK AREA				
Sulfuric Acid	Liquid	12,000 gallon aboveground storage tank	Outdoors	Cooling water and boiler feedwater pH control; battery acid
Sodium Hypochlorite	Liquid	20,000 gallon aboveground storage tank	Outdoors	Cooling Tower biological control
Circulating Water Chemical Additives (e.g., Magnesium nitrate, magnesium chloride, 2-bromo-2-nitropropane-1,3-Diol, 5-chloro-2-Methyl-4-Isothizaoline-3-one)	Liquids	Typically 55-gallon drums to less than 500-gallon tank	Indoors	Corrosion Inhibitor/Biocides
Boiler Feedwater Chemicals (e.g., Carbonic Dihydrazide, Morpholine, Cyclohexamine, sodium sulfite)	Liquids	Typically 55-gallon drums to less than 500-gallon tank	Indoors	Boiler feedwater pH/Corrosion/ Dissolved Oxygen/Biocide control
Mineral Insulating Oil	Liquid	30,000 gallons (estimated, to be confirmed)	Indoors	Electrical Transformers
Lubricating Oil	Liquid	21,000 gallons (estimated, to be confirmed)	Indoors	Combustion Turbine/Steam Turbine/Misc. Equipment Lube Oils
Combustion turbine wash chemicals	Liquids	Intermittent use/Chemicals not stored on site/cleaning by contractor	NA*	Combustion Turbine Generator cleaning
HRSG* Cleaning Chemicals (e.g., HCl, Citric acid, EDTA Chelant, Sodium Nitrite)	Liquids	Multiyear cleaning requirement/ Temporary storage only	Indoors	HRSG Chemical Cleaning
Carbon Dioxide	Pressurized Gas	50,000 standard cubic feet	Outdoors	Generator purging after normal and emergency shut down
Hydrogen	Pressurized Gas	29,000 standard cubic feet	Outdoors (Assumes use of multi-tube trailer. Active volume based on 1 of 10 tubes per trailer)	Generator cooling (To be verified - Assumes use of H_2-cooled generators – dependent on selected manufacturer)

*Ar- argon; ASU – air separation unit; CO – carbon monoxide, HCl – hydrochloric acid; He – helium; HRSG – heat recovery steam generator H_2 – hydrogen gas, H_2S – hydrogen sulfide; NA – not applicable; SO_2 – sulfur dioxide; TBD – to be determined

Diesel fuel would be used for the emergency generator and for the fire water pump. The expected stored quantity (2000 gallons) was based on approximately 8 hours of operation of the diesel generator at full output (about 3 MWe). This limited storage would require the plant to have contracts with fuel providers specifying that deliveries of diesel fuel could be provided in less than 8 hours in the case of an emergency. Appropriate containment and monitoring for spillage control would be provided.

Other petroleum-containing hazardous materials include the combustion and steam turbine lube oils, steam turbine hydraulic fluid, transformer oils and miscellaneous plant equipment lube oils. These materials would be delivered and stored in approved containers, stored in areas with appropriate secondary containment, and would be used within curbed areas that only drain to internal drains connected to an oil-water separator system. Oil reservoirs, containment areas, and the separators would be checked regularly to identify potential leaks and to initiate appropriate actions.

2.2.3.6 Pollution Prevention, Recycling, and Reuse

The Mesaba Generating Station would be designed to minimize process-related discharges to the environment while demonstrating industrial technology in the use of coal for power generation. Table 2.2-9 lists the key pollution prevention, recycling, and reuse features that would be employed as part of that plan.

Table 2.2-9. Key Pollution Prevention, Recycling and Reuse Features

Spill Prevention Control and Countermeasure (SPCC) Plan	The SPCC Plan would develop measures to take in the event of a spill, thereby insulating environmental media from the effect of accidental releases. All aboveground chemical storage tanks would be lined or paved, curbed/diked, and would have sufficient volume to meet all regulatory requirements. A site drainage plan would also be developed that would isolate routine, process-related operations from affecting the surrounding environment.
Feed Material Handling	The coal storage area would be paved or lined so that runoff can be collected, tested, and treated as necessary. The coal storage area has facilities to control fugitive dust emissions. The coal conveyors would be covered.
Coal Grinding and Slurry Preparation	The coal grinding equipment would be enclosed and any vents would be routed to the tank vent incinerator/auxiliary boiler. The water used to prepare the coal slurry would be stripped process condensate (recycled).
Gasification, High Temperature Heat Recovery, Dry Char Removal and Slag Grinding	The char produced in gasification would be removed and returned to the first stage of the gasifier (recycled). This improves the carbon conversion in the gasifier and reduces the amount of carbon contained in the gasifier slag. Reduced carbon content makes the slag more marketable and reduces the likelihood that it must be disposed in a landfill.
Slag Handling	The slag dewatering system would generate some flash gas that contains hydrogen sulfide (H_2S). The flash gas would be recycled back to the gasifier via the syngas recycle compressor. Water that is entrained with the slag would be collected and sent to the sour water stripper for recycling.
Sour Water System	Sour water would be collected from slag dewatering and the low temperature heat recovery system, and the ammonia and H_2S would be stripped out and sent to the sulfur recovery unit. The stripped condensate would be used to prepare coal slurry. Surplus stripped condensate would be sent to the zero liquid discharge system.

Table 2.2-9. Key Pollution Prevention, Recycling and Reuse Features

Zero Liquid Discharge (ZLD) System	The ZLD system would concentrate and evaporate the process condensate. The ZLD system would produce high purity water for reuse and a solid filter cake for disposal off site. The ZLD would concentrate and dispose of heavy metals and other contaminants in the process condensate. The ZLD would also be a recycle unit because the recovered water would be reused, reducing the total plant water consumption. **An enhanced ZLD system would also recover and treat cooling tower blowdown water for recycle and reuse within the plant, thereby eliminating all discharges to surface waters.**
Carbonyl Sulfide (COS) Hydrolysis	The gasifier would produce small quantities of COS that cannot be absorbed in the AGR system. The COS hydrolysis unit would convert COS to hydrogen sulfide (H_2S), which would then be removed in the acid gas removal unit. The COS hydrolysis unit would improve the sulfur recovery efficiency and reduce the total amount of sulfur in the syngas, and ultimately, the release of sulfur dioxide (SO_2) from the heat recovery steam generator (HRSG) stacks.
Mercury Removal Features	The mercury removal unit would use specially formulated activated carbon to capture trace quantities of mercury that may remain in the syngas. Mercury in the sour water handling system would be captured via activated carbon filters strategically placed prior to potential release points.
Acid Gas Removal (AGR)	The AGR system would remove H_2S from the raw syngas and produce a sweet (low sulfur) syngas for use in the combined cycle power block. The AGR would produce concentrated H_2S feed for the SRU.
Sulfur Recovery Unit (SRU)	The SRU would convert the H_2S to elemental sulfur that would be marketed for use as a fertilizer additive or for production of sulfuric acid. The tail gas from the SRU would be recycled back to the gasifier.
Fuel Gas Moisturization	The fuel gas moisturization system would improve the recovery of low level heat from the gasification process and serve as a diluent for the syngas used in the combustion turbines. Nitrogen from the air separation unit would also be used as a diluent. Dry, clean syngas typically has a heating value in the range of 250 to 300 British thermal units per standard cubic foot. If the dry syngas was used directly in the combustion turbines, the thermal nitrogen oxides (NO_x) formed would be too high. Earlier IGCC plants used steam injection for NO_x control, which is less efficient than using fuel moisturization and nitrogen.
Integration of the Air Separation Unit (ASU) and Power Block	The ASU would produce nitrogen as a by-product; this is an effective diluent for NO_x control. The ASU would require large amounts of electrical power for air compression. Part of the air compression requirements would be provided by the combustion turbine compressors, further integrating the gasification and combined cycle power block portions. This integration reduces the ASU auxiliary power requirement and increases the net power output by the plant.
Boiler Blowdown and Steam Condensate Recovery	Boiler blowdown and steam condensate would be recovered from the combined cycle power block and gasification facilities and would be reused as cooling tower makeup.
Training and Leadership	All corporate and plant personnel would be trained on continuous improvement in environmental performance especially as such training and programs apply to: i) setting, measuring, evaluating and achieving waste reduction goals and ii) reporting the results of such programs in annual reports made available to the public.

2.2.4 Construction Plans

2.2.4.1 Construction Staging and Schedule

Under Excelsior's proposed schedule, construction of Phase I would begin on the selected site in **2010** and would be completed by **2014**. Construction of Phase II would begin in **2012** and it would be operational by **2016**. For Phase I start-up, system and feedstock testing, and long-term performance and reliability demonstration of the project would require a minimum of 1 year (beginning in **2014**), after which the plant could continue in commercial operation.

Prior to construction, environmentally sensitive areas at the selected site would be identified and flagged such that these areas would not be disturbed during site preparation activities. In accordance with 40 CFR Part 122.26(b)(14)(x), a Storm Water Pollution Prevention Plan (SWPPP) would be developed to identify best management practices (BMPs) for erosion prevention and sedimentation control that would be implemented during construction. The plan would include a description of construction activities and address the following:

- Potential for discharging sediment and/or other potential pollutants from the site;
- Location and type of all temporary and permanent erosion prevention and sediment control BMPs along with procedures to be used to establish additional temporary BMPs as necessary for the site conditions during construction;
- Site map with existing and final grades, including dividing lines and direction of flow for all pre and post-construction stormwater runoff drainage areas located within the project limits. The site map must also include impervious surfaces and soil types;
- Locations of areas not to be disturbed;
- Location of areas where construction would be phased to minimize duration of exposed soil areas.
- Identify surface waters and wetlands either on site or within one-half mile from the site boundaries, which could be affected by stormwater runoff from the construction site, during or after construction; and
- Methods to be used for final stabilization of all exposed soil areas.

Initial site preparation activities would include building access roads, clearing brush and trees, leveling and grading the site, bringing in necessary utilities, and undertaking dewatering activities that may be required. Construction of temporary parking, offices, and material storage areas at this time would involve the use of large earthmoving and logging equipment to clear and prepare the site for construction of the plant. Trucks would be required to bring fill material for roadways and the plant, removing harvested timber, removing debris from the site, and stockpiling fill material. Gravel and road base would be utilized for the temporary roads, material storage, and parking areas.

The construction plan description generally would apply to both Phases I and II of the project. The Phase II portion of the Mesaba Generating Station would be installed in the equipment staging and lay-down area utilized for Phase I construction. Therefore, **for** Phase II **construction, temporary off-site** staging and lay-down areas would be **acquired** and prepared at the beginning of the Phase II work, with the required permits and approvals obtained prior to beginning the site preparation work.

Excelsior has identified several candidate locations for off-site staging and lay-down areas in the vicinities of both potential plant sites as shown on figures in Section 2.3. Collectively these locations contain sufficient land area to provide the 85 acres needed during construction for stockpiling materials, storing equipment, and temporary operation of a concrete batch plant. In identifying candidate locations, Excelsior considered properties owned by mineral extraction firms or tax

forfeiture lands that have been cleared or disturbed during prior activities and, therefore, do not contain surface waters, wetlands, or sensitive natural resources. Candidate sites also have access to local roadways and are within a 10-mile radius of the respective plant footprint. Excelsior would select one or more of the candidate locations for staging and lay-down use near the permitted generating station site prior to Phase II construction. For the purposes of assessing potential impacts in this EIS, it is assumed that the entire lay-down area would be cleared, and high-use portions would be graveled or lined in some manner. Consistent with BMPs for erosion and sedimentation control, the site would be ringed by silt fencing, and appropriate measures would be implemented to reduce the transport of dust and soils off site by construction vehicles. Depending upon security requirements, a perimeter fence may be constructed. At the end of construction for Phase II, the site would be restored to pre-existing conditions; materials, wastes, and equipment would be removed; and the site would be replanted with vegetation similar to that currently existing.

Detailed construction plans and specifications for Phase II would include provisions necessary to protect construction and plant operating personnel and equipment from potential impacts from the adjacent operating Phase I plant and to minimize operational disruption during Phase II construction.

2.2.4.2 Construction Materials

Construction material would be delivered to the site by truck and rail. A plant access road would be developed for construction traffic. Completion of the rail spur at the start of construction activities would allow plant equipment to be delivered by rail. An estimated 15 to 20 semi-trailer trucks daily would be required to deliver material to the site. Construction deliveries by rail would likely require two trains per week. The relatively small amounts of ballast required for construction of the rail loop would be obtained from existing quarries that serve the BNSF and CN railway companies. The impacts of the small incremental demand for ballast would not affect the production capacities of the quarries.

During construction, temporary utilities would be provided to support construction offices, worker trailers, lay-down areas and the construction areas. Temporary construction power would be provided by the local utility company. Temporary generators could also be used until the temporary power system would be completed. Area lighting would be provided and strategically located for safety and security. Local telecommunication lines would be installed for phone and IT communications. Potable water bottles would be provided for drinking water. Construction water would be supplied either by pumping and treating surface waters in the vicinity or by connection to the local municipal water system.

2.2.4.3 Construction Wastes

Construction of the Mesaba Generating Station would generate certain amounts of wastes. The predominant waste streams during construction would include site clearing vegetation, soils, and debris, hydrostatic pressure-testing (hydrotest) water, used lube oils, surplus materials, and empty containers.

Surplus and waste materials would be recycled to the extent practical. If feasible, removed site vegetation would be salvaged for pulp and paper production, or recycled for mulch. Construction water use would be heaviest during the testing phase. Hydrotest water would be reused for subsequent pressure tests if practical. Spent hydrotest water would be tested to determine if it exhibits hazardous characteristics. If hazardous, the hydrotest water would be sent off site for treatment; if non-hazardous, it would be routed to the detention basin for discharge to local surface waters (in accordance with an NPDES permit). Potential scrap and surplus materials and used lube oils would be recycled or reused to the maximum practical extent. Temporary sanitation facilities would include portable toilets that would be cleaned daily and the wastes hauled to a local disposal facility.

Although Excelsior would ultimately be responsible for the proper handling and disposal of construction wastes, construction management, contractors, and their employees would be responsible for minimizing the amount of waste produced by construction activities and would be expected to fully cooperate with project procedures and regulatory requirements for waste minimization and proper handling, storage, and disposal of hazardous and non-hazardous wastes. Each construction contractor would be required to include waste management and waste minimization components in their overall project health, safety, and environmental site plans. Typical construction waste management measures may include:

- Dedicated areas and a system for waste management and segregation of incompatible wastes. Waste segregation should occur at time of generation;
- A waste control plan detailing waste collection and removal from the site. The plan would identify where waste of different categories would be collected in separate stockpiles, bins, etc., with appropriate signage to clearly identify the category of waste;
- Hazardous wastes, as defined by the applicable regulations, would be stored separately from non-hazardous wastes (and other, non-compatible hazardous wastes) in accordance with applicable regulations, project-specific requirements, and good waste management practices;
- Periodic construction supervision inspection to verify that wastes are properly stored and covered to prevent accidental spills and wastes from being blown away;
- Appropriately labeled waste disposal containers; and
- Good housekeeping procedures. Work areas would be left in a clean and orderly condition at the end of each working day, with surplus materials and waste transferred to the waste management area.

2.2.4.4 Construction Labor

The average number of construction personnel during Phase I (**2010** through **2014**) would be about 600, with as few as 50 and as many as 1,400 construction personnel on site at any given time. It is estimated that the on-site work force at the time of peak construction activities would be approximately 1,500 personnel, which would include Excelsior's staff, consultants, and visitors in addition to construction personnel. Excelsior expects that labor would be provided through the local Building Trades.

It is estimated that most of the construction activities would occur during a single shift between the hours of 7:00 am and 5:30 pm, Monday through Saturday. Additional hours and/or a second shift may be necessary to make up schedule deficiencies or to complete critical construction activities. During the warm weather season, a second shift may be utilized to complete civil work activities. There would be X-ray inspection, weld stress-relieving, and some production welding that typically occurs during a second shift. The commissioning activities, prior to initial plant startup, would occur 24 hours per day.

2.2.4.5 Construction Safety Policies and Programs

Emergency services during construction would be coordinated with the local fire departments, police departments, paramedics, and hospitals. A first aid office would be provided on site for minor first aid incidents. Trained/certified Health Safety and Environmental personnel would be on site to respond and coordinate emergencies. All temporary facilities would have fire extinguishers, and fire protection would be provided in work areas where welding work would be performed.

The natural gas pipeline facilities would be designed, constructed, tested, and operated in accordance with all applicable requirements included in the DOT regulations in Title 49 CFR Part 192 Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards; and other applicable Federal

and state regulations, including U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) requirements. These regulations are intended to ensure adequate protection for the public and to prevent natural gas pipeline accidents and failures. Among other design standards, Part 192 specifies pipeline material and qualification, minimum design requirements, and protection from internal, external, and atmospheric corrosion.

2.2.5 Operational Plans

2.2.5.1 Operational Demonstration Test Plans

Excelsior would develop and submit an Operational Demonstration Test Plan to the DOE for review and comment prior to plant startup. The plan would be intended to achieve the following objectives:

- Demonstrate mercury removal, activated carbon life expectancy, and operational costs in an IGCC application;
- Demonstrate smooth ramp-up to full capacity and greater than 90 percent annual availability with the spare gasification train;
- Demonstrate manifolding of gasification trains and operational swapping;
- Demonstrate that phased refractory repair contributes to improved gasifier availability; and
- Demonstrate the feedstock-flexible design.

2.2.5.2 Plant Demonstration and Operations

The plant demonstration would require approximately 12 months. Excelsior would implement the Operational Demonstration Test Plan and document the results of the demonstration in relation to the project objectives.

Following the demonstration phase, Mesaba Generating Station would be operated as a baseload generation facility. The station would operate 24 hours per day except during scheduled outages for maintenance. The facility would be designed for high reliability with multiple process trains. Although the plant would include three gasification trains (from slurry preparation through dry char removal), only two gasification trains would be required for full output (at 50 percent capacity each). The spare train would normally be in standby service unless maintenance was being performed on one of the gasifier trains. The Mesaba Generating Station would be designed to achieve an availability of greater than 90 percent during full operation.

The Mesaba Generating Station would be capable of “single train operation” where only one gasifier and one combustion turbine would operate. The single train plant output would be somewhat below one half of the full load output. Additional turndown would be possible by reducing the gasifier throughput in either of the two trains or single train operation. Operation at reduced loads would be limited by physical constraints, as well as the combustion turbine supplier’s emission guarantees, to about 70 percent of the full load output.

The combustion turbine generators must be started on natural gas and loaded to a minimum level before the fuel can be switched to syngas. The combustion turbine generators would be able to co-fire natural gas and syngas within limits set by the combustion turbine manufacturer. The CTGs could also operate on 100 percent natural gas. The power block would be designed to operate on 100 percent natural gas when required, but at reduced capacity relative to operation on syngas.

2.2.5.3 Operational Labor

Operator hiring and training would begin about 1 year before the commencement of start-up. Gasification area personnel would need extensive training in plant operations, reactive chemicals and safety, industrial hygiene, and environmental compliance similar to that of operators in refineries and chemical plants. Process simulators would be used as part of the training program. Generally, the staff would consist of management and engineers, shift supervision and operations management, and shift operating personnel. The operations staff would be integrated into the commissioning team so that they would have hands-on experience with the plant when each system is operational after construction.

In addition to operations and management personnel, the Mesaba Generating Station would require qualified staffing to support power production planning; equipment maintenance; procurement; laboratory chemists and technicians; health, safety, and environmental specialists; administrative support; benefits/human relations; and other necessary functions. The expected number of personnel during operations is presented in Table 2.2-10.

Table 2.2-10. Estimated Operating Staff Required for the Mesaba Generating Station

System	Phase I Staff	Phase II Staff	Total Staff (Phases I and II)
Gasification and Air Separation Unit Subtotal	96	64	160
Combined Cycle Power Block Subtotal	11	11	22
Total Staff Requirement	107	75	182

2.2.5.4 Health & Safety Policies and Programs

Facility design features and management programs would be established to address hazardous materials storage locations, emergency response procedures, employee training requirements, hazard recognition, fire control procedures, hazard communications training, personal protection equipment training and accidental release reporting requirements. Significance criteria would be determined on the basis of Federal, state and local guidelines, and on performance standards and thresholds adopted by responsible agencies.

Basic approaches to prevent spills to the environment include comprehensive containment and worker safety programs. The comprehensive containment program would ensure that appropriate tanks, walls, dikes, berms, curbs, etc. are sufficiently contained. Worker safety programs would be established to ensure that workers are aware and knowledgeable about spill containment procedures and related health and environmental protection policies.

The Minnesota Office of Pipeline Safety would have jurisdiction over the gas pipeline. Pipeline facilities would be designed, operated, and maintained in accordance with DOT Minimum Federal Safety Standards in 49 CFR Part 192, which defines and specifies the minimum standards for operating and maintaining pipeline facilities. The regulations require an Emergency Plan that would provide written procedures to minimize hazards from a gas pipeline emergency. Key elements of any emergency plan would include procedures for:

- Receiving, identifying, and classifying emergency events such as gas leakage, fires, explosions, and natural disasters;
- Establishing and maintaining communications with local fire, police, and public officials and coordinating emergency responses;

- Making personnel, equipment, tools, and materials available at the scene of an emergency;
- Proactive protection for people and insuring human safety from actual or potential hazards; and
- Emergency shutdown of the system and safely restoring service.

The safety standards specified in Part 192 require each pipeline operator to:

- Develop an emergency plan, working with local fire departments and other agencies, to identify personnel to be contacted, equipment to be mobilized, and procedures to be followed in responding to a hazardous condition caused by the pipeline or associated facilities;
- Establish and maintain a liaison with the appropriate fire, police, and public officials in order to coordinate mutual assistance when responding to emergencies; and
- Establish a continuing education program to enable customers, the public, government officials, and those engaged in excavation activities to recognize a natural gas pipeline emergency and report it to appropriate public officials.

Before placing the pipeline in service, a procedural manual for operation and maintenance of the proposed pipeline would be prepared. The pipeline facilities would be operated and maintained in compliance with Minnesota Office of Pipeline Safety regulations. The operator would become a member of the Gopher State Excavators One-Call system that is utilized to prevent damage to underground pipelines by excavators and others performing underground construction. Periodic aerial and ground inspections by pipeline personnel would be conducted to identify dead vegetation, soil erosion, unauthorized encroachment, or other conditions that could result in a safety hazard or require preventative repairs or maintenance. In addition, gas leak detection and cathodic protection surveys would be conducted periodically to ensure proper and adequate corrosion protection and proper operation.

2.2.5.5 Worst-Case Operating Scenario

For development of its “worst case” operating scenario, parameters yielding maximum emissions were identified. Operating conditions producing maximum emissions/discharges from the Mesaba Generating Station are identified in Table 2.2-11, which assumes operation of the gasifiers under partial slurry quench conditions and considers known seasonal influences and the range of potential feedstocks for which the Mesaba IGCC Generating Station would be designed to utilize. Pollutant emissions, discharges, and waste products described in this chapter were quantified by Excelsior assuming the conservative partial slurry quench conditions.

Table 2.2-11. Key Performance Indicators Used to Assess Worst Case Environmental Impacts or Emissions of Mesaba Energy Project (Phase I, partial slurry quench Mode)

Performance Parameter	Estimated Range*	Comments
CTG gross power, MWe	440	Total for two CTGs
STG gross power, MWe	265 – 300	Varies depending on quantities of steam generated by Gasification Island and HRSGs
Net plant generation, MWe	580 – **605**	Output from CTGs plus STG, less internal consumption and losses
Coal/coke feed rate, tons/day (as received)	5,300 – 8,550	Feed rate to gasifiers
Coal/coke feed energy, million Btu/hour (HHV)	5,280 – 5,910	Energy content of gasifier feedstock
Product syngas energy, million Btu/hour (HHV)	4,190 – 4,368	Energy content of syngas fuel delivered to CTGs
Coal conversion efficiency	0.71 – 0.80	Fraction of solid feedstock energy in syngas feed to CTGs
Net overall heat rate, Btu/kWh (HHV)	8,900 – 9,500	Solid feedstock energy used per unit of net electricity to grid
Flux feed, tons/day	0 – 250	Conditioning agent for gasifier feedstock
Slag by-product production, tons/day	500 – 800	Varies depending on feedstock composition and flux use
Sulfur by-product production, tons/day	30 – 165	Varies depending on feedstock composition

*generation, emission, or discharge range
Acronyms: Btu – British thermal unit; CTG – combustion turbine generator; HHV – higher heating value; kWh – kilowatt hour; MWe – megawatt electricity; STG – steam turbine generator

Full slurry quench would be achieved by increasing the slurry feed to the second stage of the gasifier to the point where only slurry is used to quench the syngas, thereby eliminating the thermal loss associated with water used to cool the syngas and increasing the overall efficiency of the plant. These efficiency gains would translate into reduced feedstock use and, consequently, reduced pollutant emissions/discharges. However, full slurry quench is an IGCC design improvement that is subject to further engineering and verification by experience at Wabash River Plant. Therefore, **as stated in Section 2.2.2.1,** full slurry quench**'s** expected benefits have not been reflected in the maximum resource requirements or maximum pollutant emissions/discharges quantified in this EIS.

2.3 DESCRIPTION OF ALTERNATIVE SITES AND CORRIDORS

This section describes the unique features of alternatives considered by Excelsior to implement the Mesaba Generating Station at either the West or East Range Site, including potential plant sites and respective alternatives for water sources and receiving waters, natural gas sources, rail and road alignments, and HVTL corridors.

2.3.1 West Range Site and Corridors

2.3.1.1 Proposed IGCC Plant Site

The West Range Site, including the plant footprint and buffer land, is located within the city limits of Taconite in Iron Range Township, Itasca County, Minnesota. The site is generally bounded by County Road (CR) 7 to the west, a HTVL corridor to the north, and the Township boundary to the east (Figure 2.3-1). The site encompasses approximately 1,**708** acres zoned by Itasca County for industrial use. Only the northern-most 200 acres of the site are outside the Taconite city limits.

Two HVTL corridors traverse the buffer land, one in a north-south direction and a second in an east-west direction. The HVTLs that occupy the north-south corridor are not currently in use. The closest residential properties are located along CR 7, approximately 3,800 feet west of the proposed power plant footprint, and on the north shore of Big Diamond Lake, approximately 3,850 feet to the southeast.

As described in Section 2.2.4.1, off-site staging and lay-down areas would be acquired to provide 85 acres of land supporting construction of Mesaba Phase II. Figures 2.3-1 and 2.3-3 show the candidate locations for the West Range Site.

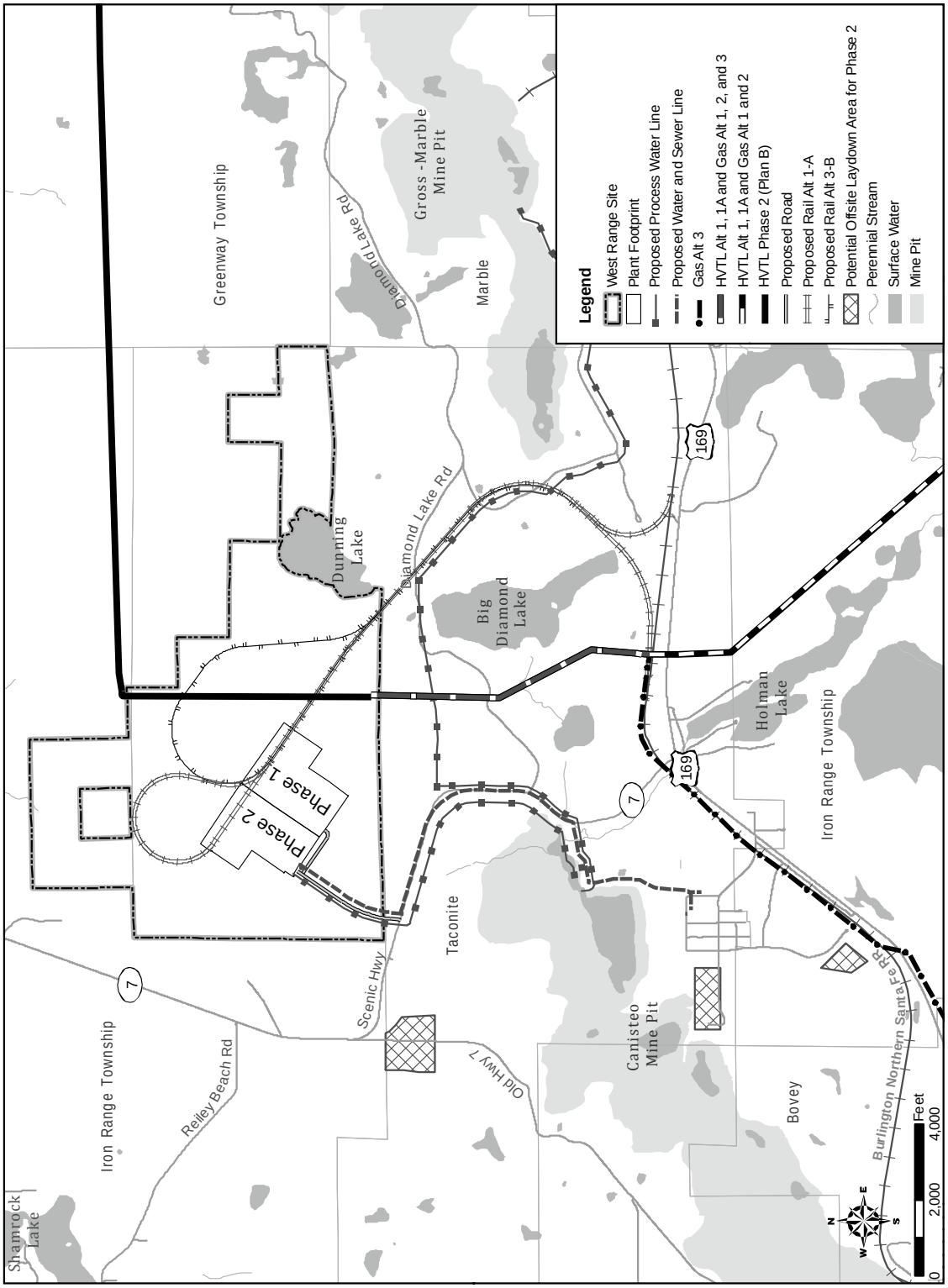


Figure 2.3-1. West Range Plant Site

2.3.1.2 Transportation Facilities

Existing Rail Lines in Vicinity of the West Range Site

The West Range Site is located approximately 1.5 miles north of the mainline tracks of the BNSF and CN Railroads.

BNSF Rail Line

Rail shipments of coal from the PRB would be transported on the BNSF rail line across North Dakota and then to Gunn and Taconite, Minnesota. Currently, about six trains per day travel along the BNSF rail line from North Dakota to Gunn at speeds up to 25 miles per hour. From Gunn to the West Range Site (approximately 12.5 miles) BNSF carried about 4 to 10 trains per day. This track is now closed because of danger associated with pit wall collapse. Alternately, the BNSF rail line could be used from Brookston northward to Kelly Lake and Keewatin westward to the West Range Site. This route would primarily be used to transport materials other than coal to the West Range Site. Unit coal trains would only use this route if there were a track problem east of Gunn; use of this route to transport coal from Powder River Basin would increase the travel distance by 100 miles in each direction.

CN Rail Line

CN would deliver coal by way of the Superior, Wisconsin, area northward to Virginia, Minnesota, and then west past Hibbing and Keewatin to Taconite/Bovey. CN unit coal trains would approach the West Range Site from the east, travel past the site, and either back into the site or stop in Bovey, have the locomotives disconnect and reconnect to the other end of the train, and access the site from the west. A reverse move would be required for the empty train. Unit coal trains supplied by CN would use an existing siding in Bovey that would need to be lengthened to accommodate this move. Delivery of other materials to the plant would occur via the same type of movement, but with shorter trains.

A short span of existing CN track near the site is temporarily out of service because of the water elevation in the Canisteo Mine Pit (CMP). Since the cessation of mining, the pit has filled with water and affected the integrity of the CN track along the steep edge of the CMP near Bovey. CN has determined that repairs to this line would not be appropriate without a solution to the rising water levels in the CMP. Under common carrier regulations, the track would be required to be repaired and returned to service at the request of BNSF or another shipper. Development of the West Range Site would lower water levels in the pit allowing this section of the rail line to be redeveloped and returned to operation (Excelsior, 2006b).

Rail Access to the West Range Site

Coal could be delivered to the West Range Site by either BNSF or CN, which operate on a single track located less than 2 miles from the West Range Site. Direct access to the site would be achieved by the construction of short spurs from the mainline tracks onto the site boundary. Construction of 2 miles of new track would be required between the existing mainline track and the boundary of the West Range Site; an additional 4 miles of new track would be required for the portion of the rail loop within the site boundaries.

The Draft EIS considered three alternative rail access alignments for the West Range Site, identified as Alternatives 1A, 1B, and 2. Based on the Draft EIS, Excelsior eliminated Alternatives 1B and 2 from further consideration for the project. Following publication of the Draft EIS, USACE, EPA, and other agencies submitted comments expressing their concerns about the extent of

wetlands impacted by the rail alternatives. USACE particularly expressed the need for avoidance and minimization of wetland impacts in the siting of the Mesaba Energy Project and associated infrastructure. DOE discussed these concerns with USACE in several telephone conferences and meetings during 2008 and conferred with Excelsior to address the need for avoiding and minimizing impacts to wetlands. The efforts made by Excelsior in coordination with DOE are summarized in DOE's updated Wetland and Floodplains Impact Assessment (Appendix F2). As a result of those efforts, Excelsior identified a new preferred rail alignment Alternative 3B that has been evaluated in the Final EIS. Revised Figure 2.3-2 shows the alignments of Alternatives 1A and 3B. Revised Table 2.3-1 provides a comparison of key aspects of the two rail alternatives.

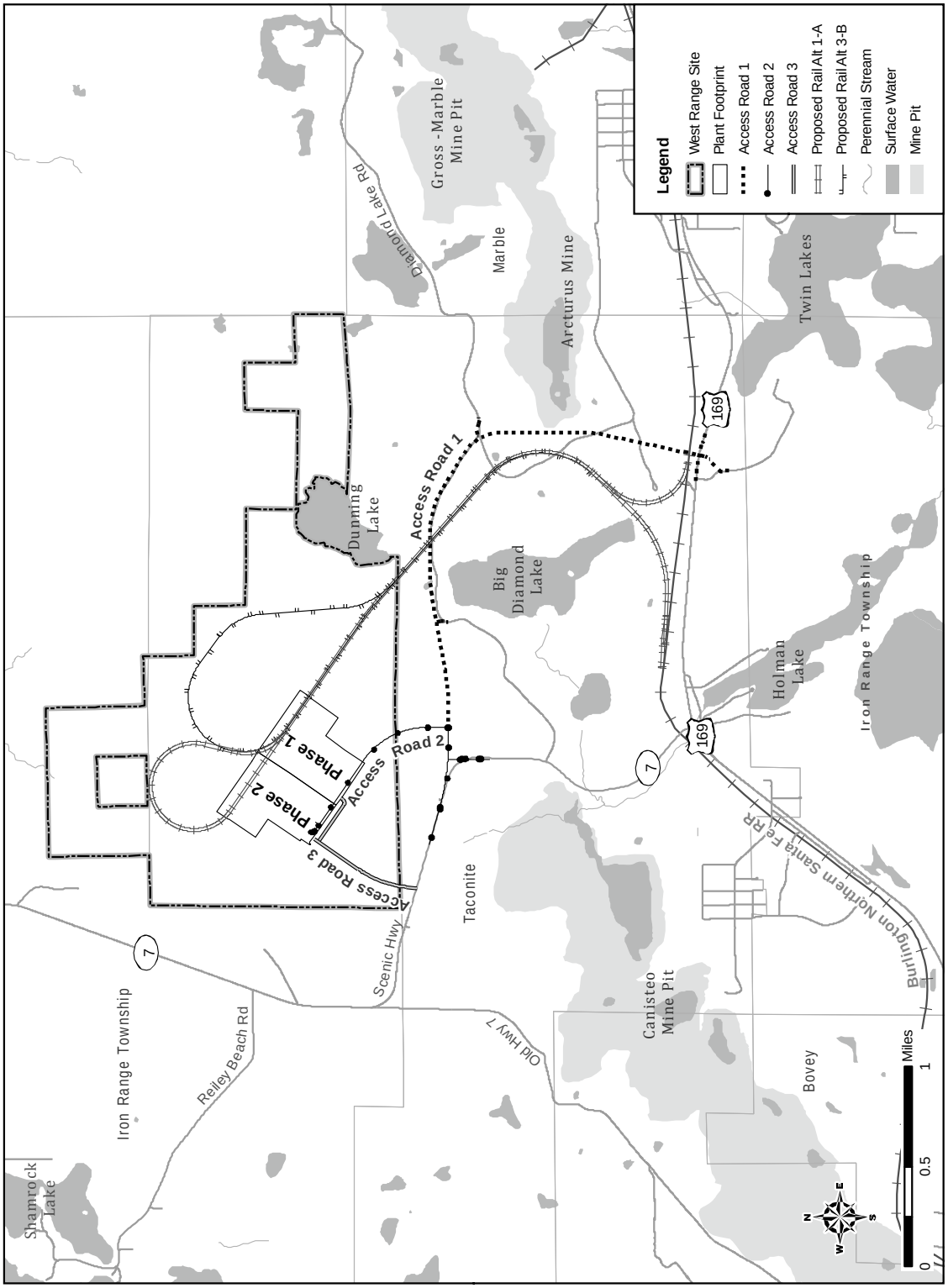


Figure 2.3-2. West Range Rail and Road Alternatives

Table 2.3-1. Rail Access Alternatives – West Range Site

Attribute	Alternative 3B	Alternative 1A
Total length of track (feet)	22,070	21,539
Rail loop elevation (feet)	1,405	1,390
Off-site length of track (feet)	15,419	15,419
Train speed (mph)	10	10
Maximum grade	0.34%	0.30%
Maximum Curvature (loaded coal train)	3 degrees	2 degrees 30 minutes
Off-site right-of-way (acres)	15	15
Largest Cut (feet)	65	65
Largest Fill (feet)	55	25
Approximate Cut Qty (cubic yards)	2,620,000	3,725,000
Approximate Fill Qty (cubic yards)	620,000	610,000
Total area disturbed (acres)	107.4	117.9
Direct wetland impact (acres)	5.7	17.9
Wetland adjacent to and enclosed by rail loop (acres)	0	58.3
No. of residences within 1,000 feet	3	3
Closest residence (feet)	470	470
Alignment Meets Applicable Standards	Yes	Yes
Comments	Preferred	Alternative

Rail Alignment Alternatives 1A and 1B

NOTE: Following publication of the Draft EIS, Excelsior eliminated Alternative 1B from further consideration. The factors justifying its elimination as reviewed by DOE include the identification of Alternative 3B, which has much lower impacts to wetlands and other environmental parameters, and concerns about the practicability of constructing Alternative 1B, which would require very large cuts through waste rock piles and filling a very deep wetland northeast of Dunning Lake. Therefore, the description of Alternative 1B in the following discussion is no longer relevant to the Final EIS, and Alternative 1B has been removed from Figure 2.3-2.

As shown in Figure 2.3-2, the common alignment for Alternatives 1A and 1B would divide from the existing CN and BNSF main lines that run parallel to U.S. Highway (US) 169, generally following an old railroad grade around the southern tip of Big Diamond Lake. East of the lake, Alternative 1A would turn to the northwest between Big Diamond Lake and Dunning Lake to the proposed generating station. The alignment for Alternative 1B would follow the same route east of Big Diamond Lake. However, instead of diverting northwest between Big Diamond and Dunning Lakes, it would continue north on the east side of Dunning Lake. Once north of the lake, it would bear west to the site. Both Alternatives 1A and 1B would include a loop to the north of the proposed Mesaba Generating Station.

The alignments for Alternatives 1A and 1B would meet a Railroad Design Guideline developed by Excelsior based on BNSF and CN unit train standards and could accommodate access by both rail service providers. Acceptable curve radii require that the track alignment be directed east of Big Diamond Lake. To provide an acceptable grade for Alternative 1A, track would require filling low areas located between the two lakes and cutting from terrain obstacles approaching the plant site. To provide an acceptable grade for Alternative 1B, construction would require cutting through a large tailing pile east of Big Diamond

Lake and through a large wetland area on the northeast corner of Dunning Lake; it would require significant additional contouring near the plant site. The rail loop for either alternative would be mostly on a fill section.

Alternative 1A would be located within 400 feet of a residence on the north shore of Big Diamond Lake and within 700 feet of a residence on the south shore of Dunning Lake. Alternative 1B would pass within about 1,200 feet of the residence on Dunning Lake. Either Alternative 1A or 1B would require construction of a bridge over the proposed new access roadway to the West Range Site to avoid public crossings that could cause traffic disruption near the Mesaba Generating Station. Existing forest roads affected by the rail alignment could be re-routed to avoid traffic disruptions.

Excelsior identified Alternative 1A as the preferred alignment **for the Draft EIS** based on cost, better alignment of curves, and lower anticipated environmental impacts. Alignment 1B would place the rail dumper building in an area that would require coal to be conveyed across a greater distance to the Mesaba Generating Station and would require significant earth removal work (as the route would cut across several large tailing piles). The only practical benefit the alignment offers over Alternative 1A is that it would divert rail traffic away from the several residential properties located on Big Diamond and Dunning Lakes. Alternative 1A would require easements over, or acquisition of, some private property. Both alternatives would have a surplus of cut/fill material that would require disposal.

Rail Alignment Alternative 2

Excelsior initially considered Alternative 2 for a rail alignment west of Big Diamond Lake (Figure 2.3-2 **in the Draft EIS**). However, due to railway routing restrictions, BNSF would not be able to originate a shipment to the site using the CN tracks. Instead, the origination point for the BNSF alignment would be west of the CN rail spur. To maintain acceptable curvatures for this alignment in accordance with the Railroad Design Guideline, based on BNSF standards, the origination point would require the alignment to be routed across a portion of Big Diamond Lake. Excelsior determined that such an alignment would not be economically or environmentally feasible and, therefore, eliminated it from further consideration **with concurrence by DOE**. **Alternative 2 has been removed from Figure 2.3-2 in the Final EIS.**

Rail Alignment Alternative 3B

Excelsior, with support from DOE, developed Alternative 3B in response to concerns raised by USACE and other agencies about the need to avoid and minimize wetland impacts identified in the Draft EIS. An important factor in this decision was that a design change in the short line rail serving the Minnesota Steel project raised its elevation, which helped Alternative 3B become a practicable alternative. Excelsior has since identified Alternative 3B as its preferred rail alignment for the Mesaba Energy Project. The alignment would follow the same route as Alternative 1A from the point of interconnection with the CN and BNSF main line to the Mesaba plant site. However, Alternative 3B would begin its rail loop approximately at a point between the footprints for Phases I and II as indicated in Figure 2.3-2. The rail loop would follow a relatively level grade around a hill located northeast of the plant footprint and rejoin the rail spur near Dunning Lake at the southeastern corner of the property.

The coal dumper would be located on the straight segment of rail alignment before the first curve in the loop, at a point approximately 2,000 feet closer to the southeastern property boundary. In conjunction with Alternative 3B, Excelsior proposes to switch the configuration of the plant site such that the Phase I footprint would be on the southeast side, closest to the coal offloading facility, and the Phase II footprint would be on the northwest side of the combined plant site. Additionally, in conjunction with Alternative 3B, Excelsior proposes to move the combined plant footprint

approximately 280 feet to the northwest on the property along the same axis as the originally proposed footprint. Finally, due to the short line rail design change mentioned above, Excelsior determined that the rail elevation can be increased, resulting in a base plant and rail yard elevation of 1,405 feet, approximately 15 feet higher than originally planned, which would reduce grading requirements.

Other Rail Alternatives Considered

Excelsior considered other rail alignments, including CN access from the west side of Big Diamond Lake and BNSF access from the east side of Big Diamond Lake. These alternatives were eliminated from further consideration because of the duplication of tracks, track alignments making it difficult to position the coal dumper, topographic limitations on rail placement to avoid unacceptable curves, and the impact on a larger area around Big Diamond Lake as compared to the other alternatives.

Roadway Access to the West Range Site

The West Range Site is located about 1.5 miles north of US 169, which is a two-lane east-west highway locally, and about 0.25 mile to the east of Itasca CR 7, commonly referred to as "Scenic Highway 7," which is a two-lane highway running mainly in a north-south direction. Other roadways include the Cross-Range Heavy Haul Road **(Diamond Lake Road)**, which is a gravel road used to allow heavy or slow loads to be transported between mines across the Iron Range. The Cross-Range Heavy Haul Road also provides access to a cluster of homes in the Big Diamond Lake/Dunning Lake area. The existing roadway system in the area of the West Range Site is shown on Figure 2.3-2.

As described in the Draft EIS, Excelsior considered two access road components (Access Road 1 and Access Road 2) to provide access to the West Range Site. **Following publication of the Draft EIS, coordination between DOE and Excelsior resulted in the consideration of an additional road access alternative to meet the objective of avoiding and minimizing impacts to wetlands in response to comments by USACE and other agencies. Excelsior's new preferred alignment for the plant access road would also avoid reliance on the proposed realignment of CR 7 by Itasca County, which has been deferred for the foreseeable future due to funding priorities as described below.**

Proposed Access Road 1

NOTE: Following publication of the Draft EIS, Itasca County deferred its planned realignment of CR 7 due to changes in funding priorities at the state level. Therefore, the construction of Access Road 1 as discussed in the following paragraphs is no longer anticipated to be available for the Mesaba project.

The Itasca County engineer expressed the county's interest in re-routing the alignment of CR 7 to better serve local traffic patterns and the additional traffic related to the two large projects undergoing environmental review (the Mesaba Energy Project and a Minnesota Steel Industries, LLC project designed to produce sheet steel from taconite ore). The current intersection of CR 7 and US 169 has poor visibility, relatively steep grades, and problems with slope stability. The realignment of CR 7 (Figure 2.3-2) would serve as the primary access road (Access Road 1) to the Mesaba Generating Station, and would better handle heavy equipment and increased traffic volumes resulting from construction activities tied to the two projects. Itasca County would construct and own the realigned roadway, which would involve constructing a new two-lane roadway beginning at a new access point on US 169, approximately 7,000 feet east of the existing CR 7 intersection. The new road would cross underneath the adjacent rail line, proceed north, then curve west between Big Diamond and Dunning Lakes before terminating in its connection with existing CR 7, just southwest of the West Range Site. The road would pass within a half

mile of 22 residences, including 6 residences within 500 feet. The closest residence would be within 300 feet.

Itasca County would seek to move the CR 7 designation to the new roadway and include it as part of the county's state aid system. This would put all future maintenance of the road under the County's responsibility. The section of existing CR 7 between the plant and US 169 would remain in place as either a lower level county road, or be turned over to the City of Taconite as a city street.

Proposed Access Road 2

NOTE: Access Road 2 has been eliminated from further consideration based on Itasca County's decision to defer the realignment of CR 7, as well as on comments by USACE and other agencies requesting DOE to avoid and minimize impacts on wetlands from plant infrastructure.

Access Road 2 would provide access to the Mesaba Generating Station from Access Road 1 (the new CR 7 alignment). If Access Road 1 were in place prior to construction of Phase I, all construction and plant employee traffic would use it to access the plant site. However, based on the timing of Itasca County's construction of Access Road 1, it might be necessary for the plant to be served by an access road from existing CR 7 (an extension of Access Road 2) until Access Road 1 was completed. If Access Road 1 were never constructed, special turning lanes onto CR 7 and US 169 would be required.

Proposed Access Road 3

Excelsior, with DOE support, developed Access Road 3 in response to concerns raised by USACE and other agencies about the need to avoid and minimize wetland impacts identified in the Draft EIS. Access Road 3 would intersect with the existing alignment of CR 7 west of the Itasca County Solid Waste Transfer Station and enter the West Range Site near the southwestern corner of the property boundary (Figure 2.3-2). The alignment of Access Road 3 would not be dependent upon the realignment of CR 7 by Itasca County; however, Excelsior anticipates that improvements to the intersection of CR 7 and US 169 would be required, including the provision of turning lanes at the intersection.

2.3.1.3 Water Sources and Discharges

Process Water Supply

For the West Range Site, the process water requirements would range from an annual average of **3,500** gallons per minute for Phase I to **7,000** gallons per minute for Phases I and II. The peak requirements would range from **5,000** gallons per minute (Phase I) to **10,000** gallons per minute (Phases I and II). Excelsior considered three alternatives for providing process water to the West Range Site, including the use of nearby abandoned mine pits, the Mississippi River, and groundwater sources. Each alternative is described below. Excelsior identified Alternative 1 (obtain water from nearby abandoned mine pits) as the preferred alternative.

Process Water Alternative 1 (Obtain Water from Abandoned Mine Pits and Prairie River)

Alternative 1 (Excelsior's preferred alternative) would involve pumping water from nearby abandoned mine pits, including the CMP, the Lind Mine Pit (LMP), and the Hill Annex Mine Pit (HAMP) Complex (Figure 2.3-3). The HAMP Complex includes the Arcturus, Gross-Marble, Hill-Trumble, and Hill Annex Mine Pits. These pits currently are filled with water and overflowing, are being pumped to avoid flooding of important historical resources (the Hill Annex Mine State Park) due to rising water levels, or are

threatening to flood due to rising water levels. **Therefore, areas within these pits shown as surface waters on Figure 2.3-3 (and other figures in this EIS) based on available geographic information system data may not represent the actual extent of surface waters currently in these pits.** Both the CMP and the HAMP Complex could support the water requirements for Phase I, while additional water resources from the LMP and possibly the Prairie River would be sufficient to support Phase II. Excelsior proposes to withdraw water from the Prairie River at a point downstream of the Prairie Lake Hydropower Facility, so water withdrawals would not affect power production at the hydropower facility.

Routings for the pipelines would be located on public property adjacent to existing transportation corridors wherever practicable. The pumps would be operated remotely from the Mesaba Generating Station.

Alternative 2 (Obtain Water from the Mississippi River)

For Alternative 2, water would be piped from the Mississippi River to the West Range Site. This would require approximately 10 miles of pipeline and several pump stations, electrical facilities, support structures, and land acquisitions. This alternative was not considered feasible due to the distance from the river and the cost to construct and operate the necessary facilities.

Alternative 3 (Obtain Water from Groundwater Wells)

For Alternative 3, groundwater wells would be pumped to provide water to the site. Most wells in the area produce only between 200 and 300 gallons per minute; therefore, this alternative would require the development, operation and maintenance of up to 50 groundwater wells, pump stations, force mains, electric services, and support structures to provide adequate flow for the Mesaba Generating Station. For these reasons, Alternative 3 was not considered feasible and was eliminated from further consideration.

Process Wastewater Discharges

NOTE: Following publication of the Draft EIS, Excelsior announced its commitment on January 21, 2008 to undertake a major regional water quality improvement program in connection with the Mesaba Energy Project Phases I and II. The program would include the installation of additional equipment to enhance the planned ZLD system at the power plant, which would result in all water used in the plant being recycled, eliminating all process water and cooling tower blowdown discharges into the Upper Mississippi River watershed. Therefore, the blowdown water discharges as described below in the Draft EIS would be eliminated. The enhanced ZLD system would be the same as proposed for the East Range Site in Section 2.3.2.3.

Process wastewater discharges would consist primarily of cooling tower blowdown blended with relatively low-flow additional wastewater streams from other plant systems (including HRSG blowdown, boiler feed water demineralizers and intermittent treated water from the oil/water separator serving the plant drainage system). All other contact process water would be managed and treated in the ZLD system. All sanitary wastewater would be treated separately. The projected peak and annual average process wastewater discharge rates for the Mesaba Generating Station are summarized in Table 2.3-2. As described in Section 2.2.3.2, nearly all of the wastewater discharged from the Mesaba Generating Station would be condenser cooling water for control of dissolved solids (cooling tower blowdown). Hence, the constituents in the discharge essentially would be the same as those in the water supply to the plant but more concentrated.

Table 2.3-2. Estimated Wastewater Discharge Rates to Receiving Waters – West Range Site

Phase	Cycles of Concentration	Peak Discharge (gpm)	Average Annual Discharge (gpm)
I	5	1,300	550-900
I and II	3	5,140	2,200-3,500

The receiving waters for process water discharges from the West Range Site would be the CMP (proposed Outfall 001) and Holman Lake (proposed Outfall 002) as shown in Figure 2.3-3. Wastewater discharge rates to the CMP and Holman Lake would be inversely proportional to the cycles of concentration at which the cooling towers would be operated. The number of cycles of concentration operative in the Mesaba Generating Station would be determined by the concentration of mercury in the CMP waters and the conditions of an NPDES permit for discharges to Holman and Panasa Lakes. Excelsior expects that the Mesaba Generating Station would operate at five cycles of concentration during Phase I and at three cycles of concentration during combined Phases I and II. A NPDES permit would establish limits for parameters such as total concentration of mercury, TDS, and hardness.

Potable Water Supply

During construction, the Mesaba Generating Station would require a peak of 45,000 gallons per day of potable water based on 1,500 personnel using 30 gallons of potable water per day each. After construction of Phase I and II, the water demand will drop to about 7,500 gallons per day assuming 250 individuals on site year around. The annual usage for the facility during normal operation is estimated at approximately 2.7 million gallons. Two alternatives were considered to provide potable water to the West Range Site as described below. Alternative 1 is Excelsior's preferred alternative based on economic and permitting considerations.

Alternative 1 (Obtain Potable Water from the City of Taconite)

The closest potable water source to the site is the City of Taconite. To provide potable water to the West Range Site, an 8-inch diameter pipeline would be constructed from the Taconite system to the site as shown in Figure 2.3-3. A booster station would be needed near the connection point to the city water distribution system in order to provide the required water pressure for the Mesaba Generating Station. The booster station would pump water from the Taconite system at a variable rate from 20 to 100 gallons per minute. The wide pumping range would be required due to the fluctuations in water use that would occur throughout the day at the facility.

Taconite is currently authorized via Minnesota Department of Natural Resources (MNDNR) Water Appropriation Permit No. 1976-2206 to withdraw a total of 20 million gallons of groundwater per year to provide for its potable water needs. The most recently published records from the MNDNR show that between 1988 and 2005, inclusive, Taconite's groundwater withdrawal rates varied between 11.3 and 17.3 million gallons per year. The Mesaba Energy Project would require a peak usage rate of 16.5 million gallons per year during construction and average roughly 2.7 million gallons per year of potable water during operations. This indicates that, at present, the Taconite water supply system does not have sufficient capacity to supply potable water to the Mesaba Energy Project during the construction phase and that the system will be close to full capacity once operations of the Mesaba Energy Project begin.

In March 2007, the City of Taconite prepared and adopted a Water Management Plan (SEH, 2007) that identified the improvements required to supply for the needs of the community and the Mesaba Energy Project. These improvements include two additional groundwater wells, additional pumping facilities, and

booster stations, along with future expansion of water storage facilities. If these system improvements are completed by the time construction begins on the Mesaba Energy Project, there will be sufficient water supply capacity, without affecting the existing firefighting and community needs. However, if these improvements were not completed prior to construction, Excelsior would provide potable water to meet construction workers' needs by bringing in tanker trucks or through development of its own wells.

Alternative 2 (Construct On-Site Water Treatment Facility)

Alternative 2 would consist of constructing an on-site treatment facility with the capacity to treat 7,500 gallons per day of water from the CMP and HAMP Complex to provide potable water to the Mesaba Generating Station. A micro-filtration system would be used to treat raw water pumped to the site from the local mine pits at a rate of 10 gallons per minute to meet potable drinking water standards. This treatment rate was determined based on a run time of approximately 12.5 hours to provide the daily water requirement of the facility. Construction of a building to house the filtration system, a 5,000-gallon underground reservoir, and pump would be required. The pump would supply the water from the reservoir to the facility at the required flow rate and pressure. Excelsior would own the water treatment facility and be responsible for the operation and maintenance of the facility.

The EPA classifies any facility that provides potable water to 25 or more of the same individuals every day as a non-transient non-community public water supply system. Because the Mesaba Generating Station would employ 182 permanent employees, it would fall into that classification. Therefore, the treatment facility must be operated by a certified water operator and the treated water must meet all standards of the Federal Safe Drinking Water Act and the Minnesota Department of Health (MDH). **Also, plans and specifications of any new water treatment facility would require MDH approval prior to construction.**

During construction of the Mesaba Generating Station, potable water would not be available until the process water features were completed. Therefore, potable water would be supplied to the site by other means (e.g., tanker trucks) during construction.

Domestic Wastewater Treatment Alternatives

Excelsior considered two alternatives for treating and disposing of domestic wastewaters produced during construction and operation of Phase I and Phase II. Alternative 1 would include the construction of an on site wastewater treatment plant. Alternative 2, preferred by Excelsior based on economic and permitting considerations, would connect the Mesaba Generating Station to the Coleraine-Bovey-Taconite wastewater treatment system via the Taconite pump station located approximately 2 miles south of the West Range Site. The alternatives are illustrated in Figure 2.3-3.

Alternative 1 (Construct On-Site Wastewater Treatment System)

Alternative 1 would consist of constructing an on site wastewater treatment facility using a stabilization pond adjacent to the Mesaba Generating Station with a capacity to treat 45,000 gallons per day of domestic wastewater (the maximum projected flow during construction). Once Phase I were operational, the wastewater treatment facility would receive a maximum of 7,500 gallons of domestic wastewater per day due to the reduced staff required to operate the station relative to that required during construction, and part of the wastewater treatment facility would be closed in accordance with Minnesota Rules.

Treated effluent from the domestic wastewater treatment facility would be routed off-site either through an 8-inch diameter gravity sewer to Little Diamond Lake or via the cooling tower blowdown

pipeline to Holman Lake (or CMP) approximately 1.4 miles south of the West Range Site. The facility would require a NPDES permit to discharge treated domestic wastewater to Little Diamond Lake, Holman Lake, or the CMP. A part-time on-site licensed operator would be required to monitor discharges and ensure that the wastewater treatment facility meets the monitoring and discharge requirements specified in the NPDES permit.

Alternative 2 (Connect to the Coleraine-Bovey-Taconite Wastewater Treatment Facility)

Alternative 2 would discharge domestic wastewater to the Coleraine-Bovey-Taconite (CBT) wastewater collection and treatment system, which receives wastewater from the three cities and discharges treated effluent to the Swan River. The system has a design capacity of 499,000 gallons per day and received an average flow of 334,000 gallons per day during the period from January 1 through May 31, 2005. During the wettest 30-day period, the system received an average of 444,000 gallons per day with a peak day of 969,000 gallons per day.

Alternative 2 would consist of constructing approximately 10,000 feet of 12-inch gravity sewer, a pump station, and 2,400 feet of force main from the West Range Site to the City of Taconite's main pump station located in the northeast corner of the city (Figure 2.3-3). The alternative would require a 50-foot construction right-of-way and a permanent 30-foot ROW affecting approximately 14 acres and 8 acres, respectively. The facilities would have the capacity to convey a maximum projected wastewater flow of 30,000 gallons per day during construction (7,500 gallons per day during generating station operations), which is within the existing capacity of the Coleraine-Bovey-Taconite wastewater treatment facility (CBT WWTF).

NOTE: As explained in response to comments on the Draft EIS, the CBT WWTF has capacity available to treat sanitary wastewater from the Mesaba Energy Project as discussed in Sections 3.14.2.1 and 4.14.3.3 of this volume. However peak flows in collection sewers during wet-weather conditions can exceed the capacity of Taconite's main wastewater pump station and result in untreated sewage overflowing into a nearby wetland upstream of the Swan River. Also, during periods of heavy rainfall, the CBT collection system just north of Trout Lake can become overwhelmed by incoming wastewater. At such times, overflow pumps are activated to transfer untreated wastewaters into an adjacent holding tank. If the tank's capacity is exceeded, untreated wastewater can overflow into Trout Lake.

Therefore, in its commitment on January 21, 2008, Excelsior agreed to make significant capital improvements to the CBT WWTF when construction commences on the Mesaba Energy Project and to address excessive inflow and infiltration (I/I) rates exhibited by the Taconite collection system during periods of high rainfall or high groundwater. Excelsior proposes to help address this concern by expanding I/I studies for Taconite, helping fund efforts to fix major problems, and/or expanding the capacity of the overflow tank.

Also, although the CBT WWTF is equipped for addition of alum to flocculate dissolved phosphorus entering the system, no such additions are currently in practice. Excelsior proposes to fund the addition of such flocculants for as long as the Mesaba Generating Station is operative and the disposal of the biosolids collected. This would significantly reduce phosphorus loading to the Swan River from the CBT WWTF. Finally, Excelsior proposes to fund studies to determine whether sand filters would be effective for reducing mercury concentrations in the CBT WWTF effluent.

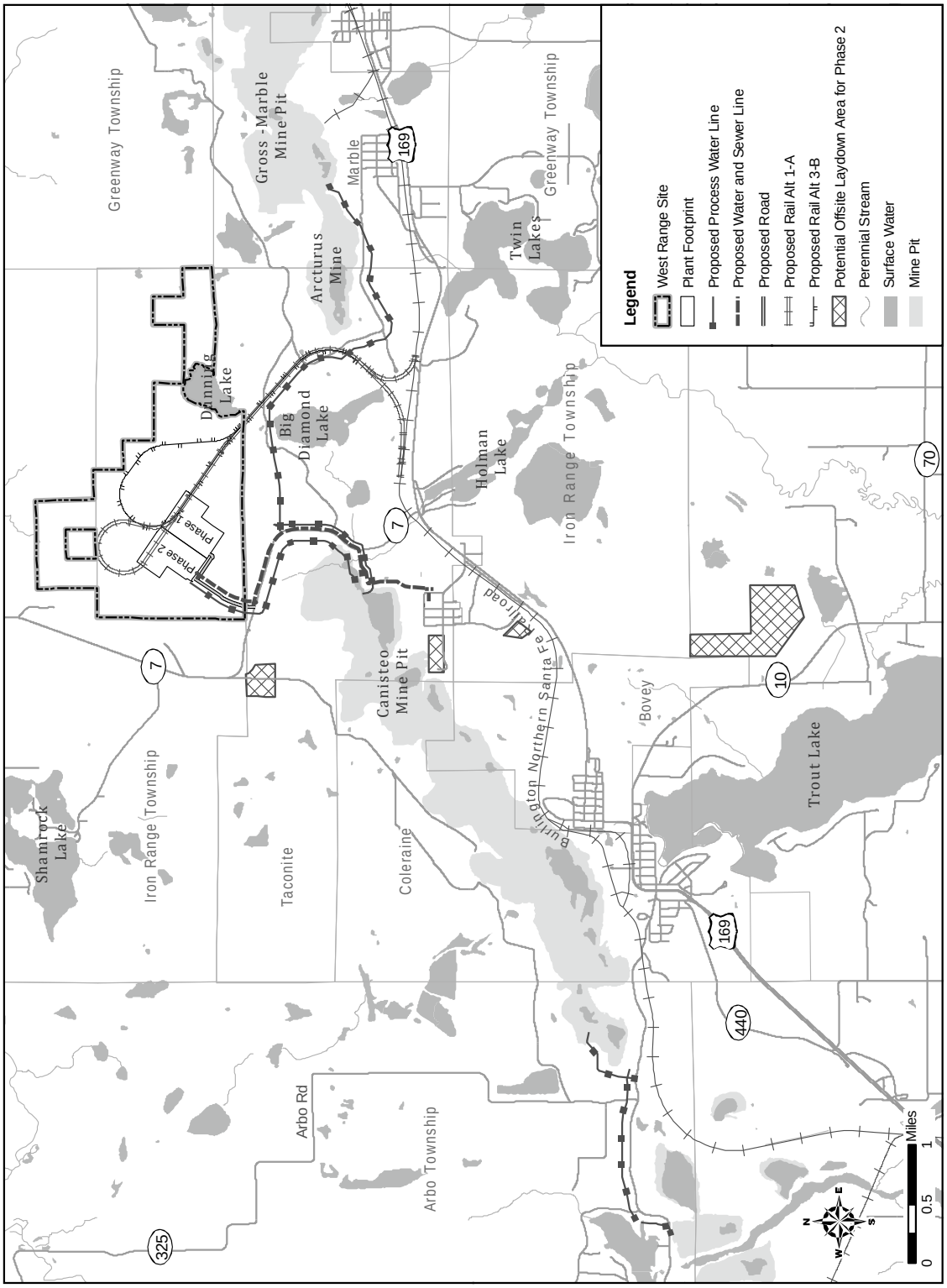


Figure 2.3-3. West Range Water Sources and Pipelines

Excelsior prefers Alternative 2 for treatment of domestic wastewater from the Mesaba Generating Station because it would avoid the discharge of treated domestic effluent to public waters impaired for DO and nutrients.

2.3.1.4 Natural Gas Facilities

As described in the Draft EIS, Excelsior **proposed** to construct, own, and operate one 16-inch (or potentially 24-inch) diameter gas pipeline to supply natural gas to the Mesaba Generating Station that would tap the two existing 36-inch GLG pipelines approximately 12 miles due south of the West Range Site. Three potential natural gas pipeline alternatives were initially considered by Excelsior to provide natural gas to the West Range Site as indicated in Table 2.3-3. Excelsior identified Alternative 1 as the preferred route (Figure 2.3-4) based on economic factors.

On March 7, 2007, Nashwauk Public Utilities Commission submitted a permit application (PUC Docket No. PL, E280/GP-06-1481**; http://energyfacilities.puc.state.mn.us/Docket.html?Id=19035**) proposing to construct and operate a 24-inch diameter, high-pressure natural gas pipeline between a take-off point on the existing 36-inch GLG pipelines in Blackberry Township and a termination point near the City of Nashwauk. The new pipeline would follow essentially the same alignment as proposed by Excelsior for its natural gas pipeline Alternative 1 between Blackberry and Taconite near the West Range Site. From Taconite, the proposed pipeline would follow an additional 9-mile alignment to the City of Nashwauk. The commission indicated in its application that the proposed pipeline would provide natural gas required to fuel the proposed Minnesota Steel facility and that the Nashwauk Public Utilities Commission would be seeking other industrial customers in the future. Therefore, the proposed gas pipeline would be sized to allow for industrial expansion near Nashwauk. Excelsior has indicated that if this pipeline were approved by PUC and constructed in sufficient time as to be available for use by the Mesaba Energy Project, Excelsior would enter into negotiations with the Nashwauk Public Utilities Commission to purchase nature gas from the utility and would not construct a separate natural gas pipeline for the power plant. **After publication of the Mesaba Draft EIS, the Minnesota PUC issued a Pipeline Route Permit dated April 16, 2008 for Nashwauk Public Utilities Commission to construct the pipeline.**

Table 2.3-3. Natural Gas Pipeline Alternative Routes – West Range Site

Attribute		Alternative 1	Alternative 2	Alternative 3
Pipeline Length	Existing Corridor	2.5 miles	10.5 miles	7 miles
	New Corridor	10.7 miles	4.5 miles	5.5 miles
Residential Dwellings	Within 300 ft	3	5	29
Water Crossings	Stream	4	4	4
	Lake	0	0	0

Both alternate routes, like the preferred route, would involve tapping the two existing 36-inch diameter GLG pipelines. Unlike the preferred route, a pipeline developed along either of the other routes would be licensed/permitted, constructed, owned and operated by NNG (as an interstate pipeline operator) rather than Excelsior. Both alternate routes would originate approximately 9.4 miles southwest of the West Range Site at the La Prairie tap and metering point located in La Prairie, Minnesota. Excelsior or the gas pipeline owner would negotiate with landowners for easements to install the pipeline on each individual tract that the route would cross.

2.3.1.5 HVTL Corridors

Overview

As discussed in Section 2.2.2.4, power systems are designed according to the single failure (n-1) criterion, which means that the power system must withstand the loss of a single line, generator, transformer or bus bar without any severe disturbance of power supply. Excelsior applied for a HVTL Route Permit including a combination of circuits and routes that would provide the necessary reliable interconnection of Phases I and II to the power grid in accordance with the single failure criterion.

Point of Interconnection

The POI for the Mesaba Generating Station at the West Range Site would be the existing, 230/115-kV Blackberry Substation owned and operated by MP and located approximately 8.5 miles south-southeast of the West Range Site. The substation is located at the intersection of CR 10 and CR 434 about equidistant between the unincorporated community of Blackberry and the community of Marble. The Blackberry Substation is the major HVTL hub in the area (Figure 2.3-4).

Alternative HVTL Routes to Support the West Range Site

As described in Section 2.2.2.4, Excelsior believes that 345-kV will be the future standard for transmission developments on the Iron Range. Currently, however, there is no 345-kV transmission infrastructure at the Blackberry Substation, and the likelihood of future 345-kV development at the station is dependent on the results of MISO Interconnection Studies. Until MISO confirms its decision on the interconnection voltage for Phases I and II, Excelsior has requested an HVTL Route Permit that would allow flexibility to change its West Range Site interconnection voltage plans. Excelsior's Plan A assumes the use of 345-kV circuits, while Plan B provides a contingency to allow the use of 230-kV circuits. Both plans provide capacity for the Phases I and II combined output and allow for redundancy to meet the single failure criterion. Accordingly, and in compliance with Minnesota Rules Chapter 4400, Excelsior's plans provide for preferred and alternative routes (that follow three potential alignments) as described below and illustrated in Figure 2.3-4.

Plan A

Plan A would utilize two 345-kV HVTLs on a single steel pole structure (single ROW) from the Mesaba Generating Station to the Blackberry Substation. This double-circuit 345-kV plan would accommodate the full **nominal 1,200**-MWe output of Phases I and II while meeting the single failure criterion. Each 345-kV HVTL would have sufficient transfer capacity to carry the entire station electrical output, and both lines would be installed during construction of Phase I. For Phase I, each of the two 345-kV HVTLs would be operated at 230 kV, and either line would be capable of supporting the entire output of the plant in the event of a contingency forcing one line out of service. Before Phase II would come on line, each of the 345-kV HVTLs operating at 230-kV would be upgraded to its rated 345-kV capacity and thereafter be capable of conveying the entire output capacity of the generating station to the substation. The necessary upgrades would apply only to electrical substation equipment and involve no modification to the HVTL structures or conductors installed to accommodate Phase I.

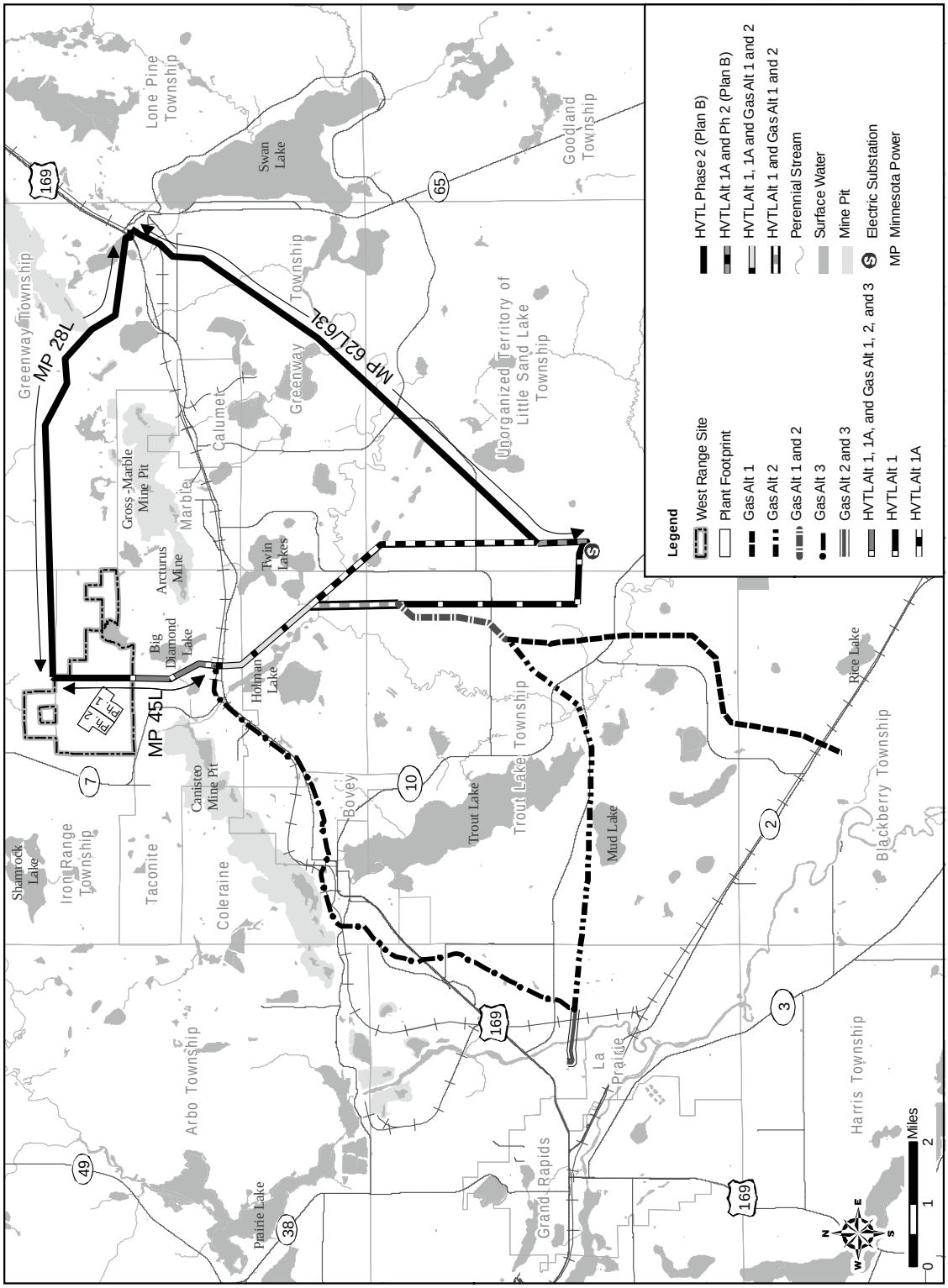


Figure 2.3-4. West Range Natural Gas Pipeline and HVTL Alternatives

Plan A provides for a preferred route (WRA-1, following alignment HVTL-1) and an alternative route (WRA-1A, following alignment HVTL-1A) as illustrated in Figure 2.3-4. Both routes would share two common segments (one existing and one new ROW), and each route would include two unique segments (one existing ROW and one new ROW). The major difference between the routes is that WRA-1A would run east of and parallel to Twin Lakes Road, while WRA-1 would run west of and parallel to Twin Lakes Road. Both routes would avoid residences located on the road. Excelsior prefers WRA-1 because it would have fewer water crossings, would cross fewer open fields, would avoid gravel mining operations, and would generally be less visible **from public recreation areas**. Both routes are similar in that they traverse areas that have a similar residential density and are the shortest and most direct routes to the substation.

Plan A – Excelsior's Preferred Route (WRA-1)

The preferred 345-kV double circuit HVTL route (WRA-1) would follow an alignment HVTL-1 including the following four segments:

(1) Approximately 1.6 miles of existing ROW shared with a MP 45 Line (45L) from the southern boundary of the West Range Site south to the retired Greenway Substation located just south of US 169.

(2) Approximately 1.7 miles of new ROW from the retired Greenway Substation south and southeast to a point near Twin Lakes.

(3) Approximately 4.6 miles of new ROW from the point near Twin Lakes south to the point of intersection with MP's 83L (230-kV) and 20L (115-kV) HVTL ROW.

(4) Approximately 1 mile of existing ROW shared with MP's 83L and 20 Line 20L ROW east to the interconnection with the Blackberry Substation.

The new alignment segments would require a ROW with a minimum width of approximately 92 feet; however, Excelsior intends to acquire 100-foot ROWs (150-foot where natural gas pipeline and HVTL would share routes), which would result in a total permanent ROW of approximately 134 acres. Existing HVTL ROWs would not require widening of corridors. Approximately 66 residences would be located within a half mile of the centerline of the preferred alignment, of which 17 would be located within a quarter mile of the alignment. One residence would be located within 300 feet of the alignment and three others would be located within 500 feet.

Plan A – Excelsior's Alternative Route (WRA-1A)

Because route WRA-1 would require acquisition of about 6 miles of new ROW between the Greenway Substation and the point of intersection with MP's 83L and 20L HVTLs, Excelsior is required by Minnesota Rules 4400.1150 Subpart 2.C to consider an alternative route.

The alternative route (WRA-1A) would follow alignment HVTL-1A and include the following four segments:

(1) Same as first segment of WRA-1 (1.6 miles, existing ROW).

(2) Same as second segment of WRA-1 (1.7 miles, new ROW).

(3) Approximately 4.1 miles of new ROW from the point near Twin Lakes southeast then south to the point of intersection with MP's 62L (115-kV) HVTL ROW.

(4) Approximately 0.9 miles of existing ROW shared with MP's 62L (115-kV) HVTL ROW south to the interconnection with the Blackberry Substation.

The new alignment segments would require a ROW with a minimum width of approximately 92 feet. However, Excelsior intends to acquire 100-foot ROWs (150-foot where natural gas pipeline and HVTL would share routes), which would result in a total permanent ROW of approximately 121 acres. Existing HVTL ROWs would not require widening of corridors. Approximately 62 residences would be located within a half mile of the centerline of the preferred alignment, of which 21 would be located within a quarter mile of the alignment. Two residences would be located within 300 feet of the alignment and five others would be located within 500 feet.

Plan B

If MISO determines that the 345-kV transmission infrastructure is incompatible with regional transmission planning initiatives, or if the timetable for building 345-kV transmission in the region would not be acceptable, Excelsior would implement a 230-kV transmission contingency plan. Plan B would begin by interconnecting the generating station to the POI with two 230-kV HVTL circuits mounted on a single steel pole structure, which would accommodate the full **600**-MWe output of Phase I and meet the single failure criterion. Although the double-circuit 230-kV HVTLs could accommodate the entire **1,200**-MWe output of the combined Phases I and II, they would not meet the single failure criterion. Therefore, Plan B would provide for an additional HVTL with the construction of Phase II. The routes considered under Plan B are discussed in the four subsections below and shown in Figure 2.3-4.

Plan B, Phase I – Excelsior's Preferred Route (WRB-1)

The preferred route for the double-circuit 230-kV HVTLs for Phase I of Plan B (WRB-1) would follow alignment HVTL-1, the same as the preferred route WRA-1 of Plan A. However, the single-pole HVTL structures required for 230-kV HVTLs would be shorter, ranging in height from 107 to 143 feet. Approximately 10 structures would be 125 feet or taller. The new alignment segments would require a ROW with a minimum width of approximately 73 feet. Existing HVTL ROWs would not require widening of corridors.

Plan B, Phase I – Excelsior's Alternative Route (WRB-1A)

The alternative route for the double-circuit 230-kV HVTLs for Phase I of Plan B (WRB-1A) would follow alignment HVTL-1A, the same as the alternative route WRA-1A of Plan A.

Plan B, Phase II – Excelsior's Preferred Route (WRB-2)

The preferred route for Phase II of Plan B would be the route not selected for the double-circuit 230-kV HVTL in Phase I of Plan B. That is, if Excelsior's route WRB-1 (alignment HVTL-1) were approved for Phase I, route WRB-1A (alignment HVTL-1A) would be the preferred route for the single circuit 230-kV HVTL for Phase II. Conversely, if WRB-1 were not approved as the preferred route for Phase I of Plan B, it would be proposed as the preferred route for Phase II of Plan B.

The structures and new ROW requirements for the separate alignments would be comparable to those described for WRB-1; however, the single-circuit 230-kV alignment would enable the use of shorter poles (by approximately 20 feet). In the segments where the double-circuit 230-kV HVTL alignment would coincide with the single-circuit 230-kV alignment, a minimum permanent ROW width of approximately 138 feet would be required for the parallel pole structures (affecting approximately 1.7 miles of new ROW). The new alignments for Plan B, Phases I and II (including both routes) would require permanent ROWs affecting approximately 255 acres. Existing HVTL ROWs would not require widening of corridors.

Plan B, Phase II – Excelsior's Alternative Route (WRB-2A)

Plan B would require an alternative route for the same reason as Plan A. The alternative route proposed for Phase II of Plan B would combine segments from two existing HVTL corridors, one of which traverses the northern section of the West Range Site. WRB-2A (alignment HVTL Phase 2 in Figure 2.3-4) would follow an alignment including portions of the ROWs for the MP 45L/28L and 62L/63L HVTLs. Because the length of the HVTL for WRB-2A would be about 18 miles, Excelsior proposes to use HVTLs rated at 345-kV on this route to avoid excessive line losses and elaborate switching requirements that would be required for 230-kV. Both of the existing corridors are occupied by 115-kV HVTLs structures owned by MP. Therefore, Excelsior proposes to use delta configuration 345-kV structures with an underbuild feature that would carry the existing 115-kV HVTLs below the arms holding the 345-kV conductors. The delta configuration structures would require a minimum permanent ROW width of approximately 106 feet, which is generally within the parameters of the existing HTVL ROWs. Therefore, the new alignments for Plan B, Phases I and II (including both routes) would require permanent ROWs affecting approximately 134 acres. Approximately 214 residences are located within a half mile of the ROWs that would be used for Alternative Alignment WRB-2A, 98 of which are located within a quarter mile of the ROWs. Eight residences are located within 300 feet of the ROWs and 21 others are located within 500 feet.

2.3.2 East Range Site and Corridors

2.3.2.1 Proposed IGCC Plant Site

The East Range Site, including the power plant footprint and buffer land, is located within the City of Hoyt Lakes in St. Louis County, Minnesota (Figure 2.3-5). The site is generally bounded by CR 666 to the east and a large mine tailings pile to the west. An existing 138-kV HVTL corridor leading to MP's Laskin Substation runs along the western boundary, and a rail line owned by a CN subsidiary runs along the east and south sides of the property. The site encompasses approximately **1,322** acres of undeveloped property owned by CE within the Superior National Forest and is zoned a mining district (MD) to support mining operations that historically took place within the immediate vicinity of the site. The site has direct access to CR 666 and includes a private, unpaved road used by CE to access its water pumping station on Colby Lake. The closest residential properties are located along the southeast shore of Colby Lake, approximately 1.2 miles south of the power plant footprint.

As described in Section 2.2.4.1, off-site staging and lay-down areas would be acquired to provide 85 acres of land supporting construction of Mesaba Phase II. Figure 2.3-5 shows the candidate locations for the East Range Site.

2.3.2.2 Transportation Facilities

Existing Rail Lines in the Vicinity of the East Range Site

One railroad, a subsidiary of CN, serves the area and could be used to transport coal and other materials to the East Range Site. The nearest access to the BNSF Railway is at Hibbing, 40 miles from the East Range Site. Therefore, the CN would be the only feasible near-term rail provider to the East Range Site. The power plant footprint is located approximately 1 mile north and 1 mile west of two CN railroad tracks. The east-west track runs from Eveleth, Minnesota, to Two Harbors, Minnesota. The north-south track connects with the east-west track at Wyman Junction (about 1.7 miles southeast of the East Range Site) and extends north to Embarrass, Minnesota.

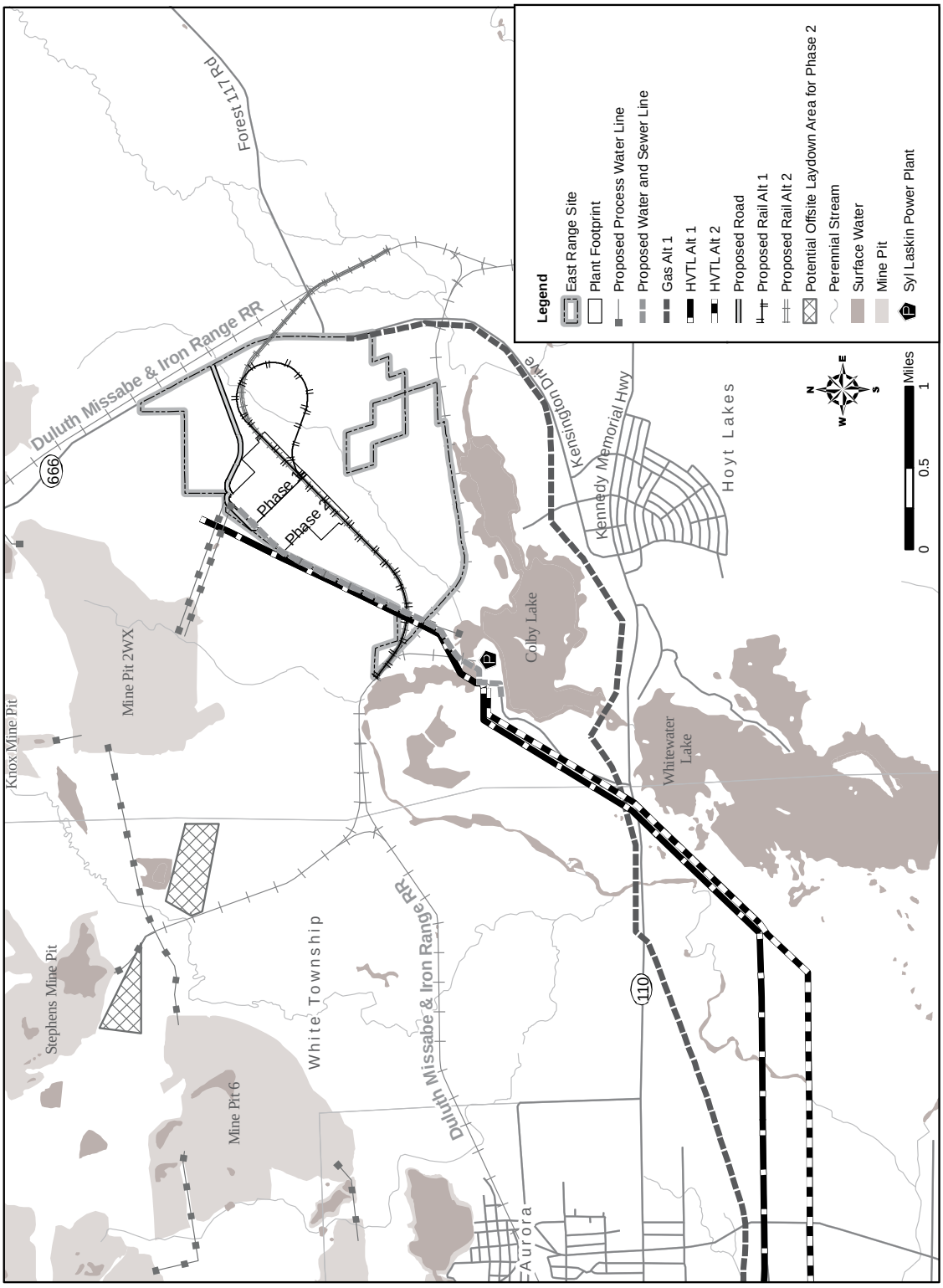


Figure 2.3-5. East Range Plant Site

The CN operates trains daily on the track serving Minnesota Power's Syl Laskin Generating Station. Coal would be delivered by other railroads to the CN at either Superior, Wisconsin, or at a rail yard south of Eveleth, Minnesota. The CN rail line would be used to deliver coal to the site from Eveleth, and empty trains would return by the same route.

Rail Access to the East Range Site

Excelsior considered two alternative rail alignments (Alternative 1 and Alternative 2) to connect the East Range Site to the existing CN rail line. Figure 2.3-6 shows the alternatives, which are described below. Table 2.3-4 summarizes of each alternative. **Following publication of the Draft EIS, USACE, EPA, and other agencies submitted comments expressing their concerns about the extent of wetlands impacted by the rail alternatives.** In particular, **USACE expressed the need** to avoid and minimize impacts to wetlands **in the siting of the Mesaba Energy Project and associated infrastructure. DOE discussed these concerns with USACE in several telephone conferences and meetings during 2008 and conferred with Excelsior to address the need** to **avoid and minimize impacts to wetlands. The updated DOE Wetland and Floodplains Impact Assessment (Appendix F2) summarizes Excelsior's efforts in coordination with DOE. The Excelsior efforts to address the USACE concerns regarding avoiding and minimizing impacts to wetlands did not result in additional rail alignments for the East Range Site for evaluation in the Final EIS.**

Table 2.3-4. Rail Access Alternatives – East Range Site

Attribute	Alternative 1	Alternative 2
Total length of track (miles)	3.4	3.5
Off-site length of track (miles)	1.25	2.1
Train speed (mph)	10	10
Maximum grade	0.40%	0.40%
Maximum Curvature (loaded coal train)	2 degree 30 minutes	3 degrees
Off-site right-of-way (acres)	15	26
Largest cut (feet)	50	50
Largest fill (feet)	20	20
Approximate cut Qty (cubic yards)	2,390,000	2,180,000
Approximate fill Qty (cubic yards)	**123,000**	**116,000**
Potential wetland impact (acres)	59	18
No. of residences within 1,000 feet	0	0
Closest residence (feet)	Over 1,000 feet	Over 1,000 feet
Alignment Meets Applicable Standards	Yes	Yes

Rail Line Alternative 1

Alternative 1 would provide a traditional coal loop, which could accommodate a unit train that would return in the same direction. The track would originate near MP's Syl Laskin Generating Station rail spur and travel east-northeast to the Mesaba Generating Station. The track would be about 17,800 feet long. No residential dwellings are located near the proposed alignment.

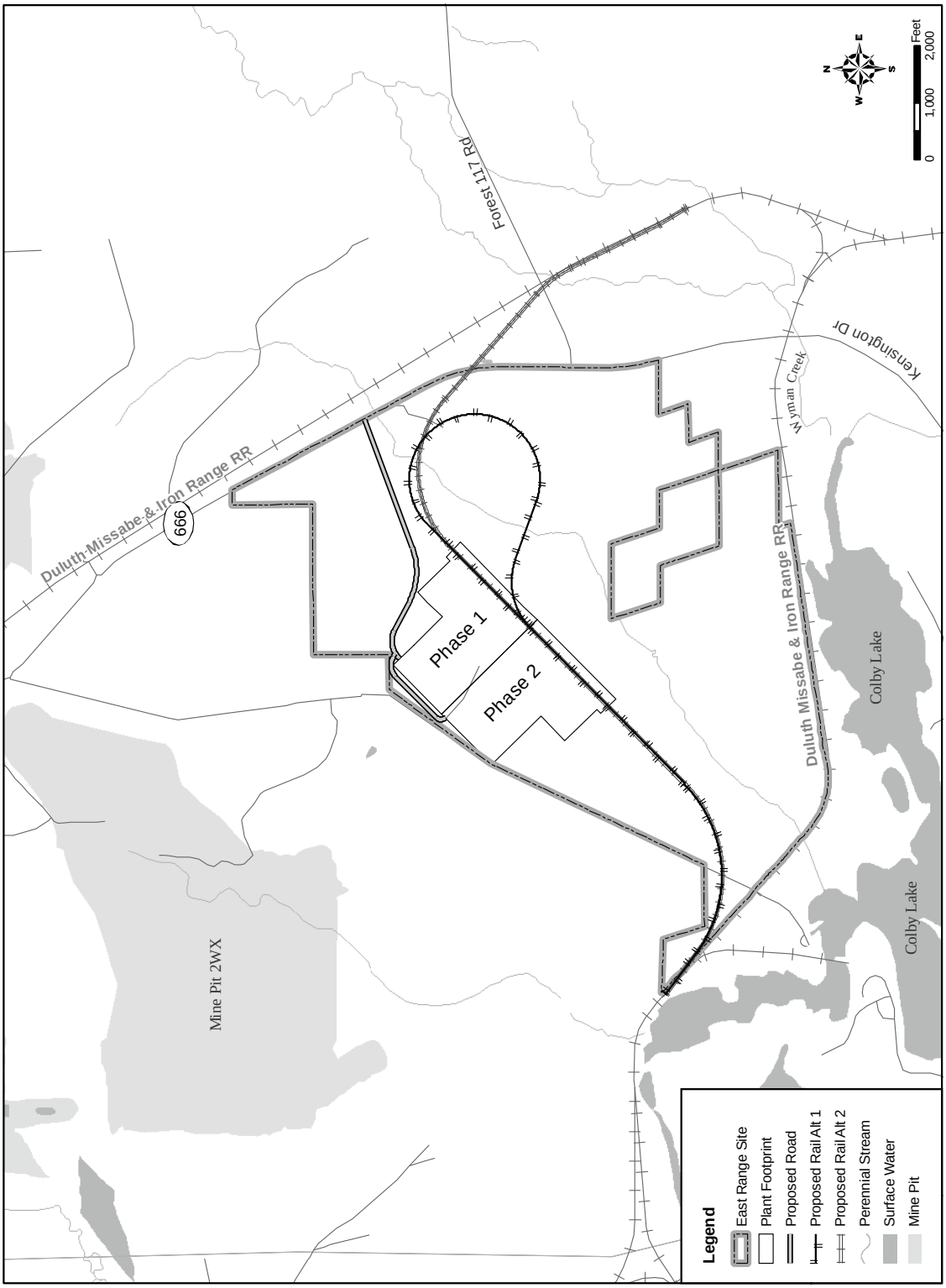


Figure 2.3-6. East Range Rail & Road Alternative

Rail Line Alternative 2

Alternative 2 would accommodate a complete coal train, but it would cross the site (rather than looping within it) and connect to the CN north-south track just north of Wyman Junction. This track would be about 18,500 feet long with the rotary coal dumper near the midpoint. The track would depart the Syl Laskin spur at an elevation of 1,455 feet, climb to an elevation of about 1,465 to 1,470 feet at the coal dumper, and continue to climb to about 1,485 feet at the north-south CN track. To maintain a workable grade, the track would need to cross under CR 666, which would require construction of a roadway bridge.

This alternative may have a lesser impact on wetlands; however, it would limit the choices for locating the rotary coal dumper, and it would cause trains to climb 35 feet in elevation from west to east making the profile grades difficult. The alternative would also affect a wider area than Alternative 1. Based on these factors, Excelsior prefers Alternative 1.

Other Rail Alternatives Considered

The East Range Site could also receive shipments of fuel via water at Taconite Harbor, with transportation to the site via CE's privately owned 70-mile rail line that served the former LTV Mining operations. However, Excelsior does not consider this alternative feasible in the near term.

Roadway Access to the East Range Site

Local Roadways

Roadway transportation in the area of the East Range Site is provided by county roads. The nearest state highway is State Route (SR) 135, approximately 7 miles west of the site. The primary county road is CR 110, which departs from SR 135 in Aurora and passes through Hoyt Lakes. CR 110 is the western terminus of the Superior National Forest Scenic Byway (SR 11). This byway is newly constructed and connects the north shore of Lake Superior with the Mesabi Iron Range. The east-west section of CR 110 in Hoyt Lakes passes approximately 1.6 miles south of the East Range Site. Key local roadways are shown in Figure 2.3-6.

Traffic approaching the East Range Site from the west would travel on CR 110 and turn north onto CR 666 in Hoyt Lakes. This intersection is controlled as a four-way stop. CR 666 extends to the north about 1.6 miles, where it adjoins the eastern boundary of the East Range Site for a distance of about 1.4 miles. It continues beyond the East Range Site for about 2.1 miles north-northwest to the CE administration building. Traffic approaching the East Range Site from the east on CR 110 would turn north onto Hampshire Road in Hoyt Lakes for about 0.3 miles, then turn northeast onto CR 666 toward the site.

Proposed Access Road

After publication of the Draft EIS, Excelsior reconsidered the need for a looped access road based on comments received from USACE regarding potential impacts on wetlands. Therefore, as shown in revised Figure 2.3-6, only the southern portion of the access road described in the following paragraph would be constructed.

CR 666 adjoins the proposed East Range Site and is the most practical choice for public road system access. The proposed access road (Figure 2.3-6) would consist of a looped roadway intersecting CR 666 at two locations to provide gentle curves and good sightlines. Traffic would enter the site from the north access point. During construction and other periods of peak volumes, traffic would exit the site at the

south access point. Having two access points from CR 666 would also provide flexibility in accessing the Station during construction and when maintenance or construction work is performed on CR 666.

2.3.2.3 Water Sources and Discharges

Process Water Supply

The water requirements for the East Range Site would be less than required by the West Range Site **as originally proposed** because an enhanced ZLD system as described in Section 2.2.1.4 (required to comply with stringent regulations affecting discharges to Lake Superior Basin surface waters) would be used to recycle water to the maximum extent possible. Water requirements can be reduced by up to **900** gallons per minute per phase through such recycling efforts. **As discussed previously, Excelsior has subsequently committed to enhanced ZLD treatment at the West Range Site, making water requirements equal for both sites.** The enhanced ZLD system would allow for the potential use of wastewaters from other industrial neighbors, but **due to lower source water quality,** the system would require power above that required for a station at the West Range Site making the generating station at the East Range Site less efficient and more costly to operate. The system also would produce large amounts of residual minerals that would require landfilling in a permitted facility.

Process water for the East Range Site would be drawn from numerous mine pits located in the vicinity. The water level in several of these pits is rising, but there is currently no need to control water levels at any of these pits. Therefore, water could be pumped as needed to support the Mesaba Generating Station **without posing public health risks**. Mine Pit 2 West Extension would serve as the primary source (similar to the CMP at the West Range Site). A permanent pumping station would be added to this mine pit, and the pit would receive input from one or more of the pits listed in Table 2.3-5. **In the event that mining occurs in Mine Pit 2 West Extension, other mine pits could serve as alternative reservoirs (e.g., Stephens Mine Pit).** Excelsior proposes to link the various mine pits using water intakes, pump stations, and pipelines as illustrated in Figure 2.3-7. **Note that disused mine pits shown on this and other figures in this EIS have been filling with surface water and groundwater. Therefore, the areas within these pits shown as surface waters based on available geographic information system data may not represent the actual extent of surface waters currently in these pits.** In the event of high inflow rates into Colby Lake during spring runoff or during high precipitation events, water also may be pumped from Colby Lake into Mine Pit 2 West Extension **or other available mine pits. New text was added below which discusses potential conflicts with Mine Pit 2 West Extension and other water sources identified in the Draft EIS. New text in Section 4.5.4.1 discusses new water sources identified since publication of the Draft EIS. Table 2.3-5 has been revised to reflect these updates.**

Table 2.3-5. Process Water Sources – East Range Site

Water Source	Estimated Range of Flow (gpm)	Average Annual Flow (gpm)
Mine Pit 6[1]		1,800 **(Minnesota Mining/Steel Dynamics (SD) is proposing to dewater and mine therein; however, no permit acquired yet for use.)**
Mine Pit 2 West Extension[1]		**0 (Minnesota Mining/SD proposing to dewater and mine therein and has a permit for standby appropriation; thus, assuming no longer available.)**
Mine Pit 2 West[1]		900
Mine Pit 2 East[1]		100
Mine Pit 3[2]	150-450	300
Mine Pit 9 (Donora Mine Pit) [2]	130-380	260
Stephens Mine Pit [2]	190-590	390
Knox Mine Pit[2]	20-70	45
Mine Pit 9S[2]	90-270	180
Mine Pit 1 Effluent (Mesabi Nugget's Outfall SD001)[3]	0-1,000	1,000
PolyMet Mining Dewatering Operations[4]	2,000-8,000	**0 (PolyMet/NorthMet would use for internal processes; thus, assuming no longer available.)**
Mine Pit 5N[5]	**800-850**	
Colby Lake[6]		**5,600* (PolyMet/NorthMet plans variable use of Colby Lake)**
Total Water Available		**11,375**
Average Water Requirements (Phase I/Phases I and II)[6]		**3,500/7,000**
Peak Water Requirements(Phase I/Phases I and II)[6]		5,000/10,000

[1] East Range Hydrology Report, MNDNR, Division of Lands and Minerals, Division of Waters, March 2004.
[2] Range of flow based on the surface drainage area to the pit and average yearly rates of runoff. This should be considered a gross approximation as the actual flow rates are likely much more dependent on groundwater components. The groundwater inflow/outflow component in this area can be highly variable as a result of fractures in the bedrock and/or highly pervious tailings dikes. Due to the complexity associated with the groundwater component, groundwater inflow/outflow has not been evaluated.
[3] Minnesota Pollution Control Agency NPDES Permit Issued to Mesabi Nugget. Mine Pit 1 effluent represents the wastewater discharged from Mesabi Nugget's permitted operation of Mine Pit 1 in accordance with terms of a NPDES Permit.
[4] North Met Mine Environmental Assessment Worksheet.
[5] Excelsior meeting with PolyMet, Hoyt Lakes, MN, July 22, 2008.
[6] Cliffs-Erie **historic use via** Water Appropriation Permit No. 490135; permitted withdrawal is 12,000 gpm daily average over continuous 60-day average; 15,000 gpm peak; and 6,307.2 million gallons per year (Assumes no discharge from the operation of the Mesaba Generating Station). *** Approximate average appropriation rate in CY2000 (2,900 gpm was erroneously presented in the Draft EIS. The total CY2000 appropriation was 2,900 million gallons, which translates to an average appropriation rate of 5,600 gpm.)**
[7] From Table 2.2-3.

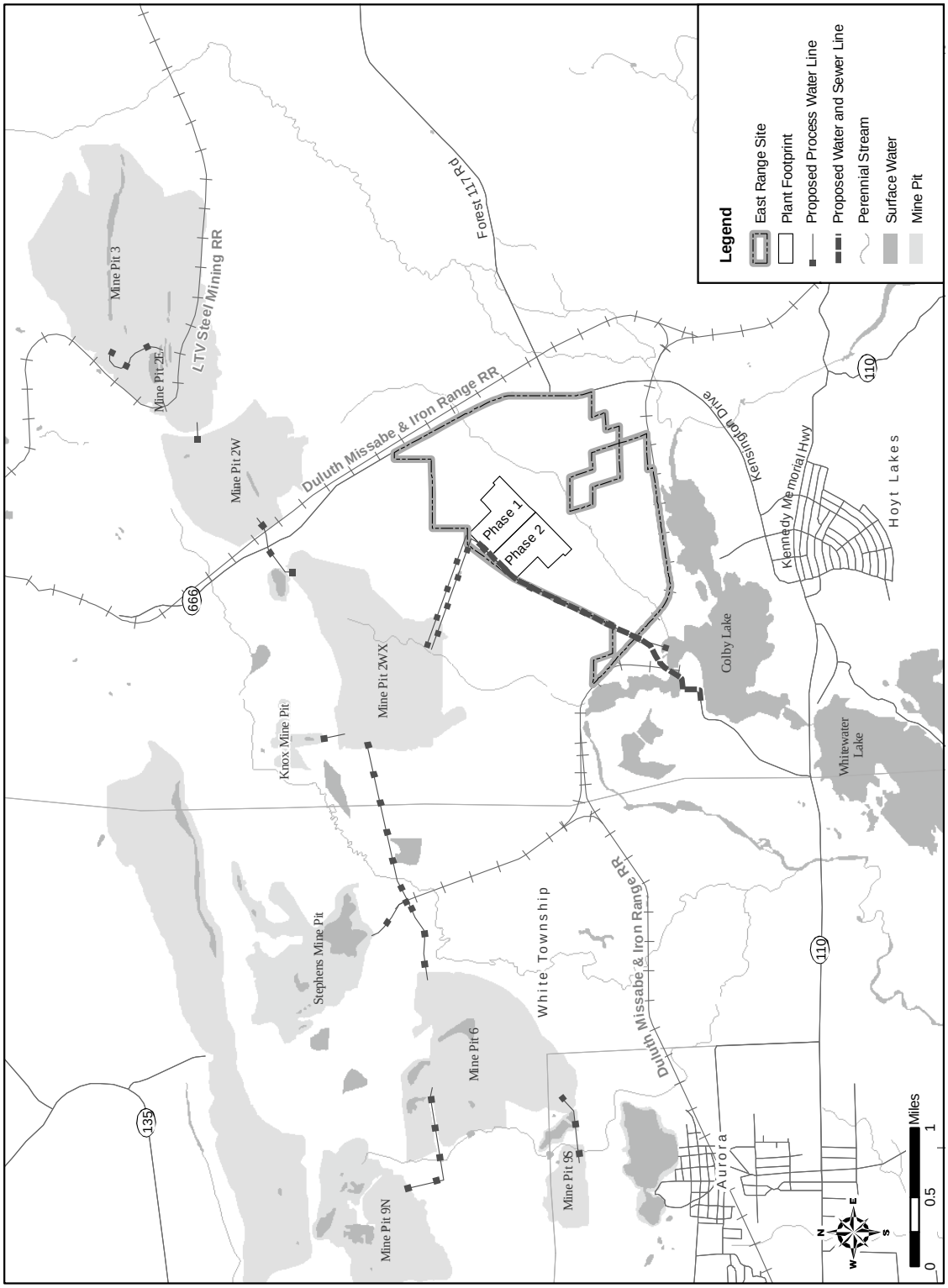


Figure 2.3-7. East Range Water Sources and Pipelines

Process Wastewater Discharges

The East Range Site is located within the Lake Superior Basin watershed, which is regulated for bioaccumulative chemicals of concern (BCCs), such as mercury, in discharges. Water quality criteria applied to waters located within the Lake Superior Basin are defined at Minnesota Rules 7052.0211 Subpart 3 ("Mixing zones for BCCs") states:

> *After March 9, 1998, acute and chronic mixing zones shall not be allowed for new and expanded discharges of bioaccumulative chemicals of concern (BCC) to the Lake Superior Basin.*

The water quality criterion for mercury in all waters within the Lake Superior Basin watershed is 1.3 nanograms per liter. Sampling in two of the pits from which water supplies for the Mesaba Generating Station would be appropriated showed median concentrations of 0.75 nanograms per liter for mercury, meaning that the cycles of concentration at which the cooling towers could operate would be reduced so severely as to preclude the use of these sources. Excelsior concluded that there are no proven technologies to remove mercury at such low concentrations at the high flow rates that would be necessary to operate the Mesaba Generating Station (the peak discharge from Phase I and II would approach 3,500 gallons per minute).

Excelsior's preferred method for dealing with the mercury discharge limitations at the East Range Site would be to totally eliminate the discharge of cooling tower blowdown by expanding the use of ZLD technologies to address all of the generating station's process wastewater streams. The system would evaporate any water that could not be reused in the plant processes leaving only a solid stream of salts for disposal at a licensed treatment/disposal facility. The process would significantly increase the cost of the Mesaba Generating Station but would enable utilization of the East Range Site.

Excelsior considered discharging process wastewater to the Hoyt Lakes POTW as an alternative, but the POTW does not have sufficient existing capacity to manage the daily volumes of cooling tower blowdown. An expansion of the POTW could not be done without a major non-degradation study.

Potable Water Supply

Excelsior considered two alternatives to provide potable water to the Mesaba Generating Station at the East Range Site. Alternative 1 would rely on a connection to the Hoyt Lakes water system; Alternative 2 would provide an on-site water treatment facility. Alternative 1 is Excelsior's preferred alternative based on economic and permitting considerations.

Alternative 1 (Obtain Potable Water from the City of Hoyt Lakes)

The City of Hoyt Lakes 1.5 million gallons per day water treatment plant, which treats surface water from Colby Lake, has adequate capacity to meet the potable water needs of the Mesaba facility. For Excelsior's preferred alternative, a 6-inch diameter pipeline would be constructed approximately 11,000 feet from the East Range Site connecting to a 12-inch water main that serves Minnesota Power (Figure 2.3-7). MP uses an average of 75,000 gallons per day or 100 gallons per minute over a 24-hour period, which would leave adequate capacity in the existing 12-inch water main to supply the additional potable water requirement for Phase I and II of 45,000 gallons per day during construction and 7,500 gallons per day during operations. The proposed 6-inch pipeline would provide the required flow and pressure to the Mesaba Generating Station without the need for a booster station. The City of Hoyt Lakes would own and maintain the pipeline, and Excelsior would enter into an agreement with the city to purchase water.

Alternative 2 (Construct On site Water Treatment System)

Alternative 2 would consist of constructing an on-site treatment facility with the capacity to treat 7,500 gallons per day of potable water for Phases I and II operations. A micro-filtration system similar to that required for the West Range IGCC Power Station would be used to treat a portion of the process water procured for project cooling systems that would be pumped to the East Range Site from nearby mine pits. Chemical treatment of the source water may be required to meet all standards of the Federal Safe Drinking Water Act and the Minnesota Department of Health and would be determined during detailed engineering design of the Mesaba Generating Station. Excelsior would own the water treatment facility and be responsible for its operation and maintenance. **Also, plans and specifications of any new water treatment facility would require MDH approval prior to construction.**

During construction of the Mesaba Generating Station, potable water would not be available until the process water features were completed. Therefore, potable water would be supplied to the site by other means (e.g., tanker trucks) during construction.

Domestic Wastewater Treatment Alternatives

Excelsior considered two alternatives for treating and disposing of domestic wastewaters produced during construction and operation of Phases I and II. Alternative 1 would include the construction of an on-site wastewater treatment plant. Alternative 2, preferred by Excelsior based on economic and permitting considerations, would connect the Mesaba Generating Station to the existing Hoyt Lakes wastewater treatment system. The alternatives are illustrated in Figure 2.3-7.

Alternative 1 (Construct On site Wastewater Treatment Facility)

The on-site WWTF for the East Range Site would be comparable to the facility described for the West Range Site. A 12-inch gravity sewer would be constructed to convey treated effluent to the mine drainage stream running from northeast to southwest through the site and discharging into Colby Lake.

A disadvantage of this alternative is that the treatment facility would be required to have a capacity of 45,000 gallons per day to meet construction demands, but would receive only about 25 percent of this design flow once construction was completed. Thus, part of the facility would have to be closed and other modifications made to the facility after completion of Phase II. Another disadvantage is that effluent from the system would discharge into Colby Lake, which is the source for the Hoyt Lakes drinking water treatment plant. A part-time on-site licensed operator would be required to monitor discharges and ensure that the wastewater treatment facility meets the monitoring and discharge requirements specified in the NPDES permit.

Alternative 2 (Connect to the Hoyt Lakes Wastewater Treatment System)

Excelsior's preferred alternative, Alternative 2, would discharge domestic wastewater to the City of Hoyt Lakes' wastewater collection and treatment system. The City of Hoyt Lakes owns, operates, and maintains a POTW that receives wastewater from the residential, commercial and industrial establishments within the service area and discharges treated effluent to Whitewater Lake. The system has a design capacity of 680,000 gallons per day and receives an average flow of approximately 300,000 gallons per day.

Alternative 2 would consist of constructing approximately 9,500 feet of 12-inch diameter gravity sewer, a pump station, and about 2,500 feet of 4-inch force main. The wastewater piping would parallel the existing HVTL easement along the west side of the proposed property boundary, south to Colby Lake.

A pump station would be located on the north side of Colby Lake. The 12-inch diameter sewer would have ample capacity to convey the estimated wastewater flow of 45,000 gallons per day during construction, and the Hoyt Lakes wastewater treatment facility has adequate capacity to treat the estimated flow from the proposed project. The City of Hoyt Lakes would operate and maintain the sewer line and would be compensated through sewer user fees.

2.3.2.4 Natural Gas Facilities

NNG is the only pipeline company serving the immediate vicinity of the East Range Site. A 10-inch diameter branch of NNG's pipeline from Iron Junction, Minnesota serves the nearby CE plant (the CE branch) and directly abuts the eastern boundary of the East Range Site. However, this branch line lacks adequate capacity to supply the Mesaba Generating Station demand. Therefore, to provide natural gas in the quantity and at the pressure required to supply the Mesaba Generating Station, the following infrastructure would be required:

- Installation of approximately **29** miles of new, 16- to 24-inch pipeline placed within the existing ROW for the 10-inch CE branch line.
- Addition of a new compressor at the existing point where the GLG and NNG pipelines interconnect.
- Installation of an ultrasonic meter facility to serve the Mesaba Generating Station.

The proposed pipeline route is illustrated in Figure 2.3-8. As an interstate pipeline, the East Range natural gas supply pipeline would not be subject to Minnesota Pipeline Route Permit requirements but would be permitted by NNG under the Federal Energy Regulatory Commission (FERC) review process. Approximately 856 residences are located within a half mile of the existing pipeline ROW, 46 of which are located within 300 feet of the ROW.

2.3.2.5 HVTL Corridors

Overview

Excelsior would configure the high voltage switchyard for the East Range Site at 345-kV for both phases of the Mesaba Generating Station. The option to operate the switchyard at 345-kV at the start of Phase I was based on a 5-MWe lower net line loss than would occur if the facilities were operated at 230-kV. Over the project life, the capacity gain associated with the 345-kV option would offset its higher capital cost. The high voltage switchyard required to transmit the entire output from Phase I and Phase II to the point of interconnection with minimum line loss would be installed during construction of Phase I. No further development would be required to accommodate Phase II.

Point of Interconnection

Transmission lines near the East Range Site are part of the MP transmission network known as the "North Shore Loop," which extends from the east end of the Iron Range, along the north shore of Lake Superior, and into Duluth. The 115/138-kV transmission facilities that make up this loop are heavily loaded and currently operate with several special protection schemes involving generation reduction and/or unit tripping to avoid overloading the remaining transmission facilities during critical equipment outages. To minimize the impact on this already constrained local transmission system, Excelsior proposes to construct new HVTLs to the Forbes Substation, approximately 30 miles directly west-southwest of the East Range Site, which would be the POI for the Mesaba Generating Station (Figure 2.3-8). The Forbes Substation is a major electrical hub on the east end of the Iron Range that has 500-kV, 230-kV, and 115-kV buses owned by both MP (115/230-kV) and Xcel Energy (500-kV).

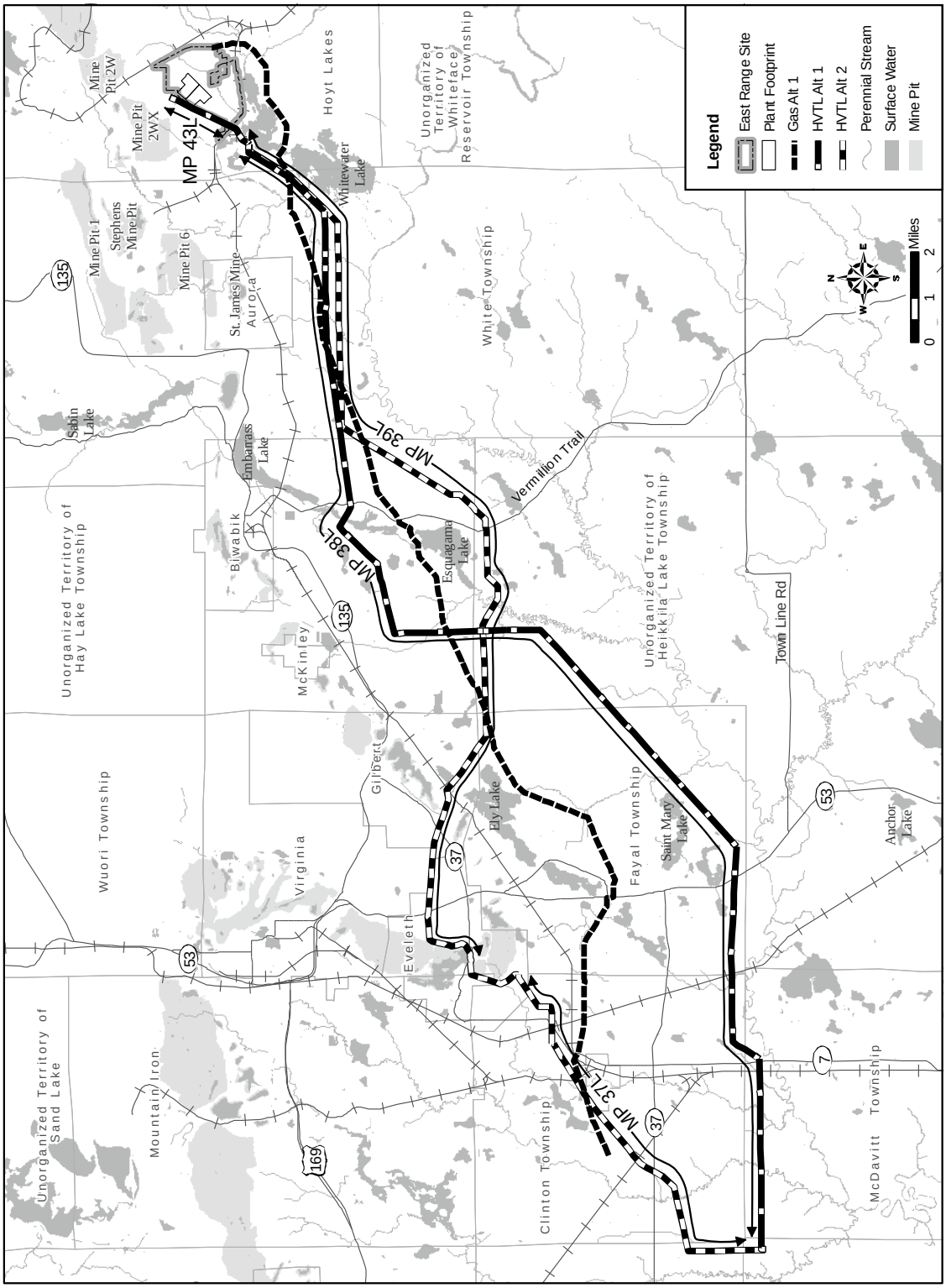


Figure 2.3-8. East Range NG and HVTL Alternatives

Based upon preliminary system studies, interconnecting the Project directly to the Forbes 500/230-kV Substation would result in minimal impact on the underlying MP system, including the already congested "North Shore Loop." The MISO generator interconnection process has been initiated to evaluate Forbes as the POI and to determine what network upgrades are necessary to deliver the output of Phase I to the Xcel Energy control area (Twin Cities).

HVTL Alternative Routes to Support the East Range Site

Excelsior's preferred transmission plan for the East Range Site consists of constructing two new 345-kV HVTLs to link the Mesaba Generating Station with the Forbes Substation. As discussed in Section 2.2.2.4, even though one 345-kV HVTL is sufficient to accommodate the combined full load output of Phases I and II, both new lines must be constructed to address the single-failure criterion concerns. Excelsior proposes to utilize mostly existing ROWs of 115/138-kV HVTL corridors owned by MP that interconnect the Syl Laskin Energy Center with the Forbes Substation and minimize any interruption in electrical service of the existing lines within the corridors selected. Excelsior proposes to use two existing corridors, the 39L/37L corridor and the 38L corridor, as routes for its two 345-kV HVTLs**, both of which would be used beginning with the Phase I plant**. These routes are illustrated in Figure 2.3-8**, which shows the 38L corridor as "HVTL Alt. 1" and the 39L/37L corridor as "HVTL Alt. 2"**. Each corridor spans a length of approximately 33 miles between the East Range Site and the Forbes Substation.

The ROW of a 138-kV line (43L) connecting the Laskin Substation with the CE Substation adjoins the western boundary of the East Range Site. The southern portion of this line could be replaced with double circuit structures to carry the lines from the Mesaba Generating Station and the existing 138-kV HVTL to the Laskin Substation via the existing ROW. However, Excelsior would avoid taking the existing 138-kV HVTL out of service due to the critical role it plays as part of MP's North Shore Loop.

To minimize the impact of the Mesaba Generating Station on the already constrained local transmission system, Excelsior proposes to avoid removing any of the 115/138-kV facilities (the 43L, the Laskin Substation, or the interconnecting HVTLs between the Laskin Substation and the Forbes Substation) from service without providing a replacement HVTL. This can be done in one of two ways. First, the existing 115-kV HVTLs can be handled in "hot" conditions (i.e., HVTLs that are energized) allowing the new HVTL structures to be constructed within the existing ROW and the existing "hot" lines to be transferred to the new structures with no interruption of service. Second, Excelsior could acquire a minimal width of additional ROW along an existing corridor so that new structures can be constructed with less risk.

To avoid the high cost and dangerous conditions associated with "hot" construction methods, Excelsior proposes to acquire an additional 30 feet of ROW along one of the routes between the Laskin and Forbes Substations.

Based on a review of aerial photographs and video taken during overflights of the routes in September 2005, Excelsior identified the 39L/37L corridor as the preferred route along which to acquire the additional 30-foot ROW. For the alternative plan, Excelsior would acquire the additional ROW along the 38L corridor. The preferred and alternative route plans are described in the following subsections.

Either **Excelsior's preferred or alternative** plan would require the acquisition of two new segments of ROW **along with the 30-foot addition described in the preceding paragraph**. One **of the two** new ROW **segments would be** about 2 miles in length **and** would extend alongside the existing MP 43L HVTL corridor **to** connect the Mesaba Generating Station with the initiation point of the 39L and 38L corridors.

The second **new ROW segment would be** about 2 miles **in length and** would be required to link the 39L and 37L corridors near the City of Eveleth.

Excelsior's Preferred Route Plan (Additional Right-of-Way Taken Along 39L/37L Route)

Excelsior considers the best option for widening the 39L corridor to involve acquiring ROW on the south side of the existing ROW from the Laskin Substation to CR 97, then moving to the north side from CR 97 to, and across, the Thunderbird Mine. The 39L has single-family residential conflicts in three potential locations and potentially one industrial site conflict. These narrow sections of ROW would necessitate either hot line construction or construction in short, scheduled outage windows on the existing line in affected ROWs. The 37L could be widened on either side of the ROW since the only conflicts involve existing transmission lines, which may require outage windows for construction.

Approximately 962 residences are located within a half mile of the centerline of the existing ROWs of the 39L and 37L, of which 369 are located within a quarter mile of the alignment **(many of these residences are located within the City of Eveleth)**. Approximately 16 residences are located within 300 feet of the ROWs and 33 others are located within 500 feet.

Excelsior's Alternative Route Plan (Additional Right-of-Way Taken Along 38L Route)

The alternative route plan would involve the same alignments as the preferred route plan. However, for the alternative plan, Excelsior would acquire the additional 30 feet of ROW along the 38L corridor. Excelsior determined that the best option for widening the ROW for the 38L corridor would involve acquiring ROW on the north side of the existing structures. This route conflicts with three to four short sections of existing 38L ROW where single family residences are located on the north side of the existing 115-kV ROW. The ROW in these locations is too narrow for a 30-foot expansion. Therefore, Excelsior would propose constructing these sections during short, scheduled line outages, or under hot line construction, on the existing 38L 115-kV centerline.

Approximately 271 residences are located within a half mile of the centerline of the existing ROWs of the 38L, of which 116 are located within a quarter mile of the alignment. Approximately 11 residences are located within 300 feet of the ROWs and 11 others are located within 500 feet.

2.4 SUMMARY COMPARISON OF ALTERNATIVES AND IMPACTS

Table 2.4-1 summarizes the potential impacts for the No Action Alternative in comparison to the Proposed Action at either of Excelsior's alternative sites. The baseline conditions that are relevant to the No Action Alternative are described in Chapter 3 for each resource area. The impacts for each environmental resource are based on the detailed analyses of impacts in Chapter 4.

Table 2.4-1. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	Aesthetics	
No change in existing conditions; no change in viewsheds or aesthetic resources.	**Power Plant Site:** Change in viewshed for properties within sightline of power plant location. Security lighting and aircraft warning lights for power plant may be visible to closest residences (~50 within 1 mi). Three public lands are located within 20 mi, where vapor plumes may be visible at times (Hill Annex Mine State Park, Forest History Center, and Chippewa National Forest). See also: Noise. **Mesaba Generating Station (Phases I and II) would be twice the size of Phase I only and have 8 emission stacks instead of 4.** **No substantial differences in utility and transportation corridors for 2-phased plant compared to Phase I only.** **Transportation Facilities:** Aesthetic impacts from rail and road construction and operation for closest residences. See also: Noise. • Rail alt. 1A within 0.5 mi of 16 residences (closest within **470** ft). • Rail alt. 1B **eliminated based on Draft EIS.** • **Rail alt. 3B within 0.5 mi of 16 residences (closest within 470 ft).** • **Access Roads 1 and 2 eliminated after Draft EIS (CR 7 realignment deferred by Itasca County).** • **Access Road 3 within 0.5 mi of 2 residences (both within 1,250 ft).** **Water Sources and Discharges:** Temporary aesthetic impacts during construction. • Process water pipelines within 0.5 mi of 104 residences (4 within 500 ft). • Cooling water effluent pipelines **avoided using enhanced ZLD system.** • Potable/sanitary pipelines within 0.5 mi of 114 residences (4 within 500 ft). **Natural Gas Facilities:** Temporary aesthetic impacts during construction. Permanently cleared ROW (low-growing vegetation) • Alt. 1 within 0.5 mi of 153 residences (3 within 300 ft). • Alt. 2 within 0.5 mi of 339 residences (5 within 300 ft). • Alt. 3 within 0.5 mi of 935 residences (29 within 300 ft).	**Power Plant Site:** Change in viewshed for properties within sightline of power plant location. Security lighting and aircraft warning lights for power plant may be visible to closest residences (none within 1 mi). Site is on private land within Superior National Forest boundary, and two other public lands are located within 20 mi, where vapor plumes may be visible. See also: Noise. **Mesaba Generating Station (Phases I and II) would be twice the size of Phase I only and have 8 emission stacks instead of 4.** **No substantial differences in utility and transportation corridors for 2-phased plant compared to Phase I only.** **Transportation Facilities:** Aesthetic impacts from rail and road construction and operation for closest residences. See also: Noise. No residences within 0.5 mi of either rail alignment alternative (closest, ~1 mi). No residences within 0.5 mi of site access road (closest, >1 mi). **Water Sources and Discharges:** • No residences within 0.5 mi of process water pipeline segments (closest residence >0.75 mi). • No cooling water effluent pipeline (enhanced ZLD system). • No residences within 0.5 mi of potable/sanitary pipelines (closest >0.75 mi). **Natural Gas Facilities:** Temporary aesthetic impacts during construction. Proposed natural gas pipeline on existing pipeline ROW within 0.5 mi of 856 residences (46 within 300 ft).

Table 2.4-1. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	HVTL Corridors: Change in viewshed for properties within sightline of new HVTLs (permanently cleared ROW with low-growing vegetation). Increased height and visibility of power poles in existing HVTL ROWs. • **HVTL Alt 1 (WRA-1 or WRB-1)** within 0.5 mi of 66 residences (4 within 500 ft). • **HVTL Alt 1A (WRA-1A or WRB-1A)** within 0.5 mi of 62 residences (7 within 500 ft). • **HVTL Phase 2 Plan B (WRB-2A)** existing HVTL ROW within 0.5 mi of 214 residences (29 within 500 ft).	**HVTL Corridors:** HVTLs on existing HVTL ROWs (<4 mi of new ROW); widening of one corridor required (permanently cleared ROW with low-growing vegetation). Increased height and visibility of power poles for properties within sightline of HVTLs. **Note that taller poles would be required for all HVTLs, but ROW widening would only occur on one of the two alignments.** • **HVTL Alt 1 (widen 38L ROW)** within 0.5 mi of 271 residences (22 within 500 ft). • **HVTL Alt 2 (widen 39L/37L ROW)** within 0.5 mi of 962 residences (49 within 500 ft).
Air Quality		
No change in existing conditions; no new emissions affecting air quality.	**Power Plant Site:** The facility would be a major source of SO_2, NO_X, CO, PM_{10}, and VOCs (for both Phase I-only and combined Phases I and II) under the PSD regulations (Table 4.3-7). Annual emissions of criteria pollutants **for combined Phases I and II** would include **(emissions for Phase I-only would be halved in comparison to the levels that would occur during the combined phase):** • 1,390 tons of SO_2, • 2,872 tons of NO_X, • 2,539 tons of CO, • 0.03 tons of Pb, • **532** tons of PM_{10}, and • 197 tons of VOCs; Predicted concentrations for each pollutant would be below allowable levels under NAAQS and MAAQS. The plant would potentially emit 0.026 tons per year (tpy) of mercury (below the HAP threshold of 25 tpy)**. EPA recently decided to develop emissions standards for power plants consistent with the D.C. Circuit's 2008 ruling to vacate CAMR. Although the final MACT is unknown at this time, the Mesaba Energy Project would implement mercury control technology, which would meet or exceed any anticipated regulatory requirement as activated carbon beds to treat pre-combustion syngas would be state-of-the art technology.**	**Power Plant Site: Similar to the West Range Site, the facility at the East Range Site would be a major source of SO_2, NO_X, CO, PM_{10}, and VOCs (for both Phase I-only and combined Phases I and II) under the PSD regulations (Table 4.3-7). Annual emissions of criteria pollutants for the East Range Site would be the same as the West Range Site, except for PM_{10}, which would be 709 tons.** Because of the source water quality at the East Range Site, emissions of PM_{10} would be higher than at the West Range Site. Similar to the West Range Site, predicted concentrations for each pollutant would be below allowable levels under NAAQS and MAAQS. The plant would potentially emit 0.026 tpy of mercury (below the HAP threshold of 25 tpy). **EPA recently decided to develop emissions standards for power plants consistent with the D.C. Circuit's 2008 ruling to vacate CAMR. Although the final MACT is unknown at this time, the Mesaba Energy Project would implement mercury control technology, which would meet or exceed any anticipated regulatory requirement as activated carbon beds to treat pre-combustion syngas would be state-of-the art technology.**

Table 2.4-1. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	Class II PSD increment analysis: Because the highest predicted impacts were significant (i.e., above PSD Significant Impact Levels [SILs]), increment and NAAQS compliance modeling was necessary for SO_2, PM_{10}, and NO_X (Table 4.3-9). Class II PSD increment analysis indicates that the project would comply with all state and Federal Class II increment limits **(for both the single and combined phases)**. **Results of Class II PSD increment analysis for Phases I and II combined (emissions for Phase I-only would be halved in comparison to the levels that would occur during the combined phase) are as follows:** • **SO_2 - 118.2 µg/m^3 for 1-hr averaging time; 71.2 µg/m^3 for 3-hr averaging time; 21.0 µg/m^3 for 24-hr averaging time; and 4.2 µg/m^3 for annual averaging time** • **PM_{10} – 24.8 µg/m^3 for 24-hr averaging time; and 1.7 µg/m^3 for annual averaging time** • **NO_2 – 7.6 µg/m^3 for annual averaging time** **NAAQS/MAAQS evaluation calculated the maximum impact of the Mesaba Generating Station, combined with all other regional sources and background concentrations. For Phase I-only and Phases I and II combined, the following predicted concentrations are below allowable levels, and the results demonstrate compliance with all MAAQS and NAAQS (Tables 4.3-10 and 4.3-11):** • **SO_2 – 521.9 µg/m^3 for 1-hr averaging time; 237.6 µg/m^3 for 3-hr averaging time; 73.3 µg/m^3 for 24-hr averaging time; and 8.6 µg/m^3 for annual averaging time** • **PM_{10} – 126.1 µg/m^3 for 24-hr averaging time; and 37.9 µg/m^3 for annual averaging time** • **$PM_{2.5}$ – 31.7 µg/m^3 for 24-hr averaging time; and 8.1 µg/m^3 for annual averaging time** • **NO_2 – 17.0 µg/m^3 for annual averaging time** • **CO – 8,959 µg/m^3 for 1-hr averaging time**	**Class II PSD increment analysis: Because the highest predicted impacts were significant (i.e., above PSD Significant Impact Levels [SILs]), increment and NAAQS compliance modeling was necessary for SO_2, PM_{10}, and NO_X (similar to West Range Site) (Table 4.3-9). Class II PSD increment analysis indicates that the project would comply with all state and Federal Class II increment limits for both the single and combined phases. Results of Class II PSD increment analysis for Phases I and II combined (emissions for Phase I-only would be halved in comparison to the levels that would occur during the combined phase) are as follows:** • **SO_2 – 294.3 µg/m^3 for 1-hr averaging time; 200.4 µg/m^3 for 3-hr averaging time; 52.5 µg/m^3 for 24-hr averaging time; and 2.9 µg/m^3 for annual averaging time** • **PM_{10} – 26.3 µg/m^3 for 24-hr averaging time; and 0.7 µg/m^3 for annual averaging time** • **NO_2 – 8.1 µg/m^3 for annual averaging time** **NAAQS/MAAQS evaluation calculated the maximum impact of the Mesaba Generating Station, combined with all other regional sources and background concentrations. Similar to West Range Site, for Phase I-only and Phases I and II combined, the following predicted concentrations are below allowable levels, and the results demonstrate compliance with all MAAQS and NAAQS (Tables 4.3-10 and 4.3-11):** • **SO_2 – 565.1 µg/m^3 for 1-hr averaging time; 360.4 µg/m^3 for 3-hr averaging time; 166.5 µg/m^3 for 24-hr averaging time; and 30.8 µg/m^3 for annual averaging time** • **PM_{10} – 112.2 µg/m^3 for 24-hr averaging time; and 32.9 µg/m^3 for annual averaging time** • **$PM_{2.5}$ – 30.1 µg/m^3 for 24-hr averaging time; and 7.5 µg/m^3 for annual averaging time** • **NO_2 – 32.5 µg/m^3 for annual averaging time** • **CO – 11,565 µg/m^3 for 1-hr averaging time**

Table 2.4-1. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	Class I PSD increment analysis: Class I PSD increment modeling for West Range Site was based on Phase I and Phase II both operating at the "proposed" emission rates. Class I area impacts analysis indicates that the project impacts would be below allowable increments for all pollutants in Class I areas (i.e., BWCAW, VNP, and RLW) for both the Phase I-only emissions and Phases I and II combined emissions (Table 4.3-13). Long-term impacts are also below the SILs, indicating that impacts would not be significant, with no further analysis necessary. However, impacts are indicated to exceed the SILs for short-term SO_2 and PM_{10} at both BWCAW and VNP; therefore, a cumulative impact analysis (includes other regional SO_2 and PM_{10} increment sources, as well as reasonably foreseeable sources) was conducted to quantify total PSD increment consumption at both sites. The cumulative air impacts analysis indicates that there would be no exceedance of state/Federal standards (including applicable SIL) in any Class I area. Additionally, the cumulative impacts analyses demonstrate that there would be minor differences in cumulative impacts between the West Range Site versus East Range Site (Section 5.2.2.2; Table 5.2.2.-2).	**Class I PSD increment analysis: Because the East Range Site is in closer proximity to the Class I areas, the Class I PSD increment modeling for the East Range Site was based on Phase I operating at the "proposed" emission rates and Phase II was operating at the "enhanced" emission rates. Similar to the West Range Site, Class I area impacts analysis indicates that the project impacts would be below allowable increments for all pollutants in Class I areas (i.e., BWCAW, VNP, RLW, and IRNP – note, IRNP was analyzed for East Range Site due to proximity) for both the Phase I-only emissions and Phases I and II combined emissions (Table 4.3-14). Long-term impacts are also below the SILs, indicating that impacts would not be significant, with no further analysis necessary. However, impacts are indicated to exceed the SILs for short-term SO_2 and PM_{10} at BWCAW and short-term SO_2 at VNP; therefore, a cumulative impact analysis (includes other regional SO_2 and PM_{10} increment sources, as well as reasonably foreseeable sources) was conducted to quantify total PSD increment consumption at both sites. Similar to the West Range Site, the cumulative air impacts analysis indicates that there would be no exceedance of state/Federal standards (including applicable SIL) in any Class I area. Additionally, the cumulative impacts analyses demonstrate that there would be minor differences in cumulative impacts between the West Range Site versus East Range Site (Section 5.2.2.2; Table 5.2.2-2).**
	Class I Visibility/Regional Haze Analysis: Visibility/regional haze analysis in Class I areas using Method 2 predict that there would be days with ≥5% change in light extinction or ≥10% change in light extinction (Table 4.3-15). Results based on Method 8, indicate that emissions associated with Phases I and II would have the potential to produce impacts above the 5% limit at BWCAW and VNP (Table 4.3-15). The following summarizes the visibility impacts analysis results for both Method 2 and Method 8: **BWCAW** • **Method 2 (in a given year): 1 to 21 days of ≥5% light extinction and 0 to 6 days of ≥10% light extinction, depending on operating scenario.**	**Class I Visibility/Regional Haze Analysis: The visibility modeling analysis results for the East Range Site reflect the influence of the site's closer proximity to BWCAW by the commensurate higher predicted number of days with a change in light extinction above 5% and 10% for the same operating scenarios (Table 4.3-16). The following summarizes the visibility impacts analysis results for both Method 2 and Method 8:** **BWCAW** • **Method 2 (in a given year): 10 to 86 days of ≥5% light extinction and 0 to 29 days of ≥10% light extinction, depending on operating scenario.** • **Method 2 (2002-2004): 71 to 193 days of ≥5% light**

Table 2.4-1. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	• Method 2 (2002-2004): 5 to 54 days of ≥5% light extinction and 0 to 13 days of ≥10% light extinction, depending on operating scenario. • Method 8 (annual): 8th highest values would exceed the 5% limit for "proposed" / "proposed" (highest value, 5.13%). • Method 8 (20%): 8th highest values would exceed the 5% limit for "proposed" / "proposed" (highest value, 7.4%) and "proposed" / "enhanced" (highest value, 5.75%). **VNP** • Method 2 (in a given year): 1 to 22 days of ≥5% light extinction and 0 to 7 days of ≥10% light extinction. • Method 2 (2002-2004): 9 to 51 days of ≥5% light extinction and 1 to 12 days of ≥10% light extinction, depending on operating scenario. • Method 8 (annual): 8th highest values would exceed the 5% limit for "proposed" / "proposed" (highest value, 5.95%). • Method 8 (20%): 8th highest values would exceed the 5% limit for "proposed" / "proposed" (highest value, 8.57%) and "proposed" / "enhanced" (highest value, 6.64%).	extinction and 7 to 43 days of ≥10% light extinction, depending on operating scenario. • Method 8 (annual): 8th highest values would exceed the 5% limit for all operating scenarios modeled (highest value, 10.28%). • Method 8 (20%): 8th highest values would exceed the 5% limit for all operating scenarios modeled (highest value, 14.69%). **VNP** • Method 2 (in a given year): 1 to 7 days of ≥5% light extinction and 0 to 2 days of ≥10% light extinction. • Method 2 (2002-2004): 4 to 14 days of ≥5% light extinction and 0 to 3 days of ≥10% light extinction, depending on operating scenario. • Method 8 (annual): 8th highest values would exceed the 5% limit for none of the operating scenarios modeled. • Method 8 (20%): 8th highest values would exceed the 5% limit for "proposed" / "proposed" (highest value, 5.49%). **IRNP** • Method 2 (in a given year): 0 to 2 days of ≥5% light extinction and 0 to 1 days of ≥10% light extinction. • Method 2 (2002-2004): 1 to 2 days of ≥5% light extinction and 0 to 1 days of ≥10% light extinction, depending on operating scenario. • Method 8 (annual): 8th highest values would exceed the 5% limit for none of the operating scenarios modeled. • Method 8 (20%): 8th highest values would exceed the 5% limit for none of the operating scenarios modeled.

Table 2.4-1. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	Odors from H_2S and NH_3 would be negligible, because associated processes would be enclosed. Sulfur and Nitrogen Deposition: The National Park Service (NPS) has established a Deposition Analysis Threshold (DAT) of 0.01 kg/hectare/yr for both sulfur (S) and nitrogen (N) deposition in Class I areas, which is the level below which adverse impacts are not anticipated. **No exceedances of the DAT for nitrogen would occur under any of the operating scenarios (Table 4.3-20). No exceedances of the DAT for sulfur would occur under the Phase I-only scenario; exceedances of the DAT for sulfur would occur at BWCAW for the "proposed"/"proposed" scenario and at VNP for the "proposed"/"proposed" and "proposed"/ "enhanced" scenarios.**	Odors from H_2S and NH_3 would be negligible, because associated processes would be enclosed. Sulfur and Nitrogen Deposition: The DAT of 0.01 kg/hectare/yr established by NPS for both S and N deposition in Class I areas would apply to the East Range Site. **DAT exceedances for nitrogen would occur at the BWCAW for all operating scenarios (Table 4.3-20). DAT exceedances for sulfur would occur at BWCAW for all operating scenarios and at VNP for the "proposed"/ "proposed" scenario. Further cumulative analysis on nitrogen and sulfur deposition impacts are discussed in Section 5.2.2.**
	Modeled mercury concentration over lakes and watershed (from AERMOD modeling) = 1.3 x 10^{-5} µg/m^3. The deposition rate for mercury would be **1.3 x 10^{-9} µg/m^2 per** sec over lakes and **6.5 x 10^{-9} µg/m^2 per** sec over the rest of the watershed. Big Diamond Lake would be within the release plume of future facility emissions; therefore, the concentration and rate of deposition was used to determine the incremental contribution of mercury in fish tissues caught from Big Diamond Lake (see Section 4.17, Health and Safety). Mercury emissions and subsequent deposition would be reduced by the high efficiency IGCC technology combined with the design-added mercury removal carbon absorption beds to ensure that mercury emissions from the facility would be less than 10 percent of the mercury in the feedstock. **Maximum predicted concentration of elemental mercury concentration in Class I areas due to operation of Phase I and Phase II is 1.6 x 10^{-6} µg/m^3 at VNP (0.11% of background concentration of elemental mercury). See Table 5.2.2-5. Phase I impacts would be roughly halved.** **Transportation Facilities:** Fugitive dust emissions during construction and operations from vehicle traffic, transportation of materials, and material handling. The impacts would be localized and would decrease with distance from site and alignments. **Relative to plant-wide emissions and considering sources are mobile, transportation-related emissions are considered negligible for both the single and combined phases; estimated transportation-related emissions are as follows (Phase I-only**	**Modeled mercury concentration over lakes and watershed (from AERMOD modeling) = 1.3 x 10^{-5} µg/m^3. The deposition rate for** would be **1.3 x 10^{-9} µg/m^2 per** sec over lakes and **6.5 x 10^{-9} µg/m^2 per** sec over the rest of the watershed. Colby Lake would be within the release plume of future facility emissions; therefore, the concentration and rate of deposition was used to determine the incremental contribution of mercury in fish tissues caught from Colby Lake based on the analytical results for Big Diamond Lake (see Section 4.17, Health and Safety). Mercury emissions and subsequent deposition would be reduced by the high efficiency IGCC technology combined with the design-added mercury removal carbon absorption beds to ensure that mercury emissions from the facility would be less than 10 percent of the mercury in the feedstock. **Maximum predicted concentration of elemental mercury concentration in Class I areas due to operation of Phase I and Phase II is 4.1 x 10^{-6} µg/m^3 at BWCA (0.28% of background concentration of elemental mercury). See Table 5.2.2-6. Phase I impacts would be roughly halved.** **Transportation Facilities:** Fugitive dust emissions during construction and operations from vehicle traffic, transportation of materials, and material handling. The impacts would be localized and would decrease with distance from site and alignments. **Relative to plant-wide emissions and considering sources are mobile, transportation-related emissions are considered negligible for both the single and combined phases; estimated transportation-related emissions are as follows (Phase I-only**

Table 2.4-1. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	emissions would be half of levels occurring under the combined phase): • **Emissions from personally owned vehicles (POVs): During peak construction activities, the following daily emission rates (lb/day) would occur: 0.8 NO_x; 11 CO; 0.48 NMOC (non-methane organic compounds); and 0.2 PM. Peak traffic counts from project (during Phase I and II construction overlap) would still be minor fraction of existing AADT threshold and, therefore, impacts are considered negligible.** • **Emissions from rail deliveries: During operation, the following annual emissions would occur (tpy): 150,000 CO_2; 1.5 SO_2; 2,300 NO_x; 80 PM; and 410 CO.** • **Emissions from truck deliveries: During operation, the following annual emissions would occur (tpy): 7,700 CO_2; 0.1 SO_2; 60 NO_x; 0.8 PM; and 7 CO.** **Water Sources and Discharges, Natural Gas Facilities, and HVTL Corridors:** Fugitive dust emissions during construction related to the respective lengths of potential alignments.	**emissions would be half of levels occurring under the combined phase):** • **Emissions from POVs: During peak construction activities, the daily emission rates and impacts would be similar to those of West Range Site.** • **Emissions from rail deliveries: During operation, the following annual emissions would occur (tpy): 170,000 CO_2; 1.7 SO_2; 2,600 NOx; 90 PM; and 460 CO.** • **Emissions from truck deliveries: During operation, the following annual emissions would occur (tpy): 8,100 CO_2; 0.1 SO_2; 61 NOx; 0.8 PM; and 7 CO.** **Water Sources and Discharges, Natural Gas Facilities, and HVTL Corridors:** Fugitive dust emissions during construction related to the respective lengths of potential alignments.
Geology and Soils		
No change in existing conditions; no new land disturbance.	**Power Plant Site:** The plant footprint (Phases I & II) would occupy approximately **202** ac. Site grading and preparation for the plant footprint would require approximately **3,100,000** yd^3 of cut land and approximately **2,350,000** yd^3 of fill land. **The Phase II footprint would be cleared to serve as a laydown area for Phase I construction. Therefore, the amount of disturbed soil on site would not dramatically change between Phase I and Phase II construction. Offsite laydown areas for Phase II construction would be established on 85 ac of lands at 4 potential sites that have been disturbed from prior mining activities.** **All utilities and transportation infrastructure would be developed for operation of Phase I (no difference in impacts for Phase I-only outcome).** Although the site is situated on **152** ac of soils classified as prime farmland or prime farmland if drained, no agriculture uses currently occur on the property. The Minnesota Prime Farmland Exclusion Rule does not apply to the site which is within 2 mi of a statutory city **(Taconite)**.	**Power Plant Site:** The plant footprint (Phases I & II) would occupy approximately **182** ac. Based on site topography, grading and preparation for the plant footprint would require **approximately 3,349,000 yd^3 of cut volume and less fill than the West Range Site**. **The Phase II footprint would be cleared to serve as a laydown area for Phase I construction. Therefore the amount of disturbed soil on site would not dramatically change between Phase I and Phase II construction. Offsite laydown areas for Phase II construction would be established on 85 ac of lands at 2 potential sites that have been disturbed from prior mining activities.** **All utilities and transportation infrastructure would be developed for operation of Phase I (no difference in impacts for Phase I-only outcome).** There are no areas designated as prime farmland within the East Range Site boundary and no agriculture uses currently occur on the property. The Minnesota Prime Farmland Exclusion Rule does not apply to the site which is within 2 mi of a statutory city.

Table 2.4-1. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	Transportation Facilities: Construction impacts from rail and road alignments. No long-term operational impacts. • Rail alt. 1A would disturb **118** ac, require approximately **3,725,000** yd^3 of cut land and **610,000** yd^3 of fill land, and **affect** approximately **50** ac of prime farmland soils. • Rail alt. 1B **eliminated based on Draft EIS.** • **Rail alt. 3B would disturb 107 ac, require approximately 2,620,000 yd^3 of cut land and 620,000 yd^3 of fill land, and affect approximately 66 ac of prime farmland soils.** • **Access Roads 1 and 2 eliminated after Draft EIS (CR 7 realignment deferred by Itasca County).** • **Access Road 3 would disturb 20 ac, all of which are prime farmland soils.** **Water Sources and Discharges:** Construction of process water supply pipelines would disturb **134** ac and occupy **55** ac of prime farmland soils. Cooling water effluent pipelines **avoided using enhanced ZLD system**. Potable/sanitary pipelines would disturb **9** ac and occupy **<1** ac of prime farmland. **Natural Gas Facilities:** Construction impacts of alignments. • Alternative 1 would disturb **135** ac. • Alternative 2 would disturb **84** ac. • Alternative 3 would disturb **99** ac. **HVTL Corridors:** Impacts of alignments. • **HVTL Alt 1 (WRA-1 or WRB-1)** would disturb 134 ac and occupy <1 ac of prime farmland soils. • **HVTL Alt 1A (WRA-1A or WRB-1A)** would disturb **136** ac and occupy <1 ac of prime farmland soils. • **HVTL Phase 2 Plan B** (WRB-2A) would disturb land on an existing HVTL ROW.	**Transportation Facilities:** Construction impacts from rail and road alignments. No long-term operational impacts. • Rail alt. 1 would disturb **53** ac and require approximately **2,390,000** yd^3 of cut land and less fill than at West Range. • Rail alt. 2 would disturb **58** ac and require approximately **2,180,000** yd^3 of cut land and less fill than at West Range. • Access road construction **(single segment)** would disturb **26** ac. Impacts on prime farmland could not be determined from data available, because the soil survey for St. Louis County has not been completed. **However, the Minnesota Prime Farmland Exclusion Rule does not apply to the alignment which is in or within 2 mi of a statutory city (Hoyt Lakes).** **Water Sources and Discharges:** Construction of process water supply pipelines would disturb approximately 109 ac. No cooling water effluent pipelines required (due to the use of an enhanced ZLD system). Potable/sanitary pipelines would disturb 25 ac. Impacts on prime farmland could not be determined (soil survey for St. Louis County not complete). **Natural Gas Facilities:** Pipeline would be constructed within an existing gas pipeline ROW requiring disturbance of **259** ac. **HVTL Corridors:** HVTLs constructed on existing HVTL ROWs with new towers (<4 mi of new ROW); widening of one or the other corridor required. • **HVTL Alt 1 (widen 38L ROW)** would disturb **about** 457 ac. • **HVTL Alt 2 (widen 39L/37L ROW)** would disturb **about** 455 ac.

Table 2.4-1. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	Water Resources	
No changes to water resources in the project area. **At West Range Site, potential to aid the state in maintaining mine pits that are currently being pumped (HAMP) or may overflow (CMP) would not occur. No benefits to water quality of Swan River as a result of funded I/I studies and planned improvements at CBT WWTF. At East Range Site, potential to aid other industrial users (e.g., PolyMet) in the treatment of their wastewaters would not occur.**	**Power Plant Site:** Disturbance of land areas during plant construction, as summarized for Geology and Soils, would create potential for erosion and sedimentation. Impacts on surface waters would be minimized through the implementation of an erosion and sediment control (ESC) plan required for a National Pollutant Discharge Elimination System (NPDES) General Construction Permit. Potential impacts during operation would be minimized through the implementation of a stormwater pollution prevention plan (SWPPP) based on state requirements. **All stormwater discharges (within a 24-hour, 100-year storm event) would be eliminated, as stormwater would be treated and reused within the plant, primarily for cooling water**. No impacts on groundwater from the construction or operation of the plant are expected. **Transportation Facilities:** Disturbance of land areas during road and railway construction, as described for Geology and Soils. Impacts on surface waters would be minimized through the implementation of a SEC plan required for a NPDES General Construction Permit. No impacts on surface waters or groundwater from the operation of the road and railway expected. **Water Sources and Discharges: No direct discharge of any process wastewaters to surface waters would occur due to the enhanced ZLD system. During Phase I, annual process water demand** from CMP and interconnected mine pits would not adversely affect water sources. Lowering of water level in CMP would reduce potential for overflow impacts on Coleraine and Bovey. **At the end of the 30-year project life, concentration of phosphorous in the CMP would increase from 0.0037 mg/L to 0.0057 mg/L; however, this predicted concentration is below the state's standard of 1 mg/L and is expected to have minimal impact on biota in the CMP. During Phase II, water demand would lower water levels in HAMP Complex and may cause exposure of land bridges. Use of HAMP would require consultation with MNDNR to determine agency's operating priorities and to ensure minimal impacts to water resources. Elimination of LMP's discharge to the Prairie River represents 1.3 percent of river's average annual flow during normal operating conditions for Phase II. During dry seasons, Prairie**	**Power Plant Site:** Disturbance of land areas during plant construction, as summarized for Geology and Soils, would create potential for erosion and sedimentation. Impacts on surface waters would be minimized through the implementation of an ESC plan required for a NPDES General Construction Permit. Potential impacts during operation would be minimized through the implementation of a SWPPP based on state requirements. **All stormwater discharges (within a 24-hour, 100-year storm event) would be eliminated, as stormwater would be treated and reused within the plant, primarily for cooling water**. No impacts on groundwater from the construction or operation of the plant are expected. **Transportation Facilities:** Disturbance of land areas during road and railway construction, as described for Geology and Soils. Impacts on surface waters would be minimized through the implementation of a SEC plan required for a NPDES General Construction Permit. No impacts on surface waters or groundwater from the operation of the road and railway expected. **Water Sources and Discharges: No direct discharge of any process wastewaters to surface waters would occur due to the enhanced ZLD system. During Phase I, annual process water demand of 3,500 gpm (average) and 5,000 gpm (peak) from interconnected mine pits would not adversely affect water sources. During Phase II, water demand would cause fluctuations of water levels in Colby Lake, which is expected to result in minor impacts to fish populations, boat access and property values; greater fluctuation may occur in Whitewater Reservoir, which may cause similar impacts, but to a greater extent, depending on level of fluctuation. Excelsior would conduct further hydrologic modeling and investigations into limiting losses of water from Whitewater Reservoir as part of the water appropriation permit process. Any credit ultimately ascribed to recovering waters leaking from Whitewater Reservoir would be required to be supported by in-depth studies conducted in conjunction with input from the MNDNR. There are potential water quality benefits to the**

Table 2.4-1. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	River's normal low flow could be reduced by approximately 18 percent. If necessary, to protect river flows during such events, Excelsior would curtail direct appropriations from the river and instead withdraw from stored capacity in other mine pits. **I/I studies and planned improvements at the CBT WWTF would improve water quality of Swan River watershed.** Potable water use of 7,500 gpd during operation would not adversely affect Taconite water system, however, the existing water system does not have sufficient capacity to provide the 45,000 gpd during construction. Planned improvements to the system would be necessary to handle this demand, or Excelsior would provide potable water via truck during construction. Domestic wastewater discharges would be within the effective treatment capacity of the regional facility. **Natural Gas Facilities:** Best management practices (BMPs) would be implemented to minimize impacts from erosion and sedimentation during construction. **HVTL Corridors:** BMPs would be implemented to minimize impacts from erosion and sedimentation during construction.	**Lake Superior Basin watershed from providing treatment to industrial users' wastewaters.** Potable water use of 45,000 gpd during construction and 7,500 gpd during operation would not adversely affect the Hoyt Lakes water system. Domestic wastewater discharges would be within the effective treatment capacity of the municipal facility. **Natural Gas Facilities:** BMPs would be implemented to minimize impacts from erosion and sedimentation during construction. **HVTL Corridors:** BMPs would be implemented to minimize impacts from erosion and sedimentation during construction.
Floodplains		
No change in existing conditions; no impact on floodplains.	**Power Plant Site:** No impact. The site is approximately one mile from the nearest 100-year floodplain, along the Prairie River. **None of the candidate sites for Phase II staging and laydown activities is located within or would otherwise affect a 100-year floodplain.** **Transportation Facilities:** No impact. Proposed rail and access road alignments would be located outside of the 100-year floodplain. **Water Sources and Discharges:** No impact. Construction of pipelines would occur outside of the 100-year floodplain. **Natural Gas Facilities:** Temporary impacts may occur during construction of natural gas pipeline alt. 1, 2, or 3 as a result of trenching, stockpiling of soil, and storage of equipment where pipelines would cross the 100-year floodplain of Swan River or Prairie River However, impacts would be mitigated through the use of construction BMPs, and floodplain contours would be restored	**Power Plant Site:** No impact. The site is approximately one mile from the nearest 100-year floodplain, along the Partridge River. **None of the candidate sites for Phase II staging and laydown activities is located within or would otherwise affect a 100-year floodplain.** **Transportation Facilities:** No impact. Proposed rail and access road alignments would be located outside of the 100-year floodplain. **Water Sources and Discharges:** No impact. Construction of pipelines would occur outside of the 100-year floodplain. **Natural Gas Facilities:** Temporary impacts may occur during construction of the natural gas pipeline as a result of trenching, stockpiling of soil, and storage of equipment where the pipeline would cross the 100-year floodplain of the Partridge River. However, impacts would be mitigated through the use of construction BMPs, and floodplain contours would be restored

Table 2.4-1. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	following construction. No permanent impacts on flood elevations would occur, because the pipelines would be located below the land surface. **HVTL Corridors:** No impact. Construction of HVTLs would occur outside of the 100-year floodplain.	following construction. No permanent impacts on flood elevations would occur, because the pipelines would be located below the land surface. **HVTL Corridors:** Temporary impacts may occur during widening of HVTL corridors (38L or 39L/37L) where the HVTLs would cross the 100-year floodplain of the Partridge, Embarrass, or East Two River. No permanent impact on flood elevations would occur, because permanent structures would be limited to HVTL towers that have small footprints.
Wetlands		
No change in existing conditions; wetlands would remain in their current status.	**Power Plant Site:** Wetland **fill for** the plant footprint (Phases I & II) would be approximately 31 ac **(13 ac for Phase I and 18 ac for Phase II)**. **No wetlands would be disturbed for use of offsite laydown areas to support Phase II construction.** **All utilities and transportation infrastructure would be developed for operation of Phase I (no difference in wetland impacts for Phase I-only outcome).** **Transportation Facilities:** Construction of rail and road access would result in **filling of wetlands and potential isolation of wetlands in rail loops:** • Rail alt. 1A would **fill 18 ac of wetlands and isolate 58 ac of additional wetlands in the rail loop**. • Rail alt. 1B **eliminated based on Draft EIS**. • **Rail alt. 3B would fill <6 ac of wetlands.** • **Access Roads 1 and 2 eliminated after Draft EIS (CR 7 realignment deferred by Itasca County).** • **Access Road 3 would fill <0.2 ac of wetlands.** **Water Sources and Discharges:** Construction of pipelines: • Process water supply pipelines would **permanently convert <5 ac and temporarily affect <3 ac of wetlands.** • Cooling water effluent pipelines **avoided using enhanced ZLD system**. • Potable/sanitary pipelines would **be installed in ROW developed for other plant infrastructure; no additional impacts**. **Natural Gas Facilities:** Construction of pipelines:	**Power Plant Site:** Wetland **fill for** the plant footprint (Phases I & II) would be approximately **17** ac **(13 ac for Phase I and <4 ac for Phase II)**. **No wetlands would be disturbed for use of offsite laydown areas to support Phase II construction.** **All utilities and transportation infrastructure would be developed for operation of Phase I (no difference in wetland impacts for Phase I-only outcome).** **Transportation Facilities:** Construction of rail and road access would result in **filling of wetlands and potential isolation of wetlands in rail loops:**: • Rail alt. 1 would **fill 13 ac of wetlands and isolate 51 ac of additional wetlands in the rail loop**. • Rail alt. 2 would **fill 18 ac of wetlands** (no center loop). • Access road construction **(single road segment)** would **fill <0.5 ac of wetlands**. **Water Sources and Discharges:** Construction of pipelines: • Process water supply pipelines would **permanently convert <2 ac and temporarily affect <1 ac of wetlands**. • No cooling water effluent pipelines required (due to the enhanced ZLD system). • No wetlands are located in the alignments for potable/sanitary pipelines **(would affect 1.1 ac segment of Colby Lake)**. **Natural Gas Facilities:** Construction of the natural gas pipeline would **permanently convert <0.5 ac and temporarily affect 24 ac of wetlands**.

Table 2.4-1. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	• Alt. 1 would **permanently convert 16 ac and temporarily affect <5 ac of wetlands**. • Alt. 2 would **permanently convert 11 ac and temporarily affect <2 ac of wetlands**. • Alt. 3 would **permanently convert 4 ac and temporarily affect 8 ac of wetlands**. **HVTL Corridors:** Construction of HVTLs. • **HVTL Alt 1 (WRA-1 or WRB-1) would fill 0.01 ac, permanently convert 36 ac and temporarily affect 2 ac of wetlands**. • **HVTL Alt 1A (WRA-1A or WRB-1A) would fill 0.01 ac, permanently convert 25 ac and temporarily affect 4 ac of wetlands.** • **HVTL Phase 2 Plan B (WRB-2A) would fill 0.03 ac of wetland (construction in existing ROWs; no additional impacts).**	**HVTL Corridors:** HVTLs would be constructed on existing HVTL ROWs with new towers (<4 mi of new ROW); widening of one or the other corridor would be required. • **HVTL Alt 1 (widen 38L ROW) would fill 0.09 ac, permanently convert 62 ac and temporarily affect negligible ac of wetlands**. • **HVTL Alt 2 (widen 39L/37L ROW) would fill 0.09 ac, permanently convert 60 ac and temporarily affect 0.2 ac of wetlands**.
Biological Resources		
No change in existing conditions; biological resources would remain in current status.	**Power Plant Site:** Approximately **202** ac of vegetation **and habitat** would be lost or destroyed from construction for **the plant footprint in both phases (111 ac** for Phase I and **92 ac** for Phase II). **DOE determined, based on a Biological Assessment (see Appendix E), that the project may affect, but would not likely adversely affect, the Canada lynx or gray wolf; the USFWS has concurred with DOE's determination for the West Range Site. USFWS has also concurred with DOE's determination that the project is not likely to adversely affect the bald eagle.** Eight state-listed plant species (17 occurrences) in general area of site, but no occurrences within the site boundary. Possible, but unlikely, that these species could be affected. **85 ac of land on 4 potential sites would be cleared for offsite laydown areas to support Phase II construction. All 4 sites have been disturbed during prior mining activities.** **All utilities and transportation infrastructure would be developed for operation of Phase I (no difference in impacts for Phase I-only outcome).**	**Power Plant Site:** Approximately **183** ac of vegetation **and habitat** would be lost or destroyed from construction for **the plant footprint in both phases (98 ac** for Phase I and **85 ac** for Phase II. **DOE determined, based on a Biological Assessment (see Appendix E), that the project may affect, but would not likely adversely affect, the Canada lynx or gray wolf at the East Range Site; however, the USFWS stated that agency policy precludes consultation on more than one site and that it would only concur on the DOE determination for one of the two sites. DOE agreed that in the event that the East Range Site would be selected by the MPUC in the site permitting process, DOE would re-initiate consultation for the East Range Site. USFWS has concurred with DOE's determination that the project is not likely to adversely affect the bald eagle.** No known occurrences of state-listed species within 1 mi of site. **85 ac of land on 2 potential sites would be cleared for offsite laydown areas to support Phase II construction. Both sites have been disturbed during prior mining activities.** **All utilities and transportation infrastructure would be developed for operation of Phase I (no difference in impacts for Phase I-only outcome).**

Table 2.4-1. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	Transportation Facilities: Construction of rail and road access: • Rail alt. 1A: **92** ac of vegetation **and habitat would be** lost or destroyed **(80 ac additional habitat in rail loop may be affected without Excelsior's assurances to the contrary)**. No known occurrences of state-listed species within 1 mi. • Rail alt. 1B: **Eliminated based on Draft EIS**. • **Rail alt. 3B: 94 ac of vegetation and habitat would be lost (212 ac additional habitat in rail loop may be affected). No known occurrences of state-listed species within 1 mi.** • **Access Roads 1 and 2 eliminated after Draft EIS (CR 7 realignment deferred by Itasca County).** • **Access Road 3: 12 ac of vegetation and habitat would be lost; 8 ac would additionally be cleared for construction. No known occurrences of state-listed species within 1 mi.**	**Transportation Facilities:** Construction of rail and road access: • Rail alt. 1**: 53 ac of vegetation and habitat would be lost (105 ac additional habitat in rail loop may be affected without Excelsior's assurances to the contrary).** Two stream crossings could cause direct mortality to aquatic biota, habitat fragmentation/conversion, increased water temperature, and increased sedimentation (causing loss in macroinvertebrate communities). No known occurrences of state-listed species within 1 mi. • Rail alt. 2**: 58 ac of vegetation and habitat would be lost (no rail loop).** One stream crossing could cause direct mortality to aquatic biota, habitat fragmentation/conversion, increased water temperature, and increased sedimentation (causing loss in macroinvertebrate communities). No known occurrences of state-listed species within 1 mi. • Access road **(single road segment)** would result in the loss of **16** ac of **habitat; 10 ac would additionally be cleared for construction**. No known occurrences of state-listed species within 1 mi.
	Water Sources and Discharges: Construction of pipelines: • Process water supply pipelines would result in **conversion of 47 ac of wooded habitat to grassland habitat as well as clearing 46 ac of additional habitat during construction**. Five known occurrences of five state-listed plant species within 1 mi of proposed pipeline. Possible, but unlikely, that these species could be affected by construction (usually found in different habitat types). • Cooling water effluent pipelines **avoided using enhanced ZLD system.** • Potable/sanitary pipelines would cause the **conversion of 1 ac of wooded habitat to grassland habitat as well as clearing 6 ac of additional habitat during construction.**	**Water Sources and Discharges:** Construction of pipelines: • Process water supply pipelines would result in the **conversion of 21 ac of wooded habitat to grassland habitat as well as clearing 38 ac of additional habitat during construction**. No known occurrences of state-listed species within 1 mi. • No cooling water effluent pipelines (due to the use of an enhanced ZLD system). • Potable/sanitary pipelines would cause the **conversion of 2 ac of wooded habitat to grassland habitat as well as clearing 12 ac of additional habitat during construction**. No known occurrences of state-listed species within 1 mi of potable/sanitary pipelines.
	Natural Gas Facilities: • Alt 1 would cause the **conversion of 76 ac of wooded habitat to grassland habitat as well as clearing 32 ac of additional habitat during construction.** Nine known occurrences of seven state-listed plant species within 1 mi of proposed pipeline. Possible, but unlikely, that these species could be affected by construction (usually found in different habitat types).	**Natural Gas Facilities:** Proposed alignment would cause the **conversion of 24 ac of wooded habitat to grassland habitat as well as clearing <2 ac of additional habitat during construction**. Five occurrences of three state-listed plant species and seven occurrences of two state-listed animal species within 1 mi of proposed pipeline. Possible that construction could affect these species.

Table 2.4-1. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	• Alt 2 would cause the **conversion of 36 ac of wooded habitat to grassland habitat as well as clearing 6 ac of additional habitat during construction.** Three known occurrences of one state-listed plant species within 1 mi of proposed pipeline. Possible, but unlikely, that these species could be affected by construction (usually found in different habitat types). • Alt. 3 would cause the **conversion of 30 ac of wooded habitat to grassland habitat as well as clearing 20 ac of additional habitat during construction**. No known occurrences of state-listed species within 1 mi.	
	HVTL Corridors: • **HVTL Alt 1 (WRA-1 or WRB-1)** would cause the **conversion of 70 ac of wooded habitat to field/meadow habitat as well as clearing 22 ac of additional habitat during construction**. Seven occurrences of five state-listed plant species within 1 mi of proposed HVTL, which could be affected during construction and operation. • **HVTL Alt 1A (WRA-1A or WRB-1A)** would cause the **conversion of 70 ac of wooded habitat to field/meadow habitat as well as clearing 29 ac of additional habitat during construction**. Seven occurrences of five state-listed plant species within 1 mi of proposed HVTL, which could be affected during construction and operation. • **HVTL Phase 2 Plan B (WRB-2A)** would not have a permanent impact on vegetation because it would be located within an existing HVTL corridor. Eleven occurrences of eight state-listed plant species and one occurrence of a state-listed animal species within 1 mi of proposed HVTL, which could be affected during construction and operation.	**HVTL Corridors: With the exception of two 2-mi segments, all HVTLs would be constructed on existing HVTL ROWs with new towers; widening of one or the other corridor would be required.** • **HVTL Alt 1 (widen 38L ROW)** would cause the **conversion of 219 ac of wooded habitat to field/meadow habitat; additional construction would be limited to existing ROW**. Eight occurrences of five state-listed plant species and eight occurrences of two state-listed animal species within 1 mi of proposed HVTL, which could be affected during construction and operation. • **HVTL Alt 2 (widen 39L/37L ROW)** would cause the **conversion of 219 ac of wooded habitat to field/meadow habitat; additional construction would be limited to existing ROW**. Two occurrences of two state-listed plant species and 16 occurrences of three state-listed animal species within 1 mi of proposed HVTL, which could be affected during construction and operation.

Table 2.4-1. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	Cultural Resources	
No new structures built, no archaeological or Native American sites disturbed.	**Power Plant Site:** Located within Western Mesabi Iron Range Early Mining Landscape District. MN State Historic Preservation Office (SHPO) has 11 historic properties recorded within the area of potential effect for the West Range Site and corridors. Coordination with SHPO required during construction to avoid or minimize potential impacts to the historic character of the District. No known archaeological resources or Native American cultural resources known to exist within 1 mi of site. The potential for the occurrence of archaeological resources is high within 55 ac (1%) and moderate on 108 ac (2%) of the site **(1,344 acres)**. Consistent with the recommendations of the SHPO, a Phase I archaeological survey of locations with high and medium potential was conducted in 2007. Although not yet final, the survey did not uncover any previously unknown resources within the site boundaries. **The Phase II footprint would be cleared to serve as a laydown area for Phase I construction. Therefore, the amount of disturbed land on site would not dramatically change between Phase I and Phase II construction. Offsite laydown areas for Phase II construction would be established on 85 ac of lands at 4 potential sites that have been disturbed from prior mining activities.** **All utilities and transportation infrastructure would be developed for operation of Phase I (no difference in impacts for Phase I-only outcome).** **Transportation Facilities, Water Sources and Discharges, Natural Gas Facilities, HVTL Corridors:** Located within Western Mesabi Iron Range Early Mining Landscape District. SHPO has 11 historic properties recorded within the area of potential effect for site and corridors. Coordination with SHPO required during construction to avoid or minimize potential impacts to the historic character of the District. No known archaeological resources or Native American cultural resources exist within the transportation or utility corridors. A total of 330 ac (5%) of high potential for archaeological resources and 580 ac (12%) of moderate potential for archaeological	**Power Plant Site:** No known archaeological sites or Native American cultural resources identified within 1 mi of the site. The study area (30,471 ac) included the site and associated transportation and utility corridors. A total of 4,862 ac (16%) of the study area has a high potential for archaeological resources and 457 ac (1.5%) has a moderate potential for archaeological resources. Phase I surveys are complete and the SHPO has agreed that no further study is needed, provided that there would be no terrain disturbance at the Longyear historic site. **The Phase II footprint would be cleared to serve as a laydown area for Phase I construction. Therefore, the amount of disturbed land on site would not dramatically change between Phase I and Phase II construction. Offsite laydown areas for Phase II construction would be established on 85 ac of lands at 2 potential sites that have been disturbed from prior mining activities.** **All utilities and transportation infrastructure would be developed for operation of Phase I (no difference in impacts for Phase I-only outcome).** **Transportation Facilities:** Included in the discussion for Power Plant Site above. **Water Sources and Discharges:** The water pipeline corridors would be located within previously disturbed areas; therefore, these corridors would not be expected to contain archaeological or historical resources. **Natural Gas Facilities:** The natural gas pipeline corridor would follow an existing ROW; therefore, no archaeological or historical resources are anticipated. **HVTL Corridors:** The proposed HVTLs would follow existing HVTL corridors, which would minimize potential for impacts.

Table 2.4-1. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	resources exists along the HVTLs, rail line, and pipeline corridors (combined for all transportation and utility corridors - **4,988 acres**). Archaeological surveys would be conducted only in those corridors to be permitted by the PUC if the West Range Site were selected for permitting. Although surveys would necessarily be completed after the DOE Record of Decision, the Record of Decision would be conditional upon implementing the provisions of an agreement between DOE, SHPO, and appropriate parties for the identification and protection of resources. **DOE is developing a Programmatic Agreement with the SHPO, ACHP, and Native American tribes for the appropriate protection of cultural resources during construction for the Mesaba Energy Project.** **DOE is also negotiating a separate Memorandum of Agreement with regional Native American tribes for the appropriate consideration of interests not addressed by the PA.**	There are two known archaeological sites located within 0.25 mi of the 39L/37L corridors; however, they are outside of the construction ROW. One National Register of Historic Places (NRHP)-listed building and one potentially eligible building are within the town of Eveleth in the vicinity of the 39L/37L route. One eligible site within the HVTL visual area of potential effect would be crossed by the HVTL corridor south of the plant site. Archaeological surveys would be conducted only in those corridors to be permitted by the PUC if the East Range Site were selected for permitting. Although surveys would necessarily be completed after the DOE Record of Decision, the Record of Decision would be conditional upon implementing the provisions of an agreement between DOE, SHPO, and appropriate parties for the identification and protection of resources **DOE is developing a Programmatic Agreement with the SHPO, ACHP, and Native American tribes for the appropriate protection of cultural resources during construction for the Mesaba Energy Project.** **DOE is also negotiating a separate Memorandum of Agreement with regional Native American tribes for the appropriate consideration of interests not addressed by the PA.**
Land Use		
No change in land use; sites and corridors would remain in current status.	**Power Plant Site:** Generating station on **1,708**-ac site, currently undeveloped and zoned for industrial use. ~50 residential properties within 1 mi of footprint (closest, 0.71 mi); buffered by ~0.5 mi of dense woodlands. No conflict with local or regional zoning ordinances or land use plans. **The** use of eminent domain, **as allowed by MN Statutes 216B.1694**, **may be** needed to acquire **parcels of land within** the site footprint and its surrounding buffer land. The use of eminent domain also may be necessary to acquire some public and private lands or easements if agreements to purchase such lands or easements (for **HVTLs,** associated facilities, utilities, or transportation infrastructure; or to interconnect the project with such features and available water resources) cannot be negotiated with property owners. **All utilities and transportation infrastructure would be developed for operation of Phase I (no difference in impacts for Phase I-only outcome).**	**Power Plant Site:** Generating station on **1,322**-ac site, currently undeveloped and zoned for mining use. No residential properties within 1 mi of footprint (closest, 1.28 mi); buffered by ~0.5 mi of dense woodlands. No conflict with local or regional zoning ordinances or land use plans. No use of eminent domain is needed to acquire the site footprint and its surrounding buffer land. The use of eminent domain as allowed by MN Statutes 216B.1694 may be necessary to acquire some public and private lands or easements if agreements to purchase such lands or easements (for **HVTLs,** associated facilities, utilities, or transportation infrastructure; or to interconnect the project with such features and available water resources) cannot be negotiated with property owners. **All utilities and transportation infrastructure would be developed for operation of Phase I (no difference in impacts for Phase I only outcome).**

Table 2.4-1. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	Transportation Facilities: Rail alignment alternatives: • Alt. 1A within 0.5 mi of 16 residences (closest **within 470** ft). • Alt. 1B **eliminated based on Draft EIS.** • **Alt 3B within 0.5 mi of 16 residences (closest within 470 ft).** **Access Roads:** • **Access Roads 1 and 2 eliminated after Draft EIS (CR 7 realignment deferred by Itasca County).** • **Access Road 3 within 1,250 ft of 2 residences.** **Water Sources and Discharges:** • Process water pipelines within 0.5 mi of 104 residences (4 within 500 ft). • Cooling water effluent pipelines **avoided using enhanced ZLD system**. • Potable/sanitary pipelines within 0.5 mi of 114 residences (4 within 500 ft). **Natural Gas Facilities:** Natural gas pipelines: • Alt. 1 within 0.5 mi of 153 residences (3 within 300 ft). • Alt. 2 within 0.5 mi of 339 residences (5 within 300 ft). • Alt. 3 within 0.5 mi of 935 residences (29 within 300 ft). **HVTL Corridors:** HVTL routes: • **HVTL Alt 1** within 0.5 mi of 66 residences (4 within 500 ft). • **HVTL Alt 1A** within 0.5 mi of 62 residences (7 within 500 ft). • **HVTL Phase 2 Plan B** within 0.5 mi of 214 residences (29 within 500 ft).	**Transportation Facilities:** Rail and road alignments: No residences within 0.5 mi of either rail alignment alternative (closest ~1 mi). No residences within 0.5 mi of site access road (closest >1 mi). **Water Sources and Discharges:** • No residences within 0.5 mi of process water pipeline segments (closest >0.75 mi). • No cooling water effluent pipeline (enhanced ZLD system). • No residences within 0.5 mi of potable/sanitary pipelines (closest >0.75 mi). **Natural Gas Facilities:** Natural gas pipeline on existing ROW within 0.5 mi of 856 residences (46 within 300 ft). **HVTL Corridors:** HVTL routes on existing ROWs (<4 mi of new ROW); widening of one or the other corridor would be required. • **HVTL Alt 1 (widen 38L ROW)** within 0.5 mi of 271 residences (22 within 500 ft). • **HVTL Alt 2 (widen 39L/37L ROW)** within 0.5 mi of 962 residences (49 within 500 ft).
	Socioeconomics	
No change in existing socioeconomic conditions; no potential for economic stimulus from proposed project.	**General:** Project spending and creation of new construction and operation jobs would provide **total output economic** benefits to regional economy. **For both phases, the project would generate** $3.1 billion **in total output benefits** over 6 years during construction **($2 billion for Phase I and $1.1 billion for Phase II). The Project would generate total output economic benefits of** $1.1 billion/yr during operation of both phases **($535 million/yr for Phase I operation alone)**; the power plant would be expected to operate commercially for 20 years or more). **Power Plant Site:** No displacement of population, housing, businesses, or jobs. Ten or more residential properties closest to	**General:** Project spending and creation of new construction and operation jobs would provide **total output economic** benefits to regional economy. **For both phases, the project would generate** $3.1 billion **in total output benefits** over 6 years during construction **($2 billion for Phase I and $1.1 billion for Phase II). The Project would generate total output economic benefits of** $1.1 billion/yr during operation of both phases **($535 million/yr for Phase I operation alone)**; the power plant would be expected to operate commercially for 20 years or more). **Power Plant Site:** No displacement of population, housing, businesses, or jobs. No impact on property values anticipated

Table 2.4-1. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	the plant footprint could experience impacts on property values based on proximity to facility and resulting aesthetic and noise impacts. Potential temporary adverse impacts on housing demand related to influx of workers during peak construction (>1,500/yr in **2011-13**); less than 3,000 housing units in Census Tract 9810, of which 513 were vacant (non-seasonal) or rental units in 2000. **Note: The Minnesota Steel[1] Final EIS concluded that there would be no significant cumulative socioeconomic impacts even with consideration of the Mesaba Energy Project.**	based on distances to nearest residences. Potential temporary adverse impacts on housing demand related to influx of workers during peak construction (>1,500/yr in **2011-13**); less than 1,000 housing units in Hoyt Lakes (Census Tract 140), of which 143 were vacant (non-seasonal) or rental units in 2000.
	Transportation Facilities: No displacement of population, housing, businesses, or jobs. Three residences within 1,000 ft of Rail Alignment Alternatives **3B and** 1A could experience impacts on property values due to proximity and resulting aesthetic and noise impacts. Realignment of CR 7 (connected action) **could** influence local housing development in vicinity**, but project was deferred by Itasca County after Mesaba Draft EIS publication**.	**Transportation Facilities:** No displacement of population, housing, businesses, or jobs. No impact on property values anticipated based on distances to nearest residences.
	Water Sources and Discharges: No displacement of population, housing, businesses, or jobs. No impact on property values anticipated.	**Water Sources and Discharges:** No displacement of population, housing, businesses, or jobs. No impact on property values anticipated.
	Natural Gas Facilities: No displacement of population, housing, businesses, or jobs. No impact on property values anticipated. **Excelsior proposes to negotiate with Nashwauk PUC for the purchase of natural gas from its permitted pipeline, which would follow the same alignment as Excelsior's preferred alternative.**	**Natural Gas Facilities:** No displacement of population, housing, businesses, or jobs. No impact on property values anticipated.
	HVTL Corridors: No displacement of population, housing, businesses, or jobs. **A small number of the closest residences may experience adverse effects on property values depending upon the visibility of HVTL structures**.	**HVTL Corridors:** No displacement of population, housing, businesses, or jobs. **Although HVTLs would be constructed in existing HVTL ROWs except for two 2-mi segments, the addition of 30 feet of ROW on one of the corridors would place HVTLs closer to more residences, which may adversely affect property values depending upon the visibility of the taller towers**.
Environmental Justice		
No change in existing conditions relative to minority and low-income populations; no potential for economic benefits from proposed project.	**Power Plant Site:** Minority and low-income populations in the region of influence for the power plant do not exceed 50% of the population and are not meaningfully greater than the percentages in the general population. Therefore, the plant site would not have a disproportionately high and adverse impact on minority or low-income populations.	**Power Plant Site:** Minority and low-income populations in the region of influence for the power plant do not exceed 50% of the population and are not meaningfully greater than the percentages in the general population. Therefore, the plant site would not have a disproportionately high and adverse impact on minority or low-income populations.
	The closest concentrations of American-Indian populations are located approximately 20 mi from the site. Local tribes expressed concern regarding health risks associated with project pollutants	The closest concentrations of American-Indian populations are located approximately **20** mi from the site. Local tribes expressed concern regarding health risks associated with project pollutants

Table 2.4-1. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	and their impact on traditional food sources. However, the increment of mercury (less than 0.5 percent increase) and other pollutants from the project would be very low and human health impacts from fish consumption would be negligible even within 2 mi from the power plant site. **Transportation Facilities, Water Sources and Discharges, Natural Gas Facilities, HVTL Corridors:** No disproportionately high and adverse impacts on minority or low-income populations are indicated.	and their impact on traditional food sources. However, the increment of mercury (less than 0.5 percent increase) and other pollutants from the project would be very low and human health impacts from fish consumption would be negligible even within 2 mi from the power plant site. **Transportation Facilities, Water Sources and Discharges, Natural Gas Facilities, HVTL Corridors:** No disproportionately high and adverse impacts on minority or low-income populations are indicated.
Community Services		
No change in existing conditions relative to community services.	**Power Plant Site:** Demands by the generating station may require staff at local fire and emergency response agencies to increase by 30 to 50%. Large numbers of construction workers (>1,500 during 3 years of peak construction) may affect capacities of local law enforcement agencies. Security requirements for the generating station may affect capacities of local law enforcement agencies. **OSHA Standard 1910.120 requires the Mesaba Generating Station to provide and train first responders and first aid specialists to respond until local emergency personnel arrive.** **Transportation Facilities:** Potential for delays to emergency response vehicles at 17 rail grade crossings between Grand Rapids and Taconite (8 in Grand Rapids). Approximately 2.5% daily probability of delay at a crossing caused by train serving Mesaba plant; 4% probability of delay from combined rail traffic. **Water Sources and Discharges:** Security requirements for process water intake facilities may **affect public access for recreation in the Canisteo Mine Pit depending upon MNDNR**. **Natural Gas Facilities:** No displacement of providers or change in demand on community services. **HVTL Corridors:** No displacement of providers or change in demand on community services.	**Power Plant Site:** Demands by the generating station may require staff at local fire and emergency response agencies to increase by 20% or less. Large numbers of construction workers (>1,500 during 3 years of peak construction) may affect capacities of local law enforcement agencies. Security requirements for the generating station may affect capacities of local law enforcement agencies. **OSHA Standard 1910.120 requires the Mesaba Generating Station to provide and train first responders and first aid specialists to respond until local emergency personnel arrive.** **Transportation Facilities:** Potential for delays to emergency response vehicles at 8 rail grade crossings between Clinton Township and Hoyt Lakes. Approximately 2.5% daily probability of delay at a crossing caused by train serving Mesaba plant; 5.5% probability of delay from combined rail traffic. **Water Sources and Discharges:** No displacement of providers or change in demand on community services. **Natural Gas Facilities:** No displacement of providers or change in demand on community services. **HVTL Corridors:** No displacement of providers or change in demand on community services.

Table 2.4-1. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	Utility Systems	
No change in existing conditions relating to utilities; the region would not benefit from the additional source of power from the Mesaba Energy Project.	**Power Plant Site:** The project would tie into the existing grid without service interruptions and would ensure necessary upgrades to substations and other infrastructure would be installed to prevent system failures. The project would provide another source of power for the region that could reduce outages and help meet future demand. **Transportation Facilities:** No expected impacts. **Proposed road and rail alignments would be the same for Phase I-only and combined Phases I and II.** **Water Sources and Discharges:** The Mesaba Energy Project would not adversely affect sanitary wastewater treatment capacity. The wastewater collection system in Taconite currently overflows during heavy rain and high water table events, which may be worsened by new flow from the West Range Site. This collection system would need to be redesigned or repaired regardless of the outcome of this project. During the construction phase of the project, potable water requirements would exceed the capacity of the existing Taconite water supply system; however, planned improvements and studies to the system would provide sufficient supplies **and improve water quality**. Otherwise, potable water supplies would be brought to the project site by truck**. Proposed sanitary wastewater and potable water pipelines would be the same for Phase I-only and combined Phases I and II. Proposed process water pipelines required for Phase I include pipelines to supply water from CMP and GMMP. Additional pipelines for Phase II would be required and include pipelines for LMP and Prairie River**. **Natural Gas Facilities:** No impacts on service providers or capacity expected**. Proposed natural gas pipeline route would be the same for Phase I-only and combined Phases I and II. Depending on status of Nashwauk Public Utilities Commission to construct the pipeline, Excelsior would operate a 16- or 24-inch diameter pipeline**. **HVTL Corridors:** The project's proposed utility lines would be constructed in accordance with all Federal and state regulations, and would pose no adverse impact on other resources**. No network upgrades required for Phase I. Specific network upgrades for Phase II unknown at this time; however, DOE considers the possible network upgrades that may be**	**Power Plant Site:** The project would tie into the existing grid without service interruptions and would ensure necessary upgrades to substations and other infrastructure would be installed to prevent system failures. The project would provide another source of power for the region that could reduce outages and help meet future demand. **Transportation Facilities:** No expected impacts**. Proposed road and rail alignments would be the same for Phase I-only and combined Phases I and II**. **Water Sources and Discharges:** The Mesaba Energy Project would not adversely impact existing potable and sanitary sewer systems, as both have capacity to serve the project**. Proposed sanitary wastewater and potable water pipelines would be the same for Phase I-only and combined Phases I and II. Proposed process water pipelines for Phase I include Mine Pit 2WX, Mine Pit 6, and Stephens Mine Pit (other mine pit sources may be used depending on other industrial users and consultation with MNDNR). Phase II would require additional process water pipelines from Colby Lake**. **Natural Gas Facilities:** No impacts on service providers or capacity expected**. Proposed natural gas pipeline route would be the same for Phase I-only and combined Phases I and II**. **HVTL Corridors:** The project's proposed utility lines would be constructed in accordance with all Federal and state regulations, and would pose no adverse impact on other resources**. No network upgrades required for Phase I. Specific network upgrades for Phase II unknown at this time; however, DOE considers the possible network upgrades that may be**

Table 2.4-1. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	required for Mesaba Phase II to be unavailable information that is not essential for a reasoned choice among alternatives available to DOE (see 40 CFR 1502.22). Furthermore, if network upgrades or new HVTL's were to be required for Mesaba Phase II, the potential environmental impacts would be evaluated and disclosed to the public through the MDOC environmental review process. **Plan A: Same two 345-kV HVTLs would be utilized for both Phase I (operated at 230-kV) and combined Phases I and II (upgraded to operate at 345-kV).** **Plan B: Two 230-kV HVTLs would be utilized for Phase I. An additional 230-kV HVTL would be required for Phase II**.	**required for Mesaba Phase II to be unavailable information that is not essential for a reasoned choice among alternatives available to DOE (see 40 CFR 1502.22). Furthermore, if network upgrades or new HVTL's were to be required for Mesaba Phase II, the potential environmental impacts would be evaluated and disclosed to the public through the MDOC environmental review process. Same two HVTL corridors would be required for Phase I operation as well as Phase II. Installation of high voltage switchyard would occur at Phase I construction and no further development required for Phase II**.
Traffic and Transportation		
No change in existing vehicular traffic; Level of Service (LOS) conditions would remain the same.	**Power Plant Site:** During construction: temporary level of service (LOS) degradation of **CR 7 – from an LOS of A to B.** During operation: **For Mesaba Energy Project (Phase I) number of vehicle trips generated by personnel and from truck deliveries would be 165 and 30, respectively. LOS would remain the same and in stable operating conditions on nearby roadways. Up to one roundtrip train per day would be required. Combined Phases I and II would add 115 employee-generated vehicle trips and 30 truck trips. Except for CR 7 south of project site, no substantial differences in LOS for combined-phase plant compared to Phase I-only. CR 7 would degrade from an LOS of A to B. Up to two roundtrip trains per day would be required.** **Transportation Facilities:** Rail use during construction and operations is expected to have minimal adverse impacts to baseline rail traffic conditions. Access Roads: Access Roads 1 **and 2 eliminated after Draft EIS (CR 7 realignment deferred by Itasca County)**. • Access Road **3** would not impact LOS. **Water Sources and Discharges:** Temporary and localized traffic congestion during construction. **Natural Gas Facilities:** Temporary and localized traffic congestion during construction. **HVTL Corridors:** Temporary and localized traffic congestion during construction.	**Power Plant Site:** During construction: temporary LOS degradation of most of nearby roads; however, lowest LOS would be B. Reconstruction of Hampshire Drive expected to minimize potential congestion at intersection of CR 666 and CR 110. During operation: **For Mesaba Energy Project (Phase I) number of vehicle trips generated by personnel and from truck deliveries would be 165 and 30, respectively. Combined Phases I and II would add 115 employee-generated vehicle trips and 30 truck trips.** LOS would remain the same on nearby roadways, except for CR 666 (north of CR 110), which would degrade from A to B. **Up to one roundtrip train per day would be required for Phase I. Up to two roundtrip trains per day would be required for Phase II.** **Transportation Facilities:** Rail use during construction and operations is expected to have minimal adverse impacts to baseline rail traffic conditions. Access Roads: Access Road 1 **(single segment)** would provide access from CR 666 and would not affect LOS. **Water Sources and Discharges:** Temporary and localized traffic congestion during construction. **Natural Gas Facilities:** Temporary and localized traffic congestion during construction. **HVTL Corridors:** Temporary and localized traffic congestion during construction.

Table 2.4-1. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
Materials and Waste Management		
No change in existing conditions; no increase in the risk of a hazardous waste release.	**Power Plant Site:** Proper handling and storage of materials and wastes would be conducted to minimize potential for release of a hazardous waste or material to the environment. In-state or out-of-state solid waste collection services and landfills would have the capability and capacity to accept solid wastes generated. Additional market analysis would be required to secure a market and avoid disposal of slag (1000-1600 tons per day generated for both phases); however, sufficient capacity is available if disposal of the slag is necessary. Commercially available treatment, stabilization, or disposal for waste streams generated. The Mesaba Generating Station would be regulated as a large quantity generator of hazardous waste (sulfuric acid, spent activated carbon and potentially the ZLD filter cake, as well as smaller quantities of other hazardous wastes). No substantial increase in risk of a hazardous waste release to the environment. Proper handling and storage of wastes in accordance with Resource Conservation and Recovery Act (RCRA) would be adhered to. **The Mesaba Generating Station (Phases I and II) would use the same materials and generate the same wastes as a Phase I-only plant, although the quantities would be approximately double.** **Transportation Facilities:** Proper handling and storage of materials and wastes would be conducted to minimize potential for a release of a hazardous waste or material to the environment. **Water Sources and Discharges:** Proper handling and storage of materials and wastes would be conducted to minimize potential for a release of a hazardous waste or material to the environment. **Natural Gas Facilities:** Proper handling and storage of materials and wastes would be conducted to minimize potential for a release of a hazardous waste or material to the environment. **HVTL Corridors:** Proper handling and storage of materials and wastes would be conducted to minimize potential for a release of a hazardous waste or material to the environment.	**Power Plant Site:** Proper handling and storage of materials and wastes would be conducted to minimize potential for a release of a hazardous waste or material to the environment. In-state or out-of-state solid waste collection services and landfills would have the capability and capacity to accept solid wastes generated. Additional market analysis would be required to secure a market and avoid disposal of slag (1000-1600 tons per day generated for both phases); however, sufficient capacity is available if disposal of the slag is necessary. Commercially available treatment, stabilization, or disposal for waste streams generated. The Mesaba Generating Station would be regulated as a large quantity generator of hazardous waste (sulfuric acid, spent activated carbon and potentially the ZLD filter cake, as well as smaller quantities of other hazardous wastes). No substantial increase in risk of a hazardous waste release to the environment. Proper handling and storage of wastes in accordance with RCRA would be adhered to. **The Mesaba Generating Station (Phases I and II) would use the same materials and generate the same wastes as a Phase I-only plant, although the quantities would be approximately double.** **Transportation Facilities:** Proper handling and storage of materials and wastes would be conducted to minimize potential for a release of a hazardous waste or material to the environment. **Water Sources and Discharges:** Proper handling and storage of materials and wastes would be conducted to minimize potential for a release of a hazardous waste or material to the environment. **Natural Gas Facilities:** Proper handling and storage of materials and wastes would be conducted to minimize potential for a release of a hazardous waste or material to the environment. **HVTL Corridors:** Proper handling and storage of materials and wastes would be conducted to minimize potential for a release of a hazardous waste or material to the environment.

Table 2.4-1. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	Safety and Health	
No added health and safety risk, and no increase in the probability of construction or operational health and safety risks.	**Power Plant Site:** Construction workers would follow a safety plan and standard safety practices to reduce the potential for construction-related impacts. During the 5-year construction period, statistically less than 1 worker fatality (0.4) would occur. During the operation of the plant, statistically less than 1 operations-related worker fatality (0.01) would occur. **The potential for worker fatalities during Phase I construction and operation would be marginally lower than for both phases.** Based on air emission modeling results, cancer or morbidity hazards to workers or to the public would be small and would not exceed EPA standards. Specifically, the **highest cumulative** non-cancer **(morbidity)** hazard indices would be **0.081 and 0.082**, respectively **for adult and child,** compared to a threshold index of 1, and the **highest cumulative** projected cancer risks would be **$2.5x10^{-6}$ and $4.6x10^{-7}$, respectively for adult and child,** compared to a threshold of $1x10^{-5}$. **Risks from exposure to dioxins, furans, chromium, and $PM_{2.5}$ would be below established thresholds. These results, based on the emissions from both phases, indicate that the health risks associated with Phase I-only would also be below established thresholds.** Potential major operating accidents or intentional destructive acts, although not anticipated, could result in fires and localized airborne releases of substances **that are toxic in high concentrations**, such as CO, H_2S, and SO_2. In such cases, plant workers would be the most at-risk of injury or death, although the nearest residents, located 0.6 to 0.8 mi from the plant, would also be at-risk from a large release. **The probability of an accident or intentional destructive act occurring in Phase I-only or during the operation of both phases would be comparable and the potential for injury would be similar.** **All utilities and transportation infrastructure would be developed for operation of Phase I (no difference in impacts for Phase I-only outcome).** **Transportation Facilities:** During construction and operation, it is estimated, respectively, that approximately 1.2 and 0.53 fatalities could occur due to the movement of workers and material via trucks and personal vehicles. Because of the relatively low incremental	**Power Plant Site:** Construction workers would follow a safety plan and standard safety practices to reduce the potential for construction-related impacts. During the 5-year construction period, statistically less than 1 worker fatality (0.4) would occur. During the operation of the plant, statistically less than 1 operations-related worker fatality (0.01) would occur. **The potential for worker fatalities during Phase I construction and operation would be marginally lower than for both phases.** Based on air emission modeling results, cancer or morbidity hazards to workers or to the public would be small and would not exceed EPA standards. Specifically, the **highest cumulative** non-cancer **(morbidity)** hazard indices would be **0.081 and 0.082**, respectively **for adult and child**, compared to a threshold index of 1, and the **highest cumulative** projected cancer risks would be **$2.5x10^{-6}$ and $4.6x10^{-7}$, respectively for adult and child,** compared to a threshold of $1x10^{-5}$. **Risks from exposure to dioxins, furans, chromium, and $PM_{2.5}$ would be below established thresholds. These results, based on the emissions from both phases, indicate that the health risks associated with Phase I only would also be below established thresholds.** Potential major operating accidents or intentional destructive acts, although not anticipated, could result in fires and localized airborne releases of substances **that are toxic in high concentrations,** such as CO, H_2S, and SO_2. In such cases, plant workers would be the most at-risk of injury or death, although the nearest residents, located 1 mi from the plant, would also be at-risk from a large release. **The probability of an accident or intentional destructive act occurring in Phase I-only or during the operation of both phases would be comparable and the potential for injury would be similar.** **All utilities and transportation infrastructure would be developed for operation of Phase I (no difference in impacts for Phase I-only outcome).** **Transportation Facilities:** During construction and operation, it is estimated, respectively, that approximately 1.2 and 0.53 fatalities could occur due to the movement of workers and material via trucks and personal vehicles. Because of the relatively low incremental addition of project-related train trips (up to one and

Table 2.4-1. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	addition of project-related train trips (up to one and two roundtrips per day during Phase I and II, respectively), it is expected that increases to safety hazards at at-grade crossings would be low because baseline vehicular traffic numbers within the region of influence are considered low. **Water Sources and Discharges:** No impacts would be expected. **Natural Gas Facilities:** No impacts would be expected. **HVTL Corridors:** Research regarding the potential for public health risks from the inhalation of pollutant particles charged by HVTLs (i.e., the Henshaw Effect) is currently inconclusive. Therefore, these risks are considered comparable to the risks imposed by tens of thousands of mi of HVTLs already in use throughout the U.S. EMF exposure from utility lines would fall **within the 8-kV/m MN standard inside the ROW; short segments of the 345-kV single-circuit delta configuration would be slightly above 2-kV/m at the edge of the ROW.** There would be no permanent residents located in areas exceeding 2-kV/m.	two roundtrips per day during Phase I and II, respectively), it is expected that increases to safety hazards at at-grade crossings would be low because baseline vehicular traffic numbers within the region of influence are considered low. **Water Sources and Discharges:** No impacts would be expected. **Natural Gas Facilities:** No impacts would be expected. **HVTL Corridors:** Research regarding the potential for public health risks from the inhalation of pollutant particles charged by HVTLs (i.e., the Henshaw Effect) is currently inconclusive. Therefore, these risks are considered comparable to the risks imposed by tens of thousands of mi of HVTLs already in use throughout the U.S. EMF exposure from utility lines would fall **within the 8-kV/m MN standard inside the ROW. One residence within 50-100 feet of the centerline of the 38L route and 2 residences within 50-100 feet of the centerline of the 39L/37L route could fall within areas where the electric fields exceed 2-kV/m.**
Noise		
No change in noise emissions. There would be no new violations or exceedances of noise standards.	**Power Plant Site:** During construction: Aggregate noise levels at receptors not expected to exceed MPCA thresholds **and would range from 27 to 56 dBA** (Table 4.18-7)**.** Steam blows would be an unavoidable adverse impact. A series of short steam blows, lasting two or three minutes each, would be performed several times daily over a period of two or three weeks during the final weeks of construction. Resultant levels at nearby receptors would range from **86 to 100** dBA (Table 4.18-8); however, steam piping would be equipped with silencers that would reduce noise levels by 20 dBA to 30 dBA at each receptor location. During operation: Daytime – MPCA noise thresholds would not be exceeded (Table 4.18-11). Nighttime (10:00 p.m. to 7:00 a.m.) – During Phase I-only (without mitigation), R3 and R4 would remain over state thresholds (note, existing noise levels at these receptors exceed state limits because of proximity to CR 7) (Table 4.18-11); however, no perceptible change in noise levels would occur at any of the receptors. During combined Phases I and II (without mitigation), the nighttime noise levels would exceed the L_{50} threshold at R3 and R4 by **3.5 and 3.4 dBA**, respectively; however, no perceptible noise increase would occur at any receptor.	**Power Plant Site:** During construction: Aggregate noise levels at receptors not expected to exceed MPCA thresholds and would range from **31 to 65 dBA** (Table 4.18-9). Steam blows would be an unavoidable adverse impact. A series of short steam blows, lasting two or three minutes each, would be performed several times daily over a period of two or three weeks during the final weeks of construction. Resultant sound levels at nearby receptors would range from 88 to **104** dBA (Table 4.18-10); however, steam piping would be equipped with silencers that would reduce noise levels by 20 dBA to 30 dBA at each receptor location. During operation: During Phase I-only and combined Phases I and II (and without mitigation), noise levels would not exceed daytime or nighttime MPCA noise thresholds (Table 4.18-11). During Phase I and combined Phases I and II (and without mitigation), predicted daytime and nighttime noise level increases would be greatest at R1 (**8.6-dBA** increase during combined Phase I and II); however, this is an isolated industrial area. No other perceptible changes in noise levels would occur at any of the receptor locations for each phase.

Table 2.4-1. Summary Comparison of Impacts (Phases I & II)

No Action	West Range	East Range
	Transportation Facilities: Train operations: Freight train noise levels would range from **36 to 56** dBA (Table 4.18-13) at the modeled receptor locations during a train pass-by - noise from freight train operations could be noticeable to residences represented by receptors R2, R5, **and AAC-7** and may be considered an impact based on the FRA noise criteria, but would be short-term and relatively infrequent. Maximum noise levels generated by freight train operations would be below the ATPA guideline of 70 dBA at each receptor location and would not be considered significant. Train horns, as required under FRA regulations, would be adverse unavoidable impacts for receptors near at-grade crossings. Access Roads: **No perceptible noise increases would occur at any receptor during operation of proposed Access Road 3. MINNOISE modeling results indicate that noise levels at modeled receptors would range from 32.4 to 53.9 dBA during day-time hours and 32.6 to 55.1 dBA during nighttime hours (Table 4.18-15). Note that incremental noise levels related to transportation activities would be similar under the single and combined phases; however, Phase I-only would generally experience half the occurrences of noise increases that would occur under the combined phase (comparable to rail and vehicle traffic volumes analyzed).** **Water Sources and Discharges:** Temporary and localized increases in noise levels during construction of water pipelines. **Natural Gas Facilities:** Temporary and localized increases in noise levels during construction of natural gas pipelines. **HVTL Corridors:** Temporary and localized increases in noise levels during construction of HVTLs.	**Transportation Facilities:** Train operations: Freight train noise levels would range from **39 to 50** dBA (Table 4.18-14) at the modeled receptor locations during a train pass-by - noise from freight train operations could be noticeable to residences represented by receptor R1. Maximum noise levels generated by freight train operations would be below the ATPA guideline of 70 dBA at each receptor location and would not be considered significant. Train horns, as required under FRA regulations, would be adverse unavoidable impacts for receptors near at-grade crossings. Access Roads: There are no residences or sensitive noise receptors in proximity to the proposed access road intersecting CR 666. **Note that incremental noise levels related to transportation activities would be similar under the single and combined phases; however, Phase I-only would generally experience half the occurrences of noise increases that would occur under the combined phase (comparable to rail and vehicle traffic volumes analyzed).** **Water Sources and Discharges:** Temporary and localized increases in noise levels during construction of water pipelines. **Natural Gas Facilities:** Temporary and localized increases in noise levels during construction of natural gas pipelines. **HVTL Corridors:** Temporary and localized increases in noise levels during construction of HVTLs.

[1] **The Minnesota Steel project is now known as "Essar Steel Minnesota"; however it is identified throughout this EIS as "Minnesota Steel", Minnesota Steel Industries", or "MSI based on the name of the project in the Final EIS published for it.**

Acronyms: ac – acre(s); alt. – alternative; APTA – American Public Transportation Association; BMPs – best management practices; BWCAW – Boundary Waters Canoe Area Wilderness; CAMR – Clean Air Mercury Rule; CMP – Canisteo Mine Pit; CO – carbon monoxide; CO_2 – carbon dioxide; CR – County Road; DAT – deposition analysis threshold; dBA – A-weighted decibels; EMF – electromagnetic field; FRA – Federal Railroad Administration; ft – feet; gpd – gallons per day; gpm – gallons per minute; H_2S – hydrogen sulfide; HAP – hazardous air pollutant; HVTL – high voltage transmission line; IGCC – integrated gasification combined cycle; **IRNP – Isle Royale National Park;** kg – kilogram; kV – kilovolt; LOS – level of service; m – meter; M – million; MAAQS – Minnesota Ambient Air Quality Standards; mi – mile(s); MPCA – Minnesota Pollution Control Agency; N – nitrogen; NAAQS – National Ambient Air Quality Standards; NH_3 – ammonia; NO_x – nitrogen oxides; NPDES – National Pollutant Discharge Elimination System; NPS – National Park Service; NRHP – National Register of Historic Places; Pb – lead; PM_{10} – particulate matter (aerodynamic diameter <10 µm); PSD – prevention of significant deterioration; RCRA – Resource Conservation and Recovery Act; **RLW – Rainbow Lakes Wilderness Area;** ROW – right-of-way; S – sulfur; ESC – erosion and sediment control; SHPO – State Historic Preservation Office; SO_2 – sulfur dioxide; SWPPP – Stormwater Pollution Prevention Plan; tpy – tons per year; VNP – Voyageurs National Park; VOCs – volatile organic compounds; yd – yard; yr – year; ZLD – zero liquid discharge

INTENTIONALLY LEFT BLANK

3. AFFECTED ENVIRONMENT

3.1 CHAPTER OVERVIEW

This chapter describes the environmental setting as it relates to the Proposed Action and alternatives. The chapter has been prepared to address the required elements of an EIS in accordance with NEPA (40 CFR 1502.15) and the Minnesota Power Plant Siting Act, and it includes information on relevant environmental resource areas identified through the scoping process in the following sections:

3.2 Aesthetics

3.3 Air Quality and Climate

3.4 Geology and Soils

3.5 Water Resources

3.6 Floodplains

3.7 Wetlands

3.8 Biological Resources

3.9 Cultural Resources

3.10 Land Use

3.11 Socioeconomics

3.12 Environmental Justice

3.13 Community Services

3.14 Utility Systems

3.15 Traffic and Transportation

3.16 Materials and Waste Management

3.17 Safety and Health

3.18 Noise

The extent of information provided in each section of this chapter is commensurate with the baseline data necessary to support the impacts analysis presented in Chapter 4.

INTENTIONALLY LEFT BLANK

3.2 AESTHETICS

This section describes the existing aesthetic attributes that may be affected by implementation of the Proposed Action. Aesthetic resources include scenic areas, such as public lands (e.g., national parks or forests), nature preserves, viewsheds, and other visual resources preserved and managed by the Federal, state, and local governments.

3.2.1 Background and Definitions

3.2.1.1 Aesthetic Definitions and Principles

Aesthetic resources addressed in this section consist of two aspects: viewsheds and scenic resources. Other aesthetic aspects, such as noise and visual haze (air quality), are addressed in other sections of this chapter. For this EIS, scenic resources are considered to be lands that are managed by Federal, state, and local governments for preservation purposes. These areas generally have inherent natural or manmade aesthetic properties that give a landscape its character and value as an environmental factor. Viewsheds are generally non-managed areas with aesthetic value. While the government does not typically protect viewshed locations, the community may still value these aesthetic qualities.

The framework for characterizing the existing conditions is derived from the Bureau of Land Management's (BLM) resource inventory system, which was designed to categorize and describe viewscapes for management and NEPA purposes (BLM, 1980). The resource inventory system is comprised of three elements, scenic quality, visual sensitivity, and visual distance:

- "Scenic quality" measures the visual appeal of the land area, and includes factors such as landform shape, vegetation, water, color, adjacent scenery, and additional cultural modifications. In essence, it describes the purity, or "pristineness," of a given viewscape;
- "Visual sensitivity" gauges the public's concern for the scenic quality. Wilderness areas with virgin forests are considered to have higher visual sensitivity than an industrial park. Publicly held lands, parks, and scenic routes would also be expected to have high visual sensitivity; and
- "Visual distance" describes the depth perspective of the view. Objects found in the foreground tend to be more predominant than ones in the distance are. However, a deeper perspective provides depth and can add to the scenic quality. Therefore, elevation, tree height, and visual distance all contribute to a viewscape's visual distance.

The above criteria are used to qualitatively describe current aesthetics resources of the region. Public lands, industrial mining areas, lookout points, and lakes will be described here to provide context for the impacts analysis in Section 4.2.

3.2.1.2 Regional Setting

The Minnesotan north woods is a scenic area with rolling hills, many lakes of varying size, and large swaths of forests. The area is rural, with small towns, and a mixture of recreation cabins among permanent residences. Four-season outdoor activities are a main source of recreation and area income. Major activities in the area include fishing, water recreation, biking, operating all-terrain vehicles and snowmobiles, hiking, and skiing. There are numerous trails and unpaved roads within the area, which connect local villages to the deep woods. Forest views are extremely restricted during the growing seasons but extend further with the absence of leaves during the fall, winter, and early spring. Vegetation is thick and high, with an average tree height between 60 and 80 feet.

There are numerous industrial traces in the Mesabi Iron Range area, resulting from historic and active iron ore mining. An abandoned mine area consists of the mine pit and an adjacent tailings pile. Groundwater infiltrates the mining pits and generates manmade lakes and ponds. Separate mines may also be connected by water, generating long, linear lakes. Where the mine pit edge is above the water, the

slopes are very steep from the extensive local cuts. Adjacent to the mine pits are large waste rock piles from the mining activities. The tops of these tailings piles can extend up to 200 feet above the surrounding topography. They have steep slopes and sparse vegetation, and are very prominent in the landscape. Trees have begun to revegetate the top and slopes of some tailings piles; however, the shape and red rock are still visible from a distance. Figure 3.2-1 shows the Canisteo mine pit and a tailings pile near the West Range Site in late October 2005. The branch in the foreground is the top of a dead tree drowned by the increasing pit water height.

Figure 3.2-1. View of the Canisteo Mine Pit and Tailings Pile Looking North

3.2.2 Viewsheds

A viewshed is the land, water, and other environmental elements that are visible from a fixed vantage point. Since much of northern Minnesota is forested, most of the views are foreground to medium depth. Tall trees often adjoin roadways and population centers, restricting long-distance views. Breaks in the trees, from wetlands, lakes, or cleared areas generate the medium-range views in the area. The local topography is relatively flat, with a typical elevation variation of 200 feet. The best long-range views are from the summits of man-made tailings piles and on the ridges along the Messabe Mountain range. These areas have few trees and generally provide the height needed to see for many miles (Figure 3.2-2).

Figure 3.2-2. View from the Lind Mine Pit Tailings Pile Looking East

3.2.2.1 West Range Site and Corridors

West Range Site

The West Range Site is currently forested with shorter vegetation occurring in wetlands and along existing HVTL corridors that cross the property (Figure 3.2-3). Sections 3.10, Land Use; and 3.8, Biological Resources; describe the land use and local vegetation in more detail. The topography varies from 1,300 to 1,520 feet above sea level. There are several natural lakes that provide viewsheds within the vicinity of the West Range Site as shown in Figure 2.3-3 in Section 2.3.1.3, including Dunning Lake Holman Lake, Big Diamond Lake, and Little Diamond Lake. Many of the lakes in the area have water access through private cabins along the lakefront. The largest natural lakes in the West Range area are Trout Lake, Swan Lake, and Twin Lakes. Further discussion of the lakes is provided in Section 3.5, Water Resources.

Figure 3.2-3. View of West Range Site Looking North along HVTL (45L)

There are also numerous water-filled mine pits near the West Range Site. The CMP consists of a sequence of flooded mines extending from east to west. To the east, the Arcturus Mine, Hill Trumbull Mine and Hill-Annex Mine form the Gross-Marble Mine Pit (GMMP). When the pits were mined, large swaths of glacial overburden were removed, and the iron ore extracted. These cuts are still visible along the mine wall, with sheer drops of tens of feet occurring in places. Current access to the water occurs along old mining access roads and allows recreational boating to occur.

CR 7 extends north from US 169 around the west side of the West Range Site (Figure 3.2-4). This highway is screened on either side by trees and by wetlands to the west near US 169. From US 169, CR 7 extends north for approximately 25 miles and ends at Big Fork. Near Big Fork, CR 7 crosses portions of the George Washington State Forest. CR 7 is not a state or National Scenic Byway, and the designation "Scenic Highway" is considered a local reference.

West Range Corridors

HVTL corridors for the West Range Site are described in Section 2.3.1.5 and shown in Figure 2.3-4. Where possible, HVTLs would follow existing utility corridors. In general, the existing corridors are characterized by areas of cleared/maintained low-lying vegetation bordered by forested areas (Figure 3.2-3). Surrounding forests typically screen the existing utility corridors with the exception of where they intersect roads or terminate at mine pits (Figure 3.2-4).

Figure 3.2-4. View of CR 7 Near West Range Site Looking North

The proposed rail alignments would cross Diamond Lake Road (Figure 3.2-5) and a minor unpaved road **with a rail bridge crossing** as illustrated in Figure 2.3-2. These corridors are generally comprised of undeveloped, vegetated lands except at road crossings or along areas disturbed by prior mining activities. Figures 3.2-6 and 3.2-7 show the residential receptors near the West Range Site and associated utility and rail corridors.

Figure 3.2-5. View of Diamond Lake Road Near Potential Rail Crossing

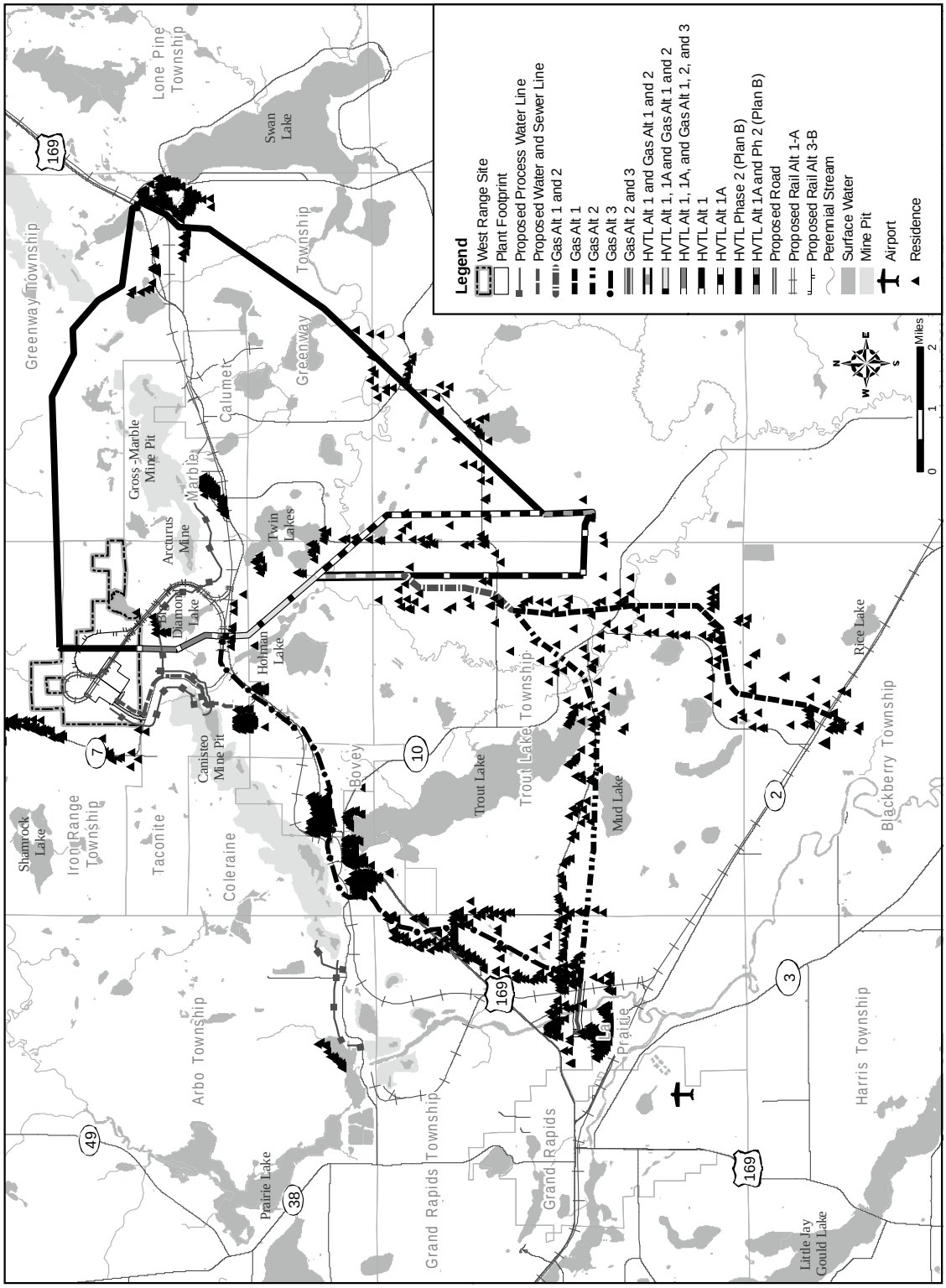


Figure 3.2-6. Receptors along the West Range Corridor

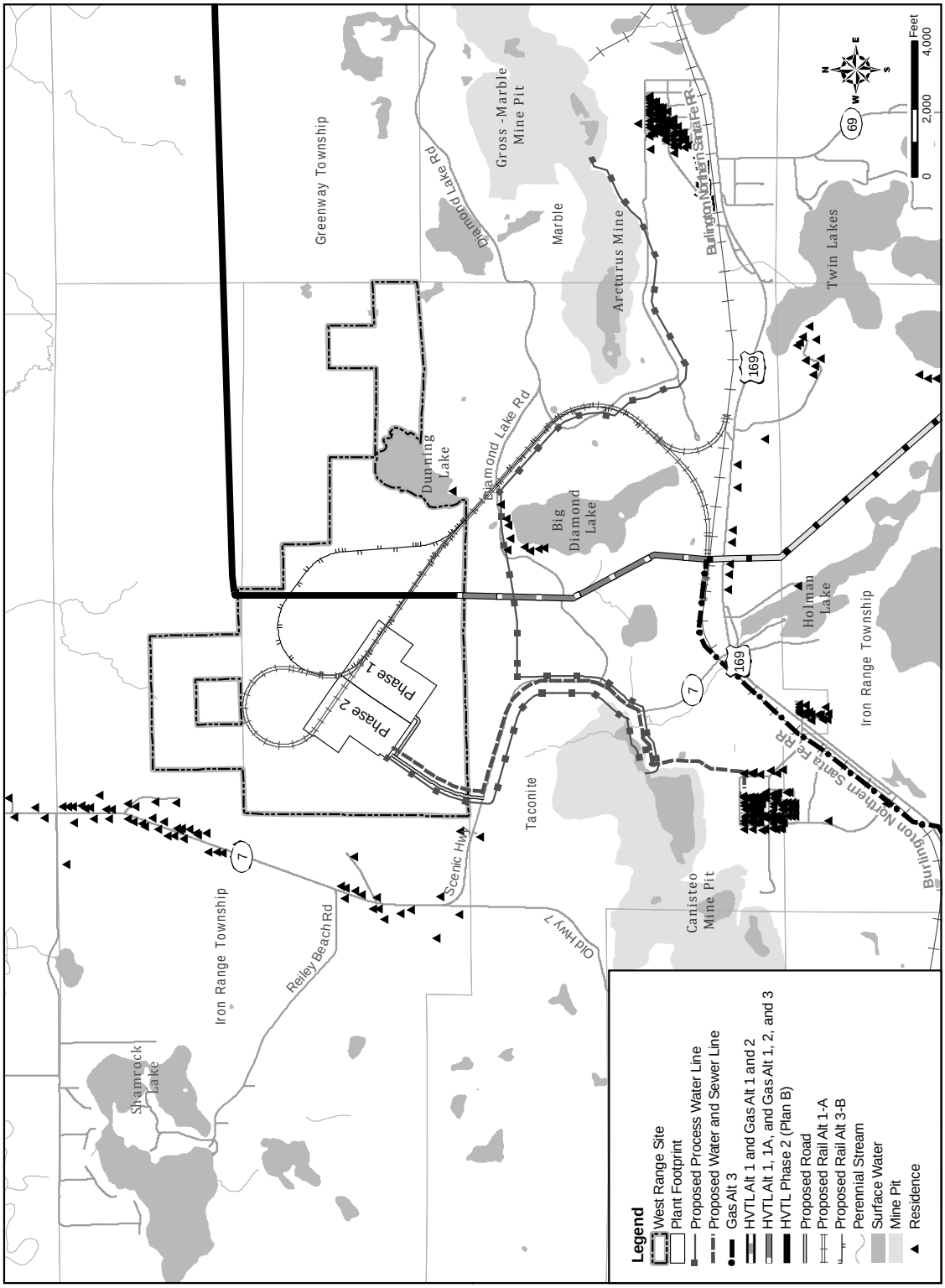


Figure 3.2-7 Receptors near the West Range Power Plant

3.2.2.2 East Range Site and Corridors

East Range Site

The East Range Site is located in an area characterized by active mining operations and undeveloped forest (Figure 3.2-8). The immediate area around the East Range Site slopes to the southeast towards wetlands and the northern border of Colby Lake. Sections 3.10, Land Use; and 3.8, Biological Resources; describe the land use and local vegetation in more detail. Area elevations range from 1,450 to 1,500 feet above sea level. Mine tailings piles exist in two locations near the proposed site. The closest is approximately 300 feet west of the East Range Site. The other is approximately one mile northeast of CR 666. Minnesota Power's Syl Laskin Energy Center, a coal-fired power plant, is located approximately 2 miles south of the East Range Site. The Syl Laskin exhaust stack is currently visible to the Hoyt Lakes population.

Two lakes are located within the vicinity of the proposed East Range Site. Colby Lake and Whitewater Lake are located directly south of the East Range Site. Numerous four-season residences are located on the shores of the lakes. There are no residences immediately north of the East Range Site due to active mining operations by CE.

Elongated bedrock mountains are located to the north-northwest of the eastern portion of the Mesabi Iron Range (including the towns of Biwabik, Aurora, and Hoyt Lakes). Embarrass Mountain is located approximately 4 miles to the northwest of the East Range Site, rising 1,940 feet above sea level. There are several lookout towers and a commercial skiing resort located on these mountains. The Giants Ridge Ski Area (1,844 feet above sea level) is located directly west of Embarrass Mountain.

Figure 3.2-8. View of East Range Site from Tailings Pile Looking East

East Range Corridors

The Mesabi Iron Range stretches north of the HVTL corridors and has topographic heights extending 500 feet above the surrounding area. The Messabe Mountain near Gilbert reaches an elevation of 1,840 feet above mean sea level. Farther north, Pike Mountain and Lookout Mountain have summit elevations of approximately 1,930 and 1,860 feet above mean sea level, respectively. Lookout stations on the summits provide views of the surrounding area. Alternative rail alignments and access roads would enter the East Range Site from the south through an area of forested land. Figures 3.2-9 and 3.2-10 show the residential receptors near the East Range Site and associated utility and rail corridors.

3.2.3 Scenic Resources

There are many types of public land in northern Minnesota. Federal lands include National Parks, Forests, and Indian Reservation Lands. The Minnesota Department of Natural Resources (MNDNR) manages 90 percent of the state-owned lands, which include state parks and forests, wildlife management areas, scientific and natural areas, and state recreation areas (Minnesota State Legislature, 2006). These areas are used for a variety of purposes, including silviculture, recreation, and scientific study. Figure 3.2-11 shows the State Parks and other public lands in northern Minnesota. Certain state forests, such as Bowstring and Blackduck, are part of national forests (e.g., Chippewa National Forest). Public lands around the West and East Range locations are discussed in respective sections below. The Mesabi Trail, owned by the St. Louis and Lake Counties Regional Railroad Authority, extends 130 miles from Grand Rapids east to Winton along US 169 and SR 135, offering a wooded path for hiking, biking, skating, skiing, snow-shoeing, and limited snow-mobiling.

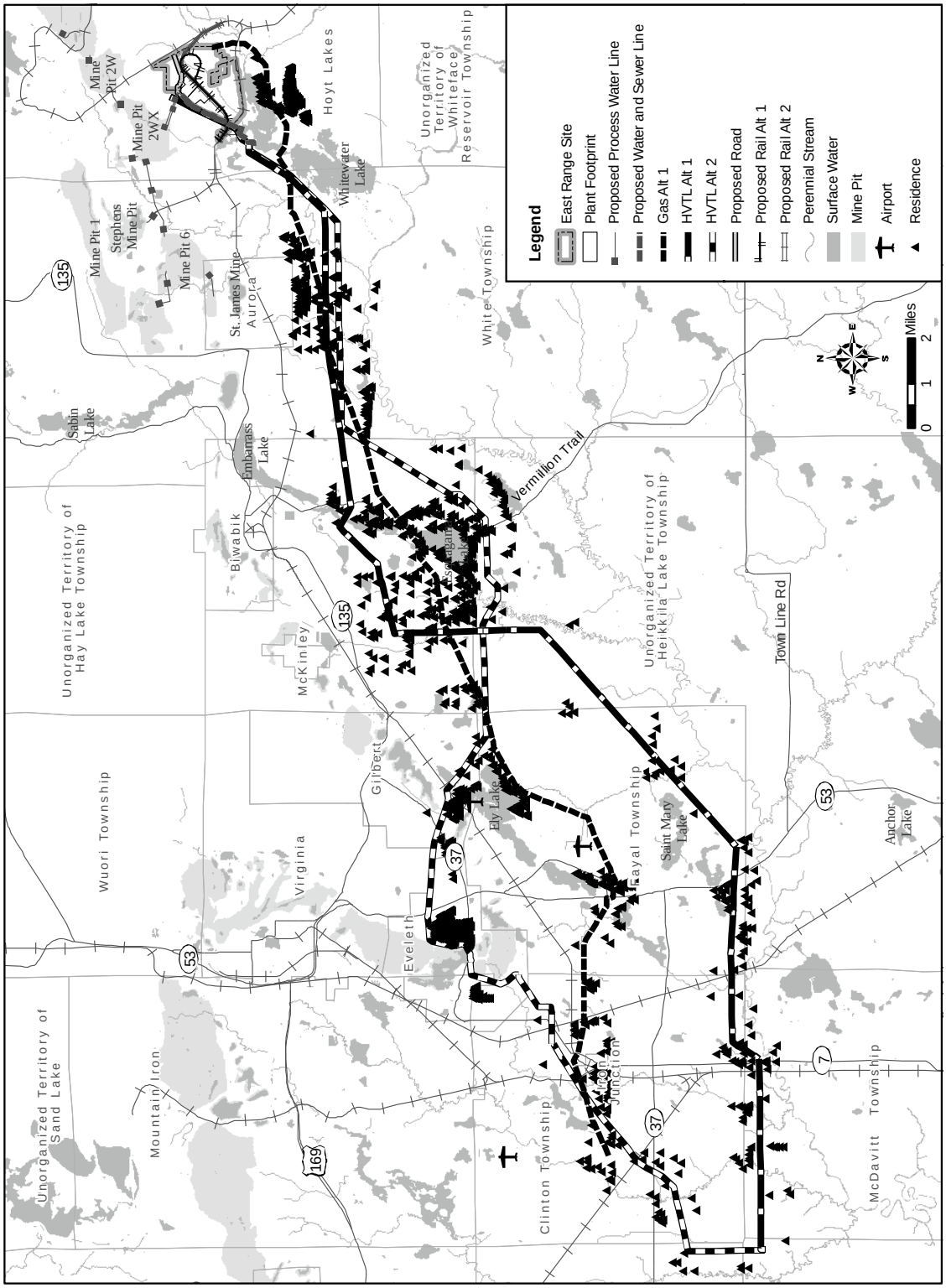


Figure 3.2-9. Receptors along the East Range Corridor

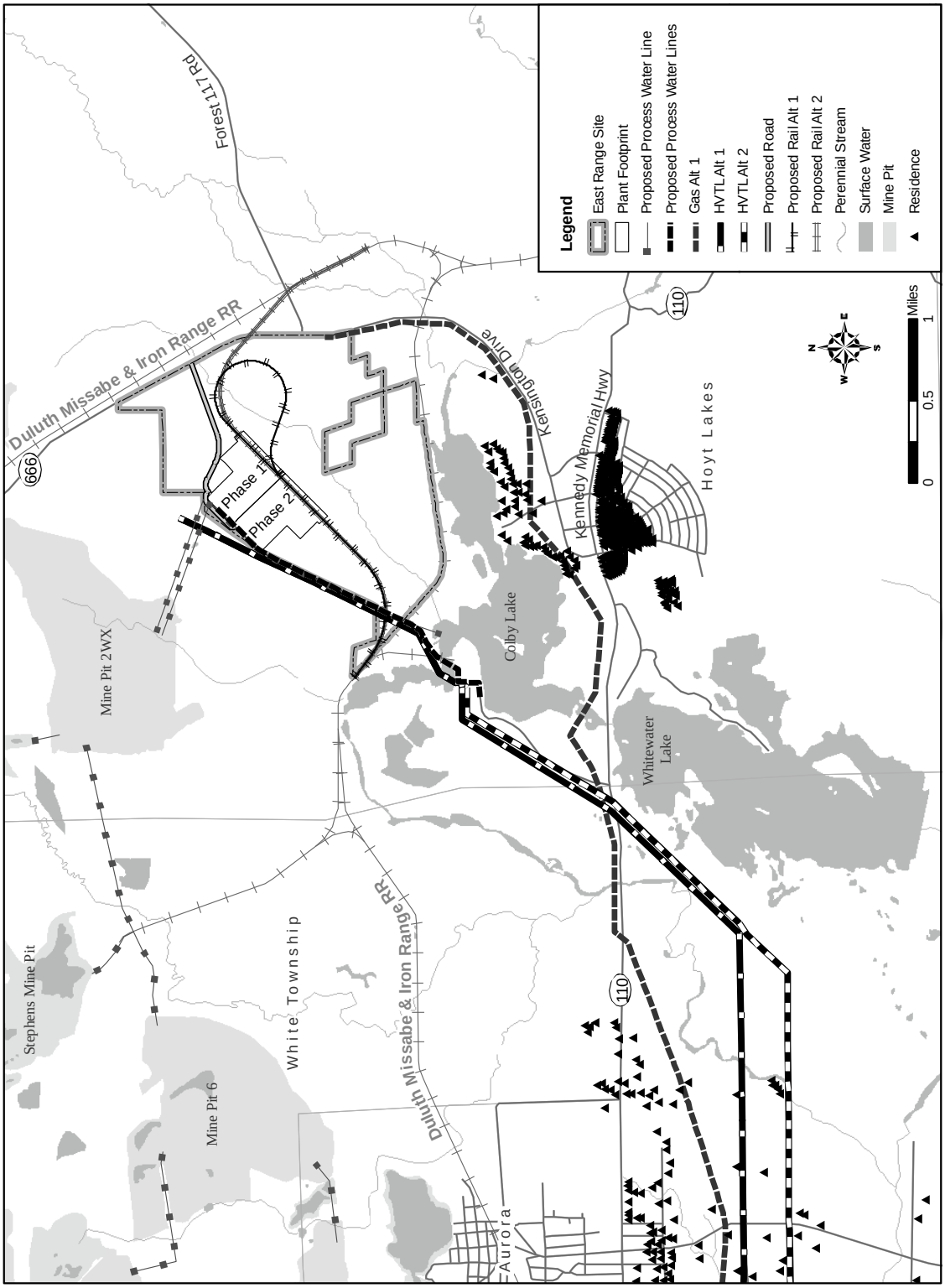


Figure 3.2-10. Receptors near the East Range Power Plant

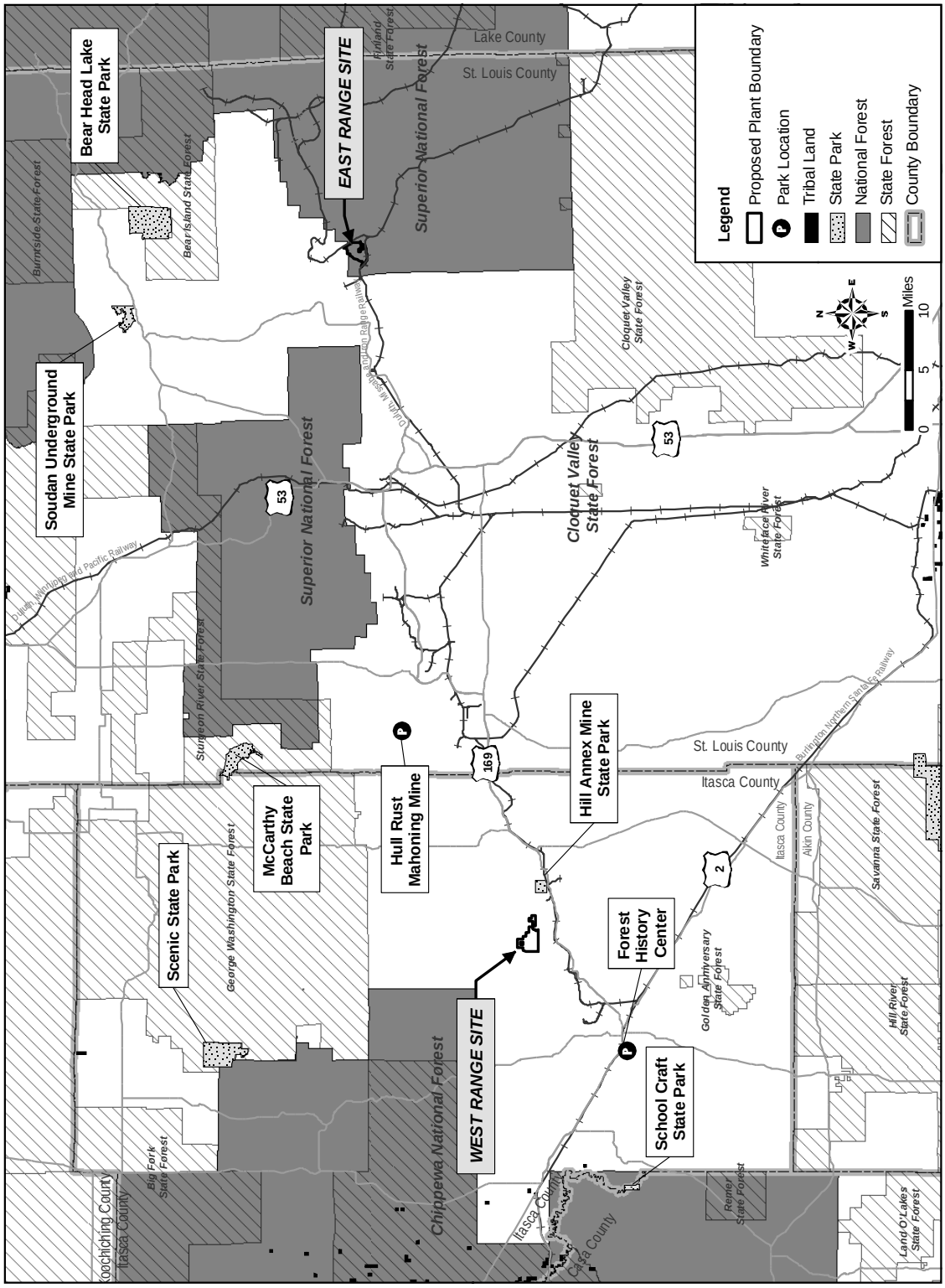


Figure 3.2-11. State Parks and Other Public Lands

3.2.3.1 West Range Site and Corridors

West of Grand Rapids, large portions of land are part of the Chippewa National Forest. The Chippewa National Forest also includes the Leech Lake Indian Reservation. The Hill Annex Mine State Park is located to the east of the West Range Site. This state park features the mining history of the area, demonstrates mining equipment and operations, and provides views of flooded mine pits and surrounding lands from the top of the tailings piles. The Forest History Center features the north woods foresting and silviculture history. The center includes a 100-foot fire tower and a living history museum. Other state parks and forests are located 20 to 30 miles away from the West Range Site and potential corridors. Locally, Holman Lake provides a public recreation and swimming area within 2 miles south of the site. Table 3.2-1 lists some of the public lands and reservations in relation to the West Range Site. Section 3.10 also describes the publicly owned lands in the area.

Table 3.2-1. Public Lands Near the West Range

Name	Approximate Distance from the Site (miles)[1]	Location in relation to the Site
Hill Annex Mine State Park	5	Southeast
Forest History Center	15	Southeast
Chippewa National Forest	Closest edge is 20 miles	West-Northwest
Leech Lake Reservation	20	West
Golden Anniversary Sate Forest	20	Southwest
School Craft State Park	22	Southwest
George Washington State Forest	27	Northwest
Scenic State Park	26	Northwest

[1]These sites are located outside of the 2-mile region of influence.

3.2.3.2 East Range Site and Corridors

The East Range Site is located adjacent to an active iron ore mining operation. The Syl Laskin Energy Center is also located south of the proposed East Range Site. A public landing and picnic spot, known as Birch Cove, is located on the southern border of Colby Lake overlooking the Syl Laskin plant (Figure 3.2-12).

Figure 3.2-12. View of Syl Laskin Energy Center from Birch Cove Park Looking North

Portions of the Superior National Forest are adjacent to Hoyt Lakes and a portion extends in to the city limits, and extends further north, south, and east. As an extension of the Superior National Forest, the Superior National Forest Scenic Byway extends from Aurora, through Hoyt Lakes, and along State Route 16 to Silver Bay at Lake Superior's north shore. The scenic byway is considered a scenic, rural passage through pine forests and the Mesabi iron mining towns (Explore Minnesota, 2006). Aside from the Superior National Forest, two other state parks are located within 30 miles of the East Range Site, as shown in Table 3.2-2. Section 3.10 describes the publicly owned land surrounding the East Range Site and corridors.

Table 3.2-2. Public Lands Near the East Range

Name	Approximate Distance from the Site (miles)	Location in relation to the Site
Superior National Forest	<1	East
Bear Head Lake State Park	16	North
Soudan Underground Mine State Park	20	Northwest

INTENTIONALLY LEFT BLANK

3.3 AIR QUALITY AND CLIMATE

This section describes the overall air quality within the region. Air quality is determined by the type and amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and the prevailing meteorological conditions. The emissions from the Mesaba Generating Station , except for particulate matter, would be independent of the site selected.

3.3.1 Sensitive Air Quality Receptors

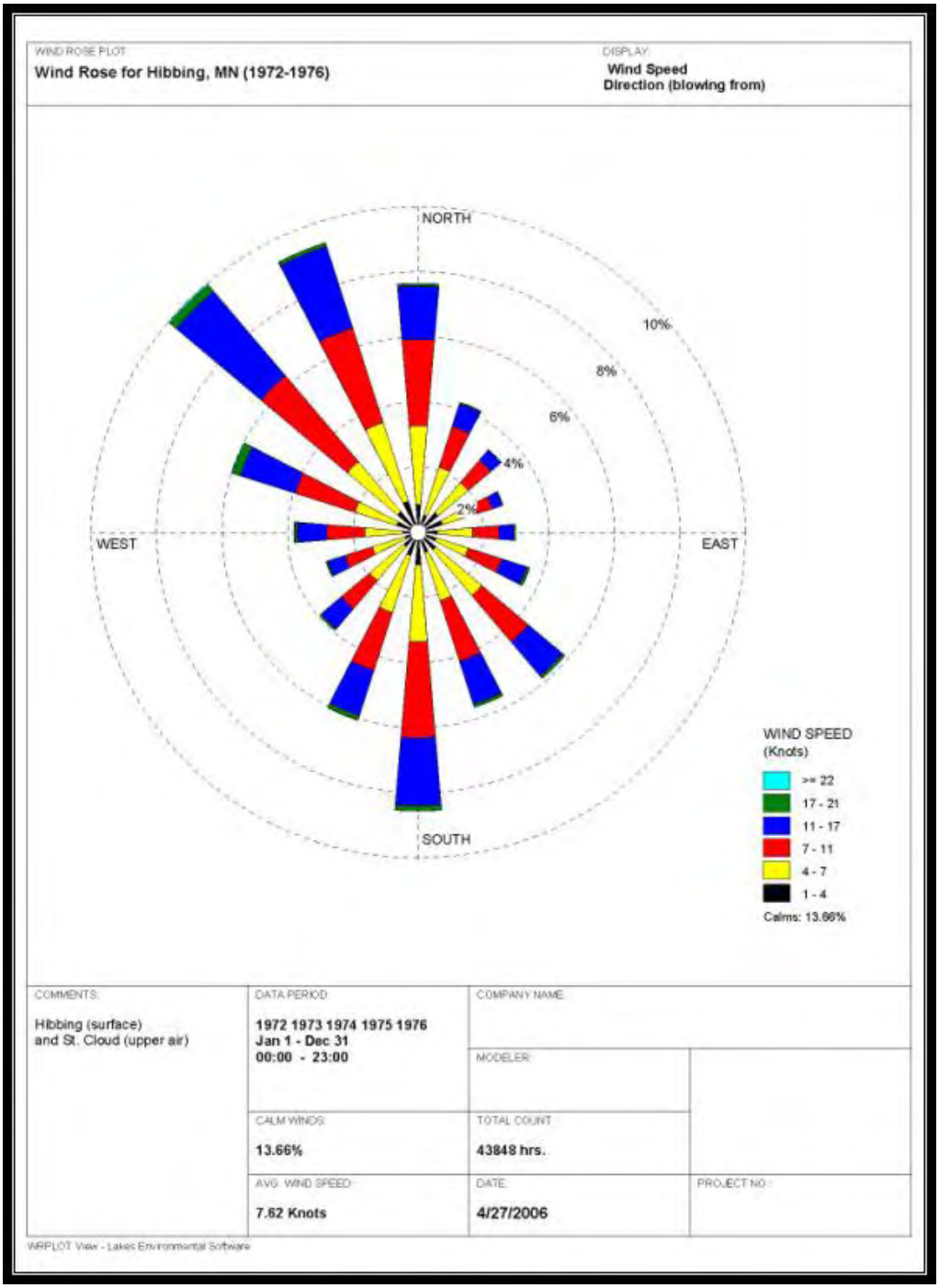
For the purposes of air quality analysis, any area to which the public has access is considered a sensitive receptor, and includes residences, day care centers, educational and health facilities, places of worship, parks, and playgrounds. An Air Emission Risk Assessment (AERA) was conducted to assess whether air emissions from the Mesaba Energy Project could pose an unacceptable health risk to nearby residents (see Section 4.17).

The closest residence to the power plant footprint in the West Range Site is located 1.1 kilometers (0.7 miles) away. A farm is located approximately 1.7 kilometers (1.1 miles) west-southwest of the power plant footprint on the West Range Site. For the East Range Site, the nearest residences are located about one mile directly south of the Mesaba IGCC Power Plant Combustion Turbine Generator/Heat Recovery Steam Generator (CTG/HRSG) stack, in the City of Hoyt Lakes. There are no other significant receptors, such as schools, daycare centers, recreation centers, playgrounds, nursing homes, or hospitals located within this distance. The primary emission point from either site will be the flare and CTG/HRSG stack. The closest residence to the flare and CTG/HRSG stack emission points on the East Range Site is located about 1.9 kilometers (1.2 miles) and 2.6 kilometers (1.4 miles) away, respectively.

3.3.2 Local and Regional Climate

Minnesota has a continental-type climate and is subject to frequent occurrences of continental polar air throughout the year, with occasional Arctic occurrence during the cold season. Occasional periods of prolonged heat occur during summer, particularly in the southern portion when warm air pushes northward from the Gulf of Mexico and the southwestern United States. Pacific Ocean air masses that move across the western United States produce comparatively mild and dry weather at all seasons (MCWG, 2006). Prevailing winds are from the northwest (approximately 10 percent of the observations) and the north-northwest (9 percent of the observations) at between 7 to 17 knots (8 to 20 miles per hour). Southerly winds occur in just over eight percent of the observations. Figure 3.3-1 provides a wind rose based on five years of hourly meteorological data (1972–1976) from Hibbing, Minnesota (surface) (MNDNR, 2006a). This wind rose is applicable to both the West Range and East Range sites.

Temperatures throughout the year are highly variable, with extremes ranging from 114°F to negative 60°F. Average temperatures range from 5.7°F in January to 67.4°F in July. From December through February, the maximum temperature is below 32°F for an average of 24 days per month. During the summer, the maximum temperature exceeds 90°F for an average of five to six days a year. Mean annual precipitation is 34 inches in southeast Minnesota and 19 inches in the northwest portion of the state. The number of days with precipitation per month varies from seven days in February to 13 days in June, with approximately two-thirds of the annual precipitation occurring between August and December.



Source: MNDNR, 2006a

Figure 3.3-1. Wind Rose Data at Hibbing, Minnesota

The area receives an average of approximately 56 inches of snow annually. Snow cover of one inch or more over Minnesota occurs on an average of about 110 days annually, ranging from 85 days in the south to 140 days in the north. Due to the abundance of small lakes in the region, fog is likely to form on and around the lakes during clear, calm conditions in the evening and early morning. Persistent fogging at either the West Range Site or the East Range Site is unlikely (MnDOT, 2006a).

3.3.3 Local and Regional Air Quality

The Clean Air Act (CAA) requires that the EPA establish National Ambient Air Quality Standards (NAAQS). Accordingly, EPA developed primary and secondary ambient air quality standards for six criteria pollutants. These pollutants are sulfur dioxide (SO_2), carbon monoxide (CO), ozone (O_3), nitrogen dioxide (NO_2), lead (Pb), and inhalable particulates, which are also known as respirable particulate matter (PM). The PM_{10} standard covers particles with aerodynamic diameters of 10 micrometers or less and the $PM_{2.5}$ standard covers particulates with aerodynamic diameters of 2.5 micrometers or less. The NAAQS are expressed as concentrations of the criteria pollutants in the ambient air; that is, in the outdoor air to which the public has access [40 CFR 50.1(e)]. Primary standards are set to protect the public health, including the health of sensitive populations such as asthmatics, children, and the elderly. Secondary standards are set to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings.

The Minnesota Pollution Control Agency (MPCA), which is responsible for monitoring air quality for each of the criteria pollutants and assessing compliance, has promulgated rules governing ambient air quality in the State of Minnesota. These rules, codified in Minnesota Rules 7009.00800, further regulate concentrations of the criteria pollutants and include standards for hydrogen sulfide (H_2S) and total suspended particulate matter (TSP). Table 3.3-1 lists the NAAQS and Minnesota Ambient Air Quality Standards (MAAQS).

Table 3.3-1. National and Minnesota Ambient Air Quality Standards

Pollutant	Averaging Period	Standard Value		Standard Type[1]	Notes
Carbon Monoxide	8-Hour	9 ppm	10 mg/m^3	Primary	Maximum concentration not to be exceeded more than once per year.
	1-Hour	35 ppm	40 mg/m^3	Primary	
	1-Hour [2]	30 ppm	35 mg/m^3	Primary and Secondary	
Nitrogen Dioxide	Annual Arithmetic Mean[2]	0.05 ppm	100 µg/m^3	Primary and Secondary	Maximum annual arithmetic mean.
Ozone	8-Hour[3] **(2008 standard)**	**0.075 ppm**		Primary and Secondary	Daily maximum 8-hour average.
	8-Hour[4] **(1997 standard)**	0.08 ppm		Primary and Secondary	
Lead	Quarterly Average		1.5 µg/m^3	Primary and Secondary	Maximum arithmetic mean averaged over a calendar quarter.
	Rolling 3-Month Average[5]		**0.15 µg/m^3**	**Primary and Secondary**	
Particulate Matter [2]	Annual Geometric Mean		75 µg/m^3	Primary	Maximum annual geometric mean.
			60 µg/m^3	Secondary	
	24-Hour		260 µg/m^3	Primary	Maximum concentration

Table 3.3-1. National and Minnesota Ambient Air Quality Standards

Pollutant	Averaging Period	Standard Value		Standard Type[1]	Notes
			150 µg/m^3	Secondary	
Particulate matter – 10 microns (PM_{10})	Annual Arithmetic Mean [6]		50 µg/m^3	Primary and Secondary	Maximum annual arithmetic mean; standard is attained when the expected annual arithmetic mean concentration is less than or equal to the value of the standard.
	24-Hour		150 µg/m^3	Primary and Secondary	Maximum 24-hour average concentration; standard is attained when the expected number of days per calendar year exceeding the value of the standard is equal to or less than one.
Particulate matter – 2.5 microns ($PM_{2.5}$)	Annual Arithmetic Mean		15 µg/m^3	Primary and Secondary	Standard is attained when the annual arithmetic mean concentration is less than or equal to the standard.
	24-Hour		35 µg/m^3	Primary and Secondary	Standard is attained when the 98th percentile 24-hour concentration is less than or equal to the standard.
Sulfur Dioxide	Annual Arithmetic Mean	0.03 ppm	80 µg/m^3	Primary	Maximum annual arithmetic mean.
		0.02 ppm	60 µg/m^3	Secondary [2]	
	24-Hour	0.14 ppm	365 µg/m^3	Primary and Secondary	Maximum concentration not to be exceeded more than once per year.
	3-Hour	0.5 ppm	1,300 µg/m^3	Primary and Secondary [7]	
	3-Hour [8]	0.35 ppm	915 µg/m^3	Secondary[2]	
	1-Hour	0.5 ppm	1,300 µg/m^3	Primary[2]	
Hydrogen Sulfide [2]	½-Hour	0.05 ppm	70 µg/m^3	Primary	½-Hour average not to be exceeded over 2 times per year.
	½-Hour	0.03 ppm	42 µg/m^3	Primary	½-Hour average not to be exceeded over 2 times in any 5 consecutive days.

Table 3.3-1. National and Minnesota Ambient Air Quality Standards

Pollutant	Averaging Period	Standard Value	Standard Type(1)	Notes

(1) Primary standards set limits to protect human health; Secondary standards set limits to protect public welfare (i.e., decreased visibility; damage to animals, vegetation).
(2) Minnesota State Ambient Air Quality Standard only.
(3) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm. (effective May 27, 2008)
(4) (a) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.
(b) The 1997 standard—and the implementation rules for that standard—will remain in place for implementation purposes as EPA undertakes rulemaking to address the transition from the 1997 ozone standard to the 2008 ozone standard.
(5) Final rule signed October 15, 2008.
(6) Due to a lack of evidence linking health problems to long-term exposure to coarse particle pollution, the EPA revoked the annual PM_{10} standard (effective December 17, 2006). However, it is still reflected in the State of Minnesota's regulations.
(7) Secondary standard for Air Quality Control Regions 128, 131, and 133.
(8) For Air Quality Control Regions 127, 129, 130, and 132.
ppm – parts per million; µg/m3 – micrograms per cubic meter
Source: EPA, 2006a and MPCA, 2006a

3.3.3.1 Air Quality Management Plan

Attainment status for NAAQS is determined primarily by evaluating data from ambient air quality monitoring stations. The MCPA conducts ambient air quality monitoring throughout the state. Currently, there are no nonattainment areas in Minnesota. Attainment means air quality in the county meets the standards. An "unclassified" status means that no data exists that demonstrates non-compliance. The West Range Site and the East Range Site are located in Itasca and St. Louis Counties, respectively. Monitoring results from the closest monitors to Itasca and St. Louis Counties are shown in Table 3.3-2. The two counties are in close proximity of each other and the monitoring sites are within the region of influence for both potential project sites.

The table includes the average ambient air concentrations over a four-year period (2002-2005) for each pollutant and averaging period. Based on the monitored data, Itasca and St. Louis Counties are designated attainment or unclassified for each of the standards.

Table 3.3-2. Monitored Background Concentrations

Pollutant	Averaging Period	Monitored Background Concentration	Standard Value	Standard Type	Monitoring Station
Carbon Monoxide	8-Hour	1.6 ppm	9 ppm	Primary	314 West Superior Street, Duluth
	1-Hour	3.3 ppm	35 ppm 30 ppm(1)	Primary Primary and Secondary	314 West Superior Street, Duluth
Nitrogen Dioxide	Annual	0.004 ppm	0.05 ppm	Primary and Secondary	Carlton County
Ozone	8-Hour (5)	0.066 ppm	**0.075** ppm	Primary and Secondary	Voyageurs National Park
Lead	Quarterly	0.01 µg/m^3	1.5 µg/m^3	Primary and Secondary	Virginia City Hall
Total Suspended Particulate (TSP)(1)	Annual	16 µg/m^3	75 µg/m^3 60 µg/m^3	Primary Secondary	Virginia City Hall
	24-Hour	35.7 µg/m^3	260 µg/m^3 150 µg/m^3	Primary Secondary	Virginia City Hall
Particulate matter – 10 microns (PM_{10})(2)	Annual	16 µg/m^3	50 µg/m^3	Primary and Secondary	Virginia City Hall
	24-Hour	35.7 µg/m^3	150 µg/m^3	Primary and Secondary	Virginia City Hall
Particulate matter – 2.5 microns ($PM_{2.5}$)	Annual	6.1 µg/m^3	15 µg/m^3	Primary and Secondary	Virginia City Hall
	24-Hour	19 µg/m^3	35 µg/m^3	Primary and Secondary	Virginia City Hall
Sulfur Dioxide	Annual	0.001 ppm	0.03 ppm 0.02 ppm(1)	Primary Secondary	Rosemount, MN
	24-Hour	0.005 ppm	0.14 ppm	Primary and Secondary	Rosemount, MN
	3-Hour	0.010 ppm	0.5 ppm 0.35 ppm	Primary and Secondary(3) Secondary(4)	Rosemount, MN
	1-Hour	0.019 ppm	0.5 ppm(1)	Primary	Rosemount, MN

(1) Minnesota State Ambient Air Quality Standard only.
(2) The EPA revoked the annual PM_{10} standard (effective December 17, 2006). However, it is still reflected in the State of Minnesota's regulations.
(3) Secondary standard for Air Quality Control Regions 128, 131, and 133
(4) For Air Quality Control Regions 127, 129, 130, and 132**; (5) New standard effective May 27, 2008.**
ppm – parts per million; µg/m3 – micrograms per cubic meter
Source: Excelsior, 2006b

3.3.3.2 Class I Areas

In addition to the NAAQS, national air quality standards exist for the Prevention of Significant Deterioration (PSD). The PSD requirements provide maximum allowable increases (expressed as increments) in concentrations of pollutants for areas that are already in compliance with the NAAQS. Allowable PSD increments currently exist for three pollutants, SO_2, NO_2, and PM_{10}. One set of allowable increments exists for Class II areas, which covers most of the United States and another set of more stringent allowable increments exists for Class I areas, which include many national parks and monuments, wilderness areas, and other areas as specified in 40 CFR 51.166(e). The allowable PSD increments are shown in Table 3.3-3.

Under the Clean Air Act, a **Class I area** is one in which only a small amount of new pollution is allowed. These areas include national parks, wilderness areas, monuments, and other areas of special national and cultural significance. **Class II areas** include all other clean air regions and allow moderate pollution increases.

Table 3.3-3. Allowable PSD Increments

Pollutant, averaging period	Allowable Increment (μg/m^3)	
	Class I Area	Class II Areas
SO_2, 3-Hour	25	512
SO_2, 24-Hour	5	91
SO_2, Annual	2	20
NO_X, Annual	2.5	25
PM_{10}, 24-Hour	8	30
PM_{10}, Annual	4	17

SO_2 – sulfur dioxide; NO_x – nitrogen oxides; PM_{10} – particulate matter-10 microns;
Source: 40 CFR 51.166(e), 2006

In addition to complying with the more stringent allowable PSD increments, proposed projects that are within 100 kilometers (62 miles) of Class I areas must evaluate impacts of the project on air quality related values (AQRVs) such as visibility, flora/fauna, water quality, soils, odor, and any other resources specified by the Federal Land Manager (FLM) (NPS, 2006). The closest Class I areas to the proposed Mesaba Energy Project sites include two areas administered by the USDA-Forest Service (the Boundary Waters Canoe Area Wilderness [BWCAW] in northern Minnesota and Rainbow Lakes Wilderness Area [RLW] in northwestern Wisconsin); and two national parks (Voyageurs National Park [VNP] in northern Minnesota and Isle Royale National Park [IRNP] in Michigan). The distances from the proposed project sites to the Class I areas are provided in Table 3.3-4.

Table 3.3-4. Distances to Class I Areas

Class I Area	Distance from West Range Site kilometers (miles)	Distance from East Range Site kilometers (miles)
BWCAW	100 (62)	40 (25)
VNP	120 (75)	90 (60)
RLW	190 (118)	170 (106)
IRNP	>300 (186)	>200 (124)

The West Range Site and East Range Site are similar regarding air quality; however the East Range Site is considerably closer to the Class I areas than the West Range Site.

3.3.3.3 Visibility and Regional Haze

In 1999, the EPA established the Regional Haze Program to improve visibility and air quality in national parks and wildlife areas. As part of this program, a network of monitors was set up by the Interagency Monitoring of Protected Visual Environments (IMPROVE) program to continuously record visibility and aerosol conditions for the protection of visibility in Class I areas. Specifically, these monitors record concentrations of ammonium sulfate, ammonium nitrate, coarse particulate matter, and variables to determine extinction coefficients and deciviews to measure visibility. The 1999 Regional Haze Program identifies certain older emission sources that have not been regulated under other provisions of the Clean Air Act. Those older sources that could contribute to visibility impairment in Class I areas may be required to install Best Available Retrofit Technology (BART).

Class I areas in northeastern Minnesota, that have monitors under the Regional Haze Program are located in the BWCAW near Ely and at VNP. **A public notice of the opportunity to comment on the Draft Regional Haze State Implementation Plan (SIP) was published on February 25, 2008**. **In July 2009, the MPCA completed a revised Draft Regional Haze SIP (MPCA, 2009a), which will remain open to public comment until September 2009.** The Regional Haze SIP identified sources that cause or contribute to visibility impairment in these areas and included a demonstration of reasonable progress toward reaching the 2018 visibility goal for each of the state's Class I areas. **Additionally, the Regional Haze SIP includes a concept plan, the Northeast Minnesota Plan, which focuses on major sources in northeast Minnesota as one part of its long term strategy for improving visibility. The plan addresses major point sources in the six counties in northeast Minnesota (including Itasca and St. Louis counties) and includes existing sources with actual emissions in 2002 greater than 100 tons per year of either NO_x or SO_2 and for new sources built after 2002 with a potential-to-emit greater than 100 tons per year of either NO_x or SO_2. The plan suggests that reduction goals from 2002 levels include a 20 percent reduction by 2012 and 30 percent reduction by 2018 reduction in region-wide NO_X and SO_2 emissions (MPCA, 2007b).**

Because the Mesaba Generating Station would be a new facility, it would not have to meet the BART requirement. However, to achieve reasonable progress toward state's visibility goals, Minnesota may need to implement control measures on other sources (including new sources) in addition to BART and ensure that they do not hinder attainment of visibility goals. Any future control strategies on newer facilities, that the MPCA implements, would affect the Mesaba Generating Station. Currently, a new source of criteria and air toxics emissions is required to assess impacts to Class I areas visibility under the NEPA and PSD regulations. Section 4.3 addresses the impacts of the Mesaba Energy Project on Class I areas.

3.3.4 Pertinent Air Quality Regulations

Local, state, and Federal air quality regulations were reviewed to determine their applicability to the proposed Mesaba Energy Project. The CAA is the basis for Federal statutes and regulations that govern air pollution. Air quality regulations within the state of Minnesota are codified in the Minnesota Rules for the MPCA, Chapters 7001 to 7023 and 7027. The Minnesota Rules establish permit review procedures for all facilities that emit pollutants to the ambient air. New facilities are required to obtain an air quality permit before construction is initiated. Federal and state regulations established as a result of the CAA and the Minnesota Rules that potentially apply to the Mesaba Energy Project are summarized in Table 3.3-5.

Table 3.3-5. Pertinent Air Quality Regulations

Regulation	Citation	Description
Prevention of Significant Deterioration (PSD)	• 40 CFR 52.21 • Minn. R. 7007.3000.	The PSD is a pre-construction review and permit process for construction and operation of a new or modified major stationary source in attainment areas. A major source is a source for which the amount of any one regulated pollutant emitted equal to or greater than significance thresholds defined by the PSD rule. The required PSD review consists of the following elements: • A case-by-case best available control technology (BACT) demonstration, which takes into account energy, environmental, and economic impacts as well as technical feasibility. • An ambient air quality impact analysis to demonstrate that the allowable emissions from the proposed project will not cause or contribute to a violation of the applicable PSD increments and NAAQS. • An assessment of the direct and indirect effects of the proposed project on general growth, soil, vegetation, and visibility. Additionally, a source that might affect a Class 1 Federal area must undergo additional review. • An ambient air quality monitoring program for up to one year may be required if no other representative data are available and if the project impacts are greater than a monitoring de minimis level. • Public comment, including an opportunity for a public hearing. The Mesaba Energy Project is projected to have emissions above the PSD significance threshold for one or more of the regulated criteria air pollutants (see Section 4.3); therefore, PSD review is required under the regulations. An application for a Part 70/New Source Review Construction Authorization Permit for an air emission facility, which covers the Mesaba Generating Station sources, has been submitted to MPCA for review in accordance with the PSD regulations. The air permit application is filed for the West Range Site.

Table 3.3-5. Pertinent Air Quality Regulations

Regulation	Citation	Description
New Source Performance Standards (NSPS)	40 CFR Part 60	The Federal NSPS are technology-based standards applicable to new and modified stationary sources of regulated air emissions. Where the NAAQS emphasize on air quality in general, the NSPS focus on particular sources of pollutants. The NSPS program sets uniform emission limitations for approximately 70 industrial source categories or sub-categories of sources (e.g., fossil fuel-fired generators, grain elevators, steam generating units) that are designated by size as well as type of process. The standards that apply to the Mesaba Energy Project are as follows: • Subpart A – General Provisions, which provides for general notification, record keeping, and monitoring requirements. • Subpart Da – Standards of Performance for Electric Utility Steam Generating Units For Which Construction is Commenced After September 18, 1978, which applies to any electric utility combined cycle gas turbine that combusts more than 73 MWe (250 MMBtu/hour) heat input of fossil fuel in the steam generator. • Subpart Db – Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units, which covers the natural gas-fired auxiliary boiler because its heat input will be greater than 100 MMBtu/hr. • Subpart Dc – Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units, which covers the Tank Vent Boiler because it is a steam-generating unit that is less than 100 MMBtu/hr, but greater than 10 MMBtu/hr. Since this unit will burn syngas, it is considered a coal-fired unit for the purposes of this regulation. • Subpart HHHH – Emission Guidelines and Compliance Times for Coal-Fired Electric Steam Generating Units: Subpart HHHH was included as part of the Clean Air Mercury Rule promulgated on March 15, 2005 (70 FR 28606). • Subpart Y – Standards of Performance for Coal Preparation Plants: Coal handling capacity at the IGCC power station will exceed 200 tons per day, and is therefore subject to this NSPS. These standards were considered as part of the BACT analysis.

Table 3.3-5. Pertinent Air Quality Regulations

Regulation	Citation	Description
Minnesota Standards of Stationary Sources	Minn. R. ch. 7011	The following Minnesota Standards of Performance are also applicable to the Mesaba Energy Project: • Control of Fugitive Particulate Matter (Minn. R. 7011.0150), which applies to bulk material handling operations including coal, petroleum coke, flux and other materials. The rule prohibits the release of "avoidable amounts" of particulate matter and facilities are required to take reasonable precautions to prevent the discharge of visible fugitive emissions beyond the property line. • Standards of Performance for Stationary Internal Combustion Engines (Minn. R. 7011.2300), which applies to the emergency fire water pumps and the emergency generators, limits visible emissions from these units to 20 percent opacity and limits SO_2 emissions to 0.5 lb/MMBTU heat input unless a higher limit has been established through modeling. • Standards of Performance for Post-1969 Industrial Process Equipment (Minn. R. 7011.0715), which applies to the Mesaba Generating Station's coal, petroleum coke, and slag handling equipment that will generate particulate matter emissions. Since the Mesaba Generating Station is located outside of Minneapolis, St. Paul and Duluth, and is located more than one quarter mile from any residence or public roadway, the required control equipment efficiency standard to be applied is 85 percent. These standards were considered as part of the BACT analysis.
National Emission Standards for Hazardous Air Pollutants (NESHAP)	40 CFR Parts 61 and 63	Non-criteria pollutants that can cause serious health and environmental hazards are termed hazardous air pollutants (HAPs) or air toxics. The 1970 CAA Amendments required EPA to promulgate national emissions standards for hazardous air pollutants to protect the public health and welfare with an ample margin of safety. Due to the difficulty in establishing health risks for HAPs, EPA identified and regulated only eight pollutants: asbestos, benzene, beryllium, inorganic arsenic, mercury, radionulides, and vinyl chloride. The 1990 CAA Amendments, section 112, changed the regulatory approach for controlling HAPs, basing it instead on available control technology. Subsequently, a list of 188 compounds to be controlled as HAPS was developed. The 1990 CAA Amendments define two types of NESHAP emissions standards: maximum achievable control technology (MACT) and generally available control technology (GACT). Unlike the health-based standards established under the initial NESHAPs, the MACT standards are technology-based emission limits that take into account available methodologies for controlling emissions of targeted HAPs from each source category. In general, a source is subject to a MACT standard if it is in a source category regulated under 40 CFR 63 and part of a facility that is defined as a major source for HAPs. A source is defined as a major source for HAPs if it emits a single HAP in excess of 10 tons (9.1 metric tons) per year or an aggregate emission rate of over 25 tons (22.7 metric tons) per year of any combination of regulated HAPs. GACTs are less stringent emission standards based on the use of more standard technologies and work practices. HAP emissions for the proposed Mesaba Energy Project would not exceed the associated major source thresholds (see Section 4.3); therefore, MACT standards do not apply to the proposed facility.

Table 3.3-5. Pertinent Air Quality Regulations

Regulation	Citation	Description
Clean Air Interstate Rule (CAIR)	Section 110 of the CAA Amendments	On March 10, 2005, EPA issued the CAIR, a rule that will achieve the largest reduction in air pollution of SO_2 and NO_X. The goal of the rule is to permanently cap emissions of SO_2 and NO_X from electric generating units (EGU) in the eastern United States so as to address $PM_{2.5}$ and ground-level O_3 transport. CAIR would achieve large reductions of SO_2 and/or NO_X emissions across 28 eastern states (including Minnesota) and the District of Columbia. When fully implemented, CAIR is expected to reduce SO_2 emissions in these states by over 70 percent and NO_X emissions by over 60 percent from 2003 levels. CAIR is expected to help sources in Minnesota reduce emissions of SO_2 by 36 percent and NO_X by 59 percent, by 2015. **The MPCA is allowing the CAIR to be implemented in Minnesota without modification.** The MPCA is currently considering changes to the Minnesota Air Rules to address the CAIR. In June 2006, the MPCA published an annotated draft of a new chapter in the state rules that would address issues related to CAIR. As a **new** EGU in the Minnesota, the Mesaba Energy Project would be subjected to the CAIR once promulgated by the MPCA **and would be allow access to allocation under the concept of a new source set aside as discussed in the MPCA's draft**. **On July 11, 2008, the Circuit Court of the District of Columbia vacated the CAIR following a lawsuit by a few parties on various aspects of the regulation but on re-hearing the Court decided simply to remand the rule to EPA. However, the Court decision did not affect state's obligations to eliminate significant contribution to downwind state's ozone and fine particle pollution (EPA, 2008a).**
Clean Air Mercury Rule (CAMR)	Section 111 of the CAA Amendments	In December 2000, EPA announced that it was "appropriate and necessary" to regulate and control emissions of mercury and other air toxics from coal- and oil-fired electric utilities under section 112 of the CAA Amendments (i.e., the MACT requirements). In January 2004, under the CAA, EPA was given the authority to regulate power plant mercury emissions by establishing performance standards or MACT, whichever the agency deems most appropriate. On March 15, 2005, EPA revised and reversed its December 2000 finding and issued the CAMR, which creates performance standards and establishes permanent, declining caps on mercury emissions from coal-fired power plants. The CAMR establishes "standards of performance" limiting mercury emissions from new and existing coal-fired power plants and creates a market-based cap-and-trade program. New coal-fired power plants ("new" means construction starting on or after January 30, 2004) will have to meet stringent new source performance standards in addition to being subject to the caps. As an electric utility steam-generating unit with more than 25 MWe output, the Mesaba Energy Project will be subject to the CAMR. In October 2005 (70 FR 62200), EPA agreed to reconsider certain aspects of its determination that regulation of electric utility steam generating units under section 112 of CAA was neither necessary nor appropriate, and removing coal- and oil-fired utility units from the list of source categories. However, EPA declined to issue a stay, and the CAMR remains in effect. The CAMR is a closely related action to the CAIR, which is discussed above. Together, the CAMR and the CAIR is expected to create a multi-pollutant strategy to reduce emissions throughout the United States **(EPA, 2008b)**.

Table 3.3-5. Pertinent Air Quality Regulations

Regulation	Citation	Description
Acid Rain Program	40 CFR Parts 72 through 78	The EPA established a program to control emissions that contribute to the formation of acid rain. The overall goal of the Acid Rain Program is to achieve significant environmental and public health benefits through reductions in emissions of SO_2 and NO_X, the primary causes of acid rain. The acid rain regulations are applicable to "affected units" as defined in the regulations. As a new utility unit, the Mesaba Generating Station is classified as an affected unit under 40 CFR 72.6(a)(3) because it would utilize fossil fuel-fired combustion to generate over 25 MWe of electricity for sale and is therefore subject to the Acid Rain Program. The objectives of the program are achieved through a system of marketable allowances, which are used by utility units to cover their SO_2 emissions. One allowance means that an affected utility unit may emit up to one ton of SO_2 during a given year. Utilities cannot emit more tons of SO_2 than they hold in allowances. Allowances may be bought, sold, or traded, and any allowances that are not used in a given year may be banked and used in the future. **The use of marketable allowances in the program limits the amount of SO_2 and NO_X that can be produced by any one facility**, **thereby helping to minimize regional effects. The Mesaba Energy Project would be required to hold SO_2 allowances in an amount equal to its actual emissions.** Owners or operators of an affected unit are subject to the following Acid Rain Program requirements: • Acid Rain Permit Application, which must be submitted at least 24 months prior to the date of initial operation of the unit • SO_2 emission allowances, which are to be secured on an annual basis. • NO_X emission limitations. • Acid Rain Compliance Plan. • Continuous emissions monitoring requirements for NO_X, SO_2, CO_2, and opacity. **Depending upon the source of the allowances, requirements under this program could reduce impacts from the IGCC power plant emissions**.
Minnesota Acid Deposition Control	Minn. R. 7021.0050	This regulation applies to existing electrical generating facilities that have a total capacity greater than 1,000 MWe. As Mesaba Energy Project, Phase I and II, will be new generating facilities, they will not be subject to this rule. However, under the Acid Rain Program, Mesaba Energy Project will be required to annually purchase SO_2 allowances in an amount equal to the total IGCC power plant's annual SO_2 emissions. The CAIR will supersede the Acid Rain Program when it becomes effective. Pursuant to Minnesota regulations, the Mesaba Energy Project's compliance with the new CAIR also constitutes compliance with the Minnesota's acid deposition requirements. The IGCC power plant would also be subject to the Reasonable Available Control Technology requirements of Minn. R. 7021.0050, Subpart 5 because the total indirect heating capacity of the CTGs, tank vent boilers, and auxiliary boilers exceed 5,000 MMBTU/hr. However, since emissions from these units are subject to BACT requirements, no additional limitations are necessary to meet reasonable available control technology requirements.

Table 3.3-5. Pertinent Air Quality Regulations

Regulation	Citation	Description
Compliance Assurance Monitoring (CAM) Rule	40 CFR Part 64	The CAM Rule will apply to facilities that have emission units located at major sources subject to Title V air quality permitting and which use control devices to achieve compliance with emission limits. It requires that these facilities monitor the operation and maintenance of their control equipment to evaluate the performance of their control devices and report if they meet established emission standards. If these facilities find that their control equipment is not working properly, the CAM rule requires them to take action to correct any malfunctions and to report such instances to the appropriate enforcement agency (i.e., State and local environmental agencies). Although a major source, the Mesaba Generating Station would not be subject to the CAM Rule because it will not be equipped with add-on air pollution control devices. However, the Mesaba Generating Station would be subject to similar requirements specified under the Acid Rain Provisions and the applicable NSPS.
Minnesota Air Pollution Episodes Rules	Minn. R. 7009.1000 – 7009.1110	Since the Mesaba Generating Station will have allowable emissions of greater than 250 tons per year of any single regulated pollutant, the plant is subject to Minnesota's Air Pollution Episode rules. The rules require preparation of an emergency action plan to be implemented in the event that the Commissioner of the MPCA makes an air pollution episode declaration. Requirements under this rule would be considered mitigation measures to reduce emissions from the Mesaba Generating Station sources.
Regional Haze Rule and the Minnesota Regional Haze Program	40 CFR Part 51, 51.300 – 51.309	In July 1999, EPA published the Regional Haze Rule to address visibility impairment in our nation's largest national parks and wilderness ("Class I") areas. Within its boundary, Minnesota has two Class I areas – the BWCAW and VNP. In addition, emissions from Minnesota may contribute to visibility impairment in other states' Class I areas, such as Michigan's IRNP and Seney Wilderness Area. **In July 2009, the MPCA completed a revised Draft Regional Haze SIP** that identifies sources that cause or contribute to visibility impairment in these areas. **Additionally, the Regional Haze SIP includes the Northeast Minnesota Plan, which includes target reduction (from 2002 levels) goals of 20 percent reduction from both existing and new sources by 2012 and 30 percent by 2018.**The Regional Haze SIP also includes a demonstration of reasonable progress toward reaching the 2018 visibility goal for each of the state's Class I areas. The Regional Haze Rule singles out certain older emission sources **(i.e., in existence on August 1977)** that have not been regulated under other provisions of the CAA. Those older sources that could contribute to visibility impairment in Class I areas may be required to install BART. **Minnesota's Draft Regional Haze SIP relies on implementation of the Federal CAIR to substitute for BART for power plants and in predictions of future emissions. EPA has indicated that it intends to stay the effectiveness of CAIR in Minnesota. However, the MPCA has requested additional information from certain power plants in order to make BART determinations that do not rely on CAIR and will revise and resubmit the Regional Haze SIP (MPCA, 2009a).** Because the Mesaba Generating Station would be a new facility, it would not have to meet the BART requirement. However, under PSD requirements a new source of criteria and air toxics emissions has to analyze its impacts to Class I areas. Section 4.3 addresses the impacts of the Mesaba Energy Project on Class I areas.

Table 3.3-5. Pertinent Air Quality Regulations

Regulation	Citation	Description
Chemical Accident Provisions	40 CFR Part 68 and Section 112(r) of the CAA Amendments	This regulation applies to stationary sources that will have more than a threshold quantity of the specific regulated toxic and flammable chemicals. It is intended to prevent accidental releases to the air and to mitigate the consequences of any such releases by focusing prevention measures on chemicals that pose the greatest risk to the public and the environment. Stationary sources covered by this regulation must develop and implement a risk management program that includes a hazard assessment, a prevention program, and an emergency response program. These elements are to be described in a risk management plan that must be submitted to EPA and state and local emergency planning authorities. The plan must also be made available to the public by the date that a regulated substance is first present in a process above a threshold quantity. The IGCC power plant is not expected to have any chemicals above the threshold amounts; however, detailed calculations would be performed when the system design for the IGCC power plant is finalized. The Mesaba Energy Project is expected to comply with all applicable provisions of the regulation in a timely manner.
Clean Air Act General Conformity Rule	40 CFR Parts 6, 51 and 93	An area that does not meet (or contributes to ambient air quality in a nearby area that does not meet) the primary or secondary NAAQS for a pollutant is referred to as a nonattainment area. The CAA requires states to submit to the EPA a SIP for attainment of the NAAQS. The 1977 and 1990 amendments to the CAA require comprehensive plan revisions for areas where one or more of the standards have yet to be attained. The 1990 Amendments to the CAA, Section 176(c)(1), required Federal actions to show conformance with the SIP. Federal actions are those projects that are funded by Federal agencies and include the review and approval of a proposed action through the NEPA process. Conformance with the SIP means conformity to the approved SIP's purpose of eliminating or reducing the severity and number of violations of the NAAQS, and achieving expeditious attainment of such standards. The need to demonstrate conformity is applicable only to areas that are not in compliance with the NAAQS or areas that were previously in nonattainment for one or more pollutants and are currently designated as maintenance areas. A Federal action will fall under the jurisdiction of either the General Conformity Rule or the Transportation Conformity Rule. The Transportation Conformity Rule covers highway and transit projects. The Mesaba Energy Project is a Federal action under the jurisdiction of the General Conformity Rule.

Table 3.3-5. Pertinent Air Quality Regulations

Regulation	Citation	Description
Federal Actions on Global Climate Change		**On June 2008, the Climate Security Act was debated in Congress. The main purpose of the act was to establish a Federal program that would substantially reduce U.S. greenhouse gas emissions between 2007 and 2050, in large part through a Federal cap-and-trade program (EIA, 2009).** **Over the years, the Federal government actions regarding GHG have focused on research, information, and voluntary programs. EPA has administered a wide array of public-private partnerships and programs to reduce U.S. greenhouse gas intensity. These programs focus on energy efficiency, renewable energy, methane and other non-CO_2 gases, agricultural practices and implementation of technologies to achieve greenhouse gas reductions. In April 2007, the Supreme Court concluded that GHGs meet the CAA definition of an air pollutant. On May 14, 2007, in response to the Supreme Court's decision, the President issued an Executive Order to control GHG emissions from motor vehicles, nonroad vehicles, and nonroad engines. EPA joined a cross-agency effort to develop new regulations that would cut GHG emissions from motor vehicles and their fuels, and EPA began an endangerment determination. However, a decision to regulate GHG emissions for motor vehicles could impact whether other sources of GHG emissions would need to be regulated as well, including establishing permitting requirements for stationary sources of air pollutants.** **In 2008, Congress directed EPA to publish a mandatory greenhouse gas reporting rule (The Consolidated Appropriations Act of 2008) under the CAA. The rule will require mandatory reporting of greenhouse gases "above appropriate thresholds in all sectors of the economy" (EPA, 2009a). Additionally, EPA is required to include in the rule reporting of emissions "resulting from upstream production (such as fossil fuel and chemical producers and importers) and downstream sources (such as large industrial facilities)," to the extent that the Agency deems appropriate. EPA published an advance notice of proposed rulemaking (ANPR) on July 2008, requesting stakeholders' help in evaluating whether there is a regulatory path available through the CAA to control emissions of GHGs and is expected to be finalized by June 2009.** **The EPA will soon be implementing the GHG reporting rules using its flexibility to determine emissions threshold and reporting frequency. The Mesaba Generating Station would be subject to these rules because it is likely that EPA may use exiting reporting requirements under Section 821 of CAA (i.e., Acid Rain Program), which requires electric generating facilities to monitor CO_2 either through continuous emissions monitoring or fuel analysis.**

Table 3.3-5. Pertinent Air Quality Regulations

Regulation	Citation	Description
State and Local Climate Change Policies – Greenhouse Gas Emissions Control	**Minn. Stat. § 216H.02**	**In May 2007, Governor Pawlenty signed the *Next Generation Energy Act* which included strategies to increase renewable energy use, increase energy conservation, and decrease carbon emissions from Minnesota (MHR, 2008). The initiative also established the Minnesota Climate Change Advisory Group (MCCAG), whose purpose is to evaluate and compile a set of aggressively reduced GHG emissions in Minnesota (MPCA, 2008a). On February 2008, the MCCAG developed a preliminary Climate Change Action Plan and made its final recommendations on effective and cost-efficient policies to reduce the emissions of greenhouse gases in Minnesota. Under Minn. Stat. 216H.02, Subd 1, the GHG emissions reduction goal involves the statewide reduction of GHG emissions across all sectors producing those emissions to a level at least 15 percent below 2005 levels by 2015, to a level at least 30 percent below 2005 levels by 2025, and to a level at least 80 percent below 2005 levels by 2050 (MPCA, 2007a). While exempt from the coal moratorium under the *Next Generation Energy Act,* the Mesaba Energy Project would be subject to the *Next Generation Energy Act* because the law requires Minnesota electric utilities to generate at least 25 percent of their electricity from renewable resources by 2025. Additional initiatives that could bring about GHG reduction legislation and affect operations at the Mesaba Generating Station are discussed below (MPCA, 2008b).** • **In November 2007, Midwestern governors and Canadian premiers signed the *Midwestern Greenhouse Gas Reduction Accord*. The Accord focused on energy efficiency, renewable electricity and advanced coal with carbon capture, the bioeconomy and transportation, and designing a regional Cap & Trade system that would place a limit on greenhouse gas emissions into the atmosphere. One of the MCCAG's recommendations for Minnesota to enter into the carbon Cap and Trade market is being addressed as part of the Accord.** • **The Midwest Governor's Association also signed the *Energy Security and Climate Stewardship Platform for the Midwest* (Stewardship Platform), which established goals for energy efficiency improvements, bio-based products and transportation, renewable electricity, and advanced coal and carbon capture and storage. The renewable electricity goal reinforces the Midwest Regional commitment to obtain at least 30 percent of the region's electricity from renewable resources by 2030. Additionally, the advanced goal of carbon capture and storage reinforces that by 2020 all new coal gasification and coal combustion power plants will capture and store CO_2 emissions.**

INTENTIONALLY LEFT BLANK

3.4 GEOLOGY AND SOILS

3.4.1 Geology

3.4.1.1 Regional Features

Physiography and Topography

The physiography surrounding the West and East Range Sites consists of rolling hills with forests, bogs, and lakes in glacial till over bedrock. The bedrock is a mixture of metamorphic and intrusive igneous rocks, and is considered to be among the oldest within the continent. Both the West Range and East Range Sites are located on the edge of the Giants Range physiographic area of Minnesota, within the Superior Upland of the Canadian Shield province (Wright, 1972). The Giants Range, also known as the Mesabi Iron Range, is a folded ridge of iron-rich rock that was exposed during erosion in the Mesozoic. The topography of the area has also been heavily modified by extensive glaciation events, the last of which occurred roughly 12,000 years ago. The regional physical relief varies from 600 feet above mean sea level (msl) at Lake Superior to an elevation of 2,301 feet above msl at Eagle Mountain. The local landscape is also influenced by a number of 300- to 400-foot deep mine pits, large mine-pit tailing piles and basins, all associated with historical iron ore mining activity.

Climate

Minnesota has a continental climate and is frequently influenced by polar air masses. In Itasca and St. Louis counties, winters are very cold and summers are short and warm. The short freeze-free time limits farmed crops to forage, small grains, and adapted vegetables. Snow covers the ground much of the time from late fall to early spring. The lowest recorded temperature in the area was in Embarrass (near the East Range Site) in 1996 at negative 63ºF. Early freezes, prior to snowfall, extend the frost depth to several feet. However, the frost depth recedes and seldom exceeds a few feet after the snow blanket is established. Frost depths, in the order of 6 feet or more, can occur in areas that are plowed or otherwise kept clear of snow.

Bedrock

The bedrock of northern Minnesota consists of primarily continental craton rocks overlain by metamorphosed sedimentary rocks that are intruded by igneous plutons and dikes. The predominant geological and physiological feature in the area is the Mesabi Iron Range, which is made of silica-rich chert and iron-rich hematite, magnetite and taconite over basal quartz sandstone. Table 3.4-1 describes the bedrock geology in the area in more detail

3.4.1.2 West Range Site and Corridors

The West Range Site is located primarily on granite of the Giants Range batholith, just north of the Mesabi Iron Range bedrock (see Figure 3.4-1). At the project site, the elevations are approximately 1,430 feet above msl to 1,470 feet above msl.

All of the West Range corridors would cross portions of the Biwabik formation, the Virginia formation, and the Giant's Range batholith (at approach to the West Range Site). Between the Biwabik formation and the batholith is the Pokegama Quartzite. The Biwabik formation consists of layers of chert with iron rich minerals (hematite, taconite, and magnetite) and carbonate rocks. South of the Biwabik formation is the Virginia Formation, which is composed of argillite and clay-rich siltstone. The northern edge of the Virginia formation is located approximately 1.5 miles south of the proposed Mesaba Generating Station site. Portions of the Virginia and Biwabik formation are covered by the Coleraine Formation, an irregular sandstone and conglomerate layer deposited during the Cretaceous (Table 3.4-1). The first appearances of the Coleraine Formation occur approximately 1 mile from the power plant site.

Table 3.4-1. Bedrock Geology at the West and East Range Sites

Age	Group	Formations	Description	Member Description[a]	Location[a]
Cretaceous	N/A	Coleraine Formation	Irregular conglomerate composed of iron-formation clasts, and hematite-cemented sandstone; contains marine fossils	N/A	WR
Upper Proterozoic	Duluth Complex	Ultramafic intrusions, Bald Eagle Lake Intrusion; South Kiwishi Intrusion; Partridge River intrusion; Anorthositic series	Troctolite-gabbro, intruded by titaniferous peridodite	Ultra mafic, oxide-rich intrusions medium grained and layered	ER
Proterozoic	Animike Group	Virginia Formation	Interbedded carbonaceous shale, mudstone siltstone	Argillaceous Siltstone/greywacke	WR/ER
		Biwabik Formation	Ferruginous chert	Granular chert, iron silicates, hematite and carbonate rocks	WR/ER
		Pokegama Quartzite	Sedimentary rock assemblages	Upper: quartz arenite Middle: shale/siltsonte Lower: laminated shale	WR
Archean Eon	Wawa subprovince of the Superior province	Giant's Range Batholith/Granite	Tonalite to granite rocks in metavolcanic + metasedimentary host rocks	Sedimentary strata overlying greenstone-granite and diabasic dikes	WR/ER
		Mud Lake Sequence	Volcanic and intrusive rocks overlain by sedimentary rocks	Greywacke, slate and Metagabboric rocks	ER

[a]N/A=Not Applicable, WR=West Range Site, ER=East Range Site
Source: Jirsa et al., 2005

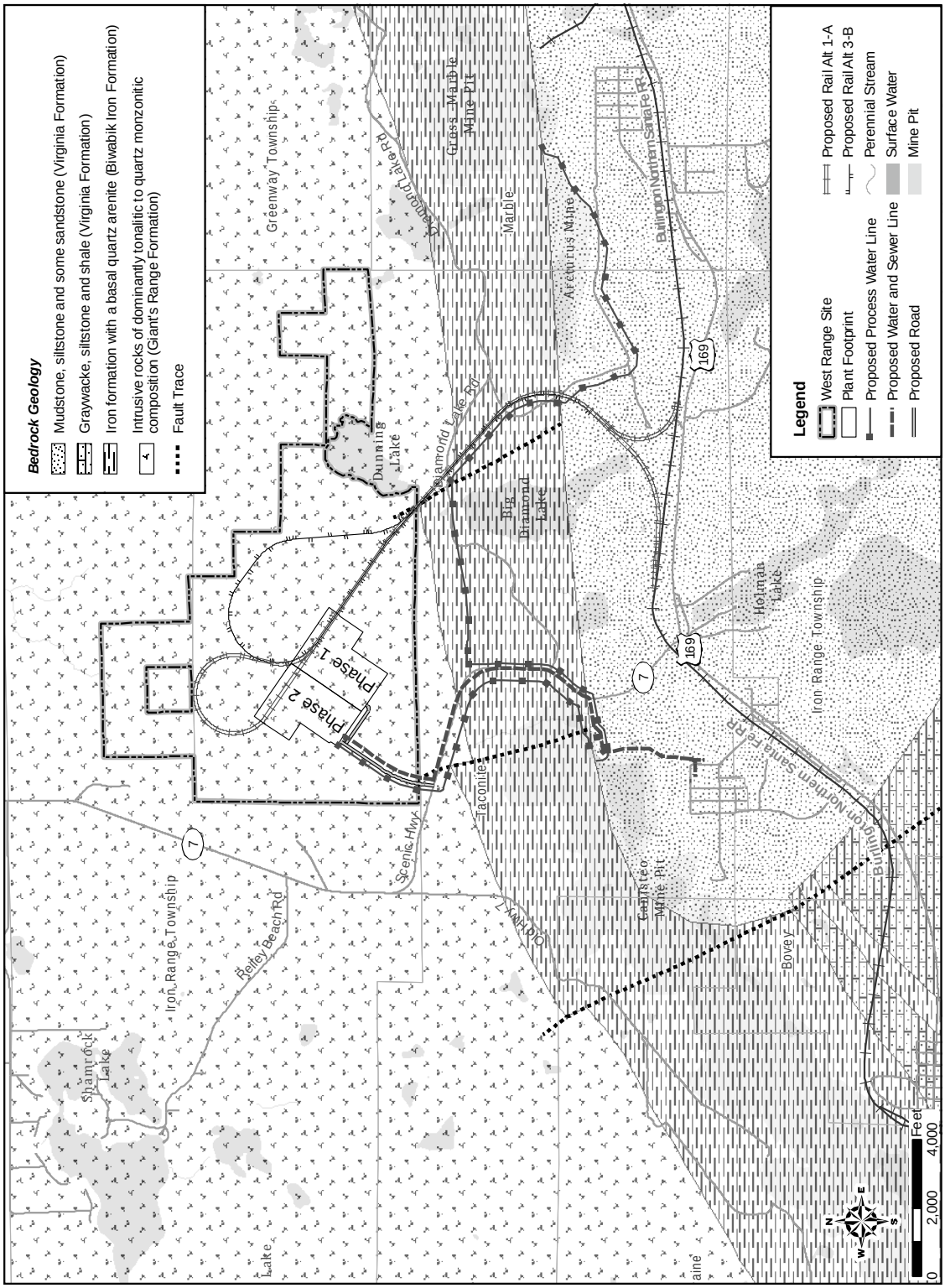


Figure 3.4-1. West Range Site Bedrock Geology

All bedrock is covered by sand and gravel deposits left from the last glaciation. In some locations, organic soils have also developed on top of the glacial deposits. Table 3.4-2 describes the type of Quaternary sediments in more detail. **This table has been revised from the version included in the Draft EIS based on project features that have been eliminated from consideration (West Range blowdown pipelines, Rail Alignment Alternative 1B, Access Roads 1 and 2) and features that have been added (West Range Rail Alignment Alternative 3B and Access Road 3) to the Final EIS.** The IGCC power plant would be located on glacial till of the Nashwauk Moraine Association. The corridors would cross portions of the Nashwauk and Sugar Hills Associations, glacial outwash, glacial lake sediment, glacial till, and peat (Hobbs and Goebel, 1982). Disturbed areas associated with mining activities are also located along the areas proposed for the corridors associated with the West Range Site.

Figure 3.4-2 shows the West Range IGCC power plant and its associated HVTL, pipeline, and transportation corridors in relation to the bedrock depth below ground surface. At the West Range Site, bedrock is closer to the surface near the proposed Mesaba Generating Station, increasing in depth further south. Bedrock is within 20 feet of the surface in three locations within the West Range Site. The bedrock is also within 20 feet of the surface in a location northeast of the Arcturus Mine. Southeast of the West Range Site is a bedrock valley that stretches northeast-southwest underneath Dunning Lake. The bottom of the bedrock valley reaches 200 feet below ground at its deepest. The rest of the bedrock immediately surrounding the IGCC power plant is within 50 feet of the ground surface.

South of Taconite and Bovey, the bedrock depth gradually increases to 250 feet below the surface. There is a subsurface ridge within 50 feet of the ground located 1 mile east of Taconite, between Holmes Lake and Twin Lakes (Meyer et al., 2004) (see Figure 3.4-2). In areas east of the West Range Site, the bedrock depth is within 50 feet of the surface.

Table 3.4-2. Quaternary Geology at the West and East Range Sites

Association	Deposit Type	Description	Location
Nashwauk Moraine Association	Ground moraine (Glacial till)	Till is brown to grey, non-calcareous drift; clasts are predominantly igneous and metamorphic rocks of the Canadian Shield	1,2,3,4,7,8,**9a,10a**
			12,13,14
Vermillion Association	Ground moraine (Glacial till)	Till is extremely stony and sandy and contains only trace amounts of clay.	--
			12,13,14,17,18
Sugar Hills Association	End moraine (Glacial till)	Locally deposited reddish colored lake sediments.	2,3,4,7,8,**9a**
			12,13,14
Culver Moraine Association	End Moraine (Glacial till)	Till is non-calcarous, clay-rich with sporatic clasts of shale. Deposits form rolling and hilly topography including numerous lakes and potholes.	--
			11,12,13,14,15,16,17, 18,19
N/A	Glacial outwash (Alluvium)	Alluvium is sorted sand and gravel deposits.	2,3,4,7,8,**9a**
			13,14
N/A	Gravel glacial lake sediment	Soft to medium stiff, stratified clay and silt deposits. Occasional cobbles and boulders also occur within the deposit. Often has high water table.	2,3,4,8,**9a**
			12,13,14,
N/A	Peat	Holocene-age, soft and highly compressible organic deposits, with a high water table	2,3,7,8,**9a**
			12,13,14,
N/A	Mine tailings pile	Piles contain overburden soil and glacial deposits from iron mining operations, typically consisting of glacial till mixed with rock fragments and low grade ore.	3,4
			13,15
N/A	Mine pit	Areas where overburden and iron deposits have been removed. Depths approach 400 feet. Includes abandoned and active mine pits.	3,4
			13,15

1. West Range IGCC Power Plant site
2. West Range HVTL WRA-1, WRA-1A, and WRB-2A
3. West Range Gas Pipeline Alternative 1, 2, and 3 corridors
4. West Range Process Water Pipeline Segments
5. **Deleted**
6. **Deleted**
7. West Range Portable Water and Sewer Pipelines
8. West Range Rail Line Alternative 1A
9. **Deleted**

9a. West Range Rail Line Alternative 3-B
10. Deleted
10a. West Range Access Road 3

11. East Range IGCC Power Plant site
12. East Range HVTL 38L corridor
13. East Range HVTL 39L/37L corridor
14. East Range Gas Pipeline 1 corridor
15. East Range Process Water Pipelines
16. East Range Potable Water and Sewer Pipelines
17. East Range Rail Line Alternative 1
18. East Range Rail Line Alternative 2
19. East Range Access Roads

N/A = Not Applicable (not organized by Association)

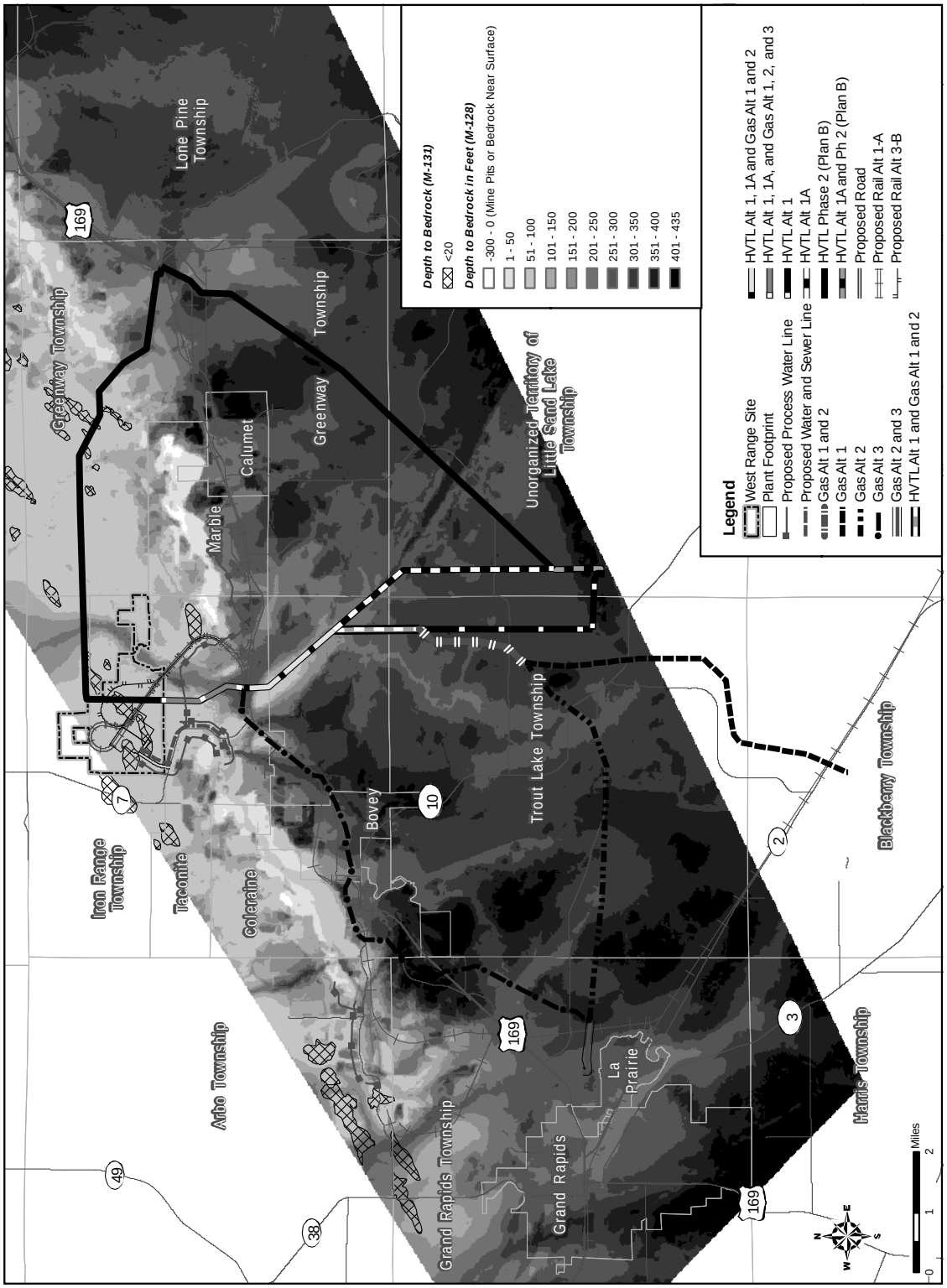


Figure 3.4-2. West Range Corridor Depth to Bedrock

3.4.1.3 East Range Site and Corridors

The East Range Site would be located on vacant land north of Colby Lake and inside the city limits of Hoyt Lakes. The average elevation for the area is 1,500 feet above msl, with a north-south grade that gradually dips approximately 20 to 40 feet into shrub swamp wetland.

The bedrock underlying most of the proposed East Range Site and its associated corridors is the Virginia formation, which consists of interbedded argillite, argillaceous siltstone, and fine-grained feldspathic greywacke. This formation lies south of the Giants Range batholith and the Biwabik Iron Formation. The southeastern corner of the East Range Site is in the Partridge River Intrusion, part of the Duluth Complex, which consists of troctolite and locally grades to gabbro, with numerous inclusions of hornfels and anorthositic rocks (Figure 3.4-3, Table 3.4-1). Some areas proposed for the utility corridors are exclusively located in the Virginia Formation. The Biwabik Formation and the Mud Lake Sequence occur around Eveleth.

The bedrock depth is within 50 feet of the ground surface near the East Range Site, rail alignments, process water pipelines and access roads (Figure 3.4-4). Bedrock is exposed at the extreme southeast corner of the East Range Site and is 1 to 50 feet below the ground surface throughout most of the site. However, there are two areas where the depth to bedrock is 50 to 100 feet below the ground surface. Beneath the area of the proposed power plant footprint, the bedrock surface slopes downward from northwest to southeast. Along the proposed HVTL and natural gas corridors, the bedrock surface gradually slopes to the southwest. The bedrock is at its deepest southwest of Aurora, at over 200 feet below the ground surface. Near Eveleth, the bedrock depth gradually becomes shallower, until it is within 50 feet of the ground surface. There is no data for the area along the proposed HVTL corridors as they approach the Forbes Substation. In areas disturbed by mining activities, the bedrock depth is typically within 50 feet of the ground surface, but may vary locally from irregular fill.

The area proposed for the East Range Site and associated corridors occur on the Culver Moraine Association, an end moraine of the Des Moines lobe. The East Range Site would be located on glacial till of the Culver Moraine Association, layered deltaic sediments, and reworked till deposits as described in Table 3.4-1 and Table 3.4-2. The corridor locations would traverse glacial till, glacial lake sediments and peat. Glacial till of the Vermillion and Nashwauk moraines and mine tailing piles would also be crossed in some areas along the corridors. From a point 200 feet east of the plant site boundary to the east end of the rail corridor, the underlying soils are glacial till of the Vermillion Association of the Rainy Lobe.

3.4.2 Mineral Resources and Mining

3.4.2.1 Regional Features

In the Mesabi Iron Range, iron ore is mined from the Biwabik formation from open pits. Mining operations remove the overburden (including the glacial deposits), any occurrences of the Coleraine Formation, and excess shale and quartzite in order to mine the iron-rich ore. Starting in 1945, many of the mining operations in the area were abandoned as the amount of high-quality ore declined. A typical abandoned mining area contains the pit and the tailings pile, as well as old access roads and a few pieces of old equipment. The area water table is close to the ground surface, and constant pumping was likely required to keep the pits dry when they were actively mined. However, once mining ceased, groundwater and other water inputs began filling the pits. Some abandoned mines in the region have reopened with the development of the taconite pellet process, which uses lower-grade ore. Other mineral resources commercially mined in northern Minnesota are crushed stone, sand and gravel for construction (USGS, 2004). Granite bedrock, as well as sand and gravel from glacial deposits are excavated by aggregate supply companies in Grand Rapids and Hibbing.

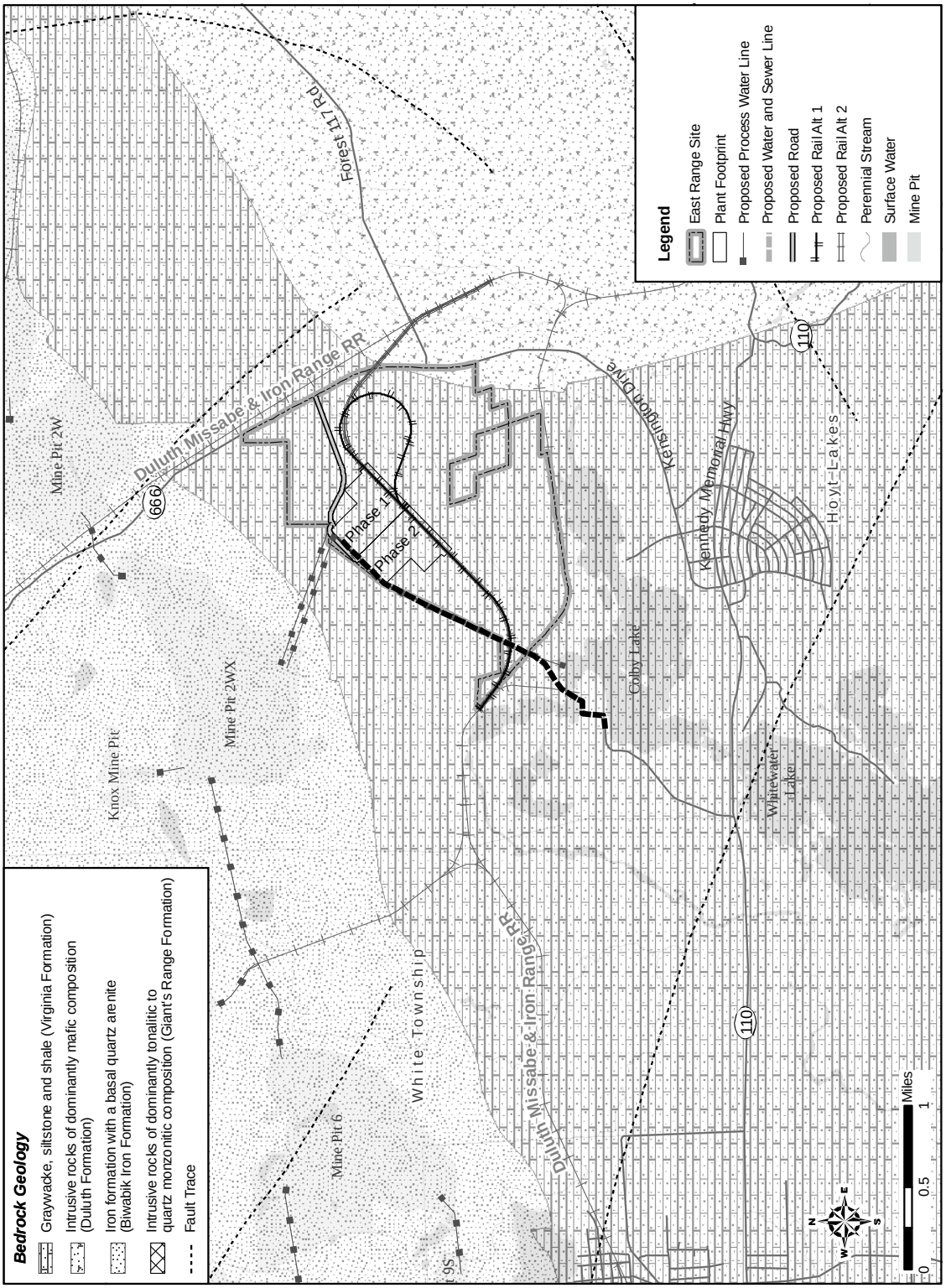


Figure 3.4-3. East Range Site Bedrock Geology

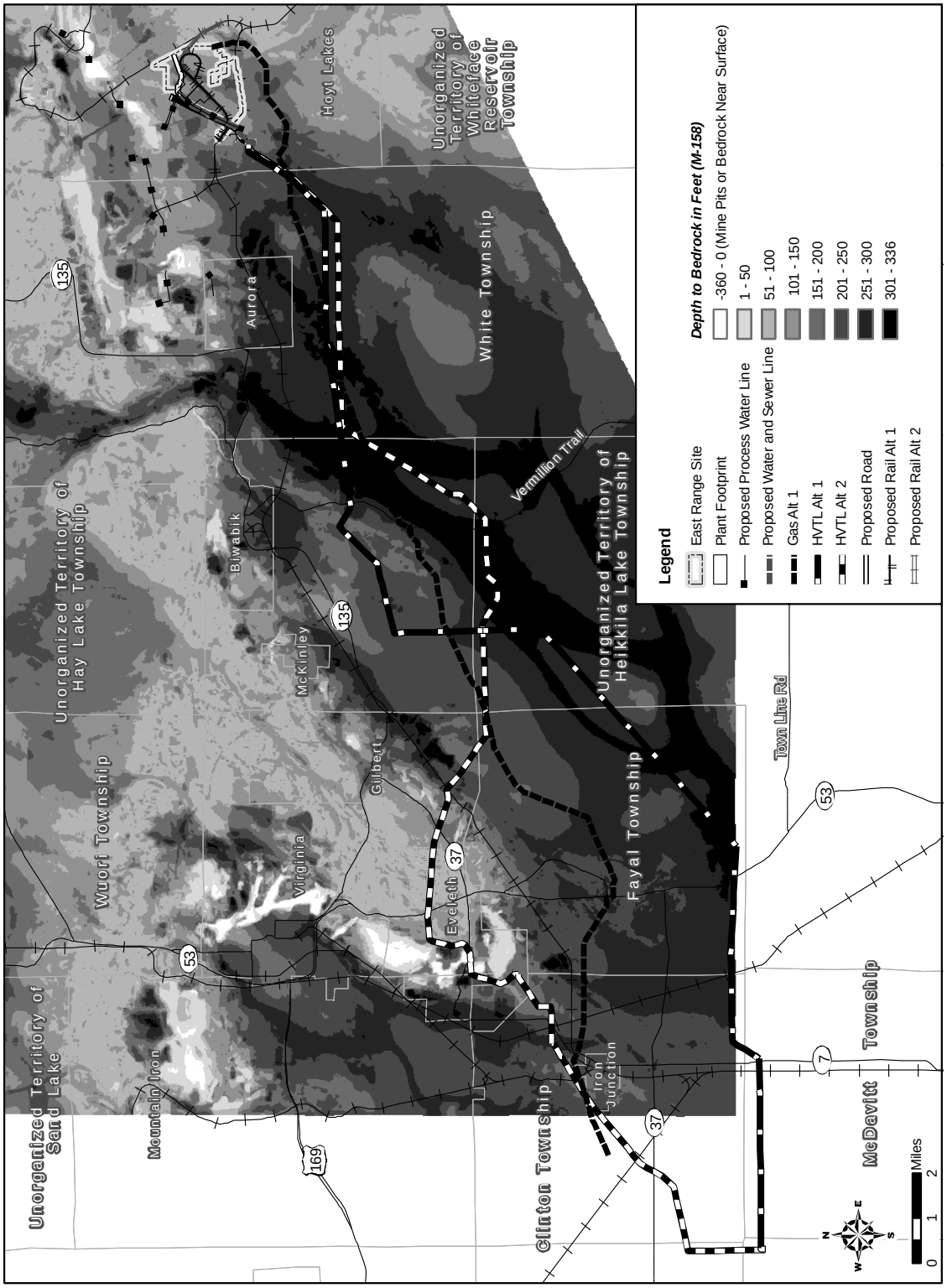


Figure 3.4-4. East Range Corridor Depth to Bedrock Geology

3.4.2.2 West Range Site and Corridors

The West Range Site has not been disturbed by mining activity. However, there are several abandoned mine pits to the southwest and southeast of the West Range site. The CMP is a flooded sequence of mines that stretches from Taconite to Coleraine. The GMMP connects the Arcturus Mine, the Hill Trumbull Mine, and the Hill-Annex Mine Pits during high water conditions. Surrounding these mine pits are mine tailing piles and basins, which are located to the south, west and east of the West Range Site. Previous mining activity is presented in Figure 3.4-5. There are no mining activities occurring near the West Range Site.

3.4.2.3 East Range Site and Corridors

The proposed East Range site has not been disturbed by mining activity (Figure 3.4-6). Two mine pits nearby are located on **former** CE property. One is located approximately 0.25 to 0.5 miles northwest of the proposed plant site and the other is north of the proposed plant site, across CR 666. Mine tailings piles also exist in two locations. One is on the west of the utility easement that forms the west edge of the proposed plant site, and the other is northeast of the proposed plant site, approximately 0.25 miles from CR 666.

Glacial deposits are also occasionally mined for aggregate rock in northern Minnesota; however, there are no rock quarries in the immediate vicinity of the East Range Site. The closest crushed rock supplier to the area is located in Hibbing.

3.4.3 Seismic Activity

3.4.3.1 Regional Features

The structural geology of the Mesabi Range is complicated; faults in the Animike Group (1,600 million years ago) record several tectonic events that occurred within the last 1 billion years. The dominant structural feature of the Mesabi Range consists of a gently dipping fold that strikes east-northeast and dips 5 to 15 degrees southeast (USDI, 1965). Fault traces within the Mesabi Iron Range vicinity tend to strike northwest to southeast. A steeply dipping northeast trending fault is located at the eastern end of the HAMP, but it appears to be inactive. The faults surrounding the Mesabi Iron Range are traces of older tectonic movement, rather than recent causes of seismic activity.

South of the West and East Range Sites is the Morris fault, a primary structural feature in central Minnesota. This fault is part of a larger mid-continent structure, the Great Lakes Tectonic Zone (GLTZ) that extends from central South Dakota to the north shore of Lake Huron in Ontario, Canada. The Morris fault has been interpreted as a late Archean suture that joined two continental blocks over 2 billion years ago. This suture fused a 2,600 to 3,600 million year old gneiss terrane to a 2,650 to 2,750 million year-old greenstone-granite terrane located to the northwest (Chandler, 1994). The Animike Basin extends northeasterly from the northeast end of the Morris fault and is separated by the Penokean fold and thrust belt in central Minnesota.

Some studies have attributed most of the seismic activity in Minnesota to the Great Lakes Seismic Zone, of which the Morris fault is the eastern anchor (Chandler and Morey, 1989). However, more recent geophysical studies in Minnesota have considerably improved the understanding of the GLTZ and adjacent structures. These recent studies have identified northwest-southeast trending substructures (subfaults) trending off of the GLTZ and the suggestion is that the earthquakes concentrated along the GLTZ are related to places where the northeast trending GLTZ is intersected by the northwest-southeast trending substructures (Chandler and Morey, 1989). The primary reason for this interpretation is that the epicenters for earthquakes near the GLTZ occur away from the immediate vicinity of the GLTZ along the northwest trending subfaults.

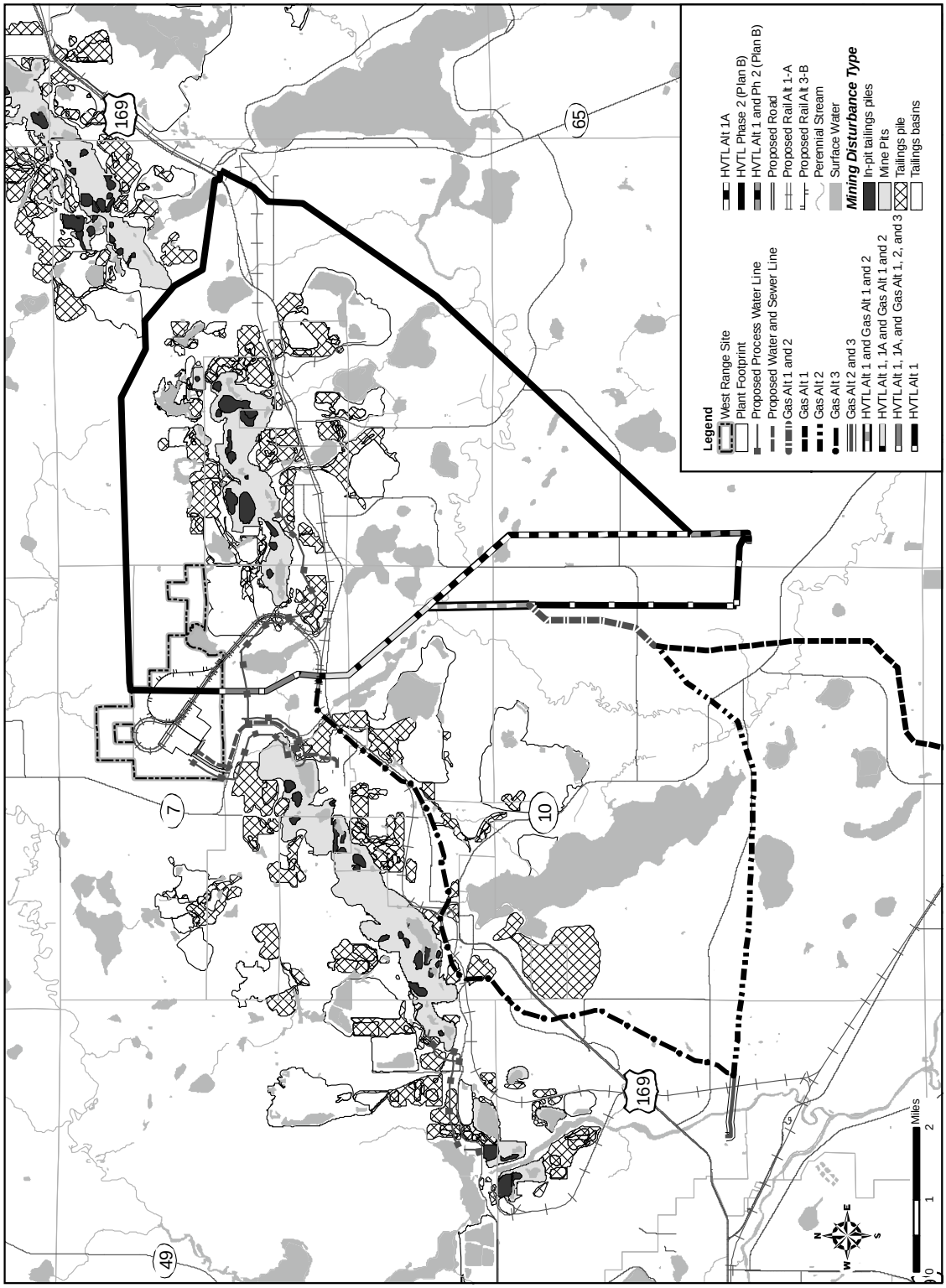


Figure 3.4-5. Mining Disturbances in the Vicinity of the West Range

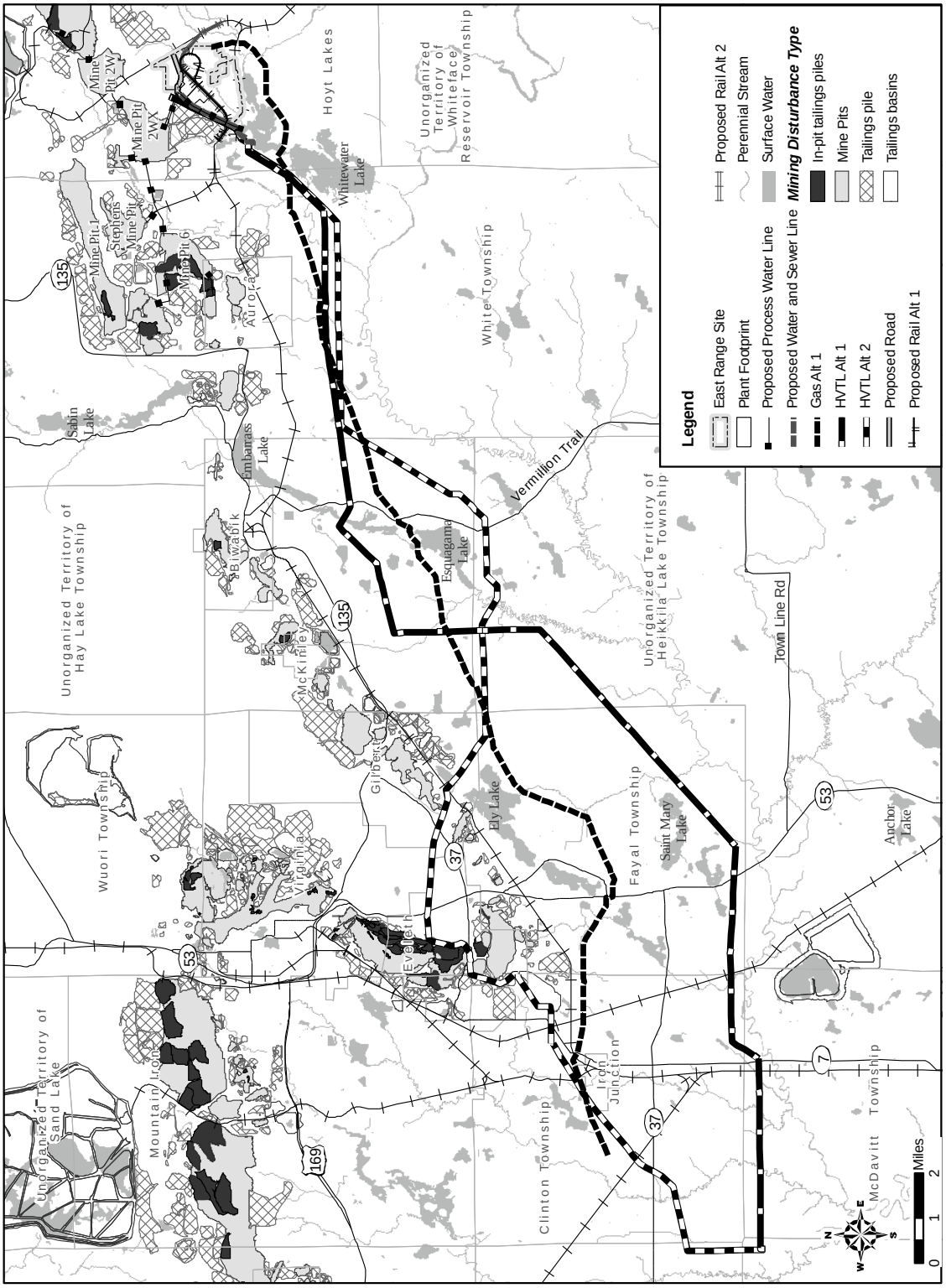


Figure 3.4-6. Mining Disturbances in the Vicinity of the East Range

3.4.3.2 Earthquake History

The mechanism of seismicity in the central United States is poorly understood, but the prevalent model suggests that earthquakes occur by the modern stress field reactivating ancestral faults in Precambrian rocks (Chandler, 1994). Minnesota is considered one of the most seismically stable states in the United States; however, this does not mean that the area is earthquake free. Chandler (1994) reviewed historical documents and cited 19 earthquakes that have occurred in Minnesota since 1860. The largest earthquake in the last 50 years occurred near Morris, Minnesota, on July 9, 1975, and recorded a magnitude of 4.6 to 4.8 on the Richter scale. A similar magnitude quake (4.1) took place about 28 miles south of this location in Dumont on June 4, 1993. Both of these quakes occurred near the Morris fault within the GLTZ. However, there is no record of these quakes being felt near the West or East Range Sites. Other researchers have hypothesized that the 7.8 magnitude New Madrid quake of 1812 would have been felt throughout Minnesota, but due to a lack of population density no records exist for that quake in northern Minnesota (Mooney, 1979). A list of historical seismic activity within Minnesota for the last 100 years is presented in Table 3.4-3.

Table 3.4-3. Minnesota Earthquakes within the Last 100 Years

Epicenter (nearest town)	Month/Day/Year	Latitude	Longitude	Felt Area (km^2)	Maximum Intensity	Magnitude (Richter Scale)
Red Lake	2/6/1917	47.9	95.0	---	V	3.8
Staples	9/3/1917	46.34	94.63	48,000	VI-VII	4.3
Bowstring	12/23/1928	47.5	93.8	---	IV	3.8
Detroit Lakes	1/28/1939	46.9	96.0	8,000	IV	3.9-3
Alexandria	2/15/1950	46.1	95.2	3,000	V	3.6
Pipestone*	9/28/1964	44.0	96.4	---	---	3.4
Morris*	7/9/1975	45.50	96.10	82,000	VI	4.8-4.6
Milaca*	3/5/1979	45.85	93.75	---	---	1.0
Evergreen*	4/16/1979	46.78	95.55	---	---	3.1
Rush City*	5/14/1979	45.72	92.9	---	---	0.1
Nisswa*	7/26/1979	46.50	94.33	v. local	III	1.0
Cottage Grove	4/24/1981	44.84	92.93	v. local	III-IV	3.6
Walker	9/27/1982	47.10	97.6	v. local	II	2.0
Dumont*	6/4/1993	45.67	96.29	69,500	V-VI	4.1
Granite Falls*	2/9/1994	44.86	95.56	11,600	V	3.1

*Denotes earthquakes that were recorded instrumentally. All others and associated magnitudes based solely on intensity data from felt reports.
Source: Chandler, 1994

The closest earthquake epicenter to the Mesabi Iron Range is the 1928 Bowstring earthquake, whose epicenter is located approximately 25 miles to the northwest of the West Range Site. The magnitude of the Bowstring quake was estimated to be 3.8. Magnitude 3 earthquake shocks are barely perceptible by humans. Magnitude 5 shocks will be disturbing to nearby observers but will not do much damage. The Bowstring epicenter is located along one of the northwest trending fault lines emanating out from the iron range. However, the West Range and East Range Sites do not appear to be located on these fault lines.

3.4.4 Paleontological Resources

3.4.4.1 Regional Features

Fossils are found within sedimentary rocks of the appropriate age and type. The Mesabi Iron Range consists of mostly igneous and metamorphic rocks, which do not contain fossils. Only one of the sedimentary rock formations in the area is known to contain fossils. The Coleraine Formation is an irregular conglomerate composed largely of iron-formation clasts, hematite-cemented sandstone, and blue-green shale, and was formed within a marine environment. There are mostly invertebrate fossils in the form of shells preserved in the deposits; though fossilized shark's teeth, ocean snails, clams, and crocodile parts have been uncovered.

3.4.4.2 West Range Site and Corridors

The Coleraine Formation is found within isolated pockets between the Proterozoic and the glacial deposits in the area around the West Range Site. Because glacial deposits cover the majority of the area, the occurrences of the Coleraine Formation are restricted to areas with mining operations, where the overburden has been removed. The Coleraine Formation is primarily known from the walls of the HAMP, which is located in the Hill Annex Mine State Park. The state park also has tailings piles with waste rock excavated from the mining operations. It currently provides fossil-hunting tours to the public.

The West Range Site is located to the north of the assumed extent of the Coleraine Formation; however, the southern portion of the rail alignments and most of the HVTL lines would be located where the formation is hypothesized to be found. The true extent of the Coleraine formation is not known, particularly because it is not continuous.

3.4.4.3 East Range Site and Corridors

The Coleraine formation is not found near the East Range Site or its corridors.

3.4.5 Soils

3.4.5.1 Regional Features

Soil formation in northern Minnesota is dominated by erosion, glacial activity, and the type of parent material. The final retreat of the glaciers at the end of the Holocene left a thick layer of sediment carried from the north. Soil formation today in northern Minnesota occurs primarily on these glacial deposits and is modified by the large amount of glacial water trapped above the igneous bedrock. Wetlands are found in areas of low elevation and generate thick organic soils sequences. Upland areas tend to be well drained and can have a wide variety of clast size. Therefore, landscape position and parent material are some of the primary factors in the area soil formation.

The soil descriptions provided are categorized by their parent material because they are well correlated to the soil characteristics pertinent to the impact analysis. Further discussion of the West Range Site soil series and their attributes can be found in the Itasca County Soil Survey (USDA, 1987).

In some locations, soil surveys in northern Minnesota are still incomplete. The Soil Survey of Itasca County was completed in 1987, and the Natural Resources Conservation Service (NRCS) is currently preparing a soil survey for St. Louis County. Selected areas around Hoyt Lakes are depicted on preliminary maps, and limited soil descriptions are available. An earlier, rudimentary survey mapped soil landscape units around Hoyt Lakes in 1989. These data provide broad descriptions and lower resolutions than standard soil survey maps, and are only used as a baseline description. Since the soil survey information is in draft form, the East Range Site soil types are discussed qualitatively. The West Range and East Range Sites have a similar Quaternary history and topographic profiles, therefore, the soils could be considered similar.

3.4.5.2 West Range Site and Corridors

The West Range Site soils consist of nearly level to very steep, well-drained and somewhat poorly drained loamy and silty soils that formed in glacial till. Organic deposits also occur within the West Range Site, directly north and south of the footprint of the proposed IGCC power plant. Table 3.4-4 presents more detail about the soil series in the West Range Site and corridors. Where areas of wetness occur the soils are described as poorly drained till sediments and peat bogs. The HVTL corridors would cross recent organic deposits and soils formed from lacustrine deposits, glacial till, and glacial outwash. Given the length of the proposed HVTL corridors, there is not one predominant soil type. More information on the soil types is described in Table 3.4-4.

The organic soils have formed nearly level bogs, lake plains, and outwash plains. The depth of the peat extends to at least 6 feet, the maximum depth evaluated by the soil survey. There are numerous areas of compressible, highly organic soils with a groundwater table 3 feet or less below the surface. Shallow excavations in organic deposits are very unstable due to seeping water and cutbank cave-ins. Some organic materials are also found over sandy alluvial materials. These soils consist of 1 to 2 feet of peat underlain by loam, loamy sand, coarse sand, loamy coarse sand, sand, and silt loam. The depth to the seasonal high groundwater table ranges from 2 feet above to 3 feet below ground surface.

Lacustrine deposits are poorly drained and occur on flat and slightly concave slopes on glacial lake plains and outwash plains. They consist of silt loam, clay loam, loam, loamy very fine sand, and very fine sand. The water table is also very high in these soils, which severely impedes shallow excavations because of wetness and caving cutbanks. Glacial till soils are extremely variable, with their characteristics depending on the local topography and water table. The soils consist of silt loams to loamy fine sand, and are located on the tops of glacial moraines to flat glacial till plains. When digging in areas with a high water table, these soils are also unstable.

The majority of soils formed on glacial outwash deposits are well to excessively well-drained. These soils include loamy fine sand, fine sand, fine sandy loam, sandy loam, loamy sand, coarse sand, loamy coarse sand, sand, silt loam, and gravelly sand. The finer soils tend to be near the ground surface and become coarser with depth.

All of the natural gas pipeline alternatives would cross organic, glacial till, and glacial outwash deposits. Given the length of the proposed gas pipeline corridors, there is not one predominant soil type. Organic deposits and a high water table are primarily found along the southern corridor of the NNG Pipeline Alternatives 1 and 2, around Trout Lake, and approaching the town of Blackberry. The process water pipeline corridors would follow existing corridors that, when necessary, cross mine tailing deposits, also known as slickens. Slickens consist of mine tailings left over from the taconite concentration process. Process water pipeline segments 2 and 3 would cross glacial till with a water table deeper than 3 feet below ground surface. More information on these soil types is provided in Table 3.4-4. **This table has been revised from the version included in the Draft EIS based on project features that have been eliminated from consideration (West Range blowdown pipelines, Rail Alignment Alternative 1B, Access Roads 1 and 2) and features that have been added (West Range Rail Alignment Alternative 3B and Access Road 3) to the Final EIS.**

[Text included here in the Draft EIS, relating to the blowdown pipeline, Rail Alignment Alternative 1B, and Access Roads 1 and 2, has been eliminated from the Final EIS.]

The Rail Alignment Alternatives 1A and 3-B would cross peat after branching from the CN rail line, and again within the West Range Site. On their approach to the Mesaba Generating Station, both alternatives would cross glacial till. The rail loops would be located on primarily poorly-drained organic and glacial till deposits. **Itasca County has deferred the project to reroute CR 7, so Access Roads 1 and 2 have been replaced with Access Road 3, which would cross sandy loams formed on glacial till.**

Table 3.4-4. Soil Types along the West Range Site and Corridors

Parent Material	Drainage	Seasonal High Groundwater Table Depth	Potential for Re-vegetation	Location
Recent Organic Deposits	Poorly drained	2 ft below to 2 ft above ground surface	**Good**: wetland plants **Poor**: grasses, wild herbaceous plants, hardwood and coniferous trees	1,2,3,4,7
Recent Organic Deposits over Alluvium	Poorly drained	3 ft below to 2 ft above ground surface	**Good**: wetland plants **Poor**: grasses, wild herbaceous plants, hardwood and coniferous trees	1,2
Lacustrine Deposits	Poorly drained	1 to 3 ft below ground surface	**Good**: wild herbaceous plants, grasses and legumes, hardwood trees and coniferous plants **Fair to Good**: wetland plants **Fair**: grasses, legumes, hardwood trees and plants	2
Glacial Till	Variable; Very poorly drained to Well drained	Variable; 1 to greater than 6 feet below ground surface	Variable; slope and local drainage determines the potential for re-vegetation **Good**: grasses, legumes, wild herbaceous plants, hardwood trees **Fair to Good**: coniferous plants and wetland plants	1,2,3,4,7,8,**9a, 10a**
Glacial Outwash	Well to excessively drained; some locations are poorly drained	Greater than 6 ft below ground surface	**Good**: grasses and legumes, wild herbaceous plants, hard wood trees, and coniferous plants **Fair**: wild herbaceous plants **Poor**: wetland plants	2,3
Mine Pits and Tailings Piles	Tailings piles are well drained. Flooding of mine pits varies by location	Varies by location	**Poor**: grasses, legumes, wild herbaceous plants, hardwood tress, coniferous and wetland plants	4

1. West Range IGCC Power Plant site
2. West Range HVTL WRA-1, WRA-1A, and WRB-2A
3. West Range Gas Pipeline Alternative 1, 2, and 3 corridors
4. West Range Process Water Pipelines
5. **Deleted**
6. **Deleted**
7. West Range Portable Water and Sewer Pipelines
8. West Range Rail Line Alternative 1A
9. **Deleted**

9a. West Range Rail Line Alternative 3-B
10. Deleted
10a. West Range Access Road 3

3.4.5.3 East Range Site and Corridors

Since the St. Louis County Soil Survey is not yet available publicly, soils at the East Range Site were assumed similar to the West Range Site due to their locations in similar climatic conditions and the similar parent materials. The depth to the water table at the East Range Site is not known.

A previous soil landscape study performed for the area was used to provide a limited characterization of the locations of organic deposits (Land Management Information Center, 1996). The East Range Site would be located on glacial till deposits. Initial studies of the soil indicate that the area has well-drained, sandy, light colored soil, which is consistent with the glacial parent materials. The HVTL 38L alternative

route would traverse glacial till, glacial lake sediments and peat. The water table would be high around the peat deposits. Glacial lake deposits contain soft to medium stiff, stratified clay and silt deposits, and tend to have a high groundwater table. Occasional cobbles and boulders are also encountered within the deposits. The HVTL 39L/37L alternative route would cross slickens from mine tailings piles around Eveleth, in addition to the glacial till, glacial lake sediments and peat. Mine tailings piles contain overburden soil from iron mining operations, which typically consists of glacial till. They also contain fragments of rock and low-grade iron ore. The ore is typically 3 to 10 inches in diameter, but can range in size from pebbles to large boulders. The tops of the tailings piles are typically flat and the side slopes are steep. Some piles are as much as 200 feet high. The Natural Gas Pipeline corridor would cross soils similar to those along the HVTL corridors.

The process water pipeline corridors would exist on **former** CE property, and would cross soils disturbed from mining operations. The spoil from mining operations includes glacial till and fragments of rock or iron ore, and becomes incorporated into the preexisting soil column. A portion of all of the process water pipelines would cross mine deposits, and segments 6-S-2WX, K-2WX, 2WX-Site, and 2WX-2W would also cross glacial till.

The soils underlying Rail Line Alternatives 1A and **3-B**, the potable water and sewer pipelines, and the access road corridors would consist of glacial till. These soils are discussed in further detail above and in the West Range section (Section 3.4.5.2).

3.4.6 Prime Farmland

3.4.6.1 Regional Features

The Federal Farmland Protection Policy Act (Public Law 97 98; 7 U.S.C. 4201 et seq.) and the Minnesota Agricultural Land Preservation and Conservation Policy Act (M.S. 17.80-17.84) have been enacted in an effort to document the potential impacts to agricultural land through the NEPA process and to preserve land with the potential to consistently produce food and raw materials. The supply of high quality farmlands is limited; therefore, the USDA encourages the preservation of soils classified as "Prime Farmland," "Prime Farmland, if Drained," or "Farmland of Statewide Importance." The NRCS Handbook, part 622.06 (USDA, 2006) defines prime farmland as:

> *Land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is also available for other uses. It has the soil quality, growing season, and moisture supply needed to produce economically sustained high yields of crops when treated and managed according to acceptable farming methods, including water management. In general, prime farmlands have an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, acceptable salt and sodium content, and few or no rocks. They are permeable to water and air. Prime farmlands are not excessively erodible or saturated with water for a long period of time, and they either do not flood frequently or are protected from flooding.*

Minnesota Rule 4400.3450, Subpart 4 ("Prime Farmland Exclusion") provides that

> *No large electric power generating plant site may be permitted where the developed portion of the plant site, excluding water storage reservoirs and cooling ponds, includes more than 0.5 acres of prime farmland per megawatt of net generating capacity, or where makeup water storage reservoirs or cooling pond facilities include more than 0.5 acres of prime farmland per megawatt of net generating capacity, unless there is no feasible and prudent alternative.*

The provision does not apply to areas located within home rule charter or statutory cities, areas located within two miles of home rule charter or statutory cities of the first, second, and third class, or areas designated for orderly annexation under Minnesota Statutes § 414.0325 (Excelsior, 2006a).

Prime farmland or farmland of statewide importance may occur in a variety of parent materials, geomorphic locations and climates. In northern Minnesota, soils formed on lacustrine or glacial till parent materials are generally considered prime farmland. Soils that also contain surface water may also be considered "Prime Farmland, if Drained." Some soils are not considered prime farmland but may have properties that are recognized by the state as suitable for production of food, feed, fiber, or forage. The Minnesota state soil surveys identify soils that are considered prime farmland or farmland of statewide importance.

3.4.6.2 West Range Site and Corridors

Fourteen soil series found along the proposed West Range Site and utility corridors are classified as either "Prime Farmland," "Prime Farmland, if Drained," or "Farmland of Statewide Importance." These soils are primarily silt loams located on shallow slopes and are generally well drained.

The West Range Site footprint is primarily located on soils identified either as "Prime Farmland Soils," or "Prime Farmland, if Drained." For the West Range Site, soils that are within the site ownership boundary or within the utility corridor rights–of-way and have been designated as prime or statewide important farmland are shown on Figure 3.4-7. Some soils have a seasonally high water table, but qualify as prime farmland where they have been drained. There currently is no active farming in this area.

Prime and statewide important soils are ubiquitous in the area surrounding the West Range Site (Figure 3.4-7). All of the HVTL, pipeline, and transportation corridors would cross over sections of soils classified as "Prime Farmland," "Prime Farmland, if Drained," and "Farmland of Statewide Importance." Some corridors would cross land that has previously been disturbed from mining activities. The process water pipelines Segments 1, 2, and 3 would cross fewer farmland soils as they approach the mine pits.

Facilities associated with the West Range Site that lie outside the City limits of Taconite and Marble (Taconite and Marble abut one another at the eastern-most boundary of Taconite and both are statutory cities) are limited to the LMP pumping station, Segment 1 of the Process Water Supply Pipeline, and the outfall at its point of termination of the Segment 1 pipeline (Excelsior, 2006a).

3.4.6.3 East Range Site and Corridors

The St. Louis County soil survey is currently being prepared, therefore, only preliminary soils data exists for parts of the county. However, the soils surrounding the East Range Site have been qualitatively analyzed from preliminary maps. Based on available mapping, two soil series are classified as "Farmland of Statewide Importance" soils within the vicinity of the East Range Site. No soils in the southern portion of St. Louis County are associated with the Prime Farmland classification. Since the soil survey data from St. Louis County are preliminary, the maps used in this analysis, as well as soil series classifications, are subject to change. In locations where the corridors cross tailing piles or disturbed mining areas, the presence of prime and statewide important soils is highly unlikely.

The area surrounding the East Range Site is an industrial region with several mining operations. Therefore, there is little farming activity surrounding the East Range site and no current farming practices are being conducted on the proposed project site.

The generating station footprint and many of the station's associated facilities are located entirely within the City limits of Hoyt Lakes, a statutory city. The Process Water Supply Pipeline Segment 7 is located within the City of Aurora, also a statutory city. Facilities associated with the East Range Site that lie outside the City limits of Hoyt Lakes or Aurora are Segment 6 and Segment 8 of the Process Water Supply Pipeline (Excelsior, 2006a).

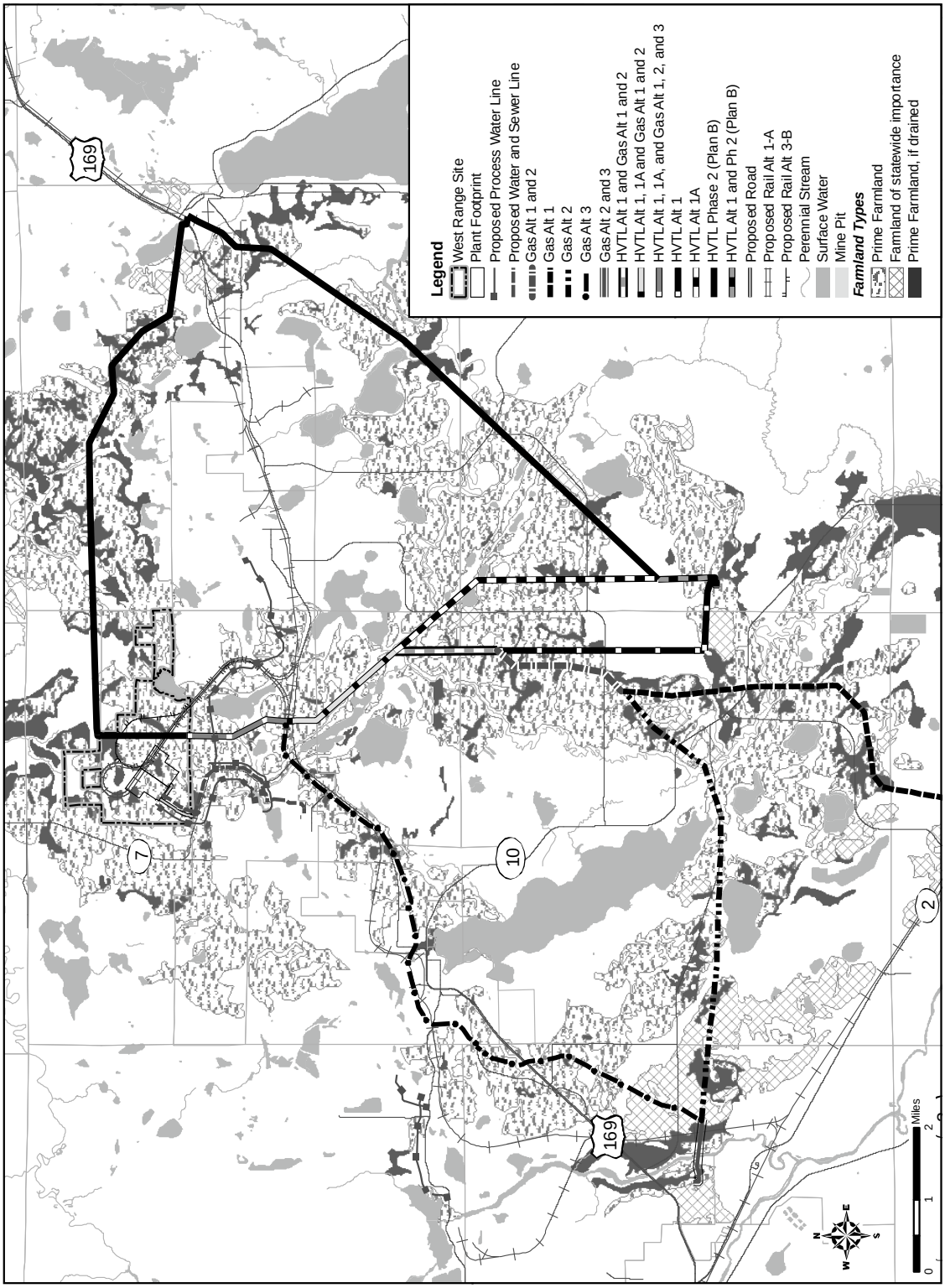


Figure 3.4-7. West Range Location of Prime Farmland Soils

3.4.7 Suitable Formations for Geologic Sequestration of Carbon Dioxide

Excelsior is currently working with the University of North Dakota Energy and Environmental Research Center to assess CO_2 management options as part of the Plains CO_2 Reduction Partnership (see Section 2.2.1.3). The Phase I and Phase II Mesaba Generating Station would be designed as carbon capture adaptable, in the event that the CO_2 can be either commercially used under economically advantageous conditions, or sequestered in response to a nationally implemented climate change program that includes regulatory constraints on greenhouse gas emissions. It is anticipated that approximately one third of the carbon in the PRB feedstock could be captured with existing technology, with a subsequent reduction in capacity and plant efficiency.

Carbon is currently being sequestered in capped sandstone or limestone aquifers, frequently around areas with oil or gas production. Some of the closest areas for potential carbon sequestration around the Proposed Action would be in the oil fields or coal seams in the Williston Basin in northwestern North Dakota (approximately 400 miles from the proposed West Range Mesaba Generating Station). There is also potential for sequestration in saline formations within the Mississippian-Madison Saline Aquifer System in western North Dakota and northwest South Dakota, and within the Lower Cretaceous Saline Aquifer System in central North Dakota and South Dakota (approximately 260 miles from the West Range Mesaba Generating Station). Additional information on these potential sinks and their estimated storage capacities is available in a December 2005 Plains CO_2 Reduction Partnership publication titled "Geologic Sequestration Potential of the Plains CO_2 Reduction Partnership Region" at http://www.netl.doe.gov/technologies/carbon_seq/ partnerships/phase1/pdfs/MDJ-Geologic Sequestration Potential.pdf.

Excelsior prepared a "Plan for Carbon Capture and Sequestration" in October 2006 that explored the economic factors associated with selecting geologic sequestration options and locations. The most promising options would deliver the CO_2 by pipeline for enhanced oil recovery operations in the Williston Basin. The plan also evaluated injection into the Lower Cretaceous Saline Formation in eastern North Dakota. Although existing CO_2 pipelines would be utilized wherever feasible, new CO_2 pipeline would need to be constructed to transport CO_2 to the sequestration sites. Excelsior would continue to work with the Plains CO_2 Reduction Regional Partnership to explore possibilities for sequestering the CO_2 from the Mesaba Energy Project, such as collaborating on a potential Phase III demonstration project proposal under NETL's Carbon Sequestration Program.

Excelsior recently discussed potential carbon sinks in the Upper Midwest with Julio Friedmann, the Associate Program Leader of the Carbon Management Program at Lawrence Livermore National Laboratory and Harvey Thorleifson, Director of the Minnesota Geological Survey. Based on those discussions, Excelsior concluded that prospects do exist in Minnesota for geologic formations that may be appropriate for sequestration. At present, the geological understanding of these formations is limited and further study is necessary to determine their suitability for carbon sequestration.

A formation in eastern Minnesota called the Midcontinent Rift holds the potential to be suitable for carbon sequestration and comes within 100 miles of both proposed plant sites. It contains significant formations of sedimentary rock that may have adequate porosity for carbon sequestration. At this time, it is not certain whether such formations exist at a suitable depth and with a sufficient degree of geological seal for carbon sequestration to be feasible.

The geological formations and reservoirs that Plains CO_2 Reduction Partnership and other regional initiatives identify as carbon sequestration sinks (and quantify capacity thereof) have been relatively well characterized geologically as part of previous oil and gas exploration activities. Such characterization is expensive and therefore is generally (but not strictly) obtainable because of the economic opportunities that accompany fossil fuel exploration. Because of the lack of oil and gas exploration in the area, the Midcontinent Rift in Minnesota has not been characterized to the degree of other identified and confirmed

sinks. Excelsior is exploring ways to facilitate this research. However, until this occurs, the potential to sequester carbon in Minnesota is uncertain.

INTENTIONALLY LEFT BLANK

3.5 WATER RESOURCES

Ready access to an abundant supply for water is an important consideration in siting power plants, as water is necessary for steam generation, cooling, and process water. The following sections describe the water resources (surface and groundwater) near the Mesaba Energy Project alternatives and the associated utility and transportation corridors.

3.5.1 West Range Site and Corridors

The following sections identify the prominent surface water features and describe the major drainage areas and watersheds associated with the West Range.

3.5.1.1 Surface Water Sources

The West Range Site lies in the northern region of the Upper Mississippi River Basin Watershed. Table 3.5-1 lists the major surface water bodies near the Mesaba Generating Station. Figure 3.5-1 illustrates the major drainage areas throughout the Mesaba Generating Station and associated utility and transportation corridors.

There are three primary watersheds within the vicinity of the West Range Site. The Prairie River watershed encompasses the northern portion of the project site. The southern portion of the Power Station lies in a sub-watershed that drains into the CMP. The CMP watershed does not have a surface hydrologic connection to the other watersheds since the CMP does not have a surface water outlet. The Swan River watershed is south of the CMP sub-watershed. Both the Prairie River and the Swan River drain to the Mississippi River.

There are a number of water features (natural lakes, water-filled mine pits, and rivers/streams) located in the area surrounding the proposed generating station. The primary natural lakes in the area include Dunning Lake, adjacent to the east edge proposed generating station property; Big Diamond Lake, to the southeast of the proposed plant; and **Little Diamond Lake and** Holman Lake, to the south. **As mining ceased in areas along the Iron Range, and associated dewatering operations ended, many of the pits filled with water, some to the point that they have connected with adjacent pits.** Specifically, these pits include the CMP and the HAMP Complex. Figure 3.5-2 provides a map of the locations of these water features near the proposed power station. **Because disused mine pits shown on figures in this EIS have been filling with surface water and groundwater, the areas within these pits shown as surface waters based on available geographic information system data may not represent the actual extent of surface waters currently in these pits.** Because the abandoned mine pits are being considered as sources of raw water for the power station, Table 3.5-2 lists the current capacity of each mine pit.

Table 3.5-1. Surface Water Bodies

Surface Water	Watershed	FEMA[1] Designated Floodplain	Public Water[2]	Special Water[3]	MPCA Designated Impaired Water[4]	Target TMDL Study[5]	Source of Impairment
Big Diamond Lake	Swan River		X				
Canisteo Mine Pit (CMP)	Swan River						
Dunning Lake	Prairie River		X				
Greenway Mine Pit	Prairie River						
Hill-Annex Mine Pit (HAMP)	Swan River						
Holman Lake (Hill Lake)	Swan River		X				
Lind Mine Pit (LMP)	Prairie River						
Little Diamond Lake	Swan River		X				
Lower Panasa Lake	Swan River		X		X	NO	Mercury FCA[6]
Mississippi River		X	X	X	X	NO	Turbidity, Low oxygen Mercury FCA[6]
Oxhide Creek	Swan River		X				
Oxhide Lake	Swan River		X		X	NO	Mercury FCA[6]
Prairie River	Mississippi River	X	X				
Snowball Creek	Swan River		X				
Swan River	Mississippi River	X	X		X	NO	Fecal coliform Low oxygen Mercury FCA[6]
Trout Creek	Swan River		X				
Trout Lake	Swan River		X	X	X	NO	Mercury FCA[6]
Twin Lakes	Swan River		X				
Upper Panasa Lake	Swan River		X		X	NO	Mercury FCA[6]
West Hill Mine Pit	Prairie River						

[1]Federal Emergency Management Agency (FEMA)
[2]MNDNR Designated Public Water
[3]MPCA Designated Special Water
[4]MPCA Designated Impaired Water, 2006 EPA Draft 303(d) list of impaired waters. No data does not necessarily mean that the water body is not impaired. It may be that the water body has either not been sampled or there are not enough data to make an impairment determination.
[5]Total Maximum Daily Load
[6]Fish Consumption Advisory
Source: Excelsior, 2006a

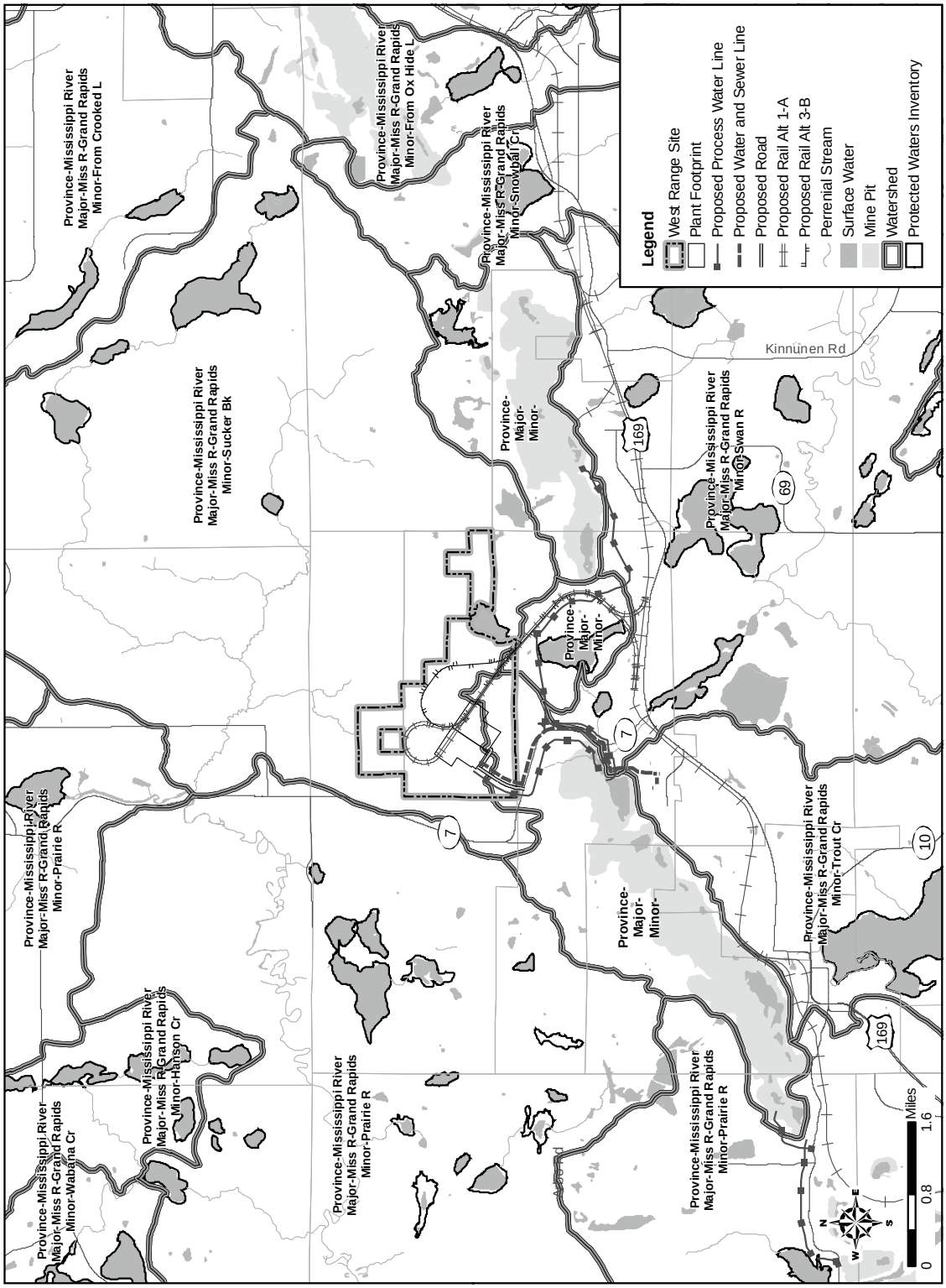


Figure 3.5-1. West Range Drainage Features

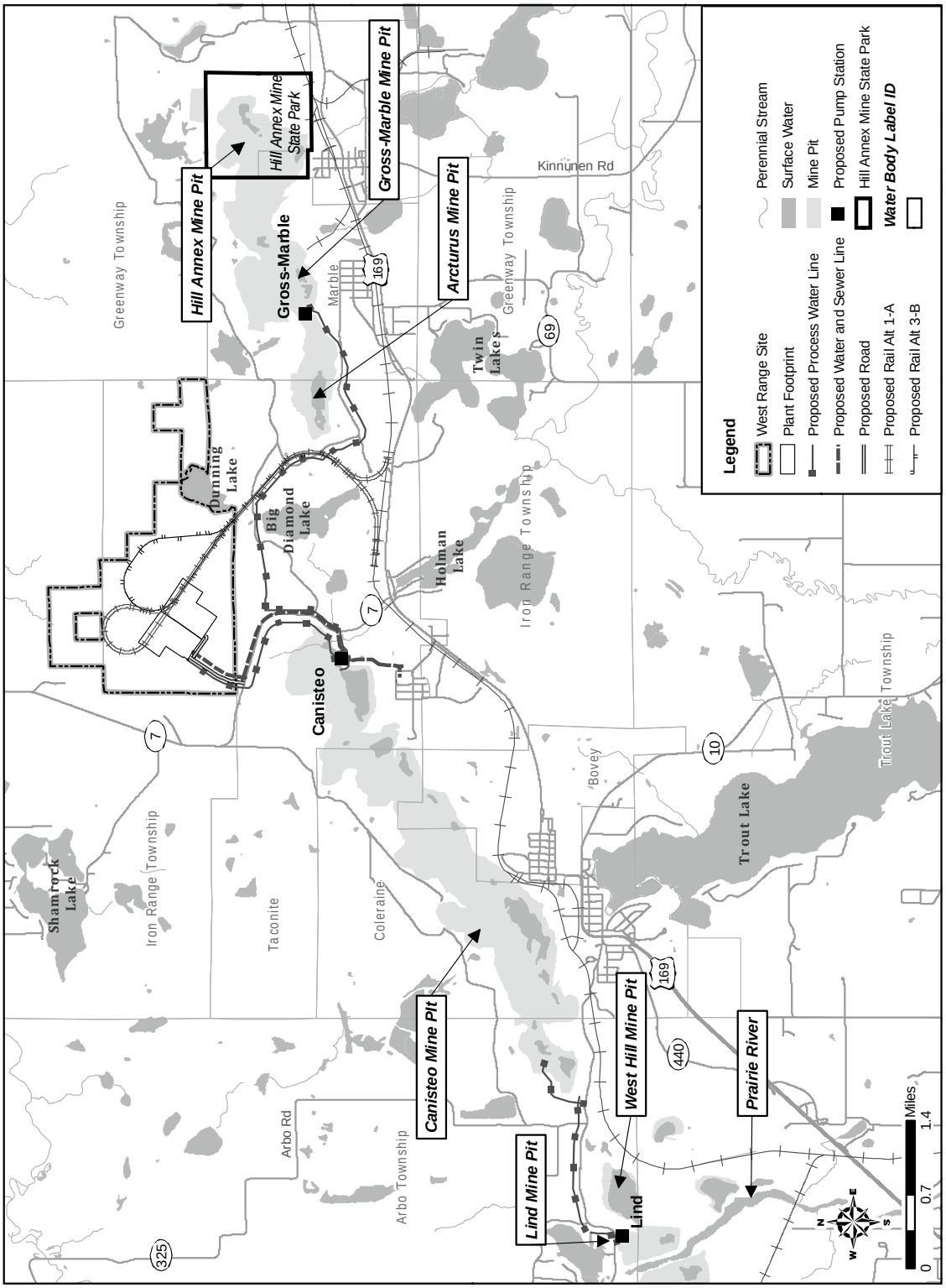


Figure 3.5-2. West Range Surface Waters

Table 3.5-2. Capacity of West Range Mine Pits (November 2005)

Water Source	Water Surface Elevation (feet)	Surface Area (acres)	Estimated Volume (acre-feet)
CMP	1,309	1,400	150,000
HAMP Complex			
Hill-Annex Mine Pit	1,249	216	20,600
Arcturus Mine Pit	1,269	105	4,490
Gross/Marble Mine Pit	1,249	141	11,100
LMP	1,265	82	8,310

Source: Excelsior, 2006a; Acronyms: CMP – Canisteo Mine Pit; HAMP – Hill-Annex Mine Pit; LMP – Lind Mine Pit.

In addition, there are a number of existing operations that use some of these water features as source water. Table 3.5-3 presents a summary of existing MNDNR water appropriation permits near the West Range Site.

Table 3.5-3. Existing Water Appropriation Permits for Surface Waters Near The West Range Site

Permitee	Resource	Permitted		Reported Pumping (Million Gallons)				
		GPM	MG/Y	2000	2001	2002	2003	2004
Jackson, Allen	Mississippi River	250	13	ND	ND	2.2	ND	ND
Schwartz Redi Mix Inc.	West Hill-Annex Pit	900	39	ND	ND	ND	ND	21.6
MNDNR	Hill-Annex Tailing Basin	4,500	500	ND	ND	ND	ND	70.3
MNDNR	Hill-Annex Mine	7,000	3,416	ND	ND	621.1	1,550.3	1,374
U of MN	Prairie River	500	7	ND	ND	ND	ND	ND
U of MN	Prairie River	1,000	60	6.7	17	18.1	25.6	20.1
U of MN	Prairie River	1,000	60	7.8	ND	0.4	23.4	26.5
Blandin Paper Co.	Mississippi River	30,000	7,000	7,985	7,041	6,350	6,429	6,088
Jackson, Allen	Mississippi River	265	4	2.8	ND	ND	2.5	ND
Swan Lake Country Club	Oxhide Creek	540	10	4.6	8.5	9.2	8.4	5.8
City of Coleraine	Trout Lake	400	41	37	19.7	19.7	12.1	11.9

ND – No Data
Source: Excelsior, 2006a

The following sections provide more detail about the primary water bodies that are being considered as raw water sources or receiving waters for discharges from the Mesaba Generating Station.

Canisteo Mine Pit Complex

The CMP Complex is made up of a number of abandoned mine pits. The CMP is situated northeast of the city of Grand Rapids and immediately north of the cities of Coleraine, Bovey, and Taconite. The entire mine pit complex is approximately 4.5 miles long and 0.5 miles wide and has a drainage area of approximately 4,536 acres. The pit complex has a maximum depth of approximately 300 feet and a surface area of almost 1,400 acres. The water surface elevation in the mine pit on November 1, 2005 was

1,308.75 feet mean sea level (msl), which corresponds to a surface area of 1,393 acres and a water volume of 149,500 acre-feet.

The CMP Complex currently does not have a surface outlet. Water enters the complex through surface water runoff and groundwater inflow. Outflow consists only of groundwater seepage and evaporation. The amount of surface and ground water that currently enters the mine pit is greater than the amount of water lost by seepage and evaporation, which results in a net inflow of water. The water surface elevation has continued to rise since pumping of the CMP ceased in September 1985.

The CMP Complex has been modeled with the WATBUD model, which is a water balance model developed by the MNDNR, used to evaluate and predict water inflows and outflows for surface water bodies. The MNDNR has also monitored the water surface elevation in the mine pit and monitoring wells since 1989, and used these data to calibrate the WATBUD model and develop stage-storage relationships for the pit.

Using the stage-storage data from 1989 to 1995, the CMP had a net average inflow of 3,164 gallons per minute. From 1995 to present, recharge rates range from 810 gallons per minute to 4,190 gallons per minute, with an average of 2,580 gallons per minute. The stage-storage data has also indicated that the net inflow decreases as the level of the water in the pit reaches 1,300 feet msl, which is the elevation of the bedrock surrounding the pit. Results of the most recent (2005) modeling effort indicate that the CMP Complex will overflow within the next 4.5 to 8.5 years.

The USGS also conducted a study of the groundwater flow between the CMP and the surrounding aquifers (Jones, 2002). This study modeled the groundwater flows over varying CMP water level elevations (from 1,300 to 1,324 feet msl) and estimated the net inflow of groundwater into the CMP ranged from 628 gallons per minute at the 1,300 feet msl to 40 gallons per minute at the 1,324 feet msl. The 1,324 feet msl is the level at which the CMP will begin to overflow. **Following publication of the Draft EIS, MNDNR announced its plans to construct a gravity outflow device from the CMP to the Prairie River that would allow the CMP to be maintained at an MNDNR-determined maximum water level (Scenic Range News Forum, 2009).**

Jones (2002) found that some groundwater outflow from the CMP did occur at the 1,300 feet msl. The outflow occurred in the area between the CMP and Trout Lake, which is also the location of the two groundwater wells used by the City of Coleraine **and the City of Bovey** as their source from drinking water. The modeling also indicated that the net outflow drops to zero at CMP water levels at or below 1,292 feet msl.

Hill-Annex Mine Pit Complex

The HAMP Complex consists of the Arcturus, Gross-Marble, Hill-Trumbull, and Hill-Annex Mine Pits. These mine pits are located immediately north of the cities of Marble and Calumet, and cover an area of over three miles from east to west. The GMMP, and HAMP Mine Pits were separated by large volumes of waste material (tailings and overburden) deposited during the mining operations. Following the cessation of mining, the water levels in the pits began to rise, and the GMMP became connected to the Hill-Trumbull/Hill-Annex when the water surface elevation reached approximately 1,215 feet msl. The water surface elevation in the Arcturus is higher than that of the other pits, and has not developed a permanent surface connection to other pits; however water currently overflows from the Arcturus into the GMMP. The stage in the GMMP and Hill-Trumbull/Hill-Annex pits were measured at 1,246.70 feet and Arcturus was measured at 1,268.51 feet on November 1, 2005 (Excelsior, 2006b).

Until 1979, mining operations kept the HAMP Complex completely dewatered. After that time, dewatering continued at several of the mine pits, while other pits began to fill with water after dewatering ceased. By 1981, all mining operations had ceased (Barr, 1987) and all the mine pits started filling with surface and groundwater. In 1988, the HAMP was established as a state park that offered tours of the mine pit features and facilities. The park, which is managed by the MNDNR, Division of Parks and

Recreation, does operate a dewatering pump in order to keep the water level below some of the unique features of the mine, but due to limited funding, the dewatering operations cannot be operated more than 5.5 months a year. As a result, the water level has risen above some of the mine features and facilities.

The current water level in the park allows the MNDNR to give boat tours of the pit during the summer months. There are mine features and several historic structures below the current water surface elevation that are viewed during these tours. According to the MNDNR's Draft Management Plan for the park, it is preferred to dewater the mine pit to an elevation between 100 and 150 feet below the current water surface elevation to expose historic structures and improve the interpretive quality of the site, as well as protect the historic structures on the pit rim. However, the dewatering of the pit to this level is currently cost-prohibitive under the State Park's annual budget.

Inflows into the HAMP Complex include seasonal precipitation, surface and ground water components. Discharges from the system include evaporation, seepage (ground water outflow), and dewatering. The water levels in the HAMP Complex fluctuate as a result of the seasonal variations in evaporation, runoff, and dewatering. The dewatering operations at the HAMP by the MNDNR occur from the end of May until October, and the pumping averages 6,200 gpm while in operation.

Pumping records for the HAMP have been kept since 1973, and MNDNR staff continue to report dewatering volumes on a monthly basis, however stage data were not collected on a regular basis. Using the pumping records from 1973 to1979, when the HAMP was in operation, the estimated recharge rate was determined to range from 3,230 to 4,030 gallons per minute. Since these recharge rates are based on keeping the pit empty, they are likely the maximum rates and should decrease as the water level in the pit rises.

For the Arcturus Mine Pit, given that the pit was completely dewatered on January 1, 1979, and was completely full by 1999, an average recharge rate of 2,150 gallons per minute was calculated.

Prairie River

The Prairie River lies within the Upper Mississippi River Basin Watershed and drains into the Mississippi River southeast of Grand Rapids and La Prairie. According to USGS data, the Prairie River watershed has an approximate drainage area of 360 square miles at the gauging station. The USGS also maintains a gauging station (gauge number 05212700) on the Prairie River, several miles upstream of its confluence with the Mississippi River. Prairie Lake lies on the Prairie River between the gauging station and the Mississippi River. Lake levels are controlled at an existing hydroelectric dam, located approximately 5 miles upstream of its confluence with the Mississippi River.

Flow data have also been collected at the gauging station from 1967 to 1983 and 2001 to present. Average monthly flow rates range from 50 to 200 cubic feet per second from August through March and range from 200 to 600 cubic feet per second range during the months of April, May, June, and July.

The Prairie River is being considered as a source of raw water for the West Range Power Station, and therefore, the raw water intake would be subject to the CWA rule 316(b) criteria regarding cooling water intake structures. The rule specifies that, for cooling water intake structures on fresh water rivers, the maximum amount of water that can be taken is "5 percent of the mean annual flow or 25 percent of the 7Q10[1], whichever is the lesser."

The mean annual flow in the Prairie River is 319 cubic feet per second, and five percent of that flow is equal to 16 cubic feet per second. The 7Q10 in the Prairie River was determined to be 22 cubic feet per second, and 25 percent of that flow is equal to 5.5 cubic feet per second. Since 25 percent of the 7Q10 is the smaller amount, the maximum amount of water that can be appropriated from the Prairie River at one

[1] The 7Q10 is the seven day low flow average with a 10-year recurrence interval.

time is 5.5 cubic feet per second (2,468 gallons per minute). Only these data collected by MP at the Prairie Lake Dam from 1998 to 2004 were used in the determination of the mean annual flow and the 7Q10, since there was not a full year of record for 1997 and 2005.

Trout Lake

Trout Lake does not currently receive any surface water discharges from the CMP. Since the CMP water surface continues to rise, surface outlets for the CMP to Trout Lake have been evaluated by the MNDNR and Barr Engineering, and Trout Lake has been evaluated as a potential receiving water. The available studies (Excelsior, 2006b; Barr, 2004) identify a number of potentially negative and positive outcomes as a result of the CMP Complex discharging to Trout Lake.

Upper Panasa Lake

Upper Panasa Lake currently receives water from the HAMP Complex dewatering operations. The amount of water that is discharged ultimately to Upper Panasa Lake from the HAMP Complex is shown in Table 3.5-3. The impacts on Upper Panasa Lake resulting from the discharge water from the HAMP have not been studied.

Greenway Mine Pit

There are very little data on the Greenway Mine Pit. The pit has filled with water and has an outlet pipe that discharges to the Prairie River. Short Elliot Hendrickson, Inc. (SEH) personnel measured the pipe size, flow depth, and flow velocity at the pipe outlet (Excelsior, 2006b) and determined the outflow from the Greenway Mine Pit was approximately 1 cubic foot per second (450 gallons per minute) at the time of the field investigations.

West Hill Mine Pit

There are very little data on the West Hill Pit. The pit has filled with water and has an outlet pipe that discharges to the LMP. SEH personnel (November 2, 2005) measured the pipe size, flow depth, and flow velocity at the pipe outlet and determined the outflow from the West Hill Mine Pit was approximately 3.5 cubic feet per second (1,570 gallons per minute) at that the time of the field investigations.

Lind Mine Pit

There are very little data on the LMP. The pit has filled with water and has an outlet pipe that discharges to the Prairie River. SEH personnel (November 2, 2005) measured the pipe size, flow depth, and flow velocity at the pipe outlet and determined the outflow from the LMP was approximately 4 cubic feet per second (1,800 gallons per minute) at that time. A majority of the outflow comes from the West Hill Mine Pit (3.5 gallons per minute).

Holman Lake

Holman Lake was not considered as a source for process water, but was considered as a potential receiving water for cooling tower blowdown discharges **(note that there would no direct discharges to Holman Lake with use of the enhanced ZLD system. See Section 4.5 for updated discussions on potential impact to surface waters)**. Holman Lake currently receives outflow from Little Diamond Lake, as well as surface water runoff. The lake previously received the dewatering discharge from the Canisteo Mine when the mine was operational. At that time, the water level in the lake was controlled by a concrete spillway. Currently, the water level is affected by a beaver dam built just upstream of the spillway. The lake is listed on MNDNR's Public Waters Inventory, but it is not currently designated for a particular water use classification, however there is a public swimming area on the eastern side of the lake. Some limited water quality information is available for Holman Lake.

3.5.1.2 Water Quality and Uses

The water needs of the Mesaba Generating Station at the West Range Site would be met by appropriating water out of the following nearby abandoned mine pits: the CMP, HAMP Complex, and the LMP. The Prairie River would also serve as a source of water supply and would be integrated into the mine pit water plan. Table 3.5-4 summarizes the current water quality of each water source. In general, the current concentration of each constituent is based on the median concentration of available qualified water quality analyses.

Table 3.5-4. Current Water Quality for West Range Water Bodies

Constituent*	Units*	Water Quality Data*				
		CMP	HAMP Complex	LMP	Prairie River	Holman Lake
Hardness	mg/L	308	229	n/a	n/a	n/a
Alkalinity	mg/L	180	163	178	76	186
Calcium	mg/L	55.3	59.1	73.2	50	50.2
Magnesium	mg/L	40.8	20.5	n/a	22	n/a
Iron	mg/L	<0.05	<0.05	n/a	n/a	0.75
Manganese	mg/L	<0.02	<0.02	n/a	n/a	0.04
Chloride	mg/L	5.15	5.2	4.9	1.3	8.4
Sulfate	mg/L	105	54.7	n/a	<5	10.1
TDS	mg/L	337	252	402	n/a	236
pH	mg/L	8.4	8.3	7.7	7.4	7.9
Aluminum	µg/L	<25	<25	n/a	91	n/a
Barium	µg/L	28.6	29.3	n/a	n/a	n/a
Cadmium	µg/L	<10	<10	n/a	n/a	n/a
Chromium (6+)	µg/L	<5	<5	n/a	n/a	n/a
Copper	µg/L	<10	<10	n/a	n/a	n/a
Fluoride	mg/L	n/a	n/a	n/a	n/a	n/a
Mercury	ng/L	0.9	0.9	0.8	0.59	<4.0
Nickel	µg/L	<5	<5	n/a	n/a	n/a
Selenium	µg/L	<2	<2	n/a	n/a	n/a
Sodium	mg/L	6.7	6.2	5.0	2.5	7.4
Specific Conductivity	µmhos/cm	476	418	n/a	171	n/a
Zinc (3)	µg/L	<10	<10	n/a	n/a	n/a
BOD	mg/L	<2	<2	n/a	n/a	n/a
COD	mg/L	<2	<2	n/a	n/a	n/a
TOC	mg/L	1.9	1.8	n/a	n/a	n/a
TSS	mg/L	2	<1	n/a	n/a	n/a
Ammonia (as N)	mg/L	<0.1	<0.1	0.1	0.018	<0.1
Phosphorus	mg/L	<0.1	<0.1	0.01	0.029	0.01

*n/a – no data available (not analyzed); mg/L – milligrams per liter; µg/L – micrograms per liter; ng/L – nanograms per liter; µmhos/cm – micromhos per centimeter; CMP – Canisteo Mine Pit; HAMP – Hill-Annex Mine Pit; LMP – Lind Mine Pit; TDS – total dissolved solids; BOD – biochemical oxygen demand; COD – chemical oxygen demand; TOC – total organic carbon; TSS – total suspended solids; N - nitrogen
Source: Excelsior, 2006b

The natural surface water bodies within the project area are used for recreational purposes such as fishing, boating, and swimming. The CMP and the Greenway Mine Pit also host recreational uses, while the West Hill Mine Pit and the LMP do not have any known recreational uses.

3.5.1.3 Groundwater

Groundwater Quality and Quantity

The primary aquifer at the site is shallow Quaternary drift comprised of water-bearing sand and gravel deposits. Regionally, these aquifers occur beneath till and in ice contact features on the flanks of end moraines. End moraines are the ridge-like accumulation of till deposits marking a standstill position of a past or present glacier. Buried bedrock valleys in the region create variable thicknesses of Quaternary deposits. North of Taconite, Minnesota, Quaternary deposits range from approximately 10 to 40 feet thick, whereas, near the cities of Coleraine and Bovey (east of the site), Quaternary deposits are approximately 130 feet thick (USDI, 1965). Based on the results of geotechnical borings at the West Range Site, the unconsolidated deposits at the proposed facility consist of varying amounts of till and coarse alluvium, approximately 10 to 35 feet thick combined.

The West Range Site is located at a potentiometric high, and groundwater recharge area for the shallow aquifer is due to the presence of the Giants Range Batholith (Excelsior, 2006b). A groundwater divide (where the groundwater flow direction is north and south with surface water features primarily influencing the direction of shallow flow) is present near the West Range Site. On the site itself, where the facility will be located, the groundwater flow direction of the shallow aquifer appears to be north and northwestward based on groundwater elevation data collected from the on-site groundwater monitoring wells. Ultimately, groundwater in the shallow aquifer at the site discharges to tributaries and surface water bodies that subsequently discharge into the Prairie River.

Immediately south of the West Range Site, a bedrock aquifer exists underlying the Quaternary deposits (Excelsior, 2006b). Bedrock in the area (Giants Range Batholith, Pokegama Quartzite, Biwabik Formation, and Virginia Formation) has very little primary porosity. However, secondary porosity in the form of fractures and leached zones has developed within Biwabik Formation allowing it to act as an aquifer (Excelsior, 2006b). Regional groundwater flow within the Biwabik Formation is south from the Giants Range Batholith toward the Swan River—a regional groundwater discharge feature. The groundwater flow direction of this bedrock aquifer specifically on the West Range site is interpreted to be south and southwest toward the CMP.

Mining activities in the area have influenced the natural groundwater system in the area (Excelsior, 2006b). Fractures and leached zones within the Biwabik Formation appear greatest near the mine pit complexes. The mine pits have been excavated below the water table and groundwater head of the Quaternary and bedrock aquifers. Since the cessation of mining activities**, including dewatering of the mine pits**, water levels in the mine pits have been increasing due to **continued inflow of surface water and groundwater** into the mined excavations. **However, the rate and direction of groundwater flow (i.e., into or out of a mine pit) depends on the hydraulic head difference between the surface water elevation in a mine pit and the adjacent aquifer. For example, the findings of a study conducted by USGS indicated that as the CMP's water level increased from 1,300 to 1,324 ft, its inflow rate decreased by about 0.4 cfs, while its outflow rate increased by about 0.85 cfs (Jones, 2002).**

Transmissivities and hydraulic conductivities of various shallow sand and gravel aquifers in the region have been estimated (Excelsior, 2006b). In studying the hydrogeology of the CMP area, the MNDNR and USGS installed 18 monitoring wells in the Quaternary drift aquifer(s) and performed pumping tests and hydraulic conductivity slug tests.

Average calculated transmissivities for sand and gravel aquifers ranged from 98 to 300 square feet per day. Average calculated hydraulic conductivities for the sand and gravel aquifers ranged from 2.2 to 68 feet per day (Excelsior, 2006b). Hydraulic conductivities for the four wells on the site ranged from 0.5 to

32.5 feet per day. Locally, well yields typically range from 300 to 500 gallons per minute for wells completed in the Quaternary drift deposits (Excelsior, 2006b), with yields up to 1,000 gallons per minute. The Biwabik Formation is a good source of groundwater for domestic use and a fair source of supply for municipal and industrial use (Excelsior, 2006b). While the local aquifers have sufficient capacity to serve local municipal and residential groundwater users, these aquifers do not appear to have sufficient capacity to provide enough groundwater for the process water needs of the Mesaba Generating Station (**10,000** gallons per minute peak requirements). Thus, a large number of wells would be required to pump enough water to meet the station's process water needs.

Although groundwater quantities and local aquifer capacities are limited (as far as being a source of process water supplies), it is feasible that one or more wells could be utilized to provide a potable water supply for the generating station. Several local public water supply wells are drilled into and utilize the Biwabik Formation.

Typically, groundwater quality in the region has moderate dissolved solids content, is moderately siliceous, is very hard, and contains high levels of iron and manganese frequently above the maximum recommended limits of 0.3 milligrams per liter for iron and 0.05 milligrams per liter for manganese (USDI 1965, Excelsior, 2006b). Sand, ice-contact sand and gravel, and buried outwash aquifers have adequate yield (5 gallons per minute or more) and suitable quality for domestic use (total dissolved solids less than 1000 milligrams per liter) (Excelsior, 2006b). Of these, only buried outwash aquifers have suitable yield (900 gallons per minute or more) and quality (total dissolved solids less than 500 milligrams per liter, iron content less than 0.3 milligrams per liter, and hardness less than 180 milligrams per liter) for municipal or industrial use (Excelsior, 2006b).

Groundwater Depth and Recharge Sources

The potentiometric surface of the shallow Quaternary aquifer at the area is approximately 1350 to 1400 feet msl (Excelsior, 2006b), approximately 10 to 60 feet below ground surface (bgs). Static groundwater elevations of the shallow aquifer(s) have been recorded by MNDNR in a series of monitoring wells in the area of the CMP, and from the period between January 2001 and April 2005, the groundwater elevations ranged from 1280 to 1382 feet msl.

Groundwater flow is influenced by mine pits in the area (USDI, 1965); a potentiometric gradient exists between the surface water in mine pit lakes and groundwater in surrounding areas directing flow towards the mine pit complexes (Excelsior, 2006b). During periods of mine operation, dewatering in the mine pits reduced the amount of lateral flow (north to south) through bedrock and Quaternary deposits, and decreased potential vertical recharge to the bedrock aquifer south of the mine pits (Excelsior, 2006b).

Municipal wells for the cities of Bovey, Calumet, Coleraine, Marble, and Taconite are located south of the local mine pits (CMP and HAMP Complex). Table 3.5-5 summarizes the static water elevations and historic pumping in these wells.

Table 3.5-5. Pumping Groundwater Elevations City Municipal Wells

Date		Water Elevation	Pumping Rate	Duration
		ft msl	gpm	hours
Marble 1				
1926	During mining operations	1150	300	-
1955		1164	350	-
1977		1105	248	2
1994	After mining operations ceased	1177	400	-
1999		1189	385	-
2000		1195	420	-
2001		1200	390	-

Table 3.5-5. Pumping Groundwater Elevations City Municipal Wells

Date		Water Elevation	Pumping Rate	Duration
		ft msl	gpm	hours
2002		1232	270	-
2003		1203	350	-
Marble 2				
1955	During mining operations	1199	385	14
1965		1198	340	-
1977		1103	300	25
1989	After mining operations ceased	1236	270	-
1994		1193	300	-
1999		1196	330	-
2000		1201	360	-
2001		1203	310	-
2002		1207	-	-
2003		1221	220	-
Bovey 1				
1953	During mining operations	1256	650	10
Coleraine 1				
1918	During mining operations	1258	500	
Coleraine 3				
1976	During mining operations	1243	1012	5
Taconite 1				
1991	After mining operations ceased	1112	218	12

Average annual recharge to groundwater is approximately 5.7 to 7.6 inches (Excelsior, 2006b). Groundwater recharge to the shallow sand and gravel aquifer(s) is derived from precipitation infiltration and interconnections with surface water bodies (including mine pits that have filled with water). Groundwater recharge to the underlying Biwabik Formation bedrock aquifer is largely by vertical infiltration through the Quaternary deposits where the formation is not overlain by other bedrock (USDI, 1965). Lateral groundwater recharge occurs as groundwater travels south from the Giants Range Batholith.

Usage and Availability

Other than the four groundwater monitoring wells recently constructed, no wells are currently located on the property. However, numerous wells are located on surrounding properties. There are 23 domestic wells, 11 monitoring wells, three “other use” wells, and two public supply non-community transient wells in the area. The domestic supply wells are concentrated along CR 7, US 169, and north of Big Diamond Lake. These domestic wells utilize the Quaternary sand and or gravel aquifers.

Wells are also located adjacent to the CMP and the HAMP Complex. The wells adjacent to the mine pits are used for:

- Community Supply (10)
- Dewatering (1)
- Domestic (19)
- Industrial (2)

- Monitoring (38)
- Municipal (2)
- Public Supply (2)
- Other (7)

Public water supply wells for the cities of Bovey, Calumet, Coleraine, Marble, and Taconite are constructed in Quaternary and Biwabik Formation aquifers. Wells for the cities of Bovey and Coleraine are completed in the same unit of ice-stratified Quaternary drift (USDI, 1965). The wells receive limited amounts of recharge through infiltration and receive some recharge from Trout Lake (USDI, 1965). According to the County Well Index and DNR State Water Use Database System of Water Appropriations Permits, the City of Bovey has one municipal well (Unique No. 228834). This well has a 16-inch diameter casing completed in sand and gravel Quaternary deposits. The static water elevation was 1,268 feet msl at the time of installation (1953). This groundwater level was recorded when the CMP was dewatered for mining activities. The City of Bovey is permitted to pump the well at a rate of 35.0 million gallons per year. The reported volume of groundwater pumped from this well in 2004 was 29.6 million gallons per year.

The City of Coleraine has two wells (Coleraine 1 and **4**: Unique Nos. 241430 and 110457, respectively). Coleraine 1 is completed at a depth of **121** feet within undivided Quaternary drift. Coleraine 1 had a static water level of 1,283 feet msl at the time of well installation (1918). Coleraine **4** is **120** feet deep. It is completed within sand, gravel, and boulder Quaternary deposits. Coleraine **4** had a static water level of 1267 feet msl at the time of well installation (1976). The City of Coleraine is permitted to pump 80 million gallons per year from both wells. The reported pumped volume in 2004 was 52.2 million gallons per year for **both wells**.

The cities of Marble, Calumet, and Taconite each have two public water supply wells. These six wells draw water from the Biwabik Formation bedrock aquifer. Marble 1 (Unique No. 228842) is **500** feet deep. The static water level was 1224 feet msl at the time of well installation (1926). Marble 2 (Unique No. 228846) had a static water level was 1258 feet msl at the time of installation (1955). The city of Marble is permitted to pump 49.0 million gallons per year from both of the wells. The reported volume of groundwater pumped for both wells in 2004 was 12.8 million gallons per year.

Calumet 2 (Unique No. 228839) was completed at a depth of **495** feet in the Virginia and Biwabik formations. The static water elevation was 1178 feet msl at the time of installation (1943). Calumet 3 (Unique No. 228838) is **500** feet deep. It is completed in the Virginia and Biwabik formations. The City of Calumet is permitted to pump 22.0 million gallons per year from both wells. The reported volume of groundwater pumped in 2004 was 5.8 million gallons per year for Calumet 2 and 6.2 million gallons per year for Calumet 3.

The City of Taconite Well 1 (Unique No. 241489) is 384 feet deep and is completed in the Biwabik Formation bedrock aquifer. The approximate static groundwater elevation in the well at the time it was constructed (19**2**6) was 1,273 feet msl. Taconite No. 2 (Unique No. 495997) is 394 feet deep and also utilizes the Biwabik Formation aquifer. Its static water elevation was 1290 feet msl at the time of installation (1991). The City of Taconite is permitted to pump 20 million gallons per year (total) from both wells. The reported volume of groundwater pumped in 2004 was 7.9 million gallons per year for Taconite 1 and 7.3 million gallons per year for Taconite 2.

The cities of Bovey, Calumet, Coleraine, Marble, and Taconite rely on groundwater resources for public water supplies. Each city has public water supply wells open to either the shallow sand and gravel aquifer (the cities of Bovey and Coleraine) or the Biwabik Formation bedrock aquifer (cities of Calumet, Marble, and Taconite). Due to the close proximity of these local public water supply wells to surface water bodies, a hydrologic connection may exist between the groundwater captured by the wells and local surface waters and mine pits. Due to the relatively high tritium concentrations detected by the Minnesota

Department of Health (MDH) in the groundwater pumped from some of these public water supply wells, the source water aquifers (Quaternary sand and gravel deposits and the Biwabik Formation) appear to recharge quickly (i.e., 50 years or less) and are therefore more sensitive to land surface activities and more vulnerable to potential contamination.

Permits

No groundwater use or withdrawal permits currently exist for the Mesaba Energy Project. As previously mentioned in Section 2.5.2.3, MNDNR Water Appropriation Permits for groundwater withdrawal/use have been issued to local municipalities for public water supply systems (the cities of Bovey, Calumet, Coleraine, Marble, and Taconite). Regionally, groundwater appropriation permits have also been issued to mining companies for dewatering and farms for agricultural purposes and irrigation.

Four well permits were obtained from the MDH for constructing the four groundwater monitoring wells installed on the West Range Site in July 2005. These permits will be reissued annually by the MDH to the facility as long as the wells are still necessary and utilized.

Should groundwater be used for a potable water supply for the facility, a well permit from the MDH will be required. If the amount of groundwater pumped from a well for potable water supplies exceeds 10,000 gallons per day or 1 million gallons per year, a Water Appropriation Permit will be required from the MNDNR.

During construction of Phase I and Phase II, dewatering may be necessary that will temporarily lower the shallow water table aquifer in small localized areas. If the dewatering is expected to exceed 10,000 gallons per day or 1 million gallons per year, a Water Appropriation Permit will be attained from the MNDNR.

Any necessary discharges from the facility will be properly managed in accordance with the NPDES permits issued for plant, and applicable state and local regulations to prevent degradation of source water aquifers used for public water supplies.

3.5.2 East Range Site and Corridors

The following sections identify the prominent surface water features and describe the major drainage areas and watersheds, land uses, soil classifications, and abandoned mine pits associated with the West Range.

3.5.2.1 Surface Water Sources

Major watersheds throughout the project area are shown in Figure 3.5-3. The drainage area boundaries shown on Figure 3.5-3 were delineated from the USGS maps of the area. This map, and therefore the drainage area boundaries, does not represent the altered hydrology in this area that has taken place due to mining activities in recent years. The East Range Site lies within the northwest region of the Lake Superior Watershed. The major surface water bodies near the project site are shown in Figure 3.5-4 and listed in Table 3.5-6. **Note that disused mine pits shown on figures in this EIS have been filling with surface water and groundwater. Therefore, the areas within these pits shown as surface waters based on available geographic information system data may not represent the actual extent of surface waters currently in these pits.**

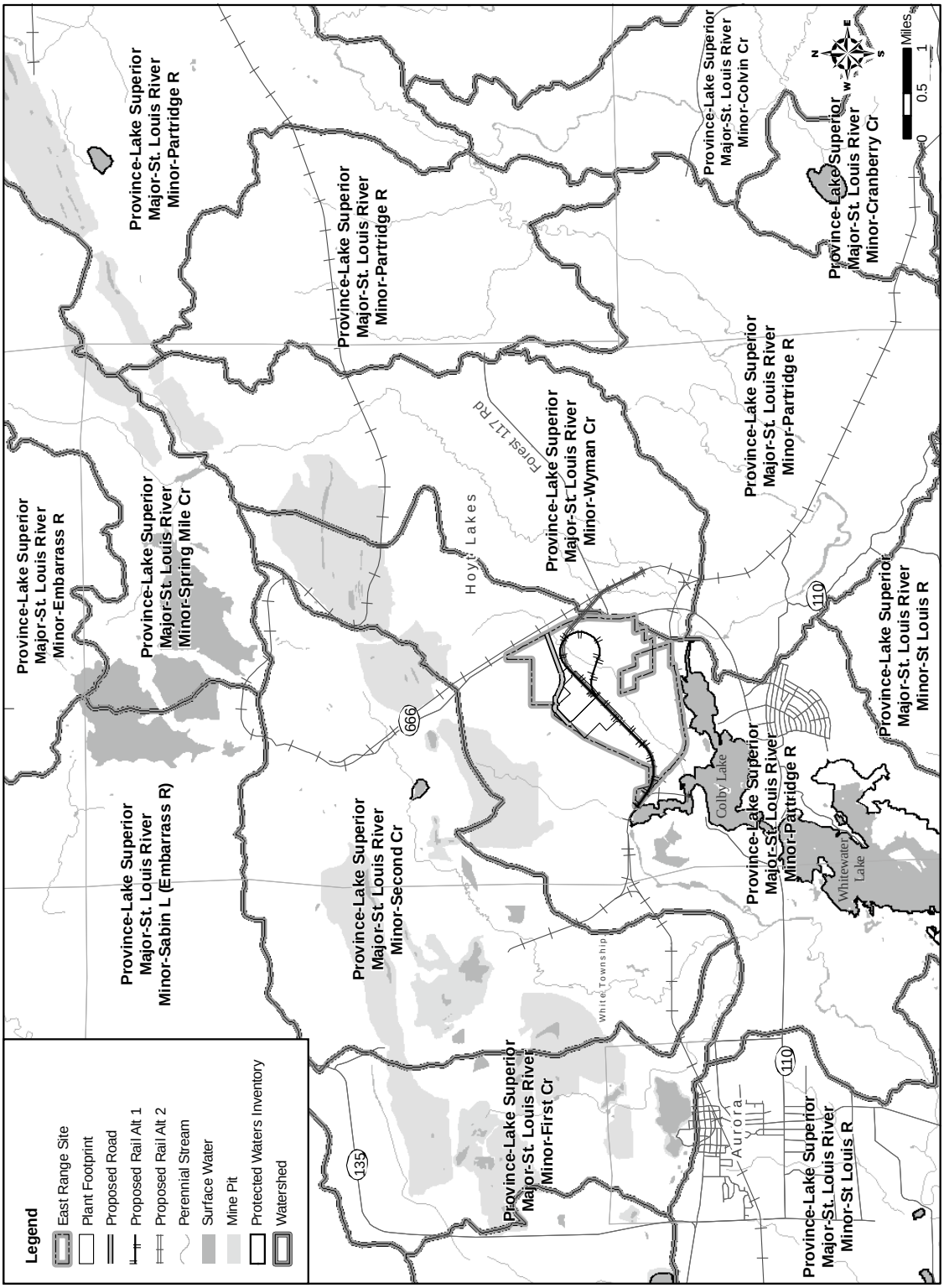


Figure 3.5-3. East Range Drainage Features

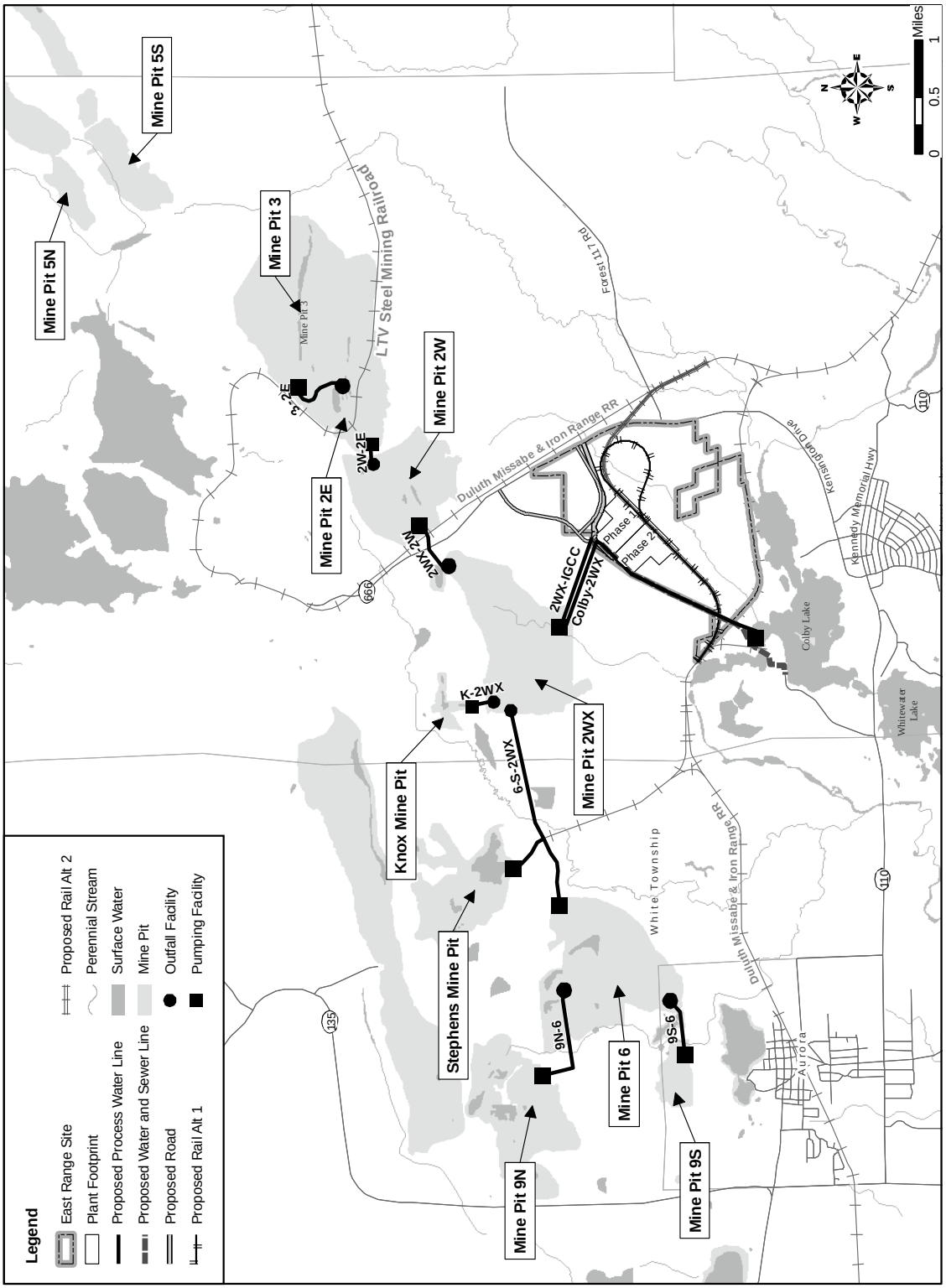


Figure 3.5-4. East Range Surface Waters

Table 3.5-6. East Range Surface Water Bodies

Surface Water	Watershed	FEMA[1] Designated Floodplain	Public Water[2]	Special Water[3]	Impaired Water[4]	Target TMDL Study[5]	Impairment
St. Louis River	Lake Superior	X	X		X	2011	Mercury FCA[6]
Partridge River	St. Louis River	X	X				
2WX Pit	**Partridge River**						
2E Pit	**Partridge River**						
3 Pit	Partridge River						
Wyman Creek	Partridge River		X	X			
5S Pit	Wyman Creek						
6 Pit							
Colby Lake	**Partridge River**		**X**		**X**	**2011**	**Mercury FCA[6]**
Whitewater Reservoir	Partridge River	X	X		X	2011	Mercury FCA[6]
First Creek	Partridge River	X	X				
St. James Mine	First Creek			X			
9S Pit	**First Creek**						
Donora Mine / 9N	**First Creek**						
1W / 1 Pit	First Creek						
Little Mesaba Lake	First Creek						
Second Creek	First Creek	X	X				
Stephens Creek	Second Creek						
Stephens Mine	**Second Creek**						
Knox Mine	**Second Creek**						
2W Pit	**Second Creek**						

[1] Federal Emergency Management Agency
[2] MNDNR Designated Public Water
[3] MPCA Designated Special Water
[4] MPCA Designated Impaired Water, 2006 EPA Draft 303(d) list of impaired waters
[5] Total Maximum Daily Load
[6] Fish Consumption Advisory
Surface Waters shown in bold were considered for either a raw water source or receiving waters for discharges.
Source: Excelsior, 2006a

Most surface water runoff eventually flows into Colby Lake or the Partridge River. Mining activities within this drainage area have significantly altered the regional hydrology. Changes to the hydrology in the watershed include removal of trees and soil, creation of mine pits and other depressions, and changes in topography.

There are a number of mine pits near the East Range Site (see Figure 3.5-4). In locations where mining activities have ceased, these mine pits are filling with water from both groundwater infiltration and surface water runoff. In 2004, the MNDNR completed a study that evaluated the water levels in several of the abandoned mine pits. Data was collected and modeled (using the WATBUD model) for pits

2E, 2W, 2WX, and 6, in order to predict when the pits would overflow and what the average and peak overflow rates would be. In addition, hydrologic changes to Colby Lake, Whitewater Reservoir, and St. James Pit were evaluated as part of the study. Pits 5N, 5S, 9N, and 9S were not included in the study, as they have reached their static water levels (i.e., they would not overflow like the pits near the West Range Site).

Though water levels in several of the pits may rise, unlike the Canisteo and Hill-Annex Mine Pits, there is no immediate need to control water levels in any of the pits on the East Range Site. Therefore, water supplies from any of the individual East Range pits can be pumped as necessary to meet demands of the generating station.

3.5.2.2 Water Quality and Uses

The current water surface elevation, water surface area and estimated water volume in the following mine pits affected by the Proposed Action are summarized in Table 3.5-7.

Table 3.5-7. Abandoned Mine Pit Water Sources

Water Source	Bottom Elevation[1] (ft)	Water Surface Elevation[2] (ft) (11/2005)	Surface Area[3] (acres) (11/2005)	Estimated Volume[3] (acre-ft) (11/2005)
2E	1,427	1,492.2	84	1,700
2W	1,282	1,413	183	13,430
2WX	1,331	1,405.4	322	8,880
6	1,276	1,426.6	207	18,850
3	1,522	1,586.7	ND	ND
5N	ND	ND	ND	ND
5S	ND	ND	ND	ND
9N / Donora	1,493	1,547.2	ND	ND
9S	1,396	1,475.2	ND	ND
Stephens	1,377	ND	ND	ND
Knox	1,362	ND	ND	ND

[1] Bottom elevations are based on blast maps and aerial contour mapping provided by Cliffs-Erie.
[2] Water surface elevations are based on field surveys provided by Cliffs-Erie.
[3] Surface area and estimated volumes were obtained from the MNDNR March, 2004 East Range Hydrology Report.
ND – No data
Source: Excelsior, 2006a

Lakes near the East Range Site are used primarily for recreational purposes, such as fishing, boating, and swimming. Most of the mine pits are located on property owned by mining interests and therefore have little public recreation activity. Cooling water for the Syl Laskin Power Plant comes from Colby Lake. Water from Whitewater Reservoir is used to augment water levels in Colby Lake when needed. Limited water quality information is available for the water sources for the East Range Site. Analytical data supplied by Excelsior Energy for two of the mine pits is presented in Table 3.5-8. The concentration of each constituent shown is based on the median concentration of available qualified water quality analyses.

Table 3.5-8. Water Quality Data for East Range Water Sources

Constituent*	Units*	Water Quality Data*	
		Mine Pit 2WX	Mine Pit 6
Hardness	mg/L	n/a	n/a
Alkalinity	mg/L	310	411
Calcium	mg/L	23.2	46.7
Magnesium	mg/L	73.5	253.5
Chloride	mg/L	17.1	10.6
Sulfate	mg/L	n/a	n/a
TDS	mg/L	449	1,585
pH	mg/L	8.5-8.6	7.7-8.6
Mercury	ng/L	0.9	0.65
Sodium	mg/L	28.7	51.5
Specific Conductivity	umhos/cm	711	1,678
TOC	mg/L	1.8	1.9
TSS	mg/L	<2	<3.3
Ammonia (as N)	mg/L	<0.1	<0.1
Phosphorus	mg/L	<0.1	<0.1

*n/a – no data available (not analyzed); mg/L – milligrams per liter; µg/L – micrograms per liter; ng/L – nanograms per liter; µmhos/cm – micromhos per centimeter; TOC – total organic carbon; TSS – total suspended solids; N – n nitrogen
Source: Excelsior, 2006b

3.5.2.3 Groundwater

Groundwater Quality and Quantity

The surface geology at the site consists of Quaternary outwash and brown silty till. The primary aquifer at the site is shallow outwash deposits comprised of fine to coarse-grained sand and gravel. The static water level in wells near the proposed site is approximately 10 to 40 feet bgs.

Underlying the Quaternary deposits at the site is argillite and greywacke of the Virginia Formation. The formation ranges in total thickness from 0 to 2,000 feet. Although the formation typically has a low yield, fractures in the top of the unit may be used for domestic or stock wells. The Virginia Formation is typically used in conjuncture with iron formation aquifers that contain larger water supplies (Excelsior, 2006b). North of the site, the Biwabik formation is upper most bedrock where the Virginia Formation is not present. Secondary porosity in the form of fractures and leached zones has developed within Biwabik Formation allowing it to act as an aquifer (Excelsior, 2006b). The total thickness of the Biwabik formation in the area ranges from 0 to 800 feet. Regional groundwater flow within bedrock in the area is south, from a bedrock high created by the Giants Range Batholith. The Duluth Complex is the upper most bedrock west of the site. Gabbro of the Duluth Complex is massive with low porosity and permeability and therefore a poor source of water. However, where fractures create secondary porosity, the formation may be used for domestic or stock supply wells.

Typically, groundwater quality in the region is of the calcium magnesium bicarbonate type (Excelsior, 2006b). In some areas water from the argillite, greywacke, and gabbro is sodium-softened. In other areas, water from these units is of sodium chloride type, deep wells may produce saline water. Water in the Biwabik formation is of good quality and suitable for use without softening or iron removal and is lower in total dissolved solids than other sources. Water from the Quaternary drift aquifer is also of the calcium magnesium bicarbonate type. Total dissolved solids from the Quaternary aquifer have been measured as high as 1,800 milligrams per liter. Surface contamination has impacted the surface aquifer in

some locations, and where this has occurred, high nitrogen concentrations are the most common contaminant. As well as bedrock aquifers, water produced from drift may have high iron content (Excelsior, 2006b).

Groundwater Depth and Recharge Sources

The potentiometric surface of the shallow Quaternary aquifer at the area is approximately 1440 to 1490 feet msl, approximately 10 to 40 feet bgs (Excelsior, 2006b). The static water level for the bedrock aquifer is approximately 10 to 40 feet bgs. Groundwater flow at and near the site is likely southwest towards Colby Lake.

Usage and Availability

No wells are currently located on the East Range Site. However, numerous wells are located on surrounding properties and include 18 monitoring wells and one domestic well. The monitoring wells are owned by St. Louis County and MP; the domestic well is also owned by MP. The wells range in depth from 14 to 90 feet and are completed in unconsolidated deposits.

Permits

No groundwater use or withdrawal permits currently exist for Mesaba Phase I and Phase II. Water Appropriation Permits have been issued by the MNDNR to CE for wells located within Township 59 North, Range 14 West, Section 29. Three permits were issued for pumping up to 10,512 millions of gallons per year to the corporation; however, there is no reported pumping for the last four years. No unique well numbers are reported for the permits.

Available drawdown for the Quaternary drift aquifer is approximately 5 to 100 feet; the available drawdown for the bedrock aquifer is approximately 100 to 200 feet. Yields for wells completed in the Quaternary drift reach 10 gallons per minute for domestic wells and 1400 gallons per minute for public supply wells.

3.6 FLOODPLAINS

This section discusses the existing floodplain conditions for the affected areas of the two site alternatives. Width, depth, and velocity of streams and rivers vary based on their position within the watershed. Waterways in the upper portion of the watershed generally can be characterized as first order steams lacking an active floodplain and can have varying water depths. As a stream migrates towards base level, the stream order typically increases in proportion to the size of the watershed and result in the development of a noticeable floodplain and potential flooding.

Since flooding events can be very costly natural disasters, the Federal Emergency Management Agency (FEMA), through the National Flood Insurance Program, enables property owners to purchase insurance protection against losses from flooding. The prerequisite for eligibility in the National Flood Insurance Program is that the potentially affected community must adopt and enforce a floodplain management ordinance to reduce future flood risks, particularly with respect to new construction. Therefore, the FEMA Flood Insurance Study floodway maps were used to determine locations of potential flood hazards associated with the Proposed Action.

3.6.1 Local Hydrology Features

3.6.1.1 West Range Site

The West Range Site is in the Upper Mississippi River Basin Watershed. Local watersheds consist of the Prairie River and Swan River sub-watersheds. Both the Prairie River (to the north and west of the site) and the Swan River (to the south) are tributaries to the Mississippi River. The project area also contains numerous small streams and wetland areas that drain into tributaries of the Mississippi River.

3.6.1.2 East Range Site

The East Range Site lies in the St. Louis River Watershed, located in the northwest quadrant of the Lake Superior Watershed. The Partridge River, to the south and east of the site, and the Embarrass River (to the west of the site) join with the St. Louis River, which ultimately drains into Lake Superior. The site also contains many small streams, natural and man-made lakes, and wetland areas that drain into local waterways.

3.6.2 Flood Hazard Areas

Floodplain management activities of the National Flood Insurance Program include the development of Flood Insurance Rate Maps (FIRMs) for flood insurance rating purposes. A FIRM is a map that outlines flood risk zones within communities for insurance purposes. FIRMs are issued, published, and distributed by FEMA to a wide range of users including: private citizens, community officials, insurance agents and brokers, lending institutions, and other Federal agencies. A FIRM is usually issued following a Flood Insurance Study prepared by FEMA that summarizes the analysis of flood hazards within the subject community.

Flood Insurance Studies include detailed engineering studies to map predicted flood elevations at specified flood recurrence intervals. Generally, Flood Insurance Studies are concerned with peak discharges in streams and rivers for the 100- and 500-year storm events and includes engineering analyses of flood elevations for each flood recurrence interval. Based on the results of the engineering analyses flood risk zones are assigned for insurance purposes. The 100-year floodplain is defined as areas that have a 1.0 percent annual chance of flooding. The 500-year floodplain is defined as areas that have a 0.2 percent annual chance of flooding.

FEMA has adopted a maximum allowable increase of water surface elevation of 1.0 foot for a 1.0 percent annual chance (100-year recurrence interval) flood event as the national standard for floodplain management purposes. However, several states and municipalities have adopted more stringent criteria with a less than 1.0-foot allowable increase of water surface elevations.

3.6.2.1 West Range Site Floodplains

The City of Taconite (FEMA Community Number 270209) and Itasca County (FEMA Community Number FM270200, Panels 0675A, 0700A, and 0800A) are the only areas within the vicinity of the site that have published FEMA FIRM panels. The Cities of Coleraine, Bovey, Marble, and Calumet are unmapped; therefore, FEMA does not have defined flood hazard zones within those communities.

According the FIRM panels, the 100-year floodplains near the West Range Site are found along the major rivers, including the Mississippi, Prairie, and Swan Rivers. The floodplains along these rivers are generally about 1,500 feet wide, but extend to almost 1 mile wide in some areas. The exception to this are two large floodplains that are more than 10 square miles in size; one located on the Prairie River at Prairie Lake; and the other on the Swan River just north of its confluence with the Mississippi River. The nearest identified 100-year floodplain is approximately 1 mile northwest of the West Range Site, along the Prairie River. These floodplains are shown in Figure 3.6-1.

The only 500-year floodplains found in the area are located in Grand Rapids, along the Mississippi River.

3.6.2.2 East Range Site Floodplains

Table 3.6-1 describes the communities and corresponding FIRM panels near the East Range Site.

Table 3.6-1. Communities with Potentially Affected Floodplains near the East Range Site

Community	FEMA Community Number	FIRM Panel
St. Louis County	27137	N/A
City of Biwabik	270418	No Map
City of Eveleth	270422	Refer to St. Louis County* 950
City of Hoyt Lakes	270575	No Map
City of Iron Junction	270580	0001
City of Mountain Iron	270424	0002
City of Virginia	270426	No Map
St. Louis County	270416	825, 925, 950, 975, 1050

The City of Hoyt Lakes and the City of Virginia do not have published FEMA FIRM panels; therefore, there are no FEMA-defined floodplains within the jurisdictional boundaries of either of these two cities. Most of the 100-year floodplains in this area are along the St. Louis, Partridge, and Embarrass Rivers, as shown in Figure 3.6-2. The nearest identified 100-year floodplain is roughly 1 mile south-southwest of the East Range Site, along the Partridge River. There are no 500-year floodplains depicted on the FEMA maps in the area that would be affected by the East Range Site.

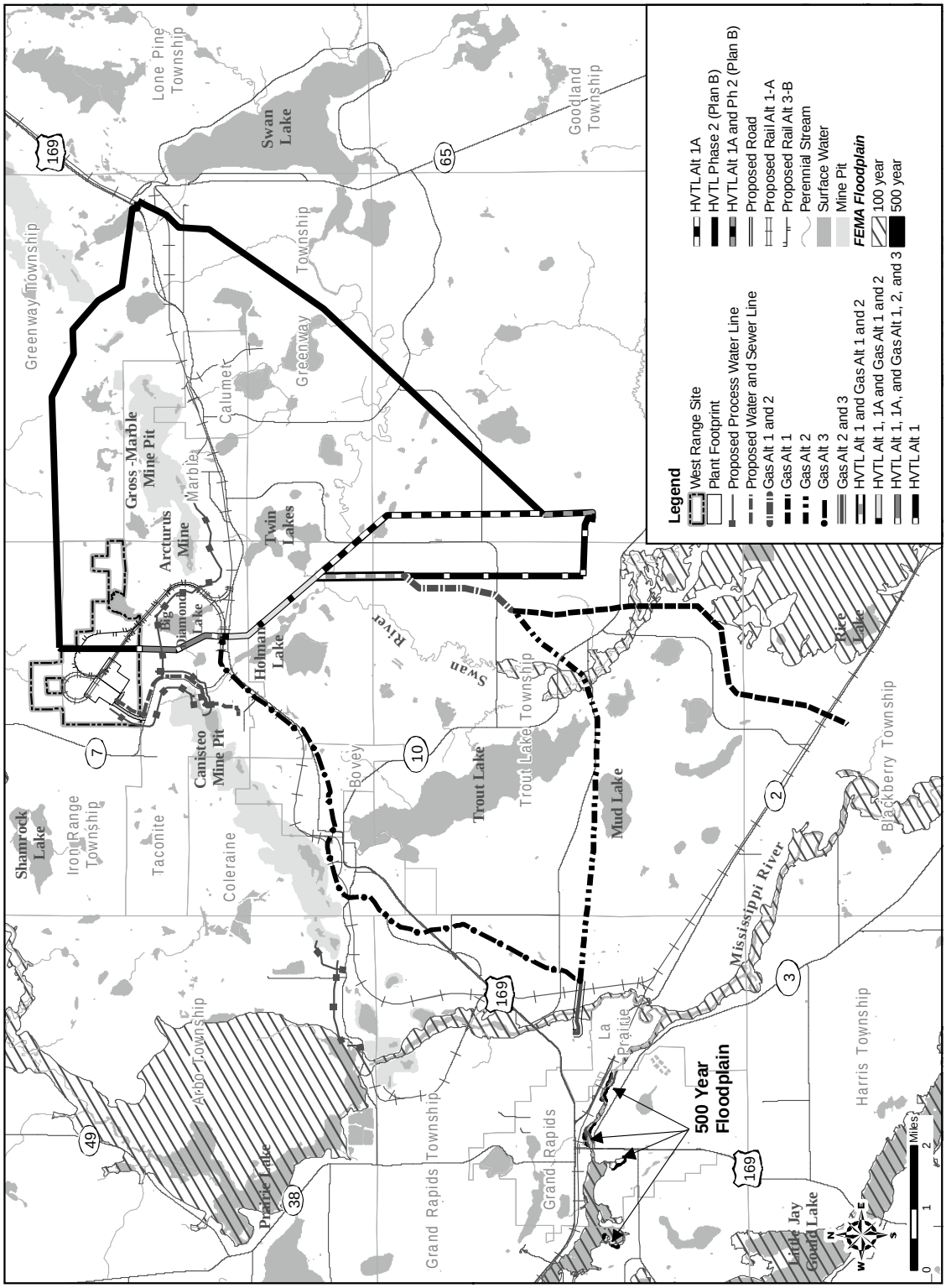


Figure 3.6-1. West Range Corridor FEMA Floodplains

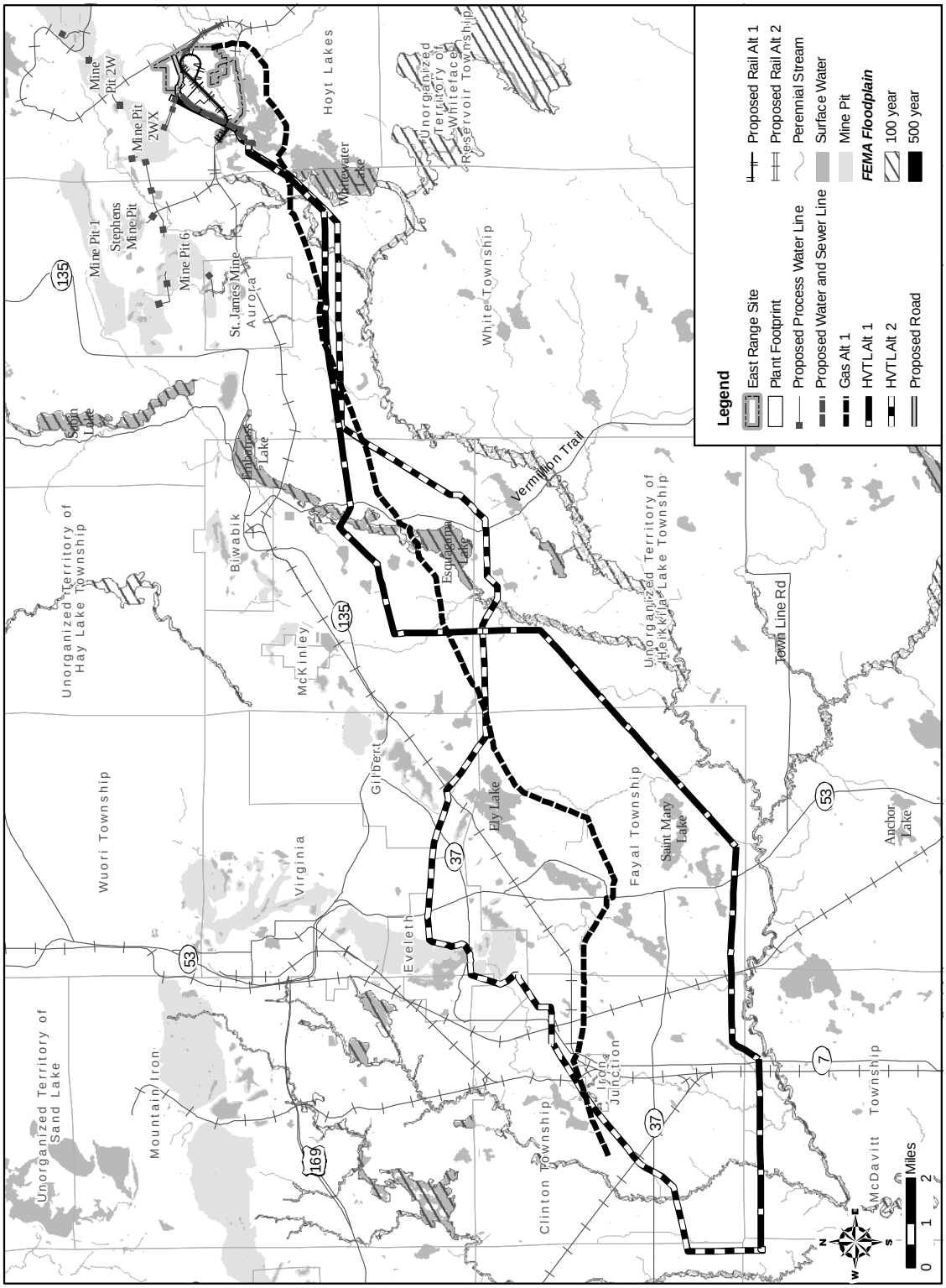


Figure 3.6-2. East Range Corridor and FEMA Floodplains

3.7 WETLANDS

3.7.1 Introduction

Wetlands are defined under the CWA as follows:

> *Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.*

Wetlands have unique characteristics that set them apart from other ecosystems. These unique characteristics include a substrate that is saturated or inundated with water for part of the growing season, soils that contain little or no oxygen, and plants adapted to wet or seasonally saturated conditions. The variety of wetland types found in the region result from differences in topography, soils, climate, water chemistry, hydrology, and other factors including human disturbance. Wetlands serve many functions, including the storage and slow release of surface water, rain, snowmelt, and seasonal floodwaters to surface waters. Additionally, wetlands provide wildlife habitat, sediment stabilization/retention functions, and perform an important role in the nitrogen cycle. They also help to maintain stream flow during dry periods, and provide groundwater recharge functions. Wetlands are among the most productive ecosystems in the world, comparable to rain forests and coral reefs. Many species of wildlife, including a large percentage of threatened and endangered species, depend on wetlands for their survival. Wetlands are important for their scientific and educational opportunities and can provide open space for recreation where public access is available.

Wetlands are an important with respect to climate change. Wetlands act as significant carbon sinks and so the destruction of wetlands will release carbon dioxide, a greenhouse gas, while wetland restoration and creation will increase the sequestering of carbon. In addition, wetlands provide a physical buffering to increasing frequency of storms, changing rainfall patterns, rising sea-levels and sea surface temperatures.

3.7.2 Regulatory Framework

Wetlands in the region are regulated by several regulatory agencies, including the USACE, EPA, the Minnesota Board of Water and Soil Resources, and the MNDNR. **Under Section 404 of the CWA, a USACE permit is required for the discharge of dredged or fill material into waters of the U.S. The USACE also has jurisdiction over navigable waters under the Rivers and Harbors Act of 1899 (33 U.S.C. Part 403). Under Section 401 of the CWA, the state is responsible for determining if the proposal will comply with state water quality standards and requirements for wetlands mitigation. The MPCA is the agency in Minnesota responsible for this certification (Minnesota Rules Chapter 7050). Furthermore, once the USACE receives a Section 404 application a copy is forwarded to the MPCA for initiating the State's Section 401 certification process. All special conditions placed on the project during the MPCA Section 401 certification process will become enforceable requirements of the USACE Section 404 Permit.**

In addition, the Minnesota Wetland Conservation Act (WCA) regulates state waters and wetlands (Minnesota Rules Chapter 8420), while the Itasca County Soil and Water Conservation District **(West Range Site)**, and St. Louis County **(East Range Site)** administer the WCA locally. Other state wetland regulations include designated Protected Waters and Protected Waters Wetlands regulated by the MNDNR (Minnesota Rules 6115.0010 to 6115.0810). The Ordinary High Water Level, as established by the MNDNR, of Protected Waters Wetlands defines the upper extent of jurisdiction by the MNDNR on these protected habitats. Development-related projects in Minnesota involving wetland impacts may require wetland encroachment permits or approvals from the above-listed regulatory agencies.

Utility ROWs crossing water bodies listed as protected waters or wetlands by the MNDNR Protected Waters Inventory (PWI) require Licenses for Utility Crossings of Public Lands and Waters under Minnesota Statutes 84.415 and subsequent Minnesota Rules Chapter 6135. The MNDNR Division of Land and Minerals is the administrative agency that issues 25- and 50-year licenses, which may be renewed at the end of the licensing period if both parties (i.e., the project applicant and the MNDNR) wish to renew these licenses. The MNDNR Commissioner establishes the renewal fee and time period of the renewed license(s).

[Text in the Draft EIS pertaining to isolated wetlands has been removed at this point per request of USACE.]

For regulatory purposes, the types of wetlands that may be impacted by a project will dictate how the wetland is regulated and subsequently what type of mitigation would be required for impacts to the wetland. For example, impacts to undisturbed tamarack bogs may have more stringent regulatory requirements than disturbed wetlands in urban settings. The MNDNR uses the **report: *Wetland Plants and Plant Communities of Minnesota and Wisconsin* (Eggers and Reed, 1997). Wetlands were also characterized using the** USFWS Circular 39 *Wetlands of the United States* (Shaw and Fredine, 1956) **and** USFWS publication *Classification of Deepwater Habitats of the United States* (Cowardin et al., 1979) **as described below**. **The majority of wetlands identified at each alternative site are regulated by USACE, because they have a connection to interstate commerce (meaning that a wetland/water body crosses a state boundary or boundary of a Federally recognized tribal reservation and that the wetland/water body was used in the past, is currently used, or may be used in the future for commerce). However, some wetlands appear to be isolated and, therefore, not regulated by USACE. [A sentence in the Draft EIS pertaining to isolated wetlands has been removed at this point per request of USACE.]**

3.7.3 Wetland Classification Systems

USFWS Circular 39 *Wetlands of the United States* (Shaw and Fredine, 1956) is a wetland classification inventory developed by the USFWS, which was initiated due to the steady decline of wetland habitats available to wildlife. The purpose of the Circular 39 wetland inventory is to identify the correlation between wetlands and wildlife, and identify areas susceptible to habitat loss from activities such as draining, filling, or otherwise human-related alteration of water resource habitats. Aerial photographs, USGS topographic maps, charts of the U.S. Coast and Geodetic Survey, Federal and state agency mapping, soil maps, and county highway maps were used to provide information identifying the locations of wetlands for the inventory (Shaw and Fredine, 1956).

The USFWS inventory identified 20 types of wetland habitats used by wildlife, which primarily focused on waterfowl habitat. Wetland habitats identified by Circular 39 were grouped into four categories: 1) Inland Fresh Areas (Types 1-8); 2) Inland Saline Areas (Types 9-11); 3) Coastal Fresh Areas (Types 12-14); and, Coastal Saline Areas (Types 15-20). Inland Fresh Areas are the only wetland group occurring in Minnesota. There are eight wetland types associated with the Inland Fresh Area group.

As stated in the Draft EIS, the USACE St. Paul District requested that wetlands be characterized by community type using *Wetland Plants and Plant Communities of Minnesota and Wisconsin* (Eggers and Reed, 1997). That document was produced for the primary purpose of assisting USACE personnel working with the regulatory program under Section 404 of the CWA and Section 10 of the Rivers and Harbors Act of 1899. The guide specifically addresses wetland plants and plant communities of Minnesota and Wisconsin and is organized by wetland plant community. In general, the wetland plant communities are organized according to water permanence and depth, and degree of soil saturation. Thus, the guide progresses from deepwater wetlands (i. Shallow, Open Water Communities) to temporary water-holding wetlands (viii. Seasonally Flooded Basins). Photographs and descriptions are provided for each of the 15 wetland

plant communities, along with representative plant species of each. Interested readers may view the document online at http://www.npwrc.usgs.gov/resource/plants/mnplant/intro.htm.

A comparison of wetland classifications under Eggers and Reed, Cowardin et al., and Shaw and Fredine is presented in Table 3.7-1, which has been revised from the table included in the Draft EIS.

Table 3.7-1. Comparison of Wetland Classification Systems in Minnesota

Wetland Plant Community Types (Eggers and Reed, 1997)	Classification of Wetlands and Deep Water Habitats of the United States (Cowardin et al. 1979)	Fish and Wildlife Service Circular 39 (Shaw and Fredine 1971)
Shallow, Open Water	Palustrine or lacustrine, littoral; aquatic bed; submergent, floating, and floating-leaved	Type 5: Inland open fresh water
Deep Marsh	Palustrine or lacustrine, littoral; aquatic bed; submergent, floating, and floating-leaved; and emergent; persistent and nonpersistent	Type 4: Inland deep fresh marsh
Shallow Marsh	Palustrine; emergent; persistent and nonpersistent	Type 3: Inland shallow fresh marsh
Sedge Meadow	Palustrine; emergent; narrow-leaved persistent	Type 2: Inland fresh meadow
Fresh (Wet) Meadow	Palustrine; emergent; broad- and narrow-leaved persistent	Type 1: Seasonally flooded basin or flat; Type 2: Inland fresh meadow
Wet to Wet-Mesic Prairie	Palustrine; emergent; broad- and narrow-leaved persistent	Type 1: Seasonally flooded basin or flat; Type 2: Inland fresh meadow
Calcareous Fen	Palustrine; emergent; narrow-leaved persistent; and scrub/shrub, broad leaved deciduous	Type 2: Inland fresh meadow
Open Bog	Palustrine; moss/lichen; and scrub/shrub; broad-leaved evergreen	Type 8: Bog
Coniferous Bog	Palustrine; forested: needle-leaved evergreen and deciduous	Type 8: Bog
Shrub - Carr	Palustrine; scrub/shrub; broad-leaved deciduous	Type 6: Shrub swamp
Alder Thicket	Palustrine; scrub/shrub; broad-leaved deciduous	Type 6: Shrub swamp
Hardwood Swamp	Palustrine; forested; broad-leaved deciduous	Type 7: Wooded swamp
Coniferous Swamp	Palustrine; forested; needle-leaved deciduous and evergreen	Type 7: Wooded swamp
Floodplain Forest	Palustrine; forested; broad-leaved deciduous	Type 1: Seasonally flooded basin or flat
Seasonally Flooded Basin	Palustrine; flat; emergent; persistent and non-persistent	Type 1: Seasonally flooded basin or flat

3.7.4 Wetland Identification and Mapping Methodology

Wetlands were identified and delineated at the West Range Site, the East Range Site, and the associated utility and transportation corridors. Identification of potential wetlands was completed in **four** successive stages: (1) **off-site assessment,** (2) on-site screening, (3) field delineation, **and (4) refined off-site assessment**. Field investigations for the presence of wetlands could not be conducted in areas where

access to private land was not granted. These areas consist of the majority of the utility and transportation corridors. Therefore, only a desktop review for approximating the potential presence and extent of wetlands was conducted in areas with restricted access.

3.7.4.1 Off-Site Assessment

[Text in the Draft EIS has been replaced at this point with the following discussion]

Off-site assessment was conducted first by review of available documentation to identify potential wetland locations, wetland type and conditions, and to engage in preliminary planning and siting of facilities. Several resources were used in the off-site assessment including:

- **USFWS National Wetlands Inventory (NWI),**
- **USGS topographic maps,**
- **MNDNR PWI,**
- **Itasca County Soil Survey and St. Louis County preliminary soil survey data, and**
- **Farm Service Agency Aerial photographs (2003).**

The above-mentioned resources were used to create a preliminary map of potential wetland habitats, including NWI boundaries where available, overlaid on aerial photography using GIS. The preliminary data was then used for early site planning and for on-site screening of wetland locations throughout the property.

The off-site assessments were also utilized to identify wetland locations, types, and estimates of wetland impacts for the areas of the transportation and utility corridors that were not accessible during the field wetland delineations.

3.7.4.2 On-Site Screening

The on-site investigations consisted of a preliminary wetland field reconnaissance to verify the location, and extent of potential water resources identified during the desktop review. The wetland reconnaissance was performed in early June 2005 at the West Range Site and in late summer 2004 at the East Range Site.

3.7.4.3 Field Delineation

The majority of the West Range Site was delineated **between June and September** 2005 (Figures **3.7-1A and 3.7-1B**). **Additional field delineation was performed in September 2008 in the southwestern-most corner of the West Range Site. The southwestern corner of the site and that area south to Highway 7 were delineated to confirm the location of wetland habitat in the area of a potential plant access road.** Potential wetlands were delineated at the East Range Site in October 2004 and August 2005 (Figures **3.7-2A and 3.7-2B**). Sections 3.7.5 and 3.7.6 describe the results of these delineations. Section 4.7 describes the locations of specific wetlands that may be impacted by proposed project features. **Note that disused mine pits shown on these figures have been filling with surface water and groundwater. Therefore, the areas within these pits shown as "lakes" based on available geographic information system data may not represent the actual extent of surface waters currently in these pits. Also, these mine pits are not "lakes" by MNDNR classification.**

The field investigations identified areas meeting wetland criteria as defined in the USACE Wetland Delineation Manual (USACE, 1987), herein referred to as the "1987 Manual." **Determination of the wetland/upland boundary was accomplished using the three-parameter approach (hydrophytic vegetation, hydric soils, and wetland hydrology) as outlined in the 1987 manual. [Per request of USACE the preceding sentence replaces text in the Draft EIS pertaining to wetland delineation.]**

The Routine On-site Determination Methodology described in the 1987 Manual was applied during the wetland delineation effort. Field notes were taken at representative points within each wetland to characterize the aquatic resource habitat. Collected data were transcribed on to the wetland data sheets, highlighting plant species, hydrologic conditions, and a description of hydric soil characteristics. The boundary of each wetland was delineated with a surveyor's tape or wire stakes labeled "Wetland Boundary," and marked with a sequential alphanumeric nomenclature. The wetland boundaries were then recorded with a Trimble Pro XR or XRS Global Positioning System (GPS). The collected GPS data were processed and incorporated into project plans and GIS.