DOE/EIS-0377

Final Environmental Impact Statement

Volume I

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Big Stone II Power Plant and Transmission Project

Prepared for:

Lead Agency:
Western Area Power Administration

Cooperating Agency:
U.S. Army Corps of Engineers

INTRODUCTION

CHAPTER 1

The Final Environmental Impact Statement (EIS) is based on a consolidation of the Draft EIS and the Supplemental Draft EIS. Changes were made in response to and to address comments received on the Draft EIS and Supplemental Draft EIS. In addition to the changes in the various chapters, other minor modifications and changes were made to make the document clearer (e.g., minor clarifications, grammatical and punctuation corrections, and organizational changes). For Western Area Power Administration's responses to comments raised during the public comment periods for the Draft EIS and the Supplemental Draft EIS and to access the response papers related to mercury emissions, renewable energy and wind alternatives, and demand side management, please see Volume II. All appendices, including the Biological Assessment, the Settlement Agreement, and new technical appendices related to groundwater studies, are included in Volume III. Volume IV contains the comment letters and e-mails received on the Draft EIS and the Supplemental Draft EIS, as well as transcribed comments received at the public hearings held on the Draft EIS and Supplement Draft EIS.

Chapter 1 Changes

The changes to Chapter 1 include descriptions of changes to ownership of the proposed Project and changes regarding agencies cooperating in the preparation of the EIS, as well as updates to regional power forecasts, the Co-owners' power requirements, and proposed Project permitting and other agency interaction. Changes include:

- Provided an introduction to the proposed Project, describing how new information and proposed Project changes were integrated into the Final EIS.
- Provided a description of the decisions being considered by Western and the U.S. Corps of Engineers (USACE) associated with the proposed Project, as well as the decisions that are not under Western's and USACE's authority.
- Described how changes affect the remaining Co-owner participants after the withdrawal of Great River Energy (GRE) and Southern Minnesota Municipal Power Agency (SMMPA) from the proposed Project.
- Integrated the 2007 Mid-Continent Area Power Pool (MAPP) Load and Capability Report into a new capacity forecast, and provided the MAPP Capacity Surplus/Deficit Forecast through 2016.
- Updated the Co-owners' utility power requirements due to the withdrawal of GRE and SMMPA.
- Provided information confirming the withdrawal of the Rural Utilities Service as a Cooperating Agency to the Final EIS.
- Updated the status of key permits, approvals, and water appropriations required for the proposed Project.
- Provided a summary of a Settlement Agreement between the Co-owners and the Energy Planning and Advocacy function of the Minnesota Department of Commerce regarding key issues.

- Briefly described the issuance of the Draft EIS and the Supplemental Draft EIS; the associated public hearings held in June 2006 and November 2007, respectively; and the public comment period related to the Draft EIS and Supplemental Draft EIS.
- Provided additional information on the coordination with Native American Tribes.

CHAPTER 1
INTRODUCTION

1.0 Introduction

This chapter briefly describes the proposed Project, consisting of the proposed Big Stone II 600-megawatt (MW) coal-fired electric generating plant and associated transmission facilities, the Co-owners' purpose and need, and the proposed Federal actions based on the purpose and need for agency action. The chapter concludes with a description of the public involvement activities for the proposed Project.

The proposed Project outlined in this chapter differs from that presented in the Big Stone II Power Plant and Transmission Project Draft Environmental Impact Statement (Draft EIS) issued in May 2006. Based on comments received on the Draft EIS and revised cost estimates for constructing the proposed make-up water storage pond presented in the Draft EIS, the Co-owners revised their proposed Project to include the use of groundwater as a source of make-up water, as well as other changes associated with groundwater use. These revisions were outlined in a Supplemental Draft EIS issued in October 2007.

This Final EIS integrates the information contained in the Draft EIS and the Supplemental Draft EIS, including revisions to the proposed Project, as well as other minor edits. The Final EIS also includes additional information or clarifications based on comments received on the Draft EIS and the Supplemental Draft EIS.

Approval of the interconnection of the proposed Project to Western Area Power Administration's (Western) electric utility grid requires compliance with the National Environmental Policy Act (NEPA) and the preparation of an EIS. Western is a Federal power-marketing agency within the U.S. Department of Energy (DOE) that sells and delivers Federal electric power to municipalities, public utilities, Federal and State agencies, and Native American tribes in 15 western and central States. The proposed Big Stone II Project is located within Western's Upper Great Plains Region, which operates and maintains nearly 90 substations and more than 8,000 miles of Federal transmission lines in Minnesota, South Dakota, North Dakota, Montana, Nebraska, and Iowa. Western is using the NEPA process to identify and assess reasonable alternatives to its proposed Federal action that will avoid or minimize adverse effects of its actions on the human and natural environment. Objectives of the document include disclosure of proposed actions and impacts to regulatory agencies and the general public.

1.1 Introduction to the Proposed Project and the Proposed Federal Actions

Otter Tail Corporation (dba Otter Tail Power Company (OTP)), Central Minnesota Municipal Power Agency (CMMPA), Heartland Consumers Power District (HCPD), Montana-Dakota Utilities Co. (MDU), and Western Minnesota Municipal Power Agency (WMMPA) (dba Missouri River Energy Services (MRES)), collectively referred to as the Co-owners, propose to develop a new 600-MW (net) baseload electric generating power plant[1] known as Big Stone II.

A systems study was carried out to identify the most appropriate locations to interconnect the proposed Big Stone II power plant to the regional utility grid. The study also identified transmission line and substation upgrades and modifications that would be required to support the addition of 600 MW of capacity within the system. The systems study determined that two transmission alternatives would meet the proposed Project requirements. The Co-owners prefer to interconnect the proposed Big Stone II power plant to Western's existing Morris and Granite Falls substations in Minnesota. This preference triggered Western's involvement and a proposed Federal action. The proposed Big Stone II power plant, including the groundwater well field, and associated transmission lines are referred to as the proposed Project in the context of this EIS.

In September 2007, two of the original participants, Great River Energy (GRE) and Southern Minnesota Municipal Power Agency (SMMPA) withdrew from the proposed Project. As a result of GRE's and SMMPA's withdrawal from the proposed Project, the Co-owners are evaluating additional potential participants in the proposed Project. Based on GRE's withdrawal, Rural Utility Services (RUS) withdrew its cooperating agency status on the EIS[2].

1.1.1 Proposed Federal Actions – Decisions Being Considered by the Federal Agencies

In most cases, Federal actions are actions proposed by a Federal agency that has control over the formulation of a project and associated alternatives that will be analyzed through the NEPA process. The Federal agency may modify the various alternatives, including its proposed Federal action, during the NEPA process as input is received from other agencies, Tribes, interested parties, and individuals. In this case, a private applicant (the Co-owners) has proposed and promoted the proposed Project. During the Draft EIS and Supplemental Draft EIS processes, Western evaluated reasonable alternatives to the proposed Project based on comments received from the public, agencies, municipalities, businesses, and Tribes. With the withdrawal of RUS as a cooperating agency, Western has updated the alternatives analysis and impact assessment based on Western's decision making authorities.

The decisions being considered in this EIS by each of the involved Federal agencies are specific and limited and are based on the purpose and need for agency action as described in Section 1.3.1, below. The Federal agencies need to make decisions as follows:

[1] A baseload unit is an energy generating facility whose sole or primary purpose is to provide minimum power requirements for customers. Baseload units are typically the most reliable and lowest cost generating facilities within a given group of generating units.

[2] The RUS was identified in the Draft EIS as a cooperating agency for their action to provide funding to GRE for their participation in the proposed Project.

Western: Western's proposed action is to consider whether to allow the Co--owners' interconnections to Western's transmission system at Morris and Granite Falls substations, an action that requires Western to complete modifications to these substations to support the interconnections.

USACE: The U.S. Army Corps of Engineers' (USACE) proposed action is to consider whether to issue a permit for Section 10 of the Rivers and Harbors Act and for Section 404 of the Clean Water Act (CWA) to the Co-owners for construction of the proposed Project within or across navigable waters and waters of the United States (WUS).

Constructing, operating, maintaining, and (where applicable) de-commissioning the proposed Big Stone II power plant, associated groundwater system (wells, pipelines, and electric distribution lines), transmission lines, and the transmission system interconnections, additions, and upgrades outside of Western's transmission system are addressed in the EIS, so the Federal decision makers are aware of the environmental ramifications of the proposed Project in making a decision on whether or not to grant the interconnections, in the case of Western, or issue Section 10 and 404 permits, in the case of the USACE. The South Dakota Public Utilities Commission (SDPUC) has jurisdiction over siting power plants within the State of South Dakota (see Section 1.5.3 below).

This EIS addresses the impacts from constructing and operating the transmission lines within specific corridors, rather than along specific routes. Minnesota and South Dakota have jurisdiction over permitting the transmission lines and approving their locations. The EIS includes specific requirements for mitigating environmental impacts from constructing and operating the transmission lines once the States approve the Co-owners' permits.

1.1.2 Decisions Not Considered

Western and the USACE do not have jurisdiction or decision-making authority for most of the proposed Project. However, this EIS does address the environmental impacts of all components of the proposed Project. Permitting authority for most of the proposed Project rests with State agencies in Minnesota and South Dakota. The following provides an explanation of these permits. For additional information, see Section 1.5.

Power Plant Permitting

The SDPUC has jurisdiction over siting power plants within the State of South Dakota. The Co-owners submitted an application for an Energy Conversion Facility Permit on July 21, 2005 (Big Stone II, 2005b). The SDPUC approved the Energy Conversion Facility Permit, with conditions, at its July 14, 2006, hearing and issued its Final Decision and Order on July 21, 2006 (SDPUC, 2006). The SDPUC permit authorizes construction of the proposed Big Stone II power plant under the South Dakota rules and regulations.

Transmission Line Permitting

The Co-owners propose to construct, operate, and maintain transmission lines for the proposed Project within the States of South Dakota and Minnesota. South Dakota requires a Route Permit for constructing transmission lines, which would be approved by the SDPUC. The Co-owners filed a permit application for the portion of the proposed Big Stone-to-Canby transmission line located in South Dakota and for the South Dakota portion of the proposed Big Stone to Morris transmission line on January 17, 2006 (Big Stone II, 2006a). This permit application required the Co-owners to identify a specific route for the transmission lines. The SDPUC approved the Route Permit for the South Dakota portion of both lines at their January 2, 2007, hearing and issued their Final Decision and Order on January 16, 2007 (SDPUC, 2007). The remaining proposed transmission lines are located within Minnesota.

The State of Minnesota has two processes for permitting transmission lines. The Co-owners submitted an application for a Certificate of Need (Big Stone II, 2005e) on October 3, 2005, and an application for a Route Permit on December 9, 2005 (Big Stone II, 2005f), to the Minnesota Public Utilities Commission (MnPUC). The Route Permit requires the State of Minnesota to prepare a State EIS for the transmission lines located in Minnesota. The Minnesota Department of Commerce (MnDOC) issued a draft State EIS on July 31, 2006, and a final State EIS on December 1, 2006 (MnDOC, 2006). The Route Permit will determine the location of the proposed transmission lines within a 2,000-foot wide corridor. The MnPUC approved the Big Stone II application for the Certificate of Need and the Route Permit on January 15, 2009. The MnPUC issued their final written order granting the Certificate of Need and the Route Permit on March 17, 2009 (MnPUC, 2009). The MnPUC approved the Co-owners' preferred route (see Section 2.2.2 for additional discussion).

1.2 Co-owners' Proposed Project

The Co-owners have proposed a 600-MW (net) capability generating plant to best serve the needs of their electrical customers and the needs of the customers of future participants. Studies performed by OTP determined that constructing a coal-fired facility would be preferable to other potential energy-producing sources to meet the Co-owners' needs. A plant siting study conducted by OTP resulted in the selection of the existing Big Stone Plant site for the proposed Project, which is located in eastern South Dakota, as shown in Figure 1.1-1.

The Co-owners' preferred transmission alternative would include reconstructing the existing 115-kilovolt (kV) transmission line between Ortonville and Morris to 230-kV service and constructing a new 230-kV transmission line between the proposed Big Stone II plant and Ortonville. This alternative would also include constructing a new 345-kV transmission line between the proposed Big Stone II plant and Canby Substation (owned by OTP), which would operate at 230 kV, and reconstructing or replacing an existing 115-kV transmission line between Canby and Granite Falls Substations with a 230-kV transmission line. The portion of the transmission line between Canby to the vicinity of Hazel Run would also be constructed at 345 kV, but would operate at 230 kV. Connections at the proposed Big Stone II plant site would be made at the existing Big Stone Substation, located adjacent to the existing Big Stone Power Plant.

An alternative transmission interconnection would be from the proposed Big Stone II plant to Willmar Substation and to Granite Falls Substation. The proposed interconnection at the Willmar Substation would require constructing a new 230-kV transmission line from the proposed plant site to the Willmar Substation. Willmar Substation is jointly owned by Willmar Municipal Utilities, Xcel Energy, and GRE. The transmission line between the proposed Big Stone II plant and Granite Falls Substation would be the same as described for the first alternative.

Various transmission corridors were studied in the EIS to meet these interconnection alternatives. The corridors are shown in Figure 1.1-2.

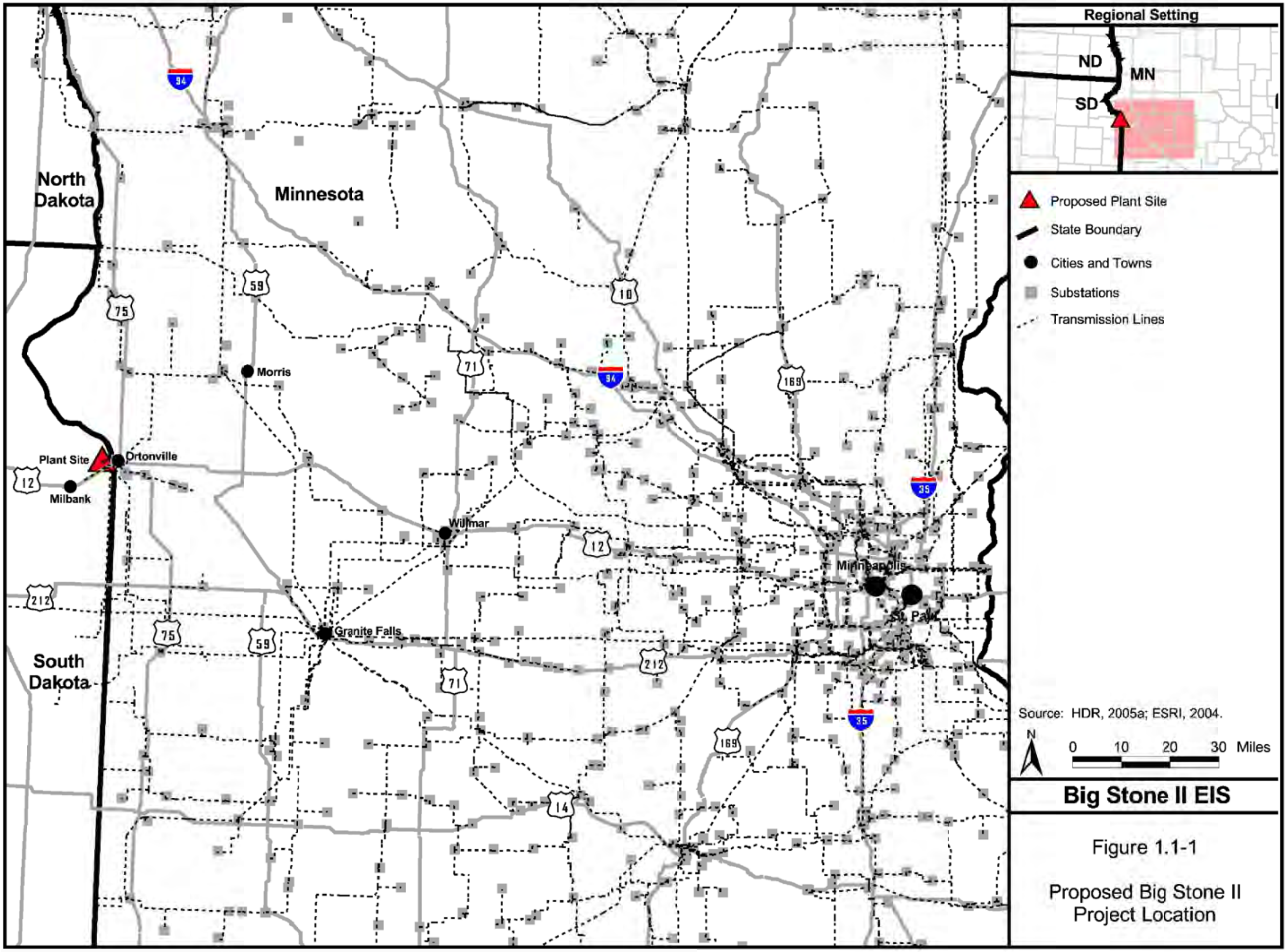


Figure 1.1-1

Proposed Big Stone II Project Location

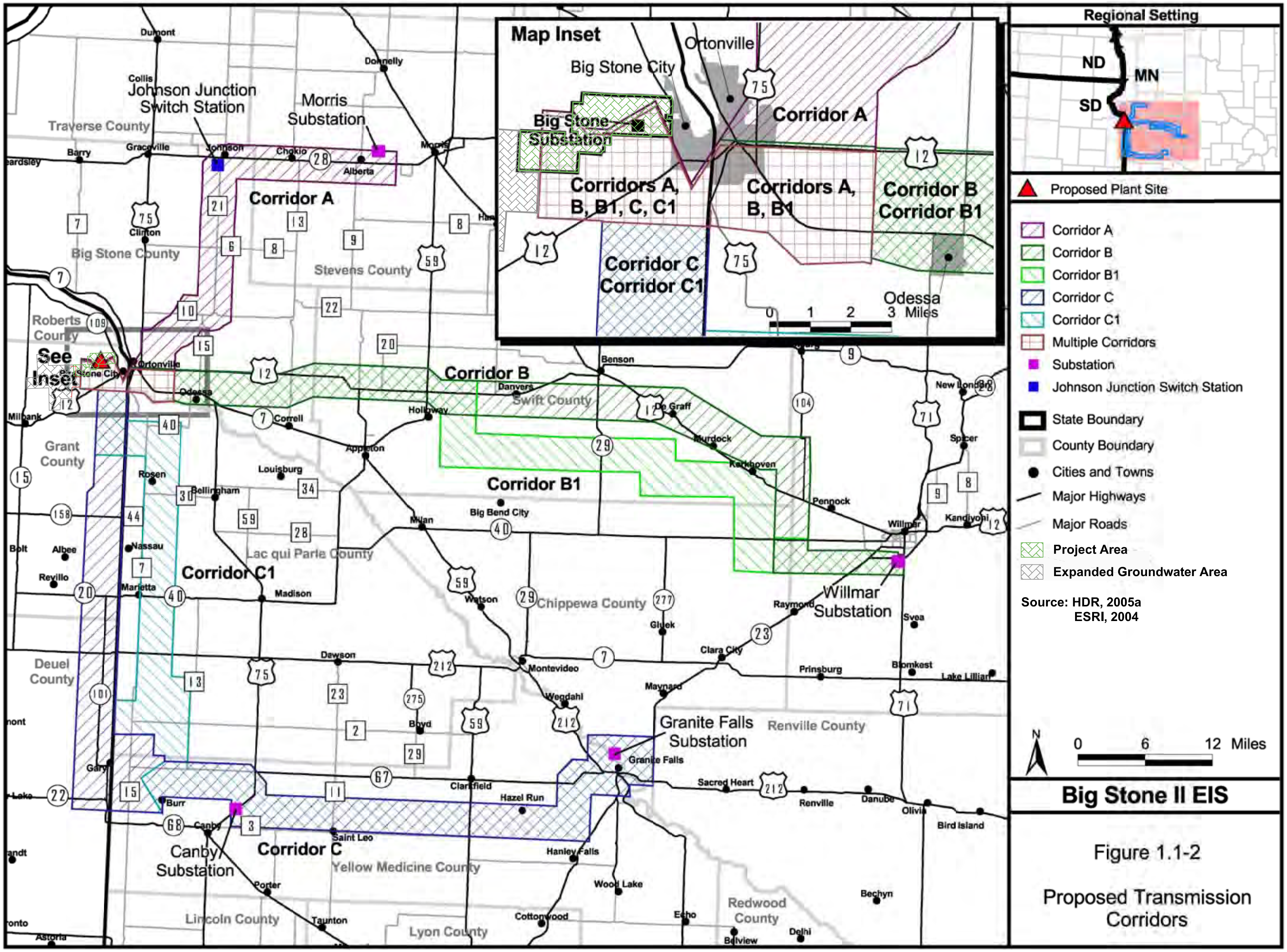


Figure 1.1-2

Proposed Transmission Corridors

1.3 Purpose and Need for Agency Action

NEPA requires Federal agencies to consider the environmental effects of their decisions. Preparation of an EIS provides the framework for the agency decision-making processes.

1.3.1 Western Area Power Administration

Western's Open Access Transmission Service Tariff (Tariff) provides open access to its transmission system. Western provides these services through an interconnection, if there is available capacity on the transmission system. MRES, on behalf of the Co-owners, has applied to interconnect the proposed Project to Western's power transmission system at the existing Morris and Granite Falls substations.

Western's action is to decide whether to grant the Co-owners' request to interconnect with Western's transmission system at its Morris and Granite Falls substations. The proposed Big Stone II Project would incorporate a major new generation resource into Western's power transmission system and would require upgrades to existing substations on Western's system and the construction of new transmission lines in the region. According to DOE NEPA Implementing Procedures, Western's proposed action requires an EIS. Because MRES and HCPD need to take service through the Western system, they submitted interconnection requests and transmission delivery service requests to Western for their transmission capacity needs. Western would also decide whether to modify its delivery service contracts with MRES and HCPD.

In response to the Need for Agency Action, Western must adhere to the following guidelines:

- Provide Transmission Service. Western offers capacity on its transmission system to deliver electricity when such capacity is available, under Western's Tariff. The Tariff complies with the Federal Energy Regulatory Commission's (FERC) Final Orders No. 888, 888A, 888B, and 888C, which are intended to ensure non-discriminatory transmission system access. Following FERC's Orders No. 2003, 2003-A, and 2003-B, Western submitted revisions to its non-jurisdictional Tariff on January 25, 2005, to FERC. The purpose of the filing was to revise certain terms of Western's original Tariff and to incorporate the Large Generator Interconnection Procedures (LGIP) and a Large Generator Interconnection Agreement (LGIA). Western received final approval on that filing from FERC on September 6, 2007. On March 1, 2007, Western submitted revisions to its Tariff to FERC pursuant to FERC Orders No. 2003-C, 661, 661-A, 676, 676-A, 2006, 2006-A, and 2006-B. The main purpose of this filing was to incorporate FERC's Small Generator Interconnection Procedures and Small Generator Interconnection Agreement, and also to include revisions of certain terms relating to the LGIP and the LGIA. Western needs to respond to the interconnection and transmission service requests under the provisions of its Tariff.
- Protect Transmission System Reliability and Service to Existing Customers. Western's purpose is to ensure that existing transmission system reliability and service is not degraded. Western's LGIP provides for transmission and system studies to ensure that system reliability and service to existing customers are not adversely affected by new interconnections.

- Consider the Co-owners' Objectives. Since the statement of Purpose and Need affects the extent to which alternatives are considered reasonable, it is important to understand both Western's Purpose and Need and that of the Co-owners.

1.3.2 Rural Utilities Service

The RUS Electric Program provides leadership and capital to upgrade, expand, maintain, and replace America's vast rural electric infrastructure. Under the authority of the Rural Electrification Act of 1936, RUS makes direct loans and loan guarantees to electric utilities to serve customers in rural areas. Through RUS, the Federal government is the majority note holder for more than 700 electric systems.

GRE, as one of the original Co-owners, applied for a loan from RUS to finance its portion of the proposed Project, and Western designated RUS as a cooperating agency for the EIS. With the withdrawal of GRE from the proposed Project, RUS has withdrawn from participating as a cooperating agency.

1.3.3 U.S. Army Corps of Engineers

The USACE is a regulatory agency with responsibilities under the Rivers and Harbors Act of 1899 and the CWA. Section 10 of the Rivers and Harbors Act of 1899 gave the USACE authority over navigable WUS. Projects that involve navigable WUS require authorization by a Department of the Army Section 10 permit. In addition, one of the major responsibilities of the USACE is administering the permitting program under Section 404 of the CWA if a project involves deposition of dredge or fill material into WUS.

The USACE has agreed to participate as a cooperating agency because the proposed Project has the potential to cross navigable water, as well as the potential to impact watercourses and wetlands that may be subject to the USACE's jurisdiction.

1.4 Purpose and Need for the Proposed Project

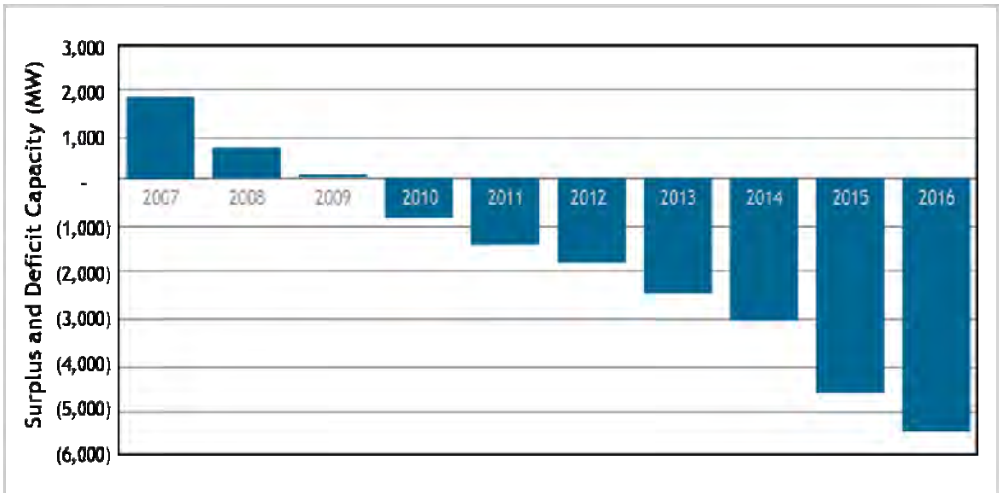
The proposed Project is needed to meet the additional regional power requirements of the five Co-owners. Mid-Continent Area Power Pool (MAPP) projections indicate that the region will not have enough generation capacity to meet its needs, even with the addition of the proposed Project (see Section 1.4.1). The proposed Project includes producing 600 MW of baseload power and interconnecting the power to the regional electric grid. Interconnecting to Western's transmission system requires modifying federally-owned electrical equipment and authorization from Western, including analysis under NEPA. The USACE, as a cooperating agency, also has a need to approve portions of the proposed Project under its jurisdiction.

1.4.1 Regional Power Requirements

The Co-owners are members of MAPP, an association of electric utilities and other electric industry participants who have interests in the Upper Midwest electrical industry. MAPP, as a regional transmission group, facilitates open access to the transmission system and generation reserve sharing. MAPP prepares an annual load and capability study that compiles each member's current capacities, load forecasts, and planned capacity from new facilities. The resulting generating capacity and reserve forecasts include current capacity as well as planned generation projects.

The proposed Big Stone II plant would be a baseload facility. However, the addition of a baseload facility would also positively impact the MAPP peak load capacity.

Figure 1.4-1 was derived from MAPP's May 1, 2007, Load and Capability Report and shows the capacity forecast from 2007 through 2016 for summer peak load conditions (MAPP, 2007). The MAPP capacity forecast includes the proposed 600 MW (net) Big Stone II plant as well as planned generation projects of other utilities. The figure indicates a capacity shortfall for utilities within the MAPP region beginning in 2010. Therefore, assuming the commercial operation date of July 2015 for the proposed Project, the summer peak load demand is projected to remain in deficit after the addition of the proposed plant.



Source: MAPP, 2007.

Figure 1.4-1 MAPP Capacity Surplus/Deficit Forecast, 2007 – 2016.

The proposed Big Stone II plant would operate as a baseload plant, producing power on a nearly full-time basis, with periodic shut-downs for maintenance. A baseload facility must be reliable and must have long-term availability of a low-cost fuel to sustain plant operations throughout its expected life cycle (approximately 30 to 50 years). A combination of upgraded and new transmission lines would carry power to the region's transmission system. The transmission system and facilities would ensure that transmission system reliability and service to existing customers are not adversely affected.

1.4.1.1 Market Factors Affecting Demand

FERC's Order No. 888 established requirements for open access transmission service, which created new markets for low-cost energy generated in MAPP and changed the regional power market. Increasing amounts of energy from within MAPP are being sold at higher prices to markets to the south and southeast of MAPP. This resulted in increased energy and capacity prices and increased price volatility. Utilities that rely on spot market purchases for a portion of their energy requirements can experience price increases and exposure to market volatility. Many utilities are now looking for opportunities to lower their exposure to the volatile market prices.

Transmission constraints in MAPP have severely limited many utilities' access to any surplus power that may be available for purchase. Some utilities have experienced situations where they have identified an economic purchase, only to find that they cannot secure transmission service to deliver the energy from the seller's system to the buyer's system. Transmission system improvements proposed for the Big Stone II Project would be integrated into the transmission system, would help MAPP to address its transmission constraints, and would reduce risks of energy delivery shortfalls within central Minnesota.

1.4.2 Co-owner Utility Power Requirements

Each of the Co-owners performed analyses to determine future resource needs. Although methodologies differed among the Co-owners, their analyses consistently forecasted increased capacity and energy requirements and identified available resource technologies to produce a plan to satisfy future needs. Econometric models were used to estimate future energy needs of the majority of the Co-owners.

Once the future capacity and energy requirements were identified, planning models were used to evaluate potential resource alternatives. A preferred plan was selected from those considered based on an individual utility's specific set of criteria, such as cost, environmental impact, risk mitigation, compliance with applicable regulations, existing resources, fuel availability, and maturity of technology. Although the Co-owners had differing criteria that were specific to their needs, they each individually selected baseload generation in the 2011 timeframe as part of their preferred plans.

Load growth projections and the need to satisfy energy requirements are different among each of the Co-owners, and the goals of each of the Co-owners include a combination of the following:

- Satisfy load growth
- Replace current capacity and energy contracts that expire
- Reduce reliance on energy production from existing oil- and gas-fired generating capacity and the associated higher costs and volatility of fuel costs.
- Reduce reliance on and exposure to power market prices
- Address the limited deliverability of future capacity and energy purchases due to transmission constraints

As part of early planning to alleviate future capacity deficits, the Co-owners conducted a qualitative assessment of various alternative baseload technologies. The general objectives that guided this assessment included:

- Ability to meet customer baseload energy and peak demand requirements reliably
- Commercially proven technology at the several hundred MW scale
- Minimize environmental and community impacts by leveraging existing generation site and transmission infrastructure
- Enhance customer value and reduce customer risk by implementing a proven, efficient technology

1.4.2.1 Central Minnesota Municipal Power Agency

CMMPA is composed of 12 municipal utility member organizations that individually are responsible for providing adequate, economical, and reliable supply of electric energy to meet customer needs. The CMMPA members plus the City of Willmar would acquire a 50-MW (about eight percent) interest in the proposed Big Stone II plant. When operational, the proposed plant would supply approximately 40 percent of CMMPA's energy requirements, reducing heavy dependence on contract energy and spot market purchases and existing member capacity that is predominately oil- and natural gas-fired.

1.4.2.2 Heartland Consumers Power District

HCPD currently serves 19 municipal customers, six State institutions, and a portion of one rural electric cooperative in eastern South Dakota. HCPD also serves six municipal customers in Minnesota and one municipal customer in northwest Iowa. Load growth has increased by an average of 9.7 percent per year from 2005 to 2008 and is expected to increase by 7.9 percent per year from 2008 to 2010, with most of the growth primarily due to new customers. From 2009 through 2015, demand requirements and energy requirements are expected to increase an average of one percent and 2.2 percent per year, respectively. HCPD currently purchases more than 50 percent of its capacity and energy resources from other utilities. The proposed Big Stone II plant would supply 30 MW (about 20 percent of HCPD's projected resource requirements) to the HCPD system, thus reducing its dependency on power purchases.

1.4.2.3 Montana-Dakota Utilities Co.

MDU's Integrated System comprises service territories in Montana, North Dakota, and South Dakota. MDU used econometric forecasting methodology to develop forecasts of energy requirements and peak demand. For the Integrated System, MDU expected a 72-MW capacity deficit for the summer of 2008 without its short-term seasonal capacity purchases and forecasts a 105-MW capacity deficit for the summer of 2013. That deficit would increase to 152 MW for the summer of 2020. The capacity deficits occur because the baseload power purchase agreement with Basin Electric Power Cooperative for 66.4 MW expired on October 31, 2006, and because customer load growth at an annual rate of 1.1 percent requires another 64 MW during the next 10 years. Consequently, MDU would need its 131-MW share of the proposed Big Stone II plant to replace purchased power and cover load growth.

1.4.2.4 Otter Tail Power Company

OTP serves eastern North Dakota, northeastern South Dakota, and western Minnesota. OTP is already purchasing short-term capacity to meet both summer and winter season deficits. A 50-MW baseload capacity and energy contract will expire in 2010. The net effect of the current capacity deficits and the expiration of the 2010 contract, coupled with the ensuing years of increased load growth, would result in a deficit of about 164 MW in the 2010 summer season. Continued forecasted load growth results in a capacity deficit of 237 MW in 2014. OTP's share of the proposed Big Stone II plant of up to 170 MW is expected to replace the expiring purchases as well as cover some of the forecasted load growth.

1.4.2.5 Western Minnesota Municipal Power Agency

WMMPA's resource need is driven by a contractual need to provide power to MRES. MRES is in turn responsible for providing power to 58 of its member utilities and for providing all of the increased future electrical power needs for 57 of its members. The predominate reason MRES needs additional generating capacity is member load growth. Additional resource requirements are driven by the 2016 expiration of the 60 MW of power that is currently provided by another supplier. MRES has one baseload resource, which can only supply half of the capacity requirements by 2010. Natural gas and other peaking resources supply the remainder. Based on MRES' calculations, the lowest-cost method to meet this shortfall is through a combination of 150 MW of the proposed Big Stone II plant baseload capacity and later peaking resource additions.

Summary of Co-owner Power Requirements

Considering the Co-owners' objectives, the Co-owners' individual needs for baseline generation, and fuel supply/cost considerations, the Co-owners selected pulverized-coal, super-critical boiler technology with a unit size of 600 MW as the preferred technology to satisfy their needs.

The proposed Big Stone II plant would be a baseload facility and would positively impact the MAPP peak load capacity. Capacity requirements identified by each Co-owner were based on anticipated energy and peak capacity needs (primarily summer months), plus a 15-percent reserve to meet MAPP requirements. Those needs are most economically met by a baseload generating unit. A general description of the Co-owners and their baseload capacity and energy needs are provided below.

Table 1.4-1 summarizes the needs identified by the Co-owners as described in the Draft EIS and Final EIS (after the withdrawal of GRE and SMMPA from the proposed Project).

Table 1.4-1. Summary of Proposed Big Stone II Co-owners' Needs

Co-Owner	Draft EIS Capacity Share (MW)	Final EIS Capacity Share (MW)
Central Minnesota Municipal Power Agency	30	50
Heartland Consumers Power District	25	30
Montana-Dakota Utilities Co.	116	131
Otter Tail Power Company	116	170
Western Minnesota Municipal Power Agency	150	150
Great River Energy	116	0
Southern Minnesota Municipal Power Agency	47	0
Additional Participants	0	69
Total	600	600

Source: OTP, 2008a.

The five Co-owners are evaluating additional parties as possible proposed Project participants who would join the proposed Project and accept a capacity share of the remaining available megawatts (noted as Additional Participants in Table 1.4-1).

1.4.3 Transmission System Modifications

The current transmission capacity available in the local area is not sufficient to carry and deliver the power generated at the proposed Big Stone II plant to the Co-owners' load centers. Transmission system modifications would be required, including upgrades to existing transmission lines and/or construction of new transmission lines. Interconnection studies carried out by OTP determined that two alternatives would meet requirements of the proposed Project. System studies are addressed in Section 2.3.2 and related upgrades and modifications to existing transmission facilities are addressed in Section 2.3.3.

Although not required to support the proposed Project, the Co-owners considered increasing transmission line capacity above the proposed Big Stone II Project needs to capacity levels that are consistent with regional transmission plans. Increasing transmission line capacity in South Dakota could enhance opportunities to develop renewable resource generation projects (e.g., wind energy) in southeastern South Dakota. Additional secondary benefits include enhanced system reliability within the regional utility grid. For this reason, the segment from the proposed plant site to the vicinity of Hazel Run (approximately 10 miles southwest of Granite Falls) would be constructed at 345-kV capacity to enhance future power transfer capabilities from western locations to the Minneapolis metropolitan area, but would be initially operated at 230-kV service.

The Co-owners and the Energy Planning and Advocacy function of the MnDOC voluntarily entered into an agreement on August 30, 2007, titled "Settlement Agreement, High Voltage Transmission Lines-Big Stone II" (Settlement Agreement) to address several key issues of interest to Minnesota residents, including the additional need for transmission to support renewable energy production. The Settlement Agreement notes that the "high voltage transmission lines that are proposed to interconnect the Big Stone Unit II are intended to and likely will provide capacity for the transport of wind energy from South Dakota and North Dakota and southwestern Minnesota to the Twin Cities and other markets." Additional conditions of the Settlement Agreement are described further in Section 1.5.2 below. A copy of the agreement is provided in Appendix K, Volume III.

1.5 Authorizing Actions

Permitting for the proposed Big Stone II Project requires coordination of the Federal EIS process and compliance with State permitting processes.

1.5.1 Federal EIS Process

Western's decision to grant or deny the requested interconnections and the USACE's decision whether or not to issue Section 10 and Section 404 permits require compliance with NEPA (42 USC §§ 4321-4247) and guidelines established by the Council on Environmental Quality (CEQ). NEPA requires Federal agencies to consider environmental consequences in their decision-making processes. CEQ regulations (40 Code of Federal Regulations (CFR) 1500-1508) to implement NEPA include provisions for both the content and procedural aspects of required environmental analysis. Implementation guidance also is provided through DOE NEPA Implementing Procedures (10 CFR 1021).

These implementing procedures provide the framework for developing the EIS. Western determined that an EIS is required to provide a decision-making tool to assess potential impacts to the human and natural environment and mitigate those impacts that cannot be fully avoided. Western issued a Draft EIS for the proposed Project in May 2006. Based on substantial changes to the proposed Project regarding its water supply for power plant cooling, a Supplemental Draft EIS was prepared and issued in October 2007.

The Big Stone II EIS satisfies the following goals:

- Assist officials of Western and the USACE in making decisions based on an understanding of environmental consequences and taking actions that protect, restore, and/or enhance the environment.
- Identify ways that environmental effects can be avoided or reduced.
- Prevent significant avoidable effects to the environment by implementing alternatives or mitigation measures, to the extent practical.
- Disclose to the public the environmental information and analyses upon which the interconnection and permitting decisions would be based.

1.5.2 Minnesota Processes

Transmission lines for the proposed Project located within Minnesota require a Certificate of Need from the MnPUC. The Certificate of Need application was filed by the Co-owners with the MnPUC in October 2005. The application for a High Voltage Transmission Line Route Permit was filed with the MnPUC in December 2005. The Certificate of Need process includes the preparation of a Minnesota Environmental Impact Statement (MnEIS) under the direction of the MnDOC on behalf of the MnPUC. The MnDOC issued a draft MnEIS on July 31, 2006, and a final MnEIS on December 1, 2006 (MnDOC, 2006). The MnPUC approved the Big Stone II application for the Certificate of Need and the Route Permit on January 15, 2009, for construction of transmission lines in Minnesota. The MnPUC issued their final written order granting the Certificate of Need and the Route Permit on March 17, 2009 (MnPUC, 2009). The MnPUC approved the Co-owners' preferred route: Alternative A (Corridor A to Morris, Minnesota and Corridor C to Granite Falls, Minnesota).

Compliance with the High Voltage Transmission Line Route Permit process includes identifying and analyzing corridors from the point-of-origin (Minnesota/South Dakota State line crossing) to termini (e.g., Morris Substation, Willmar Substation, Granite Falls Substation) that would meet the proposed Projects' purpose and need. The High Voltage Transmission Line Route Permit includes identifying potential impacts resulting from constructing and operating proposed transmission lines within each corridor.

As noted in Section 1.4.3, the Co-owners and the MnDOC have entered into a voluntary Settlement Agreement addressing several key issues of interest to Minnesota residents (see Appendix K, Volume III). The terms of the Settlement Agreement were included as a condition to the Certificate of Need, issued March 17, 2009. In the Settlement Agreement, the Co-owners and MnDOC have agreed that "Minnesota needs a diverse electric resource mix in the coming years, including renewable resources, additional energy conservation, and new conventional generation facilities." The Settlement Agreement, along with new laws regarding energy efficiency and renewable energy, combine to satisfy the MnDOC's concerns expressed in the MnDOC record pertaining to the applicable criteria for the Certificate of Need.

Some of the key elements of the Settlement Agreement are:

- The Co-owners have agreed to install pollution-control equipment including: (1) a common wet flue gas desulfurization system (i.e., wet scrubber) expected to control sulfur dioxide (SO_2) emissions from both the existing Big Stone plant and the proposed Big Stone II plant at a level that is expected to be less than 15 percent of the present emissions from the existing plant alone; (2) a selective catalytic reduction emission control technology for nitrogen oxides (NO_X), resulting in the total NO_X emissions from both plants equal to or less than the existing plant's historical NO_X emissions; and (3) a pulse-jet fabric filter with an expected removal capacity of 99.9 percent of particulate matter.
- The Co-owners have agreed (in absence of Minnesota and Federal carbon dioxide (CO_2) rules applicable to the proposed Big Stone II plant) to offset 100 percent of the emissions of CO_2 from the proposed Big Stone II plant that are attributable to the generation of electricity for Minnesota consumers, for a period not to exceed four years after the commercial operation date of the proposed Big Stone II plant. The Settlement Agreement contains specific formulas, methodologies, and guidelines to be used for calculating the percentage of generation attributable to Minnesota customers, the timing and calculation of emissions to be offset, offset methods, and carbon trading. Several of the offset methods outlined in the Settlement Agreement would serve to reduce the intensity of U.S. carbon emissions further by investing in renewable energy, achieving energy savings, and investing in transmission that the MnPUC certifies would enhance renewable energy development. However, the Co-owners and MnDOC have agreed that the offset requirements required by Section 4.1 of the Settlement Agreement would continue only until Minnesota or Federal greenhouse gas rules are developed that apply to the proposed Big Stone II plant; or if such rules have not been adopted, the offset requirement would cease four years after the proposed Big Stone II plant reaches its commercial operation date, as prescribed by Section 4.10 of the Settlement Agreement.
- The Co-owners have committed to install emission control equipment that is most likely to result in removal of at least 90 percent of the mercury emitted from both the existing and the proposed plant. Additionally, the Co-owners have agreed to act in good faith to install such equipment as expeditiously as possible, but have four years after the commercial operation date of the proposed Big Stone II plant to achieve compliance with this commitment.
- In recognition of the importance of not adversely affecting the long-term lake level or river flow out of Big Stone Lake, the Co-owners have agreed to (1) utilize groundwater for drought protection for the proposed Big Stone II plant; (2) provide data to the South Dakota Department of Environment and Natural Resources (SDDENR) and the Minnesota Department of Natural Resources (MnDNR) to evaluate the Veblen Aquifer and the effect on Big Stone Lake of extended groundwater withdrawal; (3) since June 27, 2007, and to continue, on an ongoing basis, to provide all data used to evaluate the effects of water withdrawals from Big Stone Lake to the SDDENR and MnDNR; (4) support the granting of party status to the MnDNR before the South Dakota Water Management Board in the Co-owners request for water appropriation from groundwater; and (5) perform tests to compare the groundwater pumping impacts to the modeling results provided during the water appropriation permit process.

- The Co-owners have agreed to participate constructively in meetings with State agencies to address the management of the Big Stone Lake water flow and level issues.
- Co-owners with electric sales in Minnesota are expected to meet the obligations of Minnesota statutes that (1) direct utilities to obtain certain percentages of electric sales to retail customers from renewable resources by certain deadlines and (2) require compliance with conservation improvement programs, including filing plans describing how each utility intends to meet its energy savings goal. The Co-owners' commitments to demand side management (DSM) issues are discussed in Section 2.5.1.10. Additional information on DSM may be found in the DSM Response Paper (Response Paper C, Volume II).

1.5.3 South Dakota Processes

Power plant facility siting falls under the jurisdiction of the SDPUC Energy Facility Siting Rules. Analyses included in the South Dakota permitting application have been included as part of the Federal Big Stone II Project EIS. The SDPUC also has jurisdiction over those transmission lines within the State.

The Co-owners filed the permit application for the proposed Big Stone II plant with the SDPUC in July 2005 (Big Stone II, 2005b). Western attended the public hearing held in September 2005. The SDPUC approved the "Energy Conversion Facility Permit" at its July 14, 2006 hearing and issued their Final Decision and Order on July 21, 2006 (SDPUC, 2006). The Co-owners filed a permit application for the portion of the proposed transmission lines located in South Dakota with the SDPUC on January 17, 2006 (Big Stone II, 2006a). This permit application required the Co-owners to identify a specific route for the South Dakota portion of the transmission lines. The SDPUC approved the "Route Permit" for the South Dakota portion of the lines at their January 2, 2007, hearing and issued their Final Decision and Order on January 16, 2007 (SDPUC, 2007).

The Co-owners also filed a permit application with the SDDENR Air Quality Program in July of 2005. The SDDENR issued a public notice for the draft Prevention of Significant Deterioration (PSD) Construction Permit for the proposed Big Stone II and the draft Title V Operating Permit for the existing plant on January 30, 2008. The South Dakota Board of Minerals and Environment (SDBME) issued the PSD permit to the proposed Big Stone II plant on November 20, 2008. The SDBME also issued the Big Stone site Title V permit on November 20, 2008, for the USEPA's 45-day review period. On January 22, 2009, the USEPA issued objections to the Big Stone Title V permit during their 45-day review period. The SDDENR has revised the Title V permit to satisfy the objections raised by the USEPA, and the permit revisions underwent a 30-day public notice period which began on February 11, 2009, and ended on March 13, 2009. The SDBME held hearings on April 20 and 21, 2009, to consider the revised Title V permit and whether any revisions were needed for the PSD permit issued on November 20, 2008. On April 21, 2009, the SDBME issued a signed final approval document after the SDBME the day before unanimously approved the revised Title V permit that addressed the objections raised by the USEPA and reaffirmed the PSD permit that was issued on November 20, 2008. The SDBME approved the hearing Findings of Fact and Conclusions of Law during their April 21, 2009 meeting. On April 22, 2009, the revised Title V permit was submitted to the USEPA for a 45-day review. The decisions of the SDBME constitute the State's Final Permit Decision on the Title V Permit, but may be appealed to the State Circuit Court and the State Supreme Court, and with the USEPA, as provided by law.

All water resources in the State of South Dakota are owned by the people of the State, and as such, are subject to regulation regarding protection from pollution sources and allocation of the water for public and private use. The SDDENR is responsible for managing South Dakota's water resources through its Water Rights Program. A water appropriation permit, issued by the South Dakota Water Management Board, would be required prior to using any surface or groundwater for the proposed Project. Once a water appropriation is obtained, it remains effective indefinitely, provided water use is within permit parameters and not forfeited due to nonuse or abandonment.

OTP, on behalf of the Co-owners, filed an Application for Permit to Appropriate Water within the State of South Dakota on March 29, 2006, for the surface water resources needed for the proposed Project. A public hearing concerning the permit application was held before the South Dakota Water Management Board on July 12, 2006. The board approved the permit subject to the conditions proposed in the Chief Engineer's report (SDDENR, 2006c) with respect to lake elevations and pumping rates that are consistent with the permits for the existing facility.

OTP, on behalf of the Co-owners, filed an Application for Permit to Appropriate Water within the State of South Dakota on March 28, 2007, for the groundwater resources needed for the proposed Project. A public hearing concerning the permit application was held before the South Dakota Water Management Board on July 11, 2007. The board approved the permit, subject to the conditions proposed in the Chief Engineer's report (SDDENR, 2007b).

1.5.4 Applicable Environmental Permits, Approvals, and Consultation

Construction and operation of the proposed Project would require compliance with a number of Federal, State, and local laws and regulations and would require specific permits, approvals, and consultations. Table 1.5-1 summarizes the environmental regulatory requirements for the proposed Project. Consultations are discussed in more detail in Chapter 6.

Table 1.5-1. Environmental Regulatory Requirements

Agency	Permit/Approval/Consultation
Federal	
Western Area Power Administration	National Environmental Policy Act (NEPA), Record of Decision for transmission line interconnection Statement of Findings for Compliance with Floodplain/Wetlands Environmental Review Requirements Endangered Species Act Section 7 Consultation National Historic Preservation Act Consultation
Federal Aviation Administration	No Hazard Determination (for the proposed plant's stack)
Federal Highway Administration	Permit to Cross Federal Highway
U.S. Fish and Wildlife Service	Endangered Species Act Section 7 Consultation, Biological Opinion Compatibility Analysis of Disturbed Easements Right-of-way Permit Special Use Permit
U.S. Army Corps of Engineers	NEPA, Record of Decision for CWA Section 404 permit and Rivers and Harbors Act Section 10 Permit
Natural Resources Conservation Service	Farmland Protection Policy Act/Farmland Conversion Impact Rating
State of South Dakota	
Public Utilities Commission	Energy Facility Permit Energy Facility Large Transmission Facility Permit
Water Rights Program	Water Appropriations Permit for Surface Water Withdrawal from Big Stone Lake Water Appropriations Permit for Groundwater Withdrawals
Board of Minerals and Environment	Clean Air Act Prevention of Significant Deterioration (PSD) Permit Title V Air Quality Operating Permit
Department of Environment and Natural Resources	CWA Section 401 Certification National Pollutant Discharge Elimination System (NPDES) Stormwater Permit for Construction of Power Plant NPDES Stormwater Permit for Construction of Groundwater Pipeline Temporary Discharges of Groundwater Solid Waste Disposal Permit
Aeronautics Commission	Aeronautical Hazard Permit
Game, Fish, and Parks	State-listed endangered species consultation
State Historic Preservation Office	Approve Programmatic Agreement
Department of Transportation	Utility permit for highway crossing Utility Permit for Construction and Maintenance of a Utility Facility on Public Right-of-Way
State of Minnesota	
Public Utility Commission	Certificate of Need for High Voltage Transmission Line High Voltage Transmission Line Route Permit
Department of Natural Resources	License to Cross Public Lands and Waters State-listed endangered species consultation
Pollution Control Agency	CWA Section 401 Certification NPDES Stormwater Permit for Construction
Department of Transportation	Utility Permit for highway crossing
State Historic Preservation Office	Approve Programmatic Agreement
Local, South Dakota	
Grant and Duel counties	Zoning Approval
County highways	Permit to work in right-of-way
County or township	Driveway permits
Local, Minnesota	
Multiple local governmental units	Wetland permits Zoning permits if necessary
County highways	Occupancy Permit on the Right-of-Way of County Highways
Township highways	Township Approval for Occupancy on Township Right-of-Way
County or township	Driveway permits
Other	
Burlington Northern Santa Fe Railroad	Temporary Occupancy Permit Wire Line Crossing or Longitudinal Communication and Electrical Permit
Twin City and Western Railroad	Overhead/Underground Permit

Source: ENSR, 2005a and OTP, 2008a.

1.6 Overview of Public Participation

Project scoping is an integral part of the EIS process and is conducted to help identify significant issues related to the proposed Project to be addressed in the EIS. NEPA requires that the lead agency invite affected Federal, State, and local agencies, any affected Native American tribes, the Co-owners of the action, and other interested persons to participate in the scoping process.

1.6.1 Notice of Intent

A Notice of Intent (NOI) for the Big Stone II EIS was published in the Federal Register (FR) on May 27, 2005. Western mailed scoping meeting notices directly to Federal and State agencies, Native American tribes, special interest groups, and landowners to gain information regarding environmental impacts that could potentially occur as a result of the proposed Project.

Additionally, Western announced the scoping meetings by placing display advertisements in 14 local newspapers throughout the affected region. Display advertisements were published once per week for two weeks, with the exception of once per week for three weeks in the communities of Morris and Granite Falls, Minnesota.

1.6.2 Public Meetings

1.6.2.1 Federal Scoping

Public scoping meetings were held in Milbank, South Dakota, and Morris and Granite Falls, Minnesota, on June 14, 15, and 16, 2005, respectively. Thirty-four people attended the meetings. Scoping meetings were conducted in an open house format. Western provided information and gave attendees the opportunity to ask resource specialists questions and to express their concerns about the proposed Project. Display boards showing the proposed Project location, resource information, the NEPA process, and the Minnesota and South Dakota State permitting process aided in the information exchange with meeting attendees. Several handouts, including the first issue of Western's Big Stone II Power Plant and Transmission Project Newsletter, were available at the meetings.

The public scoping period for the proposed Big Stone II Project originally ended on July 26, 2005; however, Western extended the scoping comment period to incorporate public comments received during the landowner formal meetings required for the Minnesota permitting process. On July 26, 2005, Western placed a notice in the FR extending the scoping comment period to August 29, 2005. All comments received during the entire scoping period were compiled into a scoping report and incorporated into the EIS analyses.

1.6.2.2 Minnesota State Landowner Meetings

Five landowner meetings were held as part of the Minnesota State permitting process for the transmission line portion of the proposed Project. Meetings were conducted in an open house format similar to the Federal public scoping meeting previously described. Comments received from the public during the State permitting process meetings were included in the compilation of comments received during the Federal scoping process. Meeting dates, locations, and number of attendees for the five State landowner meetings are shown in Table 1.6-1. Western attended these meetings, and comments from these meetings were included in the scoping comments for the EIS.

Table 1.6-1. Minnesota State Landowner Meetings

Meeting Location	Meeting Date	Number of Attendees
Granite Falls	August 1, 2005	27
Benson	August 2, 2005	43
Willmar	August 3, 2005	59
Canby	August 8, 2005	22
Ortonville	August 9, 2005	41

Source: OTP, 2005a.

1.6.2.3 South Dakota Public Utilities Commission Hearing

The SDPUC held a public hearing on September 13, 2005, in Milbank, South Dakota, for the application submitted by OTP on behalf of the Co-owners for an energy conversion facility permit for the construction of the proposed Big Stone II Project. Public notice for the meeting was provided on August 11, 2005. Three SDPUC commissioners, six commission staff, and 50 individuals attended the hearing. The Co-owners presented information about the proposed Project to the SDPUC and members of the public. Following the presentation, the SDPUC began receiving public testimony. Western attended this meeting and comments from this meeting were included in the scoping comments for the EIS.

1.6.2.4 Draft EIS

Western issued the Draft EIS for the proposed Project in May 2006. Western held public hearings June 13-16, 2006, to receive public input on the Draft EIS in Big Stone City, SD (June 13); Morris, Minnesota (June 14); Granite Falls, Minnesota (June 15); and Benson, Minnesota (June 16). The public hearings included informal question and answer periods where representatives of Western, USACE, and the Co-owners were available to answer questions. The formal portion of the public hearing included a presentation by Western and receipt of public comments from participants who desired to speak. A transcript of each public hearing was prepared and is available for viewing at the following reading rooms:

Western Area Power Administration
Corporate Services Office
12155 West Alameda Parkway
Lakewood, CO 80228

U.S. Department of Energy
Forrestal Building, Reading Room 1E-190
1000 Independence Avenue SW
Washington, D.C. 20585

Western Area Power Administration
Upper Great Plains Customer Service Region
South Dakota Maintenance Office
200 4th Street SW
Huron, SD 57350

1.6.2.5 Supplemental Draft EIS

Western issued the Supplemental Draft EIS in October 2007 and held one public hearing regarding the Supplemental Draft EIS in Milbank, South Dakota on November 13, 2007. The public hearing included informal question and answer periods where representatives of Western and the Co-owners were available to answer questions. The formal portion of the public hearing included a presentation by Western and receipt of public comments from participants who desired to speak. A transcript of the public hearing has been prepared and is available for viewing at the reading rooms listed above.

1.6.3 Comments

1.6.3.1 Scoping Comments

Public comments were received during the public scoping period from the Federal scoping meetings held in Milbank, South Dakota, and Morris and Granite Falls, Minnesota on June 14, 15, and 16, 2005, respectively, and the State permitting process meetings/hearing verbally and in writing by e-mail, mail, and submitting the comment forms/cards provided at the meetings. Verbal comments were recorded as notes during the scoping meetings and submitted to Western. During the entire public comment period, Western received e-mails, faxes, and comments by mail. A total of 445 separate comments were identified during the scoping period. A summary of the scoping comments is provided in Appendix A. The major categories of comments included:

Air quality
Reality and land use
Agriculture
Solid waste and hazardous materials
Alternatives
Alternative technologies
Power plant siting alternatives
Transmission line corridor and routing alternatives
Cumulative impacts
Purpose and need
Project description
Federal NEPA process
Other Federal permitting
State permitting processes
Water resources and water quality
Wetlands and riparian areas
Special status species
Wildlife
Aquatic species and fisheries
Vegetation
Noise
Recreation
Historical and cultural resources
Public safety
Visual impacts
Socioeconomics
Construction impacts
Mitigation

1.6.3.2 Draft EIS Comments

The public comment period for the Draft EIS originally ended on July 3, 2006; however, Western received several requests to extend the comment period. Western placed a notice in the FR extending the comment period to July 24, 2006. Numerous comments on the Draft EIS were received from Federal and State agencies, tribes, municipalities, private organizations, businesses, and individuals. Responses to comments are included in Volume II of this Final EIS. Where applicable, Western made changes based on comments and incorporated these changes into this Final EIS.

1.6.3.3 Supplemental Draft EIS Comments

The public comment period for the Supplemental Draft EIS originally ended on December 10, 2007; however, Western received several requests to extend the comment period. Western placed a notice in the FR extending the comment period to February 28, 2008. By the end of the public comment period on February 28, 2008, Western had received comments from Federal and State agencies, Tribes, non-governmental organizations, and individuals. Responses to comments are included in Volume II of this Final EIS. Where applicable, Western made changes based on comments and incorporated these changes into this Final EIS.

1.6.4 Native American Tribal Coordination

Western initially contacted the following potentially interested Native American tribes about the proposed Project: Upper Sioux Indian Community, Prairie Island Indian Community, Lower Sioux Indian Community, Spirit Lake Tribal Council, Sisseton-Wahpeton Oyate of the Lake Traverse Reservation, Flandreau Santee Sioux Tribe, Santee Sioux Nation, Yankton Sioux Tribe, Rosebud Sioux Tribe, Crow Creek Sioux Tribe, Cheyenne River Sioux Tribe, Lower Brule Sioux Tribe, Shakopee Midewakanton Sioux Community, Leech Lake Tribe of Ojibwe, Mille Lacs Band of Ojibwe, and the Standing Rock Sioux Tribe. During the Draft EIS, the Fort Peck Assiniboine and Sioux Tribes of Montana were added to the consultation list. Formal consultation with interested Native American tribes is ongoing (see Chapter 6 for additional information concerning consultation processes.)

DOE/EIS-0377

Final Environmental Impact Statement

Volume I

June 2009

Big Stone II Power Plant and Transmission Project

Prepared for:

Lead Agency:
Western Area Power Administration

Cooperating Agency:
U.S. Army Corps of Engineers

PROPOSED PROJECT, PROPOSED FEDERAL ACTIONS, AND ALTERNATIVES

CHAPTER 2

Chapter 2 Changes

The changes to Chapter 2 include a detailed description of the proposed Project (i.e., eliminating water-supply features described in the Draft EIS and adding a new proposed groundwater system) as well as updates to permitting information, the description of the No Action Alternative, system modifications (including the proposed upgrades of the Big Stone-Hankinson transmission line), and changes to figures. Changes include:

- Described the substantial changes to the proposed Project including elimination of the 450-acre make-up water storage pond, elimination of the 25-acre cooling tower blowdown pond, elimination of a new brine concentrator, revisions to coal handling system, elimination of the coal storage silos, relocation of the cooling tower, and the addition of a new water pretreatment building.
- Described changes in the use, management, and treatment of the water supply for the proposed Project's alternatives, as well as changes in wastewater management.
- Described the proposed groundwater well production system, pipelines, and electric distribution lines for the well system.
- Modified figures to show changed plant features; added a figure to show the location of the groundwater areas; and revised the figure that describes the water use and wastewater management plan.
- Provided a description of alternatives that were considered by the Co-owners for the back-up water supply and associated cooling system technologies for the proposed Big Stone II plant. The Co-owners' preferred alternative (a wet cooling technology with groundwater back-up water supply) is described as the proposed Project. A description of the additional mitigation measures to reduce the impacts of the alternatives is also provided.
- Updated information regarding use of raw materials and revised the table regarding the use of chemicals at the proposed plant. Updated information regarding permitting, schedule, and the summary table of environmental impacts (Table 2.6-1).
- Described changes to the transmission portion of the proposed Project including a minor change in the location of Corridor C (four miles south of the proposed plant) and the relocation of the Canby Substation.
- Identified modifications to Western's transmission system based on transmission system studies completed by the Midwest Independent System Operator and Western.
- Added an analysis of renewable energy (which focused on new information regarding wind and demand side management), including a legal framework and the status of actions being undertaken by the Co-owners.
- Provided additional details regarding the power generation technology and cooling technology alternatives that were considered but eliminated from detailed analysis in the Final EIS.

CHAPTER 2
PROPOSED PROJECT, PROPOSED FEDERAL ACTIONS, AND ALTERNATIVES

2.0 Proposed Project, Proposed Federal Actions, and Alternatives

This chapter identifies the Western Area Power Administration (Western) and the U.S. Army Corps of Engineers (USACE) proposed Federal actions associated with the Applicant's (i.e., Co-owners') proposed Project. This environmental impact statement (EIS) describes details of the proposed Federal actions, the proposed Project, and alternatives.

The power plant alternatives analysis includes the proposed Big Stone II plant, the alternative generation technologies studied by the Co-owners, and a discussion of the Co-owners' plant siting studies conducted for the proposed Project. The Project proposed by the Co-owners is also described in this chapter, including a description of alternatives for the back-up water supply and associated cooling system technologies for the proposed Big Stone II plant. This chapter also describes the screening process used to evaluate the alternatives and to select the preferred alternative for the proposed Project.

The transmission alternatives analysis includes a discussion of the studies conducted for interconnecting the proposed plant to the regional integrated transmission system and a transmission corridor identification process. The transmission alternatives analysis resulted in identifying two transmission alternatives for the proposed Project. These alternatives would require modifying existing transmission lines and/or constructing new transmission lines and modifying existing substations.

The proposed Project includes constructing and operating the proposed Big Stone II power plant and one of the two transmission alternatives. The proposed Project also includes measures proposed by the Co-owners to lessen or eliminate environmental impacts. This Chapter also includes a description of the No Action Alternative and alternatives considered but eliminated from detailed analysis.

The last section of this chapter contains a summary of the environmental impacts of the proposed Project, Alternative 3 (wet/dry cooling with groundwater supply back-up), and the No Action Alternatives based on the impact analysis in Chapter 4. The summary includes both the potential benefits and potential adverse impacts to each resource or environmental component. A number of standard mitigation measures (SMMs) are proposed by the Co-owners as part of the proposed Project in Section 2.2.4. Additional mitigation measures proposed in Chapter 4 to reduce impacts further are listed in Table 2.6-2.

2.1 Proposed Federal Actions

The proposed Federal actions evaluated in this EIS by each of the involved Federal agencies are specific and limited and are based on the purpose and need for agency action as described in Section 1.3. The Federal agencies[1] need to make decisions as follows:

Western: Western's proposed action is to consider whether to allow the Co-owners' interconnections to Western's transmission system at Morris and Granite Falls substations, an action which requires Western to complete modifications to these substations to support the interconnections.

USACE: The USACE's proposed action is to consider whether to issue a permit for Section 10 of the Rivers and Harbors Act and for Section 404 of the Clean Water Act to the Co-owners for construction of the proposed Project within or across navigable waters and waters of the United States (WUS).

Western System Modifications

Western proposes to modify its transmission system based on the transmission system studies completed by Midwest Independent System Operator (MISO) and Western (see Section 2.3.2, below) (Western, 2007c). Both proposed Big Stone II transmission alternatives would require modifications to Western's Morris and Granite Falls substations. Since publication of the Draft EIS, the specific modifications required for these substations have been identified in a facility study completed by Western. Additional electrical equipment would be needed at the Granite Falls Substation, and would include installing new concrete foundations, substation bus work, cable trenches, buried cable-grounding grid; and replacing existing equipment and/or conductors to accommodate the interconnection. Morris Substation would be expanded to accommodate a new 230-kV bay, which would include adding new electrical equipment, new concrete foundations, substation bus work, cable trenches, buried cable-grounding grid; and replacing existing equipment and/or conductors with new equipment and/or conductors and replacing an existing transformer with a larger transformer to accommodate the interconnection. Western would design, own, construct, and operate any additions and modifications at these substations. Because Western is a Federal agency, Western is not ceding any jurisdictional authority over Federal facilities to the State of Minnesota for the interconnection.

If Western decides to modify its delivery service contracts with Missouri River Energy Services (MRES) and Heartland Consumers Power District (HCPD) and determines that transmission system modifications are needed to accommodate new delivery service, Western would address the environmental impacts of these modifications in accordance with regulatory requirements.

2.2 Co-owners' Proposed Project

The Co-owners' proposed Project includes constructing and operating the Big Stone II coal-fired power plant, groundwater system, transmission additions and modifications, and substation additions and modifications. As a result of comments received on the Draft EIS and increased construction costs associated with the 450-acre make-up water storage pond presented in the Draft EIS, the Co-owners have proposed changes to the proposed Big Stone II plant. These changes include elimination of the

[1] The Rural Utilities Service (RUS) was identified in the Draft EIS as a cooperating agency for their action to provide funding to Great River Energy (GRE) for their participation in the proposed Project. Because GRE is no longer a participant in the proposed Project, RUS has withdrawn as a cooperating agency in the EIS process.

450-acre make-up water storage pond, elimination of the 25-acre cooling tower blowdown pond, elimination of a new brine concentrator, elimination of three coal-storage silos, relocation of the cooling tower, a new water pretreatment building, and changes to the plant water supply, plant cooling system, plant water usage, water treatment, and wastewater management. The proposed Project includes a wet cooling system using surface water as the primary water supply and groundwater as the back-up water supply. The proposed Project would also include installation of groundwater wells and a pipeline system to convey groundwater to the proposed plant site and other facilities associated with the use of groundwater for the proposed Project. The proposed changes were described in the Supplemental Draft EIS, issued in October 2007, and are also described in detail in this section.

In addition, certain electrical system changes identified during systems analysis are proposed that were not identified in the Draft EIS or Supplemental Draft EIS. These changes include relocation of the Canby Substation and upgrades to the 68-mile existing Big Stone to Hankinson 230-kilovolt (kV) transmission line. These changes are described in Section 2.2.3.

This section describes each of these proposed Project aspects in further detail. The proposed Project also incorporates the mitigation measures described in Section 2.2.4.

2.2.1 Power Plant and Associated Facilities

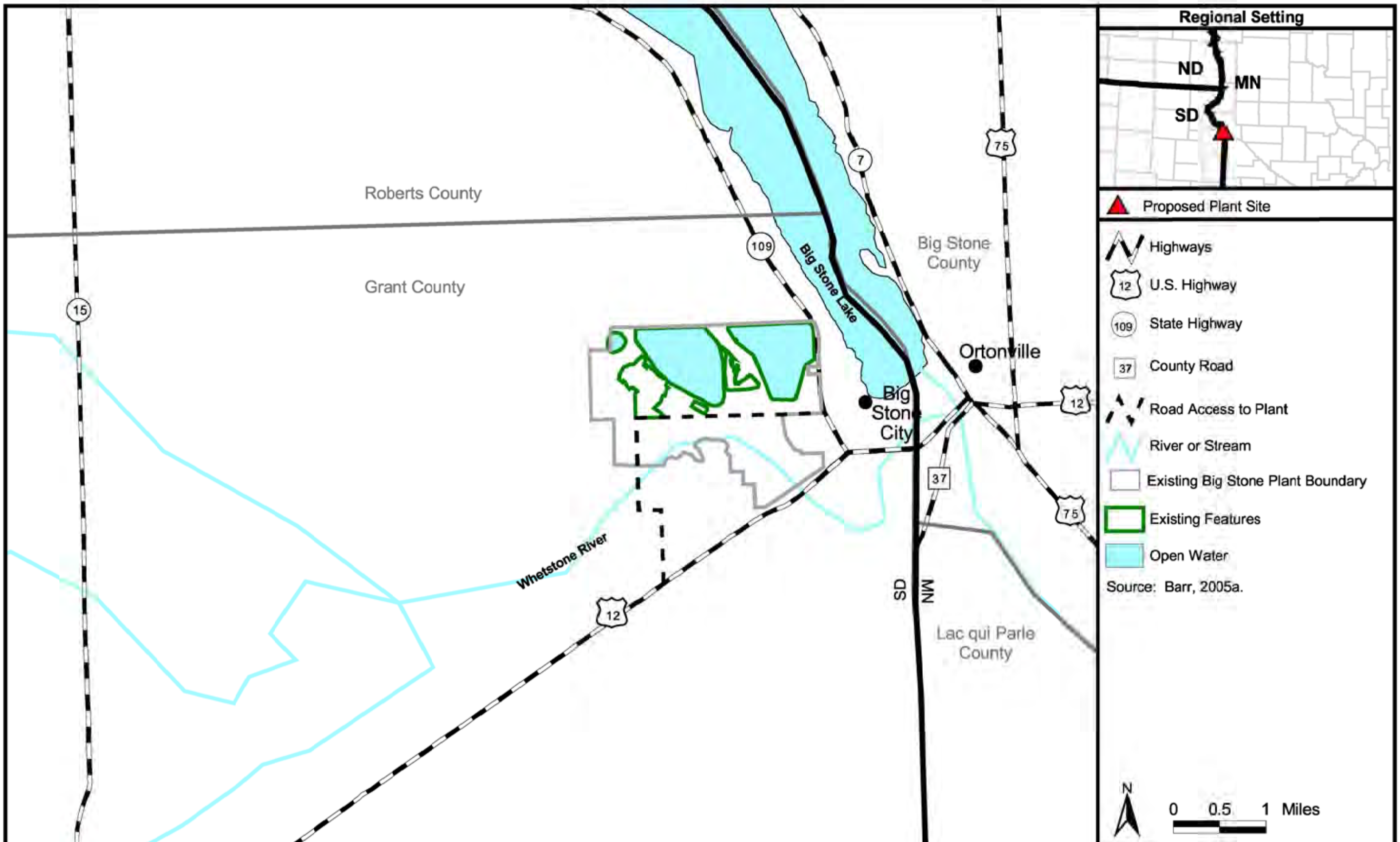
The Co-owners propose to construct a 600-megawatt (MW) net capability coal-fired electric power generating station named Big Stone II. The 600-MW net capability represents the power available for delivery to the transmission system after power for internal plant operations is consumed. Power from the proposed Big Stone II plant would be supplied to the regional integrated transmission system to meet the Co-owners' needs.

2.2.1.1 Location and Land Status

The location of the proposed Big Stone II plant would be adjacent to the existing Big Stone plant in Grant County, South Dakota, northeast of Milbank and northwest of Big Stone City as shown in Figure 2.2-1. The existing 450-MW Big Stone plant is located on a 2,271-acre parcel, as outlined in Figure 2.2-2. Otter Tail Power Company (OTP) owns adjacent parcels totaling approximately 930 acres on behalf of the proposed Project. The proposed Big Stone II plant site includes a portion of the approximately 2,271-acre existing plant site plus the adjacent 930 acres (totaling approximately 2,720 acres, as shown by the green outline on Figure 2.2-3). The combined land parcels for the existing plant and the proposed plant total approximately 3,200 acres (the "Big Stone site"). Preliminary engineering indicates that the Co-owners would have full legal access to all plant site properties necessary to complete construction of the proposed Big Stone II plant.

2.2.1.2 Site Plan

Figure 2.2-2 shows the layout of the features of the existing Big Stone plant. The Co-owners would construct the proposed features (revised from the Draft EIS) for the proposed Big Stone II plant shown on Figure 2.2-3. Existing plant infrastructure, such as the cooling water intake structure, surface water pumping system and delivery pipelines (from Big Stone Lake), coal delivery and handling facilities, solid waste disposal facilities, and water storage ponds would be used by the proposed Big Stone II plant. Existing rail and road facilities would be used for access to the property and plant site. New



Big Stone II EIS

Figure 2.2-1

Existing Big Stone Plant Location

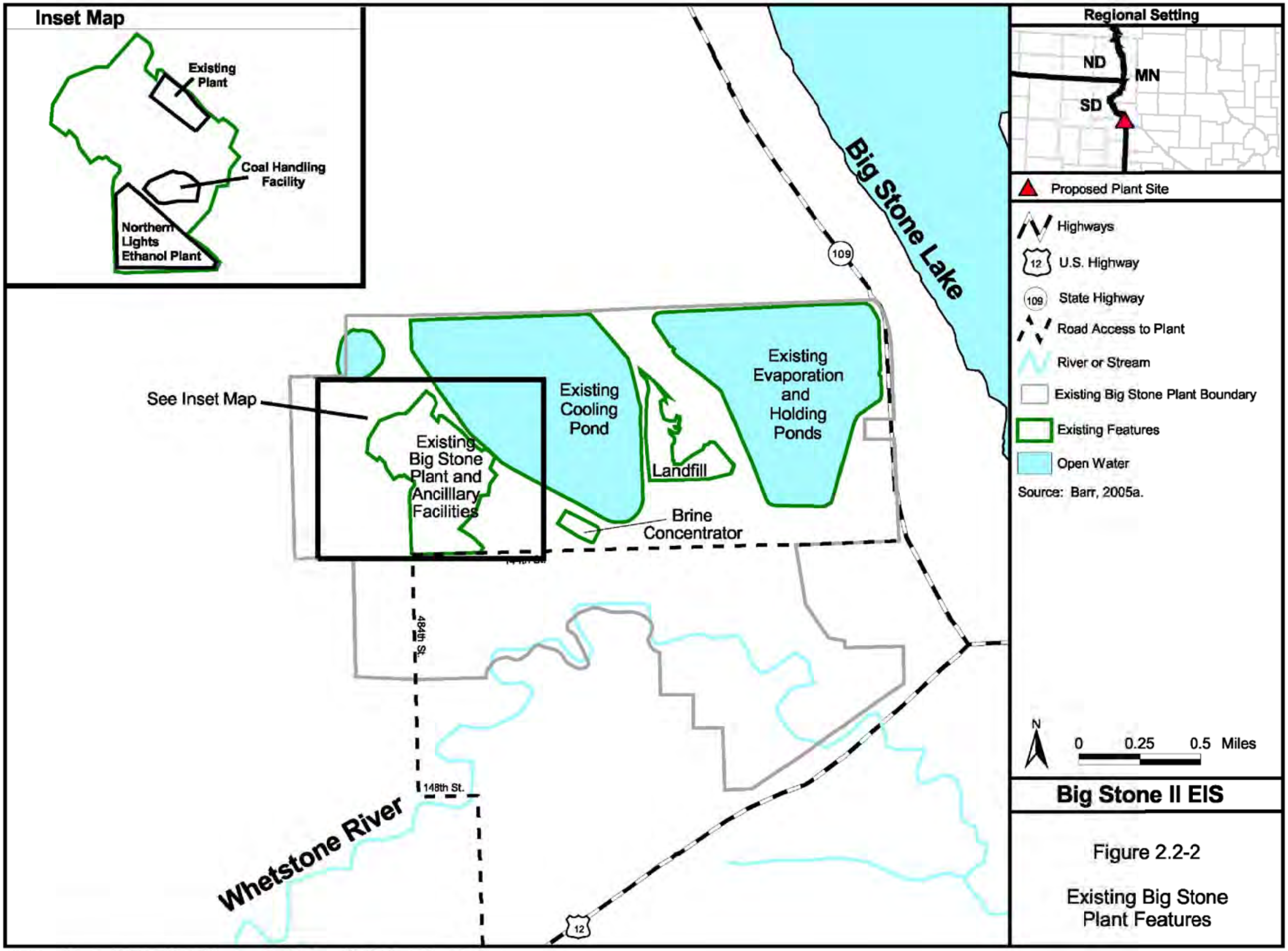


Figure 2.2-2

Existing Big Stone Plant Features

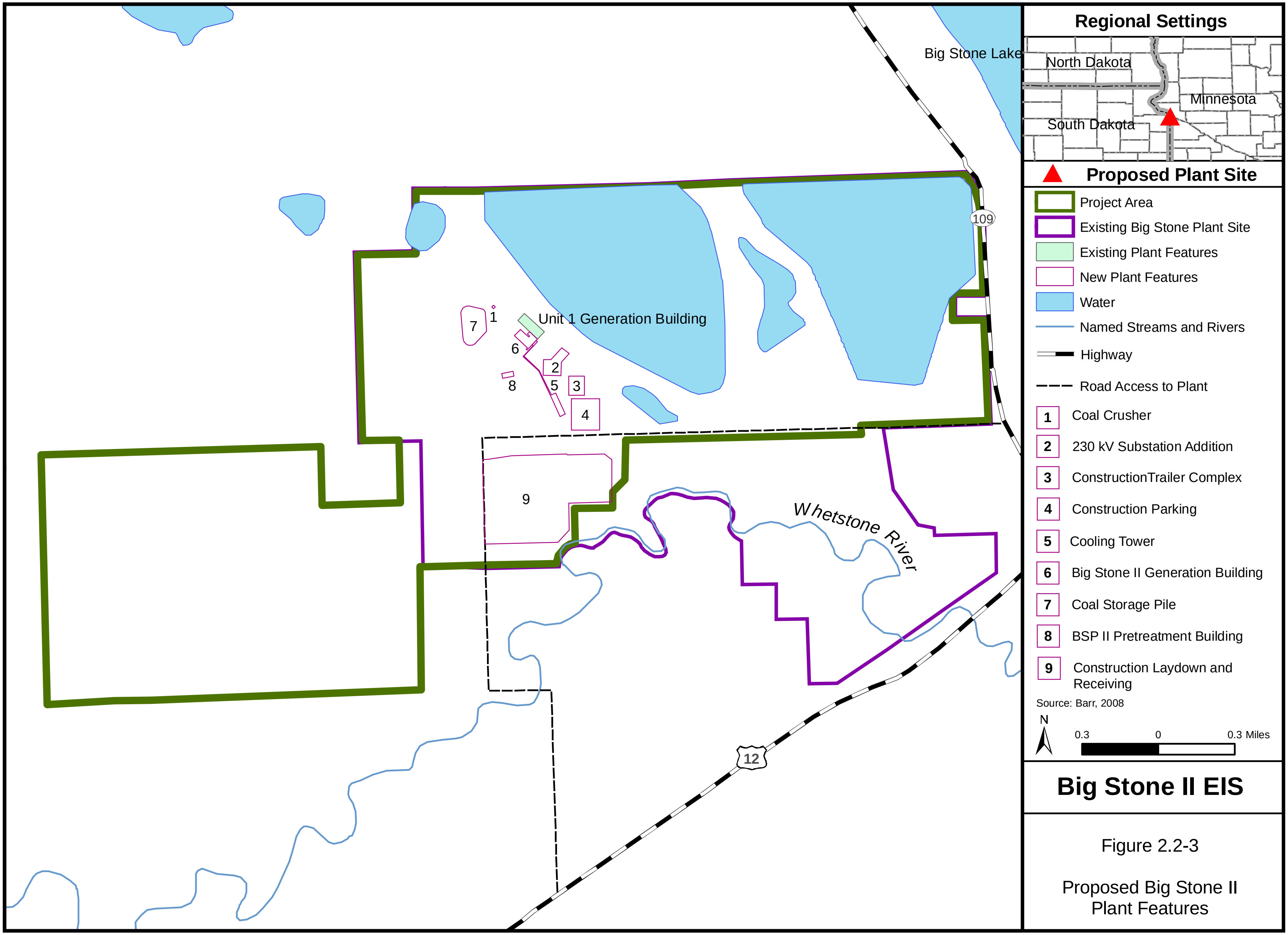


Figure 2.2-3

Proposed Big Stone II Plant Features

construction would include the proposed plant, cooling tower, additions to the existing 230-kV Big Stone Substation, and water treatment facility (BSP II Pretreatment Building). Additional parking and laydown areas for construction would also be required.

Construction activities associated with the proposed Big Stone II plant would occur on already disturbed portions of the existing Big Stone plant site. The main power block (boiler and steam turbine generator) for the proposed Big Stone II plant would occupy approximately 22.8 acres adjacent to the existing Big Stone power block. In addition to the new construction mentioned above, other construction within the existing plant site area would include coal handling and storage additions in the existing coal handling areas, addition of limestone handling facilities, infrastructure associated with the groundwater system, and modifications to the existing water storage and evaporation ponds to accommodate the proposed plant.

The Co-owners would need two areas for temporary use during construction activities for construction laydown and temporary parking. These two areas would comprise approximately 68 acres and 12 acres, respectively, and are currently in agricultural use. Some or all of this acreage used during construction would be restored to agricultural uses, depending upon the ultimate space requirements at the proposed plant.

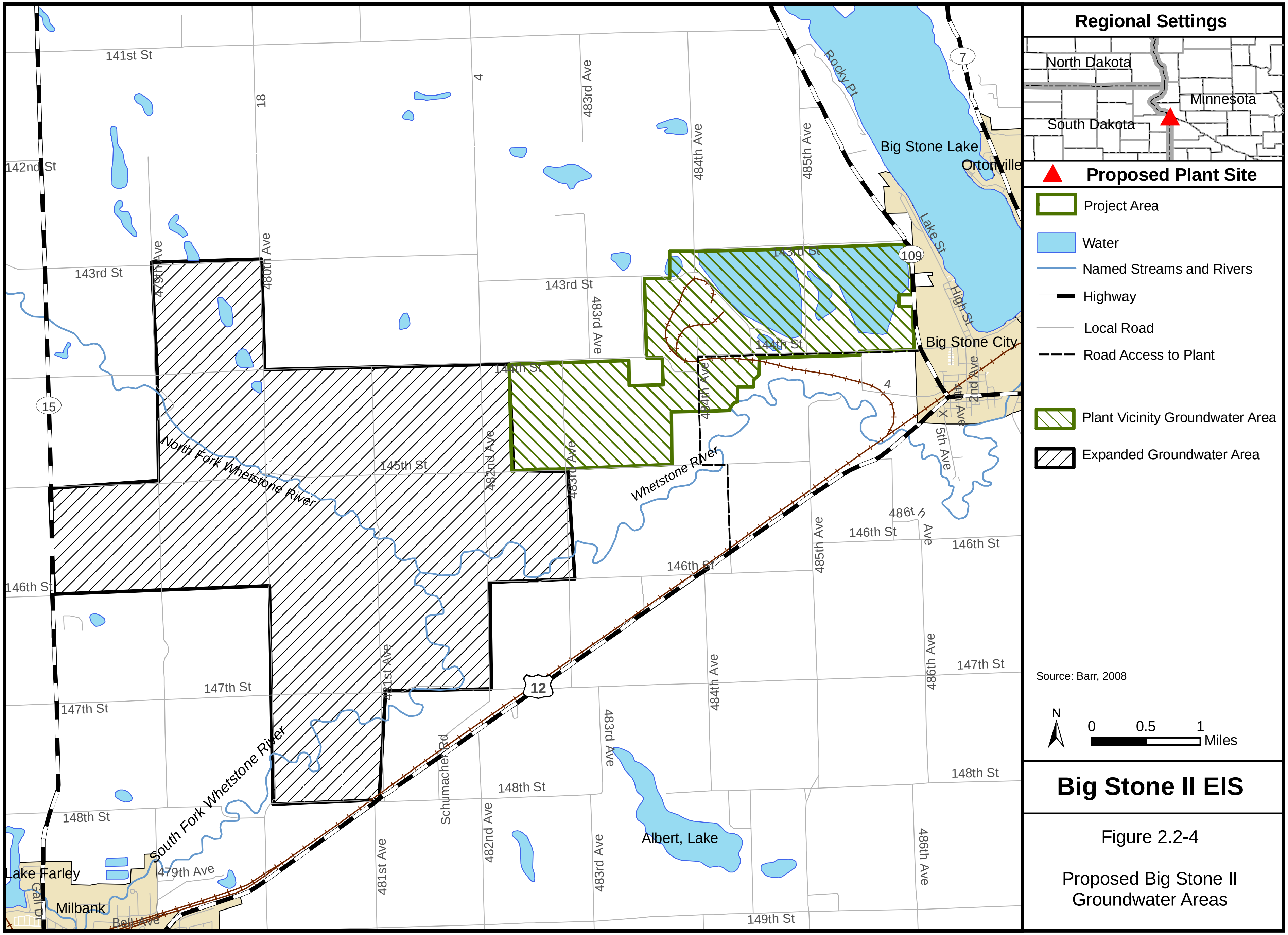
Additionally, the Co-owners propose to construct and operate a groundwater system within the boundaries shown on Figure 2.2-4. The proposed groundwater system would bring groundwater to the proposed plant site for use as make-up water and includes groundwater wells, pumphouses, pipelines, and electrical distribution lines to serve the pumps. The proposed groundwater system area covers 12 square miles of which 11.8 acres would be used for the groundwater system features.

2.2.1.3 Proposed Big Stone II Generating Facility Description

The proposed Big Stone II plant would include a pulverized-coal-fired, super-critical boiler using low-sulfur, Powder River Basin (PRB) coal. The boiler would provide steam to a single steam turbine generator that would convert mechanical energy of the steam turbine to electrical energy. A water-cooled steam condenser would accept the steam exhausted from the turbine and a circulating water system would supply cooling water from a wet cooling tower to the water-cooled steam condenser to dissipate the energy in the condensing steam. The proposed plant process design is shown on Figure 2.2-5.

Boiler

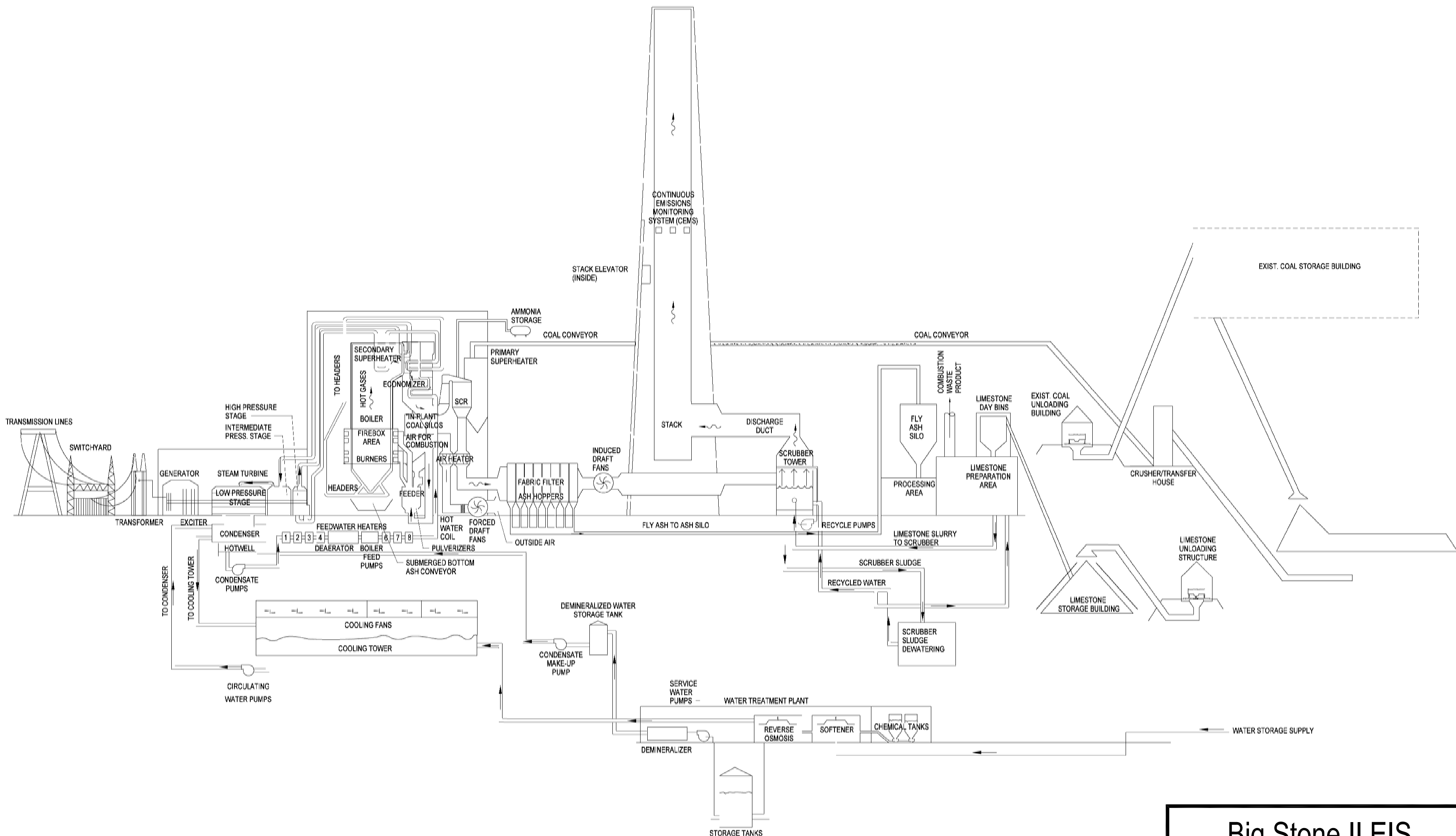
Pulverized-coal (PC) super-critical boiler technology proposed for the proposed Big Stone II plant is a reliable, highly efficient method of energy conversion. The efficiency benefits of super-critical boiler technology include lower fuel requirements and lower emissions of regulated air pollutants, such as particulate matter (PM), sulfur dioxide (SO_2), nitrogen oxides (NO_X), and mercury. Studies also indicate that greater efficiencies for this technology result in substantial reductions in carbon dioxide (CO_2) emissions over the lifetime of plant operations compared to other coal technologies (Viswanathan, 2004). The proposed plant would consume approximately 3.3 million tons of coal per year, compared to about 2.4 million tons per year (tpy) for the existing plant, for a combined consumption of approximately 5.7 million tpy.



Big Stone II EIS

Figure 2.2-4

Proposed Big Stone II Groundwater Areas



Source: Burns and McDonnell, 2005a and OTP, 2008a

Big Stone II EIS

Figure 2.2-5

Plant Process Design

Steam Turbine Generator

The proposed Big Stone II plant steam boiler would provide steam to a single steam turbine generator to produce electrical power (Figure 2.2-5). The super-critical boiler would use a single-reheat system with a condensing steam turbine configured with multiple stages for feedwater heaters and a steam condenser. The turbine would drive a hydrogen-cooled electric generator. Both the turbine and generator would be enclosed in a building.

A water-cooled steam condenser would accept steam exhausted from the turbine. A circulating water system would supply cooling water from a wet cooling tower to a water-cooled steam condenser to dissipate heat from the condensing steam. Electricity produced by the steam turbine generator would be supplied to a step-up transformer and switching equipment for input to the transmission system.

Air Pollution Control Equipment

The emission controls for NO_X, SO_2, and mercury for super-critical PC units are typically identical to those of a similar sub-critical unit. The advantage of the super-critical unit is the improved efficiency, which reduces the amount of fuel consumed per kilowatt-hour of generation, which, in turn, reduces total emissions and waste generation. The emission control equipment for the proposed Big Stone II super-critical boiler would include the following:

<u>Nitrogen Oxide Emissions Control</u>

Boiler NO_X emissions control would be achieved through boiler design and selective catalytic reduction (SCR) treatment. The SCR system would be a specifically designed reactor vessel containing a catalyst, installed between the boiler economizer and air heater. Anhydrous ammonia would be injected into the SCR reactor and would react with the NO_X on the surface of the catalyst to reduce NO_X to molecular nitrogen (an inert element) and water vapor. Operational controls would be used to minimize the amount of ammonia "slip" (i.e., unreacted ammonia) into the flue gas. Anhydrous ammonia is a liquid under pressure. It would be delivered by truck and stored on-site in pressurized storage tanks.

<u>Sulfur Dioxide Emissions Control</u>

Boiler SO_2 emissions control would be accomplished using a Wet Flue Gas Desulfurization (WFGD) system with a design SO_2 control efficiency of 95 percent. The proposed Big Stone II plant would use a fabric filter (baghouse) to first capture particulate matter from the flue gas. The system would then route the exhaust gas through the WFGD system, commonly referred to as a scrubber. The WFGD would be common to the existing Big Stone and the proposed Big Stone II plants and would control emissions of SO_2 from both units. The existing chimney or stack would be retained to allow the existing Big Stone plant to continue to operate in scrubber bypass mode in the event the common scrubber is off-line. A new chimney would be required to support the proposed Big Stone II plant operations and would also be used by the existing Big Stone plant. The SO_2 in the boiler exhaust gases would react with limestone slurry injected into the scrubber to form calcium sulfate or "gypsum." Gypsum is the predominate byproduct of the WFGD and would be processed using a dewatering system; reclaimed water would be used for the existing and proposed plant operations. The waste gypsum would either be used in manufacturing, such as wallboard, or disposed at an on-site landfill (see Section 2.2.1.6). The Co-owners would deliver limestone required by the WFGD system to the plant site by truck or rail and stockpile limestone onsite.

Mercury Emissions Control

The fabric filter (baghouse) and WFGD would reduce mercury emissions. Mercury is present in coal in trace amounts. When coal is combusted, mercury is volatilized and is found in very small concentrations in the uncontrolled flue gas exiting the boiler. The WFGD system would remove the water soluble oxidized mercury from the exhaust gases and collect it in the gypsum. The rate of mercury oxidation depends on many factors including temperature, flue gas composition, and fly ash composition. A small fraction of the elemental mercury in the flue gas may condense onto the fly ash in the flue gas, which would be removed by the fabric filter.

Based on data and emission testing of various coal-fired units nationwide for mercury content in coal and for mercury emissions, the U.S. Environmental Protection Agency (USEPA) concluded that using a fabric filter followed by a WFGD exhibits greater mercury removal than other conventional emissions control configurations when firing sub-bituminous coal (Eddinger, 2005).

The SDPUC Energy Conversion Facility Permit Final Decision and Order requires a site-wide mercury emission cap of 189 pounds (lb) per year and provides a period of three years after commercial operation date to test and implement commercially available, technically feasible mercury emissions control measures.

As part of a Settlement Agreement between the MnDOC and the Co-owners in the MnPUC Certificate of Need proceeding, the Co-owners agreed to install mercury control technology that is most likely to result in the removal of at least 90 percent of the mercury emitted from both the existing and proposed plants, which would result in annual emissions of approximately 81.5 lb of mercury. The Co-owners have four years after the commercial operation date of Big Stone II to achieve compliance with this requirement.

The Co-owners have jointly participated in a mercury control research and testing project on Texas Genco's W.A. Parish Station Unit 8, located in Houston, Texas (Laumb, et. al., 2006). This electric generating unit is a similar size, burns similar coal, and is equipped with similar emissions control equipment and configuration to the proposed Big Stone II plant. The purpose of the testing was to evaluate the suitability of a low-cost additive for reducing mercury emissions. The preliminary test results indicate that mercury removal in excess of 90 percent is possible. Thus, the testing shows promise as a technology for cost-effective reduction of mercury from the proposed Big Stone II plant. The technology may be implemented should additional reductions beyond those achievable with the proposed control equipment be required to meet the terms of the Settlement Agreement or other mercury emission reduction requirements that may be applicable in the future.

Fugitive Particulate Emission Controls

Controls would be applied to potential sources of fugitive particulate emissions. Particulate emission controls would be applied to cooling towers and materials handling operations for coal, fly ash, and limestone.

In general, particulate emissions from materials (coal, fly ash, and limestone) at handling system drop points would be controlled by fabric filters and/or passive dust control processes, or other devices with similar particulate removal efficiencies that would connect to the enclosed handling system. Material collected from dust control systems would be fed back into the respective material handling system.

Carbon Capture and Sequestration

Carbon capture and sequestration (CCS) involves the capture of CO_2 emissions (e.g., in the stack emission after coal combustion), compressing it, and pumping (or injecting) the CO_2 into deep geologic formations for permanent storage. Technologies for burning fossil fuel more efficiently and with reduced CO_2 emissions, as well as post-combustion CO_2 CCS technologies, are all being researched. Currently, there are no feasible technologies or alternative technologies that are commercially available to reduce greenhouse gas (GHG) emissions. Although CCS technology is not expected to be commercially demonstrated in the foreseeable future, the Co-owners have conducted a "Carbon Capture Retrofit Ready Analysis" (OTP, 2008b). This analysis concludes that should a CCS retrofit be required, there is adequate area within the Big Stone property boundary to accommodate the process equipment. This analysis also indicates that the proposed configuration of ductwork and equipment would accommodate a retrofit of carbon capture technology. Additional discussion of CCS may be found in Section 2.5.1.11.

Diesel Generator Air Emissions Controls

Operational requirements include installing a back-up diesel-fired internal combustion engine-driven generator. The back-up generator would be capable of safely shutting down the proposed Big Stone II plant in the event of a plant trip or blackout conditions. The engine would include state-of-the-art engine technology to minimize emissions and a catalyzed diesel particulate filter. The engine would be required to meet USEPA's New Source Performance Standards for Stationary Compression Ignition Internal Combustion Engines for particulate, carbon monoxide, NO_X, and non-methane organic compounds. A separate permit would not be required for the backup generator since it is covered under the Prevention of Significant Deterioration (PSD) construction permit for the entire plant.

Diesel Fire Pump Air Emissions Controls

Three, diesel-fired, internal combustion, engine-driven, emergency fire water pumps would be installed to support fire suppression in the event of a fire at the site. Similar to the diesel generator, the engines would include state-of-the-art technology to minimize emissions and a catalyzed diesel particulate filter. The engines would also be required to meet USEPA's New Source Performance Standards for Stationary Compression Ignition Internal Combustion Engines. A separate permit would not be required for the three engines since they are covered under the PSD construction permit for the entire plant.

2.2.1.4 Water Supply and Use, Water Treatment, Wastewater Management, and Plant Cooling System

Water Supply and Use

The proposed Big Stone II plant, with the proposed wet cooling system, would require approximately 8,800 acre-feet per year (afy) of make-up water in addition to the 4,200 afy currently required for the existing Big Stone plant operations, for a total of about 13,000 afy. This total combined maximum water consumption of about 13,000 afy is an increase of about 1,300 afy from the 11,700 afy stated in the Draft EIS. This increase is the result of additional design information for the proposed Big Stone II plant and the revised water management and water treatment plans for the proposed Project. The primary source of water for the existing plant and the proposed Big Stone II plant would be withdrawals from Big Stone Lake. Groundwater would be used to supplement the water needs of the combined plants.

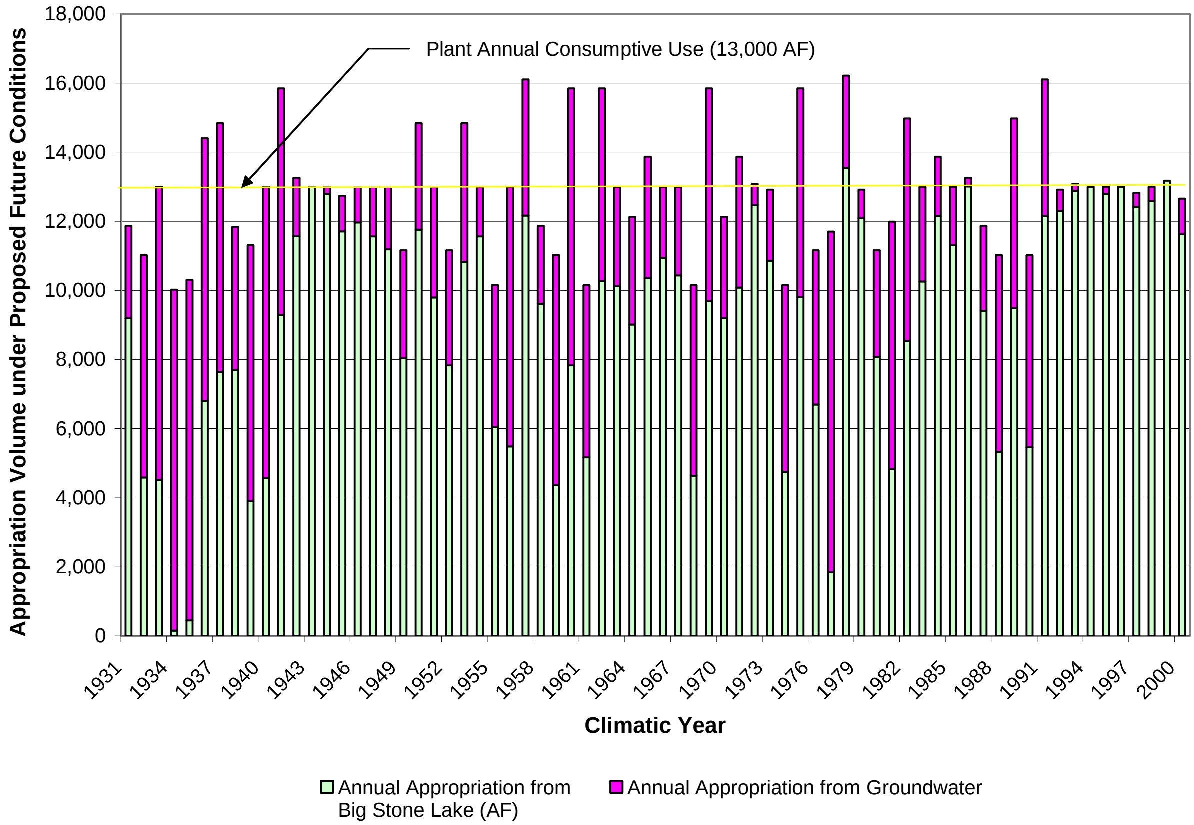
The existing Big Stone plant is permitted by the South Dakota Department of Environment and Natural Resources (SDDENR) to withdraw up to 110 cubic feet per second (cfs) and up to 8,000 afy from Big Stone Lake. The permit also includes operating limits, including a restriction that water cannot be withdrawn when Big Stone Lake levels are below 967 feet above sea level. This restriction limits withdrawals during winter and to times of high flows, usually the spring months. If the proposed Big Stone II plant is constructed, the 8,000 afy limit would need to be increased to meet the combined plant's needs. In June 2006, OTP submitted an application to the SDDENR to appropriate an additional 10,000 afy from Big Stone Lake. The permit application was based on the original plant design, which included constructing a 450-acre storage pond to store surface water for use as make-up water. The SDDENR authorized Water Permit No. 6678-3 on November 1, 2006 (SDDENR, 2006b). The operating restrictions of the previous permit and the diversion rate of 110 cfs were not changed. The two permits authorize a combined withdrawal of surface water (for both plants) of up to 18,000 afy.

Under the proposed Project, the current proposed Big Stone II plant design calls for use of groundwater as an additional source of make-up water for the combined plants. The use of groundwater would replace water that would have been kept in storage in the make-up water storage pond under the original proposal.

Detailed modeling of the proposed annual water withdrawals from Big Stone Lake was performed to determine the amount of water needed from surface water, groundwater, or a combination of both, to meet the needs of the combined plants, taking into consideration the limited storage capacity (3,500 acre-feet (af)) of the existing Big Stone plant ponds. The modeling is described in detail in Section 4.2.

Under the modeling assumptions, the existing and proposed Big Stone plants would pump water from Big Stone Lake into the existing storage ponds whenever permitted (primarily during the winter and spring months). Water from the existing storage ponds would be used as make-up water for the combined plants' use. The existing storage ponds would be kept as full as possible. When levels in the storage ponds are low, and appropriations from Big Stone Lake are not permitted, groundwater would be used to fill the storage ponds. The modeling was performed over a 70-year period of historical climatic conditions between the years 1930 and 2000 in order to approximate conditions that may occur over the life of the proposed Big Stone II plant (Barr, 2007b).

The modeling results are summarized in Figure 2.2-6. This figure illustrates the relative volumes of surface water and groundwater the existing and proposed Big Stone plants would need over the 70-year period modeled. The amount of surface water available annually to operate the existing and proposed plants ranged from zero af to 13,600 af and averaged 9,300 af. The amount of groundwater required annually to operate the existing and proposed plants ranged from zero af (four out of 70 years) to 10,000 af (three out of 70 years) and averaged 3,720 afy. The model indicates that groundwater would need to be withdrawn from the Veblen Aquifer in 66 of the 70 years.



Source: Barr, 2007b.

Figure 2.2-6 Modeled Surface Water and Groundwater Appropriations

In drought years, where combined surface water and groundwater appropriation is less than the plant requirement of 13,000 af, water would be withdrawn from the plant cooling pond. In subsequent years, the total water appropriation would be greater than 13,000 afy in order to refill the depleted cooling pond after those drought years. This may occur when either surface water or groundwater is available and when there is storage available in the cooling pond. The total maximum annual combined surface water and groundwater appropriation would be approximately 16,200 af, which according to the model, may occur in three years of the 70-year modeling period.

Based on the current water use model estimates and anticipated permit restrictions for Big Stone Lake, approximately 3,720 afy of groundwater would be needed annually (on average) to supplement combined plant water needs. On occasion (e.g., during extreme drought), groundwater would be the sole source of water supply (three of 70 years modeled). The maximum annual groundwater appropriation available to operate both plants at full output under extreme drought conditions would be 10,000 af.

The Veblen Aquifer would supply groundwater used for the proposed plant back-up water supply, which is further described in Section 3.2.2.1. The Veblen Aquifer (or stratigraphic equivalents of the Veblen Aquifer) was selected as the groundwater supply for the proposed Project based on its proximity to the proposed plant, its favorable water-quality characteristics, and its likelihood of producing the requisite quantities of water. Based on the modeling results, OTP applied for a permit to appropriate groundwater in May 2007. On August 23, 2007, the South Dakota Water Management Board approved Water Permit No. 6846-3 for the withdrawal of up to 10,000 afy of groundwater (SDWMB, 2007). Subsequently, the SDDENR issued Water Permit No. 6846-3 on November 6, 2007 (SDDENR, 2007c). A condition of the permit restricts the maximum annual groundwater withdrawal to 4,700 afy, averaged on a rolling 20-year period. This means that over a 20-year period, groundwater withdrawals cannot exceed 94,000 af. The SDDENR retains jurisdiction of the permit, and the total annual water volume (based on a 20-year rolling average) may be reconsidered if information becomes available that warrants reconsideration of permit conditions.

In summary, three water appropriation permits have been issued to the existing or proposed Big Stone plants. Two of the permits authorize a combined withdrawal of up to 18,000 afy from Big Stone Lake. The two permits are (1) the original permit issued for the existing plant (authorizing a withdrawal of 8,000 afy for the existing plant and the ethanol plant[2]) and (2) Water Permit No. 6678-3, which authorizes up to 10,000 afy for the Big Stone site. A third permit (Water Permit No. 6846-3) authorizes a withdrawal up to 10,000 afy of groundwater from the Veblen Aquifer, but not to exceed 4,700 afy, averaged on a rolling 20-year period. However, the combined water appropriation of 28,000 afy under the three permits does not mean that the combined plants would actually use 28,000 afy. This is because the existing plant’s and proposed Big Stone II plant’s combined annual consumptive water use would still average about 13,000 af. This annual use of 13,000 af would include an annual average surface water appropriation of about 9,300 af from Big Stone Lake and an average annual groundwater appropriation of about 3,700 af.

Because occasional drought conditions could occur that could deplete the water stored in the cooling pond, the cooling pond may need to be refilled after those drought years, when either surface water or groundwater is available. If this occurs, there would be an occasional need to appropriate more than the average 13,000 afy. Therefore, the theoretical maximum use of surface water and groundwater during any year would equal the sum of (1) the existing and proposed plants' annual average consumptive use (i.e., 13,000 af) plus (2) the amount required to refill the working volume of the water storage pond (i.e., 3,500 af). Thus, the theoretical maximum annual use would be 16,500 af. This assumes that the entire working storage volume of 3,500 af of the total storage pond volume of 5,440 af would be completely depleted at the beginning of the year, but would be filled by pumping 3,500 af into the pond by the end of the year.

As shown by Figure 2.2-6, the modeled maximum annual combined surface water and groundwater appropriation would be approximately 16,200 af. Combined annual appropriations would exceed 16,000 af in three years of the 70-year modeling period. The maximum annual surface water appropriation over the 70-year modeling period would be about 13,600 af and the maximum groundwater appropriation would be 10,000 af (three occurrences).

[2] The Poet Refining ethanol plant consumes about 1,129 afy.

Water Treatment

Figure 2.2-7 provides the preliminary water and wastewater mass balance developed for the proposed Project by the Co-owners, assuming a groundwater back-up water supply (Black & Veatch, 2006). A new softening process, referred to as the BSP II Pretreatment System would pretreat groundwater. Construction of the BSP II Pretreatment System affects the entire water balance and allows the cooling tower blowdown to be used as direct make-up water to the WFGD system.

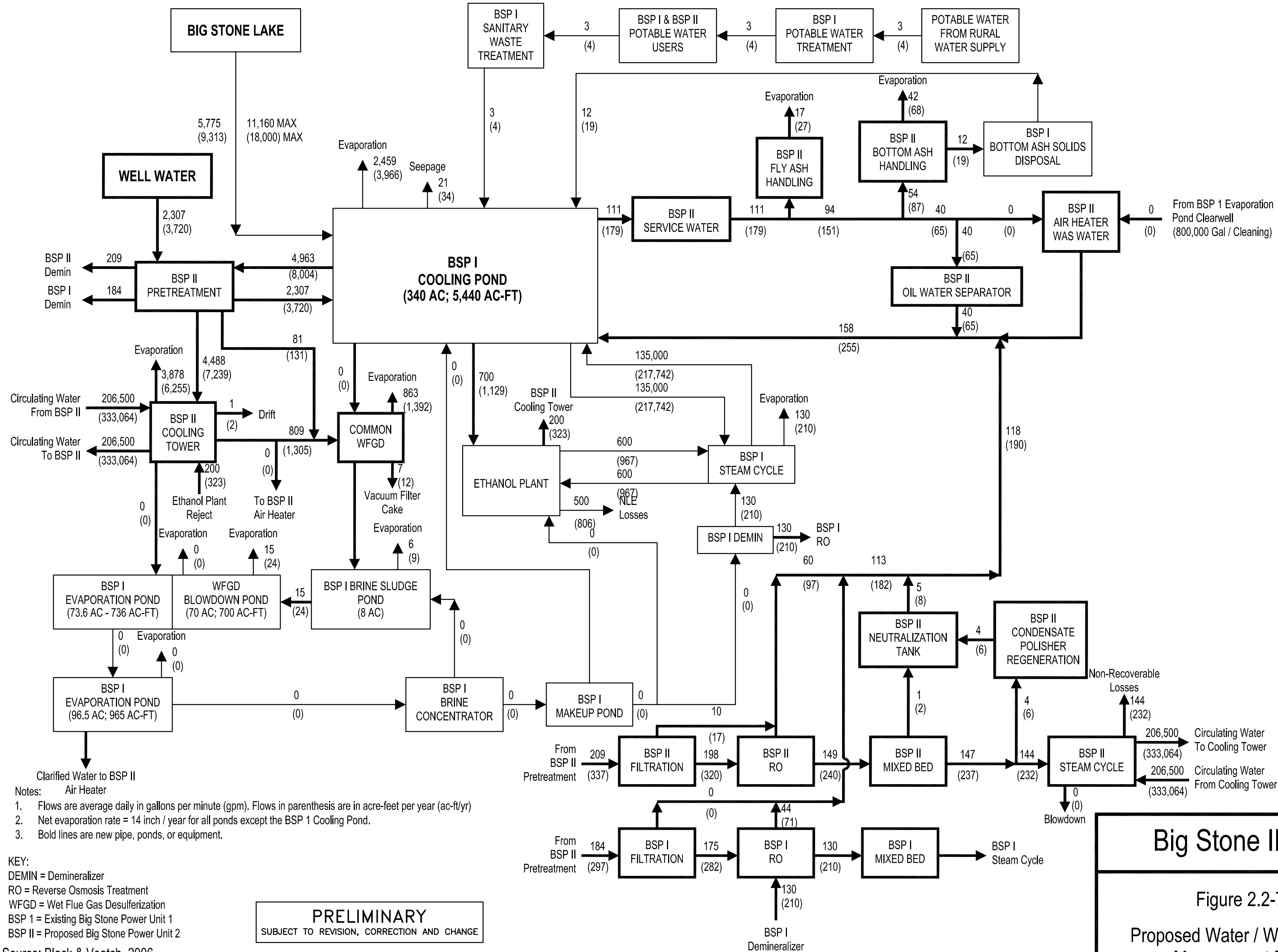
The softening process would reduce scaling and cooling tower blowdown wastewater. The softening process adds lime, soda ash, coagulant (alum), and polymer to produce a settleable solid. The solids would be used in the WFGD system. To the extent that the WFGD could not accept the waste solids from the softening process, such waste would be disposed at the on-site landfill. As shown in the site plan on Figure 2.2-3, a new 96-foot by 240-foot proposed BSP II Pretreatment building, would contain the new softening process with associated lime and soda ash storage silos, with the water storage tanks located adjacent to the building. It would also be used to pre-treat Big Stone Lake water from the existing cooling pond for the existing and proposed plants.

Softened water would be fed to a new filtration and reverse osmosis unit serving both the existing and proposed Big Stone II plants, which would remove approximately 98 percent of the dissolved solids. Additional reduction of dissolved solids would occur by ion exchange within demineralizers that follow the reverse osmosis units in order to produce water suitable for use in the proposed plant's steam cycle. The existing plant would use the demineralizer currently used for treating water, and a new mixed bed demineralizer would be used by the proposed Big Stone II plant. Neutralized wastewater streams from the demineralizers and reverse osmosis reject streams would be routed back to the cooling pond for reuse.

Wastewater Management

The proposed Big Stone II plant would use existing wastewater management facilities to the extent practical. The existing holding pond, a portion of the existing evaporation pond, and the existing brine concentrator would remain as wastewater treatment facilities. The proposed Big Stone II plant would be a zero wastewater discharge facility, and would balance wastewater production by using evaporation, wastewater concentrating equipment, and wastewater re-use to avoid discharges from the facility. Figure 2.2-7 illustrates the overall water and wastewater uses for the existing Big Stone plant and modifications that would be implemented for construction of the proposed Big Stone II plant.

The original design described in the Draft EIS included a cooling tower blowdown pond, which served as the source of water for the WFGD. The WFGD purge wastewater stream would have been routed back to a lined portion of the blowdown pond and then to the brine concentrator for treatment. The cooling tower blowdown pond is no longer included in the design. As shown in Figure 2.2-7, cooling tower blowdown water would now be directed to the common WFGD system for reuse. The purge stream wastewater from the WFGD system would be routed to the existing plant's brine sludge pond, a 9.1-acre lined pond, for settling of suspended solids. Following construction of the proposed Big Stone II plant, the existing brine sludge pond would serve as the WFGD system blowdown-settling pond. The settled solids would remain in the WFGD system blowdown-settling pond, which periodically may require removal and disposal in the existing on-site landfill. The wastewater remaining after the solids have settled would be routed to a new pond for natural evaporation. This new WFGD blowdown pond would be constructed by lining 70 acres of the existing 140-acre evaporation pond at the existing plant.



Notes:
1. Flows are average daily in gallons per minute (gpm). Flows in parenthesis are in acre-feet per year (ac-ft/yr)
2. Net evaporation rate = 14 inch / year for all ponds except the BSP 1 Cooling Pond.
3. Bold lines are new pipe, ponds, or equipment.

KEY:
DEMIN = Demineralizer
RO = Reverse Osmosis Treatment
WFGD = Wet Flue Gas Desulferization
BSP 1 = Existing Big Stone Power Unit 1
BSP II = Proposed Big Stone Power Unit 2

Source: Black & Veatch, 2006

PRELIMINARY
SUBJECT TO REVISION, CORRECTION AND CHANGE

Big Stone II EIS

Figure 2.2-7

Proposed Water / Wastewater Management Plan for the Proposed Project

The construction workforce's domestic wastewater would be handled by one or more of the following methods: holding tanks, portable treatment facilities, waste collection tank/drain field system, and/or the Big Stone City municipal sewage treatment system.

Plant Cooling System

As described in the Draft EIS, the proposed plant's boiler would provide steam to a single steam turbine generator that would convert mechanical energy of the steam turbine to electrical energy. A water-cooled steam condenser would accept the steam exhausted from the turbine, and a circulating water system would supply cooling water from a wet cooling tower to the water-cooled steam condenser to dissipate the energy (heat) in the condensing steam. The proposed Project would eliminate the cooling tower blowdown pond that would have been located approximately 1,500 feet west of the proposed plant site, and the cooling tower would move approximately 3,600 feet to the east (see Figure 2.2-3).

2.2.1.5 Groundwater Supply System

The Veblen Aquifer would supply groundwater for the proposed plant back-up water supply through a series of groundwater wells. A system of pipelines would convey the groundwater from the well locations to the proposed plant. The wells would be installed within two designated areas depicted in Figure 2.2-4: (1) the "plant vicinity" groundwater area within approximately two miles of the proposed plant site and (2) the "expanded" groundwater area between approximately two to six miles west and southwest of the proposed plant site, located within an approximately 7,694-acre 12-section area.

The Co-owners conducted groundwater modeling and groundwater exploration activities between September 2006 and June 2007. The results indicated the proposed Big Stone II plant would require 7 to 14 wells to supply the proposed plant with adequate make-up water. Fourteen potential well sites were identified during groundwater investigations: two within the plant vicinity groundwater area and 12 within the expanded groundwater area. These 14 well sites were used for the groundwater modeling and impact analysis. The final locations of the proposed well sites are determined by the Permit to Appropriate Water within the State of South Dakota, which is issued by the SDDENR.

Each production well site area would consist of a well and a small pump building within a 2,500 square-foot fenced area. Each well would likely be constructed using 12-inch steel casing from the surface to approximately the top of the aquifer and a 10-inch diameter stainless steel screen over the aquifer zone. Observation wells (installed using two-inch diameter polyvinyl chloride casing) would be installed at selected locations to monitor groundwater levels of the aquifer during pumping operations. Any observation wells installed would be approximately 400 to 500 feet away from the corresponding production well, and observation and production wells would be drilled to approximately 100 to 300 feet below ground level.

Permanent facilities installed at production wells would include a small pre-engineered building (pumphouse) on a concrete slab surrounding the well. The building (approximately 10 by 15 feet) would be weathertight and heated and ventilated, if appropriate. The building would house the water pump, power supply terminal, and disconnect for the equipment, local controls and instrumentation, lighting, and enough free floor space to allow normal maintenance of the pumps. Electrical service to the pumphouse would be provided by the local electric distribution system provider. Each well site would require an access road approximately 50-feet long by 12-feet wide. Two potential well sites are located farther out in agricultural fields within the expanded groundwater area and would require access roads approximately 1,500-feet long.

Equipment required for well drilling and installation activities would include a Rotosonic drilling rig for the exploratory pilot test holes and observation wells, a mud rotary drilling rig for drilling of groundwater production wells, and between two to five support vehicles (automobile or pick-up size) on a daily basis for drilling personnel and other support staff. The drilling rigs would be approximately the size of semi-trailer trucks. A truck-sized vehicle would be needed to deliver up to 300 feet of piping to each groundwater well for installation of the wells. A portable, trailer-mounted electrical generator would be used for pumping tests at the wells.

Construction of the groundwater pipelines and electrical distribution lines would require wetlands, stream, and river crossings. Depending upon the point of stream crossing, streamflow may be low enough for excavations to occur within the stream, followed by installation of the pipeline, and burial. These types of stream crossings would only be undertaken where it could occur with minimal impacts, and in accordance with any permit requirements. Alternatively, crossing a stream using directional boring technology (i.e., under the stream) would also be considered. At those locations where it is necessary to cross wetlands, streams, or tributaries, crossing would be in compliance with the applicable USACE and SDDENR permit requirements following procedures typical of utility line installations. Any disturbances would be temporary, and any area disturbed would be restored shortly after construction in accordance with permit requirements.

Groundwater Pipeline

A pipeline system would be required to convey the produced groundwater from the production wells to the proposed plant. The pipeline would be constructed of either high-density polyethylene or polyvinyl chloride materials. The pipeline would be buried approximately 7.5 feet deep to prevent the line from freezing. The pipeline would vary in diameter depending on the number of production wells connected to it. Based on anticipated flow rates, the pipe size would increase in diameter as each production well is added to the main pipeline. Pipes from individual production wells are expected to be eight to 10 inches in diameter, and the main pipeline, at its maximum diameter would be approximately 20 to 30 inches. The groundwater pipeline system is still in the design phase; therefore, the exact pipe diameters and routes of pipelines connecting the groundwater production wells to the plant are not yet known. The pipeline system, with a linear requirement of up to 80,000 feet (approximately 15 miles), would be installed where possible along existing road rights-of-way (ROW).

2.2.1.6 Materials Handling and Waste Management

Fuel and Limestone Receiving, Handling, and Storage

Construction of the proposed Big Stone II plant would require the addition of new ancillary material handling and storage facilities and upgrading the existing facilities used for the existing Big Stone plant. All coal delivered to the Big Stone site is, and would be, delivered by rail via the existing Big Stone plant rail spur. The proposed Big Stone II plant would operate at a coal burn rate of approximately 376 tons per hour (tph); the existing Big Stone plant currently operates at approximately 270 tph. The coal requirements for both plants would total approximately 646 tph. Based on operating at a maximum level at 100 percent of the time (100 percent plant capacity factor), the existing Big Stone plant and the proposed Big Stone II plant would require approximately 5.7 million tpy of PRB coal. Assuming 100 percent capacity requirements and a unit train size of

14,400 tons (unit train is comprised of 120 cars, each car containing 120 tons), the unloading system would need to handle approximately seven unit trains per week. However, annual operational levels of the plants are expected to average approximately 88 percent, so the actual usage deliveries would be proportionally less.

A coal unloading rate of 3,600 tph, or approximately four hours per unit train, must be achieved to effectively integrate the proposed Big Stone II plant into the existing Big Stone operations. This criterion would require upgrades to existing vibrating feeders/conveyors and the existing transfer point structure.

Other coal-handling improvements required for the proposed Big Stone II plant would include:

- Installing a new stock-out system that would deliver coal to a new 28,000-ton coal storage pile.
- Installing a new dual reclaim hopper and new enclosed crusher house with assorted conveyor interconnections.
- Installing new conveyor interconnections between the new crusher house and stock-out pile and the proposed Big Stone II plant.

The Co-owners would transport limestone (required for the WFGD system) to the Big Stone site by rail or truck, depending on which is most cost effective. Rail transport would use 100-ton railcars; truck transport would use 22-ton trucks. To operate at 100-percent capacity, the proposed Big Stone II plant would require an estimated 37,740 tons of limestone (a reduction from 94,000 tons described in the Draft EIS) and the existing Big Stone Plant would require 35,360 tons (a reduction from 91,000 tons in the Draft EIS). The reduction in the annual amount of limestone needed is based on detailed design of the proposed Project that anticipates using a grade of PRB coal with lower sulfur content than was projected in the Draft EIS. Rail shipment to supply limestone for both units would require a maximum of 730 rail car loads per year; truck shipments would require a maximum of 3,318 truckloads per year.

Vibrating feeders would transfer limestone from a receiving hopper to an unloading conveyor at a rate of 500 tph. Approximately 6,000 tons of limestone (30-day supply) would be stored and covered using a hooped-type structure with open or partially open ends measuring approximately 60 by 100 feet. This is smaller than the approximately 20,000 square-foot umbrella-shaped structure proposed in the Draft EIS.

Solid Waste Management

Coal combustion by-products include bottom ash, fly ash, and gypsum. Maximum and average coal combustion by-products have been estimated based on maximum coal consumption of 3.3 million tpy for the proposed Big Stone II plant and 2.4 million tpy from the existing Big Stone plant and assuming an 88 percent capacity factor along with the variable percent ash and sulfur content. Maximum and average annual waste generation from each power plant and the total for both plants is provided in Table 2.2-1. Table 2.2-1 has been revised from the estimates provided in the Draft EIS based on more refined plant design criteria.

Table 2.2-1. Average and Maximum Waste Generation (tpy)

Waste Form	Proposed Big Stone II Plant Average[a]	Existing Big Stone Plant Average[a]	Proposed Big Stone II Plant Maximum[b]	Existing Big Stone Plant Maximum[b]
Bottom Ash	38,000	84,000	49,000	104,000
Fly Ash	106,000	45,000	148,000	58,000
Gypsum	55,000	52,000	71,000	67,000
Total	199,000	181,000	268,000	229,000

[a]Assuming 88 percent capacity factor and average waste generation.
[b]Assuming 100 percent capacity factor and maximum waste generation.

Source: Barr, 2005a and OTP, 2008a.

Bottom ash would be disposed of at the existing on-site landfill. Fly ash would be conveyed to on-site storage silos. Fly ash that does not meet marketable specifications (or cannot be sold for other reasons) would be disposed of at the existing on-site landfill. Gypsum would be disposed of at the existing on-site landfill or trucked off-site for use in manufacturing sheetrock or wallboard. Fly ash disposal also could be achieved by hauling it off-site by rail.

Bottom ash could be used as structural fill at the proposed plant site or at non-related off-site construction projects. Fly ash could be used for soil stabilization, as a structural fill, or as a replacement for Portland cement in concrete. Gypsum produced by a WFGD system potentially could be used for making wallboard or as a supplement for making wallboard and cement. As much as 60 percent fly ash along with a superplasticizer is excellent for improving the strength and durability of concrete (Rosenbaum, 1998). Secondary benefits from using fly ash could result in reduced CO_2 that would be generated as part of cement production.

On-Site Landfill

Waste disposal requirements for the on-site landfill would average approximately 380,000 tons annually over 20 years for the combined plants for a total of more than seven million tons. Disposal of approximately seven million tons of bottom ash, fly ash, and gypsum over 20 years would require a site capable of containing approximately seven million cubic yards of material. Requirements for containing the material would total a minimum of 127 acres of land surface (assuming typical compaction factors and an average disposal depth of 35 feet). Actual size of the disposal site would be contingent upon depth of disposal material, containment cover, and other factors.

Based on these projections, the existing Big Stone plant landfill would accommodate approximately 10 years of disposal before it would need to be expanded. This projection is based on average coal characteristics, an 88 percent plant capacity factor, and average ash and sulfur content of the coal. Any byproduct sales would proportionately extend the remaining landfill life. An additional landfill would require permits in accordance with Federal, State, and local requirements and is not included in the analysis for this EIS, because the ultimate need for new landfill space is undetermined (since sales of ash by-products could significantly extend the life of the landfill) and the site location, if needed, is unknown at this time. Permitting would begin approximately three years prior to reaching capacity of the existing disposal site.

Chemicals Management

Operation of the existing Big Stone and proposed Big Stone II plants would require a variety of chemicals and materials used by various plant systems. Table 2.2-2 lists the materials, quantities, delivery frequencies, and delivery methods for the proposed Big Stone II plant, which has been updated from the presentation in the Draft EIS, to reflect more refined design information and the proposed Big Stone II pretreatment system. Some of the chemicals and materials are hazardous substances and, as such, require appropriate handling and storage equipment and associated documentation.

Hazardous Wastes

Normal day-to-day operations of the proposed Big Stone II plant would generate minimal amounts of hazardous waste. Periodically, certain maintenance activities could generate hazardous waste (i.e., chemical metal cleaning of the boiler or other equipment). Such wastes would be contained and disposed of at an approved waste disposal site.

2.2.1.7 System Communications

Systems operations would require extended-bandwidth Ethernet communications to the plant site, by either microwave or optical ground wire (OPGW). The upgraded microwave system would require a new tower in the 400- to 450-foot range at the Big Stone plant site. Additional uses for the tower would be for upgraded microwave communications to Blair Substation and upgraded microwave communications to OTP's Milbank office. Use of the existing stub tower that is on top of the Big Stone facility is not technically feasible.

The use of OPGW could be useful to provide communication links to other locations within the OTP service area. The additional bandwidth from either the microwave or OPGW also would be used for telephone service to the proposed Big Stone II plant, company Intranet, Supervisory Control and Data Acquisition (SCADA) communications, and wireless network access.

The proposed Big Stone II plant would be wired for an office telephone system along with network system wiring. A separate SCADA unit would be installed either in the common plant control room or in the adjacent plant substation. The SCADA unit would likely be digitally linked to the proposed plant control system for more precise remote monitoring from OTP's Fergus Falls System Operations Center.

2.2.1.8 Power Plant Construction

Construction of the proposed plant would involve civil construction (site grading, excavation, and foundations), structural construction (structural steel construction for boiler, WFGD system, and other supporting facilities), and electrical construction (wiring and interconnections), all of which would be designed to accommodate the proposed plant's equipment received from manufacturers. The sequence of construction would generally progress as follows:

- Site work and foundations
- Erection of structures and buildings
- Installation of major equipment components

Table 2.2-2. Anticipated Proposed Big Stone II Plant Chemicals

Material	Annual Use[a]	Delivery Quantity and Frequency[c]		Storage Location and Amount	
		Quantity[a]	Frequency	Location	Amount[a]
Wastewater Treatment System					
Scale Inhibitor	70	250	1/year	Curbed Area	500
Sulfuric Acid (96%[b])	650	3,000	1/year	Bulk Tank[d]	6,000
Anti-foaming Agent	35	250	1/year	Curbed Area	500
Sodium Hydroxide (50%[b])	70	250	1/year	Curbed Area	500
Cooling Tower Chemicals					
Sulfuric Acid (98%[b])	165,000	3,000	1/week	Bulk Tank[d]	6,000
Scale Inhibitor	12,000	1,500	8/year	Bulk Tank[d]	3,000
Biocide (12.5%[b] NaOCl[e])	190,000	4,000	1/week	Bulk Tank[d]	7,500
Boiler Make-up Water Treatment					
Anti-scalant	1,100	250	5/year	Curbed Area	500
Sodium Bisulfite	8,800 lb	1,000 lb	9/year	Curbed Area	2,000 lb
Rev Osmosis Cleaning Solution	30,000	2,500	1/month	Curbed Area	2,500
Sulfuric Acid	3,000	3,000	1/year	Bulk Tank	6,000[f]
Sodium Hydroxide	2,700	250	11/year	Curbed Area	500
Cycle Chemical Feed					
Oxygen	1,800 lb	120 lb Cylinders	15/year	Cylinders	240 lb
Ammonia	11,000	250	1/week	Curbed Area	500
Circulating Water Make-up Treatment					
Lime	4,000 ton	20 ton	4/week	Bulk Silo	80 ton
Soda Ash	5,000 ton	20 ton	5/week	Bulk Silo	100 ton
Hypochlorite	110,000	4,000	28/year	Bulk Tank	6,000
Coagulant	49,000	3,000	16/year	Bulk Tank	6,000
Coagulant Aid	25,000	1,500	17/year	Bulk Tank	3,000
FGD Chemical Feed					
Limestone	37,740 ton	1,000 ton	38/year	Enclosure	6,000 ton
Other Chemicals and Fluids					
Anhydrous Ammonia	870,000	8,000	weekly	Bulk Tank	30,000
Hydrogen	2,000 lb	Bulk	weekly	Bulk Tank	25,000
Nitrogen	500 lb	Cylinders	Monthly	Cylinders	500 lb
Carbon Dioxide	2,500 lb	Cylinders	Monthly	Cylinders	2,500 lb
Lubricating Oil/Turbine Lubricant	Negligible	Barrels	As required	Tank[d]	5,000
Electro-hydraulic Fluid	Negligible	Barrels	As required	Tank[d]	500
Diesel Fuel (fire pump)	500		As required	Tank[d]	500
Diesel Fuel (emergency generator)	500		As required	Tank[d]	500

[a]All units are in gallons, unless otherwise specified.
[b]Percent of solution.
[c]All deliveries are by truck.
[d]With containment.
[e]Sodium Hypochlorite.
[f]Boiler make-up water treatment sulfuric acid tank shared with circulating water make-up system.

Source: OTP, 2005b and 2008a.

- Mobilization
- Installation of supporting systems
- Electrical and controls testing and functional checkout
- Start-up of equipment and systems
- Initial operation
- Performance and environmental testing
- Commercial operation

Plant construction would not require the addition of new off-site staging areas. Temporary equipment and material storage areas and similar staging sites would be within the confines of the existing plant site property. These proposed materials laydown and construction parking areas are shown in Figure 2.2-3. Other temporary facilities required to support construction would include potable water, sanitary, and temporary warehouse facilities.

Heavy site-grading and excavation equipment (bull dozers, excavators, track hoes, graders, and trenchers) would be used for civil construction. Structural construction would require large cranes to erect the steel for the boiler superstructure, which would have a height of approximately 300 feet. Numerous smaller cranes would support construction of other facilities. A reinforced concrete stack would be constructed with a height of 498 feet.

During the site grading and excavation phase of construction, protective measures to control storm water construction runoff and erosion would be used, including sediment traps, diversion ditches, silt traps, and perimeter fabric erosion protection, all in accordance with the proposed Project's Stormwater Pollution Prevention Plan.

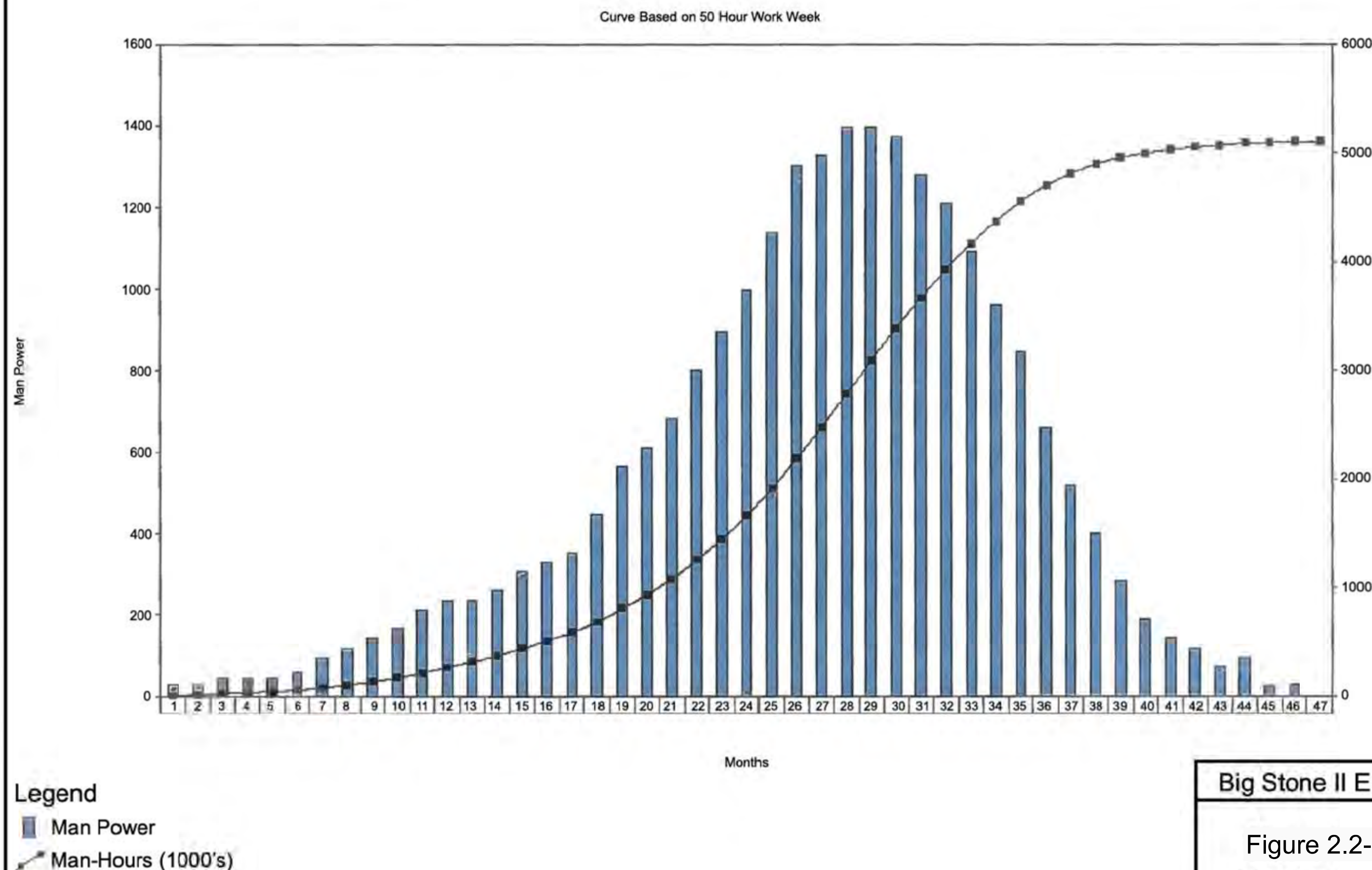
Large equipment components would be delivered to the site by rail, while smaller components would be delivered by truck.

Work Force

Construction of the proposed Big Stone II plant would require as many as 1,400 workers during peak periods, in approximately November and December 2013. Monthly labor projections are provided in Figure 2.2-8.

Schedule

The proposed Big Stone II plant would be constructed over five years with an initial mobilization construction date of August 2010 and commercial operation date of July 2015. Construction milestones are shown in Table 2.2-3, which have been updated to reflect delays in the permitting process due to changes in the proposed Project.



Source: Big Stone II, 2005b.

Big Stone II EIS

Figure 2.2-8

Monthly Labor Projections

Table 2.2-3. Proposed Big Stone II Plant Key Construction Milestones

Activity	Expected Start Date	Expected Finish Date
Mobilization	August 2010	
Site Work and Foundations Construction	October 2010	October 2012
Boiler Steel and Boiler Erection	August 2012	August 2014
Steam Turbine Erection	January 2013	May 2014
Material Handling System Erection	March 2013	February 2015
Groundwater System Construction	July 2011	July 2015
Balance of Plant Construction	May 2012	February 2015
Energize Substation	October 2012	
Boiler Commissioning	February 2015	July 2015
Steam Turbine Commissioning	May 2014	December 2014
Initial Energy and Synchronization	February 2015	
Tuning, Performance, and Availability Testing	February 2015	July 2015
Commercial Operation		July 2015

Source: OTP, 2008a.

Hazardous Materials and Waste

Hazardous wastes generated during construction activities would be contained and disposed of in accordance with Federal, State, and local regulations. Hazardous materials would be transported to and disposed in approved facilities.

2.2.1.9 Operational Work Force

The proposed Big Stone II plant would require an operating staff of 35 employees in addition to the existing 74 employees who presently work at the existing Big Stone plant. All 109 employees would be full time.

2.2.1.10 Project Decommissioning

Project decommissioning would take place following the expected lifespan of the proposed Project (estimated at 30 to 50 years), unless an alternative use for the plant were to be identified. Decommissioning would adhere to Federal, State, and local regulations in place at the time of decommissioning.

2.2.2 Transmission System Additions

Power from the proposed Big Stone II plant would be supplied to the regional interconnected transmission system. The effects on the regional transmission system were studied by adding the 600 MWs of power from the proposed Big Stone II plant and transferring it to each of the respective participants' loads, as described in Section 1.4.2. The results of the studies identified that the proposed Big Stone II plant can be reliably interconnected to the transmission system with one of two transmission alternatives. The alternatives are identified by their endpoints, or the locations where they interconnect with the regional transmission system.

Transmission alternatives for linking the proposed Big Stone II plant with the endpoints are identified in Section 2.3.3 of the alternatives analysis. The proposed Project would include one of the two alternatives briefly described below and discussed in detail in Sections 2.3.3.2 and 2.3.3.3. Since issuance of the Draft EIS, a minor adjustment[3] has been made to the northern portion of Corridor C as shown in Figure 2.2-9.

Alternative A

- Construct a new Big Stone-Ortonville 230-kV line and upgrade the existing Ortonville-Johnson Junction-Morris 115-kV line to 230 kV (Corridor A).
- Construct a new Big Stone-Canby 230-kV line and upgrade the existing Canby-Granite Falls 115-kV line to 230 kV (Corridor C or C1).

Alternative B

- Construct a new Big Stone-Canby 230-kV line and upgrade the existing Canby-Granite Falls 115-kV line to 230 kV (Corridor C or C1).
- Construct a new Big Stone-Willmar 230-kV line (Corridor B or B1).

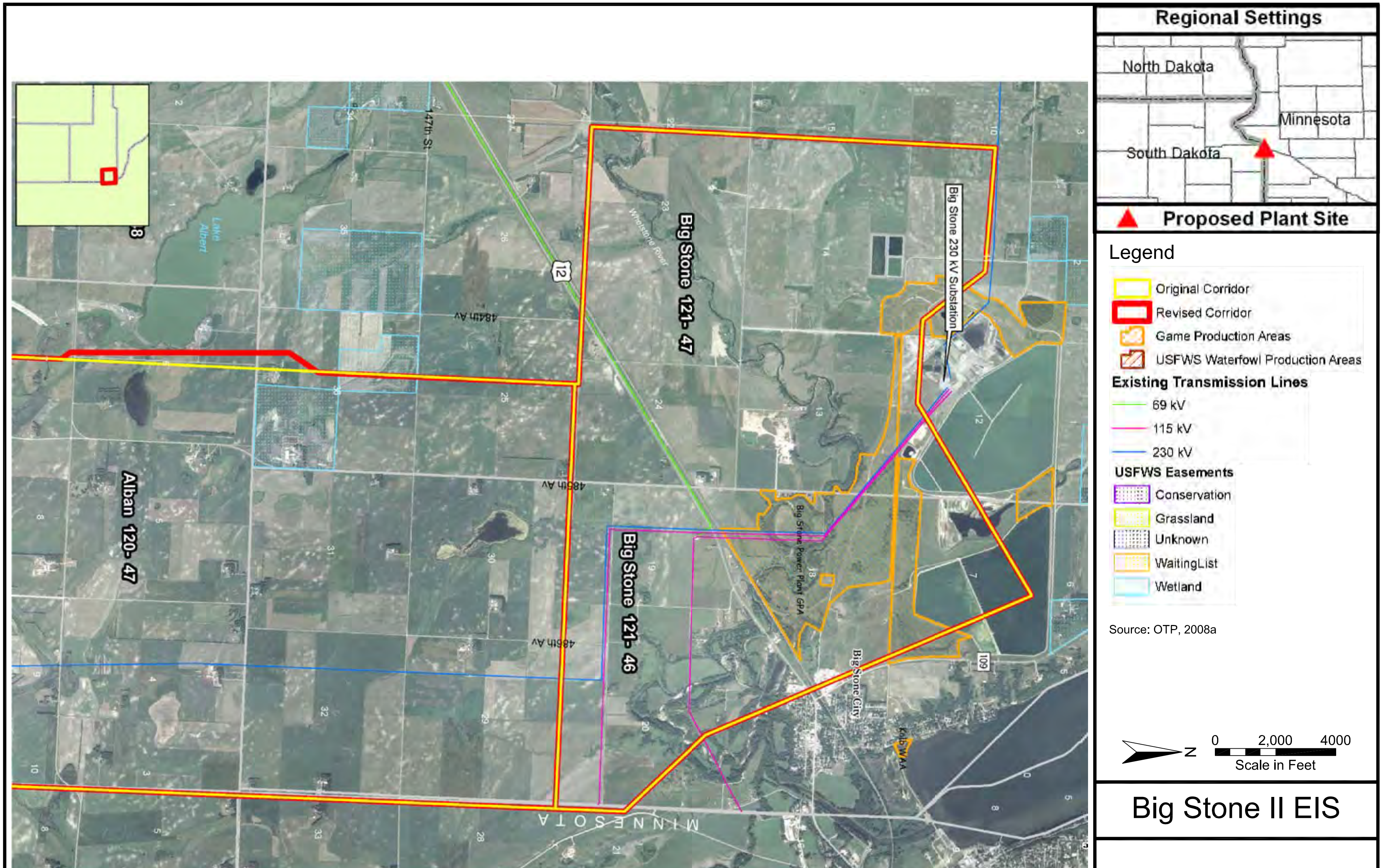
The proposed Big Stone-Canby line and the upgrade of a portion of the existing Canby-Granite Falls 115-kV line from Canby to Hazel Run would be constructed at 345-kV capacity but initially operated at 230-kV. In addition, the Ortonville-Johnson Junction-Morris 115-kV line would be rebuilt under Alternative B.

The SDPUC approved the construction of transmission lines in South Dakota on July 21, 2006. Because Western does not have jurisdiction over the siting of the specific route, the EIS focuses on corridor alternatives and the analysis of the impacts from constructing and operating the transmission lines within the corridor.

The MnPUC approved the Big Stone II application for the Certificate of Need and the Route Permit on January 15, 2009, for construction of transmission lines in Minnesota. The MnPUC issued their final written order granting the Certificate of Need and the Route Permit on March 17, 2009. The MnPUC approved the Co-owners' preferred route: Alternative A (Corridor A to Morris, Minnesota and Corridor C to Granite Falls, Minnesota).

- The information provided in this section applies to either transmission alternative, which includes both 230-kV and 345-kV transmission lines.

[3] Due to an accommodation made by the Co-owners for a nearby property owner, a small section of Corridor C has been expanded to the west by about 500 feet, along an approximately 1.6-mile stretch in Section 36 of Township 121 North, Range 47 West and in Sections 6 and 7 of Township 120 North, Range 47 West. The minor corridor change is shown on Figure 2.2-9, and is about four miles south of the existing Big Stone plant site. The expansion adds approximately 47 acres to Corridor C. The land use within the expanded area of Corridor C (substantially agricultural) is not significantly different than the land use in the adjacent Corridor C. No additional impacts are anticipated in this area due to this minor change. The potential for encountering Native American artifacts within this expanded area would be addressed in accordance with the PA.



Big Stone II EIS

Figure 2.2-9

Minor Modification to Corridor C

2.2.2.1 Interconnection Configuration

Studies were conducted to identify suitable interconnection locations and facilities to deliver power from the proposed Big Stone II plant into the regional transmission system. Results of the studies identified two interconnection alternatives with three endpoints; the alternatives include Morris and Granite Falls substations as endpoints, or Willmar and Granite Falls substations as endpoints. Morris and Granite Falls substations are owned and operated by Western.

2.2.2.2 Transmission Design

Transmission lines would be designed following standards set forth in the National Electric Safety Code and other applicable construction codes. The standards have been established to identify minimum conductor distances to ground, conductor spacing, and other parameters.

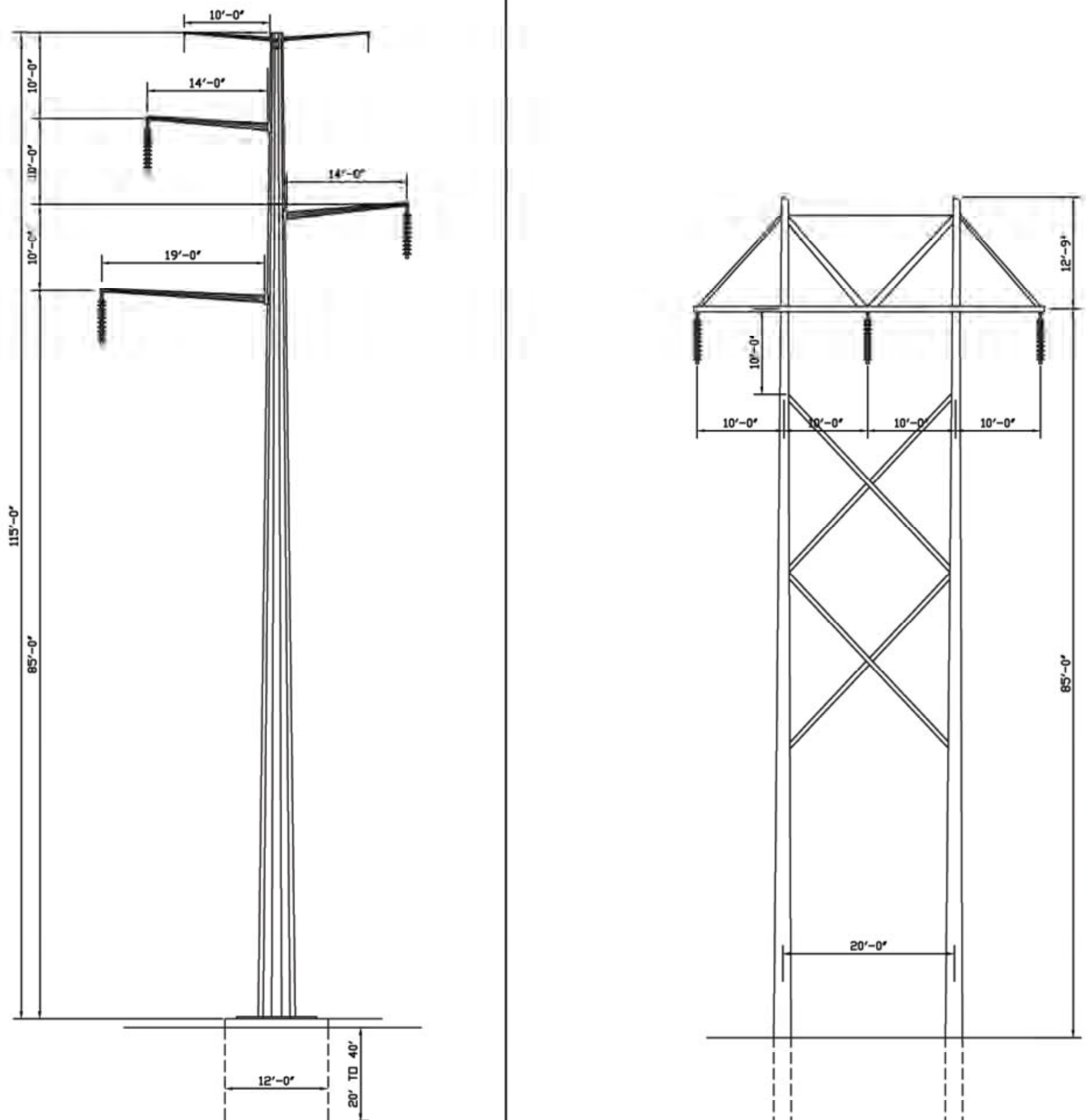
The scope of the EIS does not include specific routing options within corridors; therefore, span distances, structure (tower) designs, and other data represent a range of typical values. Specific values can only be determined following the identification and authorization of specific transmission routes and detailed engineering. The following represents parameters applicable to most project applications.

Span

Span represents the distance between structures (regardless of structure type or service design). Typical span distances applicable to the proposed Project range from 500 feet for a single-pole, 230-kV service rating, to 800 feet for an H-frame, 345-kV service rating. Maximum span distances, regardless of structure type or service rating, would total 1,000 feet. Spans used throughout the proposed Project would be adjusted to account for topography, specific physical resources along the transmission line route, and land uses.

Tower Type

Typical tower (structure) types can range from single-pole to H-frame. In most cases, tangent structures (oriented in a straight line) can be directly imbedded by installing single-pole or the “legs” of H-frame structures in borings to depths that would provide sufficient support for the structures. However, 345-kV single pole structures typically require a concrete base. Dead-end structures typically require installation of guy wires and/or foundations to compensate for angular forces associated with points of inflection or locations where directly embedded structures would not meet safety requirements. Single-pole structures required for 230-kV or 345-kV service typically include the use of davit arms (one arm on one side, and two on the opposite side). Conductors typically hang below a single horizontal cross-arm on H-frame structures. Typical H-frame and single-pole structure designs are shown on Figures 2.2-10 and 2.2-11. Structure heights would range from 70 to 130 feet, depending on structure type, voltage rating, topography, and other considerations. Due to vertically spaced conductors, single-pole structures are typically 15 to 20 feet higher than comparable H-frame structures.



Alternate Concept
Typical Pole
230-kV Davit Arm
Tangent

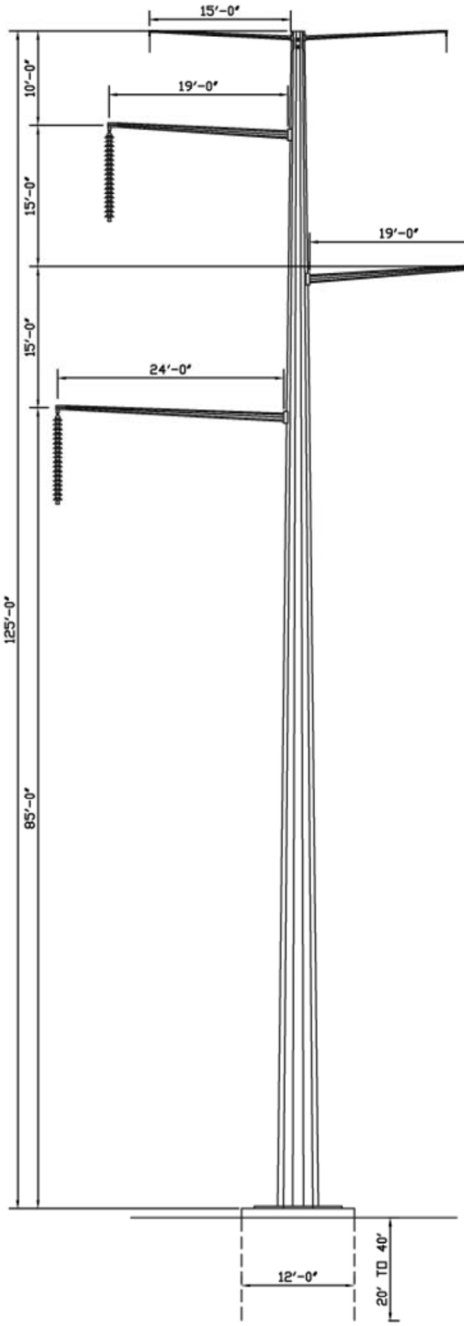
230-kV "H" Frame Standard
Tangent to 2° Angle

Big Stone II EIS

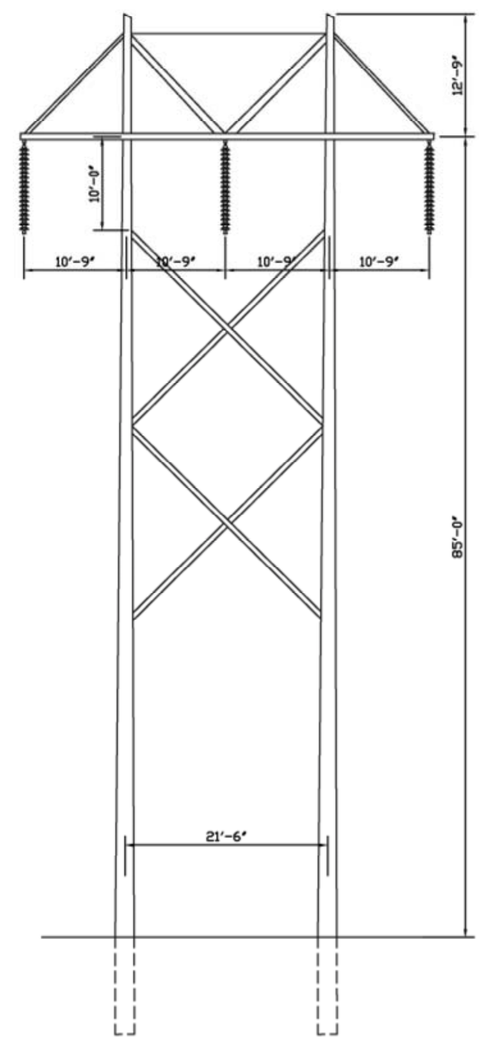
Figure 2.2-10

Typical 230-kV
Single-pole Structure
and
H-Frame Structure

Source: OTP, 2005d



Typical Pole
Single Circuit 345-kV
Tangent



Typical Structure
345-kV "H" Frame Standard
Tangent Structure

Source: OTP, 2005d

Big Stone II EIS

Figure 2.2-11

Typical 345-kV
Single-pole Structure
and
H-Frame Structure

Existing structures within the proposed Project area are typically constructed using wood; however, steel, concrete, and self-weathering steel are available alternatives. Wood poles are readily available and relatively inexpensive. Steel and concrete structures are largely associated with single-pole structures but are also available for H-frame configurations. Self-weathering steel offers an alternative to traditional steel structures.

The Co-owners prefer the use of H-frame structures. Wooden H-frame structures are typically used throughout the proposed Project area and have been in use by OTP since the company's founding.

Conductor

The conductor size and type for each portion of transmission line associated with the proposed Project are identified in Table 2.2-4 based on the information available to date. The selection of the optimal conductors on each transmission line has not yet been decided, but would depend on a number of factors, such as power losses, construction costs, and aesthetics of structure requirements, which would be determined during final transmission design.

Table 2.2-4. Typical Structure and Conductor Design Parameters

Service Rating	230-kV Service		345-kV Service	
Structure Design	Single-pole	H-frame	Single-pole	H-frame
Structure Height (feet ags[a])	80 - 120	70 - 100	90 – 130	80 - 120
Average Span (feet)	500	700	600	800
Maximum Span (feet)	1,000	1,000	1,000	1,000
Conductor Preference	954 ACSS[b] or 1272 ACSR[c]	954 ACSS[b] or 1272 ACSR[c]	Bundled 1272 ACSR[c] or Bundled 954 ACSS	Bundled 1272 ACSR[c] or Bundled 954 ACSS[b]
Capacity (MVA[d])	520 or 725	520 or 725	1,040 or 1,450	1,040 or 1,450
Conductor Horizontal Locations[e]	-19, -14, 14	-20, 0, 20	-24, -19, 19	-22, 0, 22
Conductor Vertical Locations (feet ags[a])	52, 62, 72	42	52, 64.5, 77	60

[a]Feet above ground surface.
[b]Aluminum Conductor Steel Supported.
[c]Aluminum Conductor Steel Reinforcement.
[d]Megavolt amps.
[e]Distance in feet from centerline of structure. Refer to Figures 2.2-10 and 2.2-11 for illustrations of the structure and dimensions. Dimensions and distances would vary, depending on engineering and other factors.

Source: OTP, 2005d.

Insulation and Separation of Circuits

Conductor separation ranges from 14 to 24 feet. Vertical elevation ranges from 42 feet to 77 feet above ground surface, depending upon the service rating and structure design. Table 2.2-4 provides structure design parameters and conductor parameters for single-pole and H-frame structures for 230-kV and 345-kV service.

2.2.2.3 Construction

Transmission line construction would range from removing existing structures and installing new structures within the original ROW or installing new structures within new ROW. Removal of existing structures and replacement with new structures would be considerably more labor intensive than construction along new ROW.

Construction of the proposed transmission lines would generally involve the following sequence:

- ROW Survey
- Access road grading, if required
- Structure site clearing and grading
- ROW clearing, if required
- Construction material delivery and distribution
- Structure foundation hole auguring
- Structure foundation installation (for steel poles only)
- Structure erection and framing
- Conductor and ground (static) wire stringing and tensioning
- ROW clean-up and restoration

Conductor stringing would require the use of temporary pulling and tensioning sites, work areas, and staging areas. Stringing of new conductor over roads, highways, and rail lines would be accomplished using temporary H-frame structures.

Table 2.2-5 describes the parameters for transmission line construction activities.

Table 2.2-5. Transmission Line Construction Parameters

Construction Activity	Parameter[a]
Right of way	
230-kV Transmission Line	125 feet wide
345-kV Transmission Line	150 feet wide
Temporary Access Roads	20 feet wide (included within ROW)
Structure Disturbances	
230-kV Transmission Line Structures	20,000 square feet every 700 feet
345-kV Transmission Line Structures	20,000 square feet every 800 feet
Pulling and Tensioning Site Disturbances	15,000 square feet every two miles
Vehicle Turnarounds	30-foot radius at each structure
Staging Areas	One acre every 25 miles, with one staging area located at the plant site

[a]H-frame construction parameters are the same as for single-pole construction.

Source: OTP, 2008a.

Work Force

Transmission line and substation construction would require an estimated 40 full-time personnel of which approximately 25 would be needed for transmission line construction with the remainder devoted to substation modifications. Part-time personnel also may be needed during construction.

Pulling and Tensioning Sites and Staging Areas

Pulling and tensioning sites would be required at approximately two-mile increments along transmission line construction alignments. Each site would result in a temporary disturbance to approximately 15,000 square feet (0.3 acre). Additional pulling and tensioning sites would likely be required at points of inflection locations along transmission alignments; however, specific locations and numbers cannot be determined at the corridor analysis level.

Temporary use staging areas would be required for each 25 miles of transmission line. Each staging area would total approximately 43,560 square feet (one acre). The actual number and location of staging areas cannot be determined prior to identifying specific transmission line alignments.

Construction Schedule

Transmission line construction would be scheduled to avoid adverse weather conditions, to the extent practical. The schedule duration would be contingent upon design parameters, routing decisions, allocation of construction teams, and other factors. Table 2.2-6 provides an estimated construction schedule for Alternative A (Big Stone-Morris Substation and Big Stone-Granite Falls Substation). Alternative B (Big Stone-Willmar Substation and Big Stone-Granite Falls Substation) would require a similar schedule. Construction milestones have been updated to reflect delays in the permitting process and due to changes in the proposed Project.

Table 2.2-6. Transmission Interconnection Construction Schedule

Date	Activity
January 2012	Start Big Stone Substation-to-Canby Transmission Line
April 2012	Start Big Stone Substation Modifications
May 2012	Start Canby Substation Relocation
January 2013	Finish and Test Big Stone-to-Canby Line and Canby Substation
March 2013	Start Canby-to-Granite Falls Transmission Line
April 2013	Start Granite Falls Substation
December 2013	Finish and Test Canby-to-Granite Falls Transmission Line and Granite Falls Substation
November 2013	Start Johnson Junction-to-Morris Substation Transmission Line and Morris Substation
March 2013	Start Johnson Junction Switching Station/Substation
May 2014	Finish and Test Johnson Junction-to-Morris Substation Transmission Line and Morris Substation
May 2014	Start Big Stone-to-Johnson Junction Transmission Line
December 2014	Finish and Test Big Stone-to-Johnson Junction Transmission Line
December 2014	Transmission system substantially complete

Source: OTP, 2008a.

2.2.2.4 Maintenance and Operation

Transmission line maintenance would be done with existing crews and would be carried out on an as-needed basis. To the extent practical, non-emergency repairs would be scheduled to avoid conflicts with agricultural practices and when the ground is wet or when access would be difficult. Permanent roads and trails would not be constructed or maintained. ROW clearing would be limited to woody species that would grow to a height that could interfere with line conductors. Herbicides would be applied at structure locations to control noxious weeds.

2.2.3 Electrical System Modifications

Existing substations would require modification or reconstruction to accommodate the interconnections to transfer the power from the proposed plant to the transmission system. Additionally, some existing transmission lines may need to be upgraded to accept the additional electricity generated from the proposed Big Stone II plant. Some facility studies to determine specific equipment modifications were completed to determine design parameters for electrical system modifications, while others are ongoing. These ongoing studies may identify additional upgrades. Substation modifications could include installing new control buildings, new circuit breakers and controls; adding new electrical equipment, which would include installing new concrete foundations for electrical equipment and buildings, substation bus work, cable trenches, buried cable grounding grid, and new surface grounding material; and replacing existing equipment and/or conductors with new equipment and/or conductors to accommodate the interconnections. Substations that would require modification include Big Stone, Ortonville, and Morris substations and the Johnson Junction Switching Station in Corridor A; Willmar Substation in Corridors B and B1; and Granite Falls substations in Corridor C and C1. Substation expansions may be required at all locations. As described below, the Canby Substation would need to be relocated.

Additions and Modifications to Non-Western owned Facilities

Facility additions and modifications required as part of the proposed Project would depend on the transmission alternative selected by the MnPUC. Construction work involved in facility modifications typically occurs within the existing substation property, unless expansion of the site is necessary. Non-Western-owned facilities identified for modification include Big Stone, Ortonville, Willmar, and Canby substations and Johnson Junction Switching Station, which is proposed for conversion to a substation.

Canby Substation Relocation

The Canby Substation would need to be relocated because the existing Canby Substation is within the 100-year flood plain of Canby Creek (MnDOC, 2006). The new Canby Substation site would be approximately 600 feet by 600 feet and constructed on an approximately 57-acre parcel in Yellow Medicine County, Minnesota (about three miles northeast of Canby, Minnesota). This is approximately one mile northeast of the existing Canby Substation, located adjacent to Highway 75. Construction activities would include installing a new control building, new circuit breakers and controls; and adding new electrical equipment, which would include installing new concrete foundations for electrical equipment and buildings, substation bus work, cable trenches, buried cable grounding grid, and new surface grounding material; and installing new equipment and/or conductors to accommodate the interconnection. The impacts of the relocation are described in Chapter 4. After relocation of the Canby Substation, the old substation site would be dismantled, and the property would likely be sold.

The substation initially would house a 230/115/41.6-kV transformer, two-230-kV lines, two 115-kV lines, and two 41.6-kV lines. The 230-kV portion of the substation would likely be constructed with 345-kV equipment to match the rating of the proposed Big Stone to Granite Falls transmission line. This substation would have provisions for a second transformer to allow for future expansion at the site.

Other System Modifications

Interconnection studies indicate that the Big Stone to Hankinson 230-kV transmission line would require operation at 350 megavolt amps (MVA) with the addition of the proposed Project. The existing Big Stone to Hankinson 230-kV transmission line is approximately 68 miles long and traverses from the existing Big Stone 230-kV Substation, north to the Browns Valley 230-kV Substation, through Grant and Roberts counties, South Dakota, and then north to the Hankinson 230-kV Substation in Richland County, North Dakota. The existing line is constructed on H-frame wood-pole structures and strung with steel reinforced aluminum conductor (see Figure 2.2-10, Typical

230-kV Single-pole Structure and H-Frame Structure). Overhead static wires are in place for lightning protection. The continuous summer rating of the line is currently 291 MVA, which is constrained by the rating of substation equipment at the Hankinson Substation. Replacing pertinent Hankinson Substation equipment is planned, resulting in an increased line rating of roughly 300 MVA. This new 300 MVA rating would be based on ground clearance constraints within the ROW.

The original line design did not incorporate line-to-ground clearances for a 350 MVA operating level although the conductor can transport 390 MVA. Therefore, line-to-ground clearance improvements are needed in order to upgrade the facility for operation at 350 MVA. Based on a preliminary investigation, approximately 20 percent of the existing structures would require some type of height enhancement to achieve more conductor ground clearance for a 350 MVA rating. This would most likely be accomplished by raising the cross-arms on the affected existing structures and lifting the conductors and static wires, or extending the structure height. If raising the cross-arms on an existing structure would compromise the strength of the structure beyond sound engineering principles, then the structure may need to be replaced with a taller structure.

It is estimated that about 20 percent of the structures would require modifications to achieve height enhancement. At a minimum, construction crews would need to drive an aerial basket truck to each structure site for lifting the cross-arms, conductors, and static wires. Utility trucks also would be driven to each structure to haul equipment, tools, and personnel. More than one construction crew (each consisting of about two workers) may be mobilized to make the structure modifications. Temporary disturbances at each structure site would be about 20,000 square feet.

If a structure needs to be replaced for the height enhancement, additional equipment would need to be mobilized, including a truck-mounted auger, if new holes need to be augered for the new structures. These new poles would be delivered by truck and trailer to a structure site. Any new structures would be staged at existing facilities; so new staging areas for the Hankinson line are not anticipated.

Once conductor ground clearances are remedied for a 350 MVA operating load, the rating of the existing Big Stone to Hankinson 230-kV transmission line could continue to be constrained by conductor to ground clearance. The thermal properties of its existing conductors would be approximately 390 MVA (continuous summer rating). This is the point where conductor temperatures may cause harm to the steel reinforced aluminum conductor.

At this time, the specific structures needing modification or replacement have not been identified. A thorough line survey would determine the exact number and extent of structure modifications necessary for the Big Stone to Hankinson line. After the survey, a design engineer would design structure modifications for each deficient span needing additional ground clearance. Once the specific structures are identified, site specific environmental surveys would be conducted in accordance with the transmission-related SMMs (see Table 2.2-8 Standard Mitigation Measures for the Proposed Big Stone II Project), the Programmatic Agreement (PA) for compliance with the National Historic Preservation Act (NHPA), and any measures resulting from Western's informal consultation with the U.S. Fish and Wildlife Service (USFWS) under the Endangered Species Act.

At the time of printing the Final EIS, no other definitive improvements have been identified. Details, requirements, and environmental impacts for other system improvements are unknown at this time, since they would be dictated by the various on-going electric transmission system studies. System improvements may include modification of substations and transmission lines not within the alternatives identified or in other parts of the existing transmission system.

2.2.4 Actions Incorporated into the Proposed Project to Reduce Impacts

Co-owners' Measures to Reduce Impacts

Measures proposed by the Co-owners included as part of the proposed Project range from those related to power plant technology, transmission line corridor, and transmission line construction opportunities to substation interconnection locations. Benefits associated with the proposed project design measures would result in reduced impacts to air quality, water resources, biological resources, land use, and other resources. Measures incorporated into the proposed Project that would result in reduced impacts are identified in Table 2.2-7.

In addition, SMMs have been proposed by the Co-owners that are applicable to construction and/or operation of the proposed Big Stone II plant, transmission lines, and non-Western owned substation modifications. These measures have been updated to include the construction and operation of the groundwater wells and pipelines. SMMs are provided in Table 2.2-8. Western does not have jurisdiction over the implementation of the Co-owners' measures to reduce impacts nor SMMs. Jurisdiction for the mitigation falls with other Federal, State, and local regulatory agencies. The impact assessment considered the proposed measures and SMMs in order to gain a full understanding of the environmental impacts of the proposed Project.

Western's Standard Mitigation Measures

Western maintains standard construction practices for constructing and modifying transmission lines and substations. These measures are provided in Table 2.2-9. These mitigation practices would be followed for any system modifications performed at Western facilities for the proposed Federal action. In addition, Western provides additional requirements for mitigation as part of its contracting requirements. These provisions are outlined in Western's Construction Standard 13 and are applied on a project-specific basis. Applicable mitigation measures outlined in Table 2.2-9 would be included in the Construction Standard 13 for any contracts for substation modifications issued by Western.

Table 2.2-7. Measures Incorporated into the Proposed Project to Reduce Impacts

Action and/or Design Element	Resource/Technical Area
Power Plant	
Use of existing site properties, access road, cooling water intake structure, rail spur, and use of an industrial site would avoid impacts to a new area.	Water Resources, Geology/Minerals/Paleontology/Soils, Biological Resources, Cultural Resources/Native American Concerns, Land Use, Infrastructure, Visual Resources, Noise Resources.
Mercury emissions would be reduced by applying super-critical boiler technology, installation of a fabric filter, and a wet scrubber emissions control technology common to the existing Big Stone and the proposed Big Stone II plants (i.e., the WFGD system). Additionally, the Co-owners have agreed to install emission control equipment for the existing Big Stone plant and the proposed Big Stone II plant that is most likely to remove 90 percent of the mercury emitted from both units.	Air Quality, Public Health.
NOx emissions would be reduced by applying super-critical boiler technology, installing low NOx combustion technology, and applying selective catalytic reduction technology.	Air Quality, Public Health.
SO_2 emissions would be reduced by applying super critical boiler technology, installing wet scrubber emissions control technology common to both the existing Big Stone plant and the proposed Big Stone II plant, and using PRB coal.	Air Quality, Public Health.
PM emissions would be reduced by applying super-critical boiler technology, installing a fabric filter for flue gas particulate emissions control, and emission controls on materials handling systems.	Air Quality, Public Health.
CO and volatile organic compound emissions would be reduced by the use of "good combustion practices."	Air Quality, Public Health.
Sulfuric acid mist emissions would be reduced by installing a fabric filter, applying wet scrubber emissions control technology, and using PRB coal.	Air Quality, Public Health.
Acid gas emissions of hydrogen chloride and hydrogen fluoride would be reduced by applying wet scrubber emissions control technology.	Air Quality, Public Health.
CO_2 emissions would be reduced by using super-critical boiler technology and implementation of the Settlement Agreement to offset carbon emissions.	Air Quality.
The proposed Big Stone II Pretreatment System, wastewater reuse, and the WFGD system blowdown pond would be used to avoid wastewater discharge to surface waters. The facility is designed to reuse water, thus reducing the amount of water consumption.	Water Resources, Biological Resources.
Incorporating a zero wastewater discharge into the facility design would prevent wastewater from leaving the facility and minimize impacts to surface water.	Water Quality, Biological Resources, Soils.
The proposed Big Stone II would use a super-critical boiler design with high boiler combustion efficiencies along with operations utilizing good combustion control practices to minimize air emissions.	Air Quality, Water Resources, Biological Resources, Visual Resources, Waste Management, Public Health.
The proposed Big Stone II would use a closed-cycle cooling water system to minimize water withdrawals from Big Stone Lake.	Water Resources, Biological Resources.
The proposed Big Stone II would add the BSP II Pretreatment System that would reduce scaling and the volumes of cooling tower blowdown.	Water Resources.
Coal and limestone handling systems would use fugitive particulate emission control systems and practices to minimize air emissions.	Air Quality.
Transmission	
Identifying corridors that would allow reconstruction of existing transmission lines (reconductored or rebuilt), to the extent practical such that actions do not violate sound engineering principles or system reliability criteria, would avoid new environmental impacts associated with constructing a new transmission line.	Water Resources, Geology/Minerals/Paleontology/Soils, Biological Resources, Cultural Resources/Native American Concerns, Land Use, Infrastructure, Visual Resources, Noise Resources.
New transmission lines would parallel existing transmission lines to the extent practical and to the extent that such actions do not violate sound engineering principles or system reliability criteria, thus minimizing new impacts to a different area within the transmission corridor.	Agriculture, Land Use, Visual.
Specifications of transmission hardware would reduce/control noise from connectors.	Noise Resources.
Substations	
Interconnection to existing substations, rather than constructing new substations would avoid new impacts to a new area. Canby Substation would need to be relocated out of a floodplain.	Water Resources, Geology/Minerals/Paleontology/Soils, Biological Resources, Cultural Resources/Native American Concerns, Land Use, Infrastructure, Visual Resources, Noise Resources.

Source: Big Stone II, 2005e; MnDOC, 2007.

Table 2.2-8. Standard Mitigation Measures for the Proposed Big Stone II Project

No.	Standard Mitigation Measure	Power Plant	Groundwater	Transmission	Substation Modifications
General					
Gen-1	All Federal, State, and local environmental laws, orders, and regulations would be met during construction and operation of the proposed Project.	X	X	X	X
Gen-2	All permit conditions would be adhered to for construction and operation of the proposed Project.	X	X	X	X
Gen-3	Prior to construction, all construction personnel and heavy equipment operators would be instructed on the protection of cultural, paleontological, and ecological resources, and all applicable permit requirements. To assist in this effort, the construction contracts would address: (a) Federal, State, and local laws regarding antiquities, fossils, plants, and wildlife, including collection and removal; (b) the importance and necessity of protecting such resources; and (c) all applicable permit requirements.	X	X	X	X
Air Quality					
Air-1	The emission of dust into the atmosphere during construction would be minimized to the extent practical during the manufacture, handling, and storage of concrete aggregate. Methods and equipment would be used as necessary to collect and dispose, or prevent dust during these operations. The methods of storing and handling cement and pozzolans (cement additives) would also include means of minimizing atmospheric discharges of dust.	X	X	X	X
Air-2	Construction equipment and vehicles that show excessive emissions of exhaust gases due to poor engine adjustments, or other inefficient operating conditions, would not be operated until repairs or adjustments are made.	X	X	X	X
Air-3	Burning or burying waste materials on the ROW and plant construction areas would not be permitted. All waste materials shall be disposed at permitted waste disposal areas or landfills. Tree and grubbing residue may be buried on the plant site or in the ROW with landowner approval.	X	X	X	X
Air-4	Nuisance to persons or damage to crops, cultivated fields, and dwellings from dust originating from construction would be minimized. Oil and other petroleum derivatives would not be used for dust control. Speed limits would be enforced, based on road conditions, to reduce dust problems.	X	X	X	X
Water Resources					
Water-1	Withdrawals from Big Stone Lake would be within State withdrawal requirements.	X			
Water-2	Construction activities would comply with the requirements of South Dakota, North Dakota, and Minnesota permits for stormwater discharges for construction activities, which specify appropriate best management practices, erosion and sediment control measures, and disposal practices. Construction activities that are adjacent to or encroaching on streams or watercourses, including work within ROW, construction of access roads on hillsides, and dewatering work for structure foundations, or earthwork operations would be conducted to prevent disturbed soils, muddy water, and eroded materials from entering the streams or watercourses by construction of intercepting ditches, bypass channels, barriers, settling ponds, or by other approved means.	X	X	X	X
Water-3	Construction activities would be performed to prevent entrance or accidental spillage of solid matter contaminants, debris, hazardous liquids, or other objectionable pollutants and wastes into streams, flowing or dry watercourses, lakes, land, and underground water sources. Such pollutants and waste include, but are not restricted to refuse, garbage, cement, concrete, sanitary waste, industrial waste, oil, and other petroleum products, aggregate processing tailing, mineral salts, and thermal pollution.	X	X	X	X
Water-4	Excavated material or other construction materials would not be stockpiled or deposited near or on stream banks, lake shorelines, or other watercourse perimeters unless protected from high water or storm runoff or encroachment upon the actual watercourse itself.	X	X	X	X
Water-5	Wastewater discharge from concrete batching or other construction operations would not enter streams, watercourses, or other surface waters without the appropriate permit.	X	X	X	X

Table 2.2-8 (continued)

No.	Standard Mitigation Measure	Power Plant	Groundwater	Transmission	Substation Modifications
Water-6	Equipment washing, the storage of petroleum products, lubricants, solvents and hazardous materials, structure sites, and other disturbed areas would be located at least 100 feet, where practical, from rivers, streams (including ephemeral streams), ponds, lakes, and reservoirs. This includes construction vehicles and heavy equipment when parked overnight or longer.	X	X	X	
Water-7	New access ways would be located at least 100 feet, where practical, from rivers, ponds, lakes, and reservoirs.		X	X	
Water-8	All stream crossings considered jurisdictional WUS by the USACE for new access ways would be by permit. Where required, culverts of adequate size to accommodate the estimated peak flow of the stream would be installed. Disturbance of the stream banks and beds during construction would be minimized. Disturbed areas would be regraded and revegetated in accordance with mitigation measures listed for soil/vegetation resources.		X	X	
Water-9	If the banks of ephemeral stream crossings are sufficiently high and steep that breaking them down for a crossing would cause excessive disturbance, culverts would be installed using the same measures as for culverts on perennial streams.		X	X	
Water-10	Heavy equipment movement near streams and other surface waters would be minimized, to the extent practical.		X	X	X
Water-11	Narrow flood prone areas would be spanned.			X	
Water-12	Proposed plant operation would comply with the SDDENR General Permit for Stormwater Discharges Associated with Industrial Activity and the associated stormwater pollution prevention plan, which requires use of appropriate BMPs, sediment control measures, and disposal practices. Proposed plant operations, including coal and combustion by-product storage piles that could introduce contaminants to stormwater, would be controlled and mitigated using BMPs. Operations would be conducted in a manner to prevent contamination of stormwater runoff water that may leave the plant site and to prevent disturbed soils, muddy water, and eroded materials from entering the streams or watercourses. BMPs would include intercepting ditches, bypass channels, barriers, settling ponds, or by other approved means.	X			
	Also See Measures: Bio-3, Bio-5, Bio-7, Bio-8, and Land-3.				
Geology and Minerals, Paleontology, and Soils.					
Geo-1	Structures would not be sited on any potentially active documented faults.	X	X	X	X
Geo-2	Removed topsoil would be used for landscaping and as engineered fill, as appropriate, or stockpiled and re-spread subsequent to construction.	X	X	X	X
Geo-3	During construction, if any paleontological resources are discovered, work would cease within a 50-foot radius of the discovery. Any artifacts or fossils discovered would not be disturbed and the Co-owners would notify Western of the discovery immediately.	X	X	X	X
Geo-4	Access roads would generally follow the contour of the land to the greatest extent practical rather than a straight line along the ROW where steep features would result in a higher erosion potential.		X	X	
Geo-5	To the extent practical, excavated areas would be re-contoured so that large volumes of water would not collect and stand therein. Before being abandoned, the sides of excavations would be brought to stable slopes, giving a natural appearance and revegetated. Waste soil piles would be shaped to provide a natural appearance.	X	X	X	X
	Also See Measures: Gen-3, Land-5, Land-10, Bio-4, Bio-5, Water-2, and Water-3.				
Biological Resources					
Bio-1	The Co-owners would consult with the applicable State and Federal agencies concerning all species of concern and, based on that consultation, develop appropriate survey protocols and an action plan to minimize impacts (e.g., buffer zones, construction windows, animal relocations) in the event species of concern are found during surveys. The survey protocols and action plan would be approved by Western and the applicable State and Federal agencies. Surveys would then be conducted in accordance with approved protocols during final design of the proposed plant, groundwater areas, transmission lines, and substation modifications.	X	X	X	X
Bio-2	Reasonable and prudent alternatives developed during Section 7 consultations, as specified in the U.S. Fish and Wildlife Service (USFWS) Biological Assessment would be adhered to with the same force and effect as the mitigation measures included here.	X	X	X	X

Table 2.2-8 (continued)

No.	Standard Mitigation Measure	Power Plant	Groundwater	Transmission	Substation Modifications
Bio-3	All wetland and riparian areas would be avoided to the extent practical. If wetland or riparian areas are unavoidable, impacts would be minimized or mitigated. Navigable waters and WUS that are impacted as a result of implementing the proposed Project would be mitigated in accordance with USACE requirements. Non-jurisdictional wetlands in Minnesota that are impacted as a result of implementing the proposed Project would be mitigated in accordance with Minnesota Wetland Conservation Act stipulations.	X	X	X	X
Bio-4	Care would be used to preserve the natural landscape and vegetation. Construction operations would be conducted to prevent, to the extent practical, any unnecessary destruction, scarring, or defacing of the natural surroundings, vegetation, trees, and native shrubbery in the vicinity of the work. Vegetation would be replaced at landowner's request providing mitigation complying with North American Electric Reliability Council (NERC) reliability requirements.	X	X	X	X
Bio-5	On completion of the work, all non-agricultural disturbed areas and construction staging areas not needed for maintenance access would be regraded so that all surfaces drain naturally, blend with the natural terrain, and are reseeded to blend with vegetation native to the area with a seed mixture certified as free of noxious or invasive weeds. All destruction, scarring, damage, or defacing of the landscape resulting from the construction would be repaired.	X	X	X	X
Bio-6	Construction staging areas would be located and arranged in a manner to preserve trees and vegetation to the maximum practicable extent. Unless otherwise agreed upon by the landowner, all storage and construction buildings, including concrete footings and slabs, and all construction materials and debris would be removed from the construction staging areas once construction is complete, and the areas returned to original use or regraded and seeded as for non-agricultural disturbed areas.		X	X	
Bio-7	Structures and ROW would be located to avoid game production areas, State Wildlife Management Areas, Minnesota County Biological Survey Sites of Biodiversity Significance, National Wildlife Refuges, Waterfowl Protection Areas, Scientific and Natural Areas, State identified rock outcrops, and high priority ecological areas to the extent possible. Approval for changes in these areas must be done in coordination with the appropriate agency.		X	X	
Bio-8	Removal of vegetation would be done according to NERC safety and reliability requirements. Clearing for access roads would be limited to only those trees necessary to permit the passage of equipment. All vegetative materials resulting from clearing operations would either be chipped on site or stacked in the ROW in accordance with the landowner's request.		X	X	
Bio-9	Native shrubs that would not interfere with access or the safe operation of the transmission line would be allowed to reestablish in the ROW. Areas with native shrubs that would be disturbed would be replanted with regionally-native species following the disturbance.			X	
Bio-10	The Co-owners would develop an Avian Protection Plan (APP) to minimize impacts to nesting birds, as well as to minimize the electrocution and collision of migratory and resident bird species. The APP would include provisions for adequate distance between conductors and distances between conductors and grounded surfaces. It would identify time frames for construction and routine maintenance to avoid the nesting period of breeding birds. It would also include methods for minimizing bird collisions during line routing as well as methods for minimizing collisions following construction. The APP would follow guidelines described at <www.aplic.org>. The Co-owners, in coordination with State and Federal resource management agencies and after reviewing the final route alignments, would decide where and what kind of line marking devices (i.e., visibility enhancing devices) need to be applied. The Co-owners would provide a copy of the APP to the applicable USFWS offices.			X	
Bio-11	Holes drilled or excavated for pole placement or foundation construction and left unattended overnight would be marked and secured with temporary fencing to reduce the potential for livestock and wildlife entering the holes and for public safety.	X	X	X	X
	Also See Measures: Gen-3, Water-1, Water-8, Water-9, Land-3, and Land-5.				

Table 2.2-8 (continued)

No.	Standard Mitigation Measure	Power Plant	Groundwater	Transmission	Substation Modifications
Cultural Resources					
Cult-1	A Class III Cultural Survey would be performed for the areas of potential effect in accordance with the Programmatic Agreement (PA) developed for the proposed Project. Surveys would be coordinated with the appropriate landowner or land management agency. As lead Federal Agency, Western would make a determination of eligibility for any findings of cultural or historical properties. These findings would be reviewed with the State Historic Preservation Offices and other appropriate agencies. Specific mitigation measures necessary for each site or resource would be determined, and may include relocation of access roads, structures, and other disturbed areas to avoid cultural sites that should not be disturbed, or data recovery if a site cannot be avoided.	X	X	X	X
Cult-2	Provisions of the PA would be adhered to by all parties, including: - Construction crews would be informed of the need to cease work in the location if cultural resource items are discovered. - Construction activities would be monitored or sites flagged to prevent inadvertent destruction of any cultural resource for which the agreed mitigation was avoidance. - Construction crews would be monitored to the extent possible to prevent vandalism or unauthorized removal or disturbance of cultural artifacts or materials from sites where the agreed mitigation was avoidance. - Should any cultural resources not identified during the Class III Cultural Survey be encountered during construction, ground disturbance activities at that location would be suspended until the provisions of the National Historic Preservation Act and enabling legislation have been carried out.	X	X	X	X
	Also See Measures: Gen-3.				
Land Use					
Land-1	The minimum area necessary would be used for access roads to the transmission line.			X	
Land-2	When practical, structures would be located and designed to conform to the terrain. Leveling and benching of the structure sites would be the minimum necessary to allow structure assembly and erection.			X	
Land-3	Power line structures would be located, where practical, to span sensitive land uses. Where practical, construction access roads would be located to avoid sensitive conditions.		X	X	
Land-4	The precise location of all structure sites, ROW, and other disturbed areas would be determined with landowners' or land management agencies' input.		X	X	
Land-5	The movement of crews and equipment would be limited to the ROW and areas surveyed for cultural, historical, and biological resources, including access routes. To the extent practicable, the contractor would limit movement on the ROW to minimize damage to State-designated rock outcrops, grazing land, crops, or property and would avoid marring the land.		X	X	X
Land-6	Where practical, construction activities would be scheduled during periods when agricultural activities would be minimally affected or the landowner would be compensated accordingly.		X	X	
Land-7	Fences, gates, and similar improvements that are removed or damaged would be promptly repaired or replaced.		X	X	X
Land-8	Structure design and placement would be selected to reduce potential conflicts with agricultural practices and to reduce the amount of land required for transmission lines.			X	
Land-9	ROW would be purchased through negotiations with each landowner affected by the proposed Project. Payment would be made of full value for crop damages or other property damage during construction or maintenance.		X	X	
Land-10	When weather and ground conditions permit, all deep ruts that are hazardous to farming operations and equipment movement would be eliminated or compensation would be provided as an alternative if the landowner desires. Such ruts would be leveled, filled, and graded, or otherwise eliminated in an approved manner. Ruts, scars, and compacted soils from construction activities in hay meadows, alfalfa fields, pastures, and cultivated productive lands would be loosened and leveled by scarifying, harrowing, discing, or other appropriate method. Damage to ditches, tile drains, terraces, roads, and other land features would be corrected. Land contours and facilities would be restored as nearly as practical to their original conditions.		X	X	X

Table 2.2-8 (continued)

No.	Standard Mitigation Measure	Power Plant	Groundwater	Transmission	Substation Modifications
Land-11	Where practical, all well drilling and installation would be completed in agricultural areas or uncultivated pastureland at the edge of farm fields. Installations of groundwater associated facilities would be constructed to not impact the operation of center-pivot irrigation operations. During pump testing, precautions would be taken to prevent erosion due to discharges of groundwater.		X		
Land-12	To the extent possible, pipeline routing would occur along the ROW of county roads and roads along section lines, and along well access roads.		X		
	Also See Measures: Air-4, Geo-2, Geo-4, Geo-5, Bio-4, Bio-5, Bio-6, and Water-3.				
Infrastructure, Public Health and Safety, and Waste Management					
Inf-1	Delays to railroad operations due to construction vehicles or equipment crossing tracks would be avoided. Construction would be coordinated with railroad operators. Conductor and overhead wire stringing operations would use guard structures to eliminate delays.	X		X	
Inf-2	When appropriate, pilot vehicles would accompany the movement of heavy equipment. Traffic control barriers and warning devices would be used when appropriate.	X	X	X	X
Inf-3	All necessary provisions would be made to conform to safety requirements for maintaining the flow of public traffic and avoiding congestion at critical locations. Construction operations would be conducted to offer the least possible obstruction and inconvenience to public traffic, such as by the use of pilot cars to accompany trucks with oversized loads and slow-moving vehicles, scheduling heavy equipment transport to avoid high traffic periods, and where feasible, use of existing rail facilities.	X	X	X	X
Inf-4	Fly ash and gypsum would be recycled in accordance with prevailing market conditions, if practical.	X			
Inf-5	Design would include reasonable mitigation measures to reduce problems of induced currents into conductive objects within the ROW. Problems of induced currents during construction and operation would be resolved, to the mutual satisfaction of the parties involved.			X	X
Inf-6	Complaints of radio or television interference generated by the facility and related transmission lines would be investigated and appropriate mitigation measures would be implemented (i.e., adjusting or using filtering devices).			X	X
Inf-7	Audible noise and electric and magnetic fields during construction and operation of the proposed Project would be addressed as necessary on a case-by-case basis.			X	X
Inf-8	Transmission line materials would be designed to minimize corona. Tension would be maintained on all insulator assemblies to assure positive contact between insulators, thereby avoiding sparking. Caution would be exercised during construction to avoid nicking the conductor surface, which may provide points for corona to occur.			X	
PH-1	The construction contractor would establish a health and safety program that incorporates Occupational Safety and Health Administration (OSHA) standards such as requirements for hearing protection, personal protective equipment, site access, chemical exposure limits, safe work practices, training program, and emergency procedures. The program would be reviewed with plant officials, fire department personnel, and emergency services personnel to reduce risk of construction and operation activities interfering with emergency response or evacuation plans and procedures.	X	X	X	X
PH-2	At the end of every work day, contractors would secure all construction areas to protect equipment and materials and discourage public access. Fueling of vehicles would be conducted in compliance with established procedures designed to minimize fire risks and fuel spills.	X	X	X	X
PH-3	Construction contractors would provide adequate notice to the public for all high-risk operations such as blasting. Only trained personnel would be permitted to conduct such high-risk operations. All other personnel would be required to maintain a safe distance from such operations.	X	X	X	X
	Also See Measures: Air-3, Water 3, and Noise-2.				

Table 2.2-8 (continued)

No.	Standard Mitigation Measure	Power Plant	Groundwater	Transmission	Substation Modifications
Visual Resources					
Vis-1	The proposed Big Stone II major components would be painted to blend into the surrounding environment. Lighting would be minimized, to the extent practical. Lights would be shielded to minimize output to the surrounding environment and impacts to the night sky.	X	X		
Vis-2	Transmission line materials would be designed to minimize corona. To reduce potential visual impacts at highway and trail crossings, structures would be placed at the maximum feasible distance from the crossing, within limits of structure design.			X	X
Vis-3	Structure types (designs) would be uniform, to the extent practical.			X	
	Also See Measures: Bio-8.				
Noise					
Noise-1	An adequate buffer would be maintained around the proposed plant site to minimize construction and operational noise impacts on area residents.	X			
Noise-2	Power lines would be designed to minimize noise and other effects from energized conductors.			X	X
Noise-3	To avoid nuisance conditions due to construction noise, all internal combustion engines used in connection with construction activity would be fitted with an approved muffler and spark arrester.	X	X	X	X
Noise -4	To avoid nuisance noise conditions, transmission line construction would be limited to daytime hours whenever practical.			X	X
	Also See Measures: Inf-7.				

Table 2.2-9. Western's Standard Construction Practices

1.	All construction vehicle movement outside the ROW normally would be restricted to predesignated access, contractor acquired access, or public roads.
2.	The areal limits of construction activities normally would be predetermined, with activity restricted to and confined within those limits. No paint or permanent discoloring agents would be applied to rocks or vegetation to indicate limits of survey or construction activity.
3.	In construction areas where recontouring is not required, vegetation would be left in place wherever possible and original contour would be maintained to avoid excessive root damage and allow for resprouting.
4.	In construction areas (e.g., staging yards, structure sites, spur roads from existing access roads) where ground disturbance is substantial or where recontouring is required, surface restoration would occur as required by the landowner or land management agency. The method of restoration normally would consist of returning disturbed areas back to their natural contour, reseeding (if required), installing cross drains for erosion control, placing water bars in the road, and filling ditches.
5.	Watering facilities and other range improvements would be repaired or replaced if they are damaged or destroyed by construction activities to their condition prior to disturbance as agreed to by the parties involved.
6.	Structures and/or ground wire would be marked with highly visible devices where required by governmental agencies (e.g., Federal Aviation Administration).
7.	Prior to construction, all construction personnel would be instructed on the protection of cultural, paleontological, and ecological resources. To assist in this effort, the construction contract would address (a) Federal, State, and tribal laws regarding cultural resources, fossils, plants, and wildlife, including collection and removal; and (b) the importance of these resources and the purpose and necessity of protecting them.
8.	Cultural resources would continue to be considered during post-EIS phases of project implementation following the PA being developed in conjunction with preparation of the EIS. This would involve intensive surveys to inventory and evaluate new discoveries (cultural resources not previously identified). In consultation with appropriate land managing agencies, tribal and State Historic Preservation Officer, specific mitigation measures would be developed and implemented to mitigate any identified adverse impacts. These may include project modifications to avoid adverse impacts, monitoring of construction activities, and data recovery studies. American Indian Tribes would be involved in these consultations to determine whether there are effective or practical ways of addressing impacts on traditional cultural places.
9.	Western would respond to individual complaints of radio or television interference, generated by the transmission line, by investigating the complaints and implementing appropriate mitigation measures (e.g., adjusting or using filtering devices on antennae).
10.	Western would apply mitigation needed to eliminate problems of induced currents and voltages onto conductive objects sharing a ROW to the mutual satisfaction of the parties involved.
11.	Western would continue to monitor studies performed to determine the effects of audible noise and electrostatic and electric and magnetic fields to ascertain whether these effects are significant.
12.	Roads would be built at right angles to washes to the extent practical. Culverts would be installed where needed. All construction and maintenance activities would minimize disturbance to vegetation, drainage channels, and intermittent or perennial streambanks. In addition, road construction would include dust-control measures during construction in sensitive areas. All existing roads would be left in a condition equal to or better than their condition prior to the construction of the transmission line.
13.	All requirements of those entities having jurisdiction over air quality matters would be adhered to. Any permits needed for construction activities would be obtained. Open burning of construction trash would not be allowed unless permitted by appropriate authorities.
14.	Fences and gates would be repaired or replaced to their original condition prior to disturbance caused by the proposed Federal action as required by the landowner or the land management agency if they are damaged or destroyed by construction activities. Temporary gates would be installed only with the permission of the landowner or the land managing agency.
15.	Transmission line materials would be designed and tested to minimize corona. Tension would be maintained on all insulator assemblies to assure positive contact between insulators, thereby avoiding sparking. Caution would be exercised during construction to avoid scratching or nicking the conductor surface, which may provide points for corona to occur.
16.	No nonbiodegradable debris would be deposited in the ROW. Slash and other biodegradable debris would be left in place or disposed of in accordance with agency requirements.
17.	Hazardous materials would not be drained onto the ground or drainage areas. Totally enclosed containment would be provided for all trash. All construction waste including trash and litter, garbage, other solid waste, petroleum products, and other potentially hazardous materials would be removed to a disposal facility authorized to accept such materials.
18.	Special status species or other species of particular concern would continue to be considered during post-EIS phases of the proposed Project's implementation following management policies set forth by the appropriate land managing agency. This may entail conducting surveys for plant and wildlife species of concern along access and spur roads, staging areas, and construction sites as agreed upon by the land managing agency. In cases where such species are identified, appropriate action would be taken to avoid adverse impacts on the species and its habitat and may include altering the placement of roads or structures as practical and monitoring construction activities.
19.	The alignment of any new access roads would follow the designated area's landform contours where possible, providing that such alignment does not additionally impact resource values. This would minimize ground disturbance and reduce scarring (visual contrast).

20.	Except for repairs necessary to make roads passable, no widening or upgrading of existing access roads would be undertaken in the area of construction and operation, where soils or vegetation are sensitive to disturbance. In designated areas, structures would be placed to avoid sensitive features such as, but not limited to, riparian areas, water courses and cultural sites, or to allow conductors to clearly span the features within limits of standard structure design. This would minimize the amount of disturbance to the sensitive feature or reduce visual contrast.
21.	With the exception of emergency repair situations, ROW construction, restoration, maintenance, and termination activities in designated areas would be modified or discontinued during sensitive periods (e.g., nesting and breeding periods) for candidate, proposed threatened and endangered, or other sensitive animal species.

Source: Western, 2003.

2.3 Description of Alternatives

The Council on Environmental Quality (CEQ) regulations (Title 40 CFR Parts 1500-1508) require that Federal agencies use the review process established by NEPA to identify and review reasonable alternatives to the proposed Federal action, including the No Action Alternative. The CEQ regulations state that reasonable alternatives include those practical or feasible from a common sense, technical, and economic standpoint. The CEQ regulations also require that this EIS identify those alternatives that have been eliminated from further analysis, including a brief discussion of why they were eliminated. The alternatives analysis for the EIS is summarized in this section. In addition, a detailed analysis of the Co-owners' power plant site selection process and the transmission alternatives analysis are provided in Appendix B1. The alternatives screening process and results for cooling water and water supply are provided in Appendix B2. The No Action Alternative is described in Section 2.4.

Screening of alternatives begins with a review of Western's statement of purpose and need for agency action and continues with a comparison against feasibility factors that are based on cost, logistical, technological, social, environmental, and legal factors. During scoping, the public, participating agencies, and special interest groups provided additional input into the alternatives discussion and suggested additional alternatives. Alternatives that failed to meet Western's purpose and need were dismissed from further evaluation. The criteria used by Western, along with the discussions of its analysis of alternatives, are discussed in this chapter.

The Co-owners analyzed fuel source, plant size, and plant location based on meeting the proposed Project's purpose and need and the types of feasible technologies identified. The Co-owners concluded that the best technology to meet the proposed Project's purpose and need was a coal-fired power plant located at the existing Big Stone plant site.

Cooling technology alternatives are summarized in Section 2.3.1. The wet cooling tower system with groundwater supply back-up is preferred by the Co-owners, as it offers the best performance coupled with the lowest capital cost and least total annual air emissions. The power generation technologies considered but eliminated from detailed analysis by Western are discussed in Section 2.5.1. Cooling technologies considered but eliminated from detailed analysis are discussed in Section 2.5.2. Analysis of alternative power plant locations is summarized in Section 2.5.3.

Once the Co-owners identified a power plant site, systems studies were conducted to determine the most appropriate transmission interconnection locations. Two interconnection alternatives were identified with a total of three separate interconnection endpoints, two per alternative. The interconnection analysis is summarized in Section 2.3.2.

The last step in the analysis was to identify alternative transmission line corridors or routes that could be used to interconnect the proposed plant site to the interconnection locations or endpoints. Alternative corridors linking the plant and interconnection endpoints are summarized in Section 2.3.3. Alternative corridors considered but eliminated from detailed analysis are discussed in Section 2.5.5. Specific routes within these corridors have been identified in South Dakota. The Route Permit issued by the MnPUC authorizes the Co-owners to build anywhere within a 2,000-foot wide corridor along the approved routes.

2.3.1 Cooling Technology Alternatives

After receiving new cost information on the make-up water storage pond and reviewing comments on the Draft EIS, the Co-owners decided to evaluate alternatives that would use groundwater as a source for cooling and make-up water during periods when withdrawals from Big Stone Lake are not permitted. In addition to the original scenario proposed in the Draft EIS (i.e., the 450-acre pond for back-up water storage, sourced from Big Stone Lake), the Co-owners developed three alternatives that use groundwater as the source of back-up water for the proposed Big Stone II plant.

Alternatives

Alternate supply scenarios using groundwater sources, either alone or in combination with new process technologies, were developed to eliminate dependence on surface water storage for back-up water supply for the proposed plant. Each alternative uses surface water as the primary water supply. Alternative 1, which was described in the Draft EIS, has been eliminated from full analysis and is addressed in Section 2.5.2.1. The proposed Project and Alternative 3 use groundwater as the back-up water supply and are discussed below. Alternative 4, dry cooling with groundwater as the back-up water supply, was also considered, but has been eliminated from full analysis and is addressed in Section 2.5.2.2. Appendix B2 describes the screening comparison criteria for all the alternatives. Only the alternatives carried forward for full analysis are addressed in this section.

<u>Proposed Project (Alternative 2): Wet Cooling with Groundwater Back-Up Water Supply</u>

Alternative 2 is described in detail under the heading Co-owners' Proposed Project in Section 2.2. This alternative would use groundwater as the sole back-up water supply in the event that pumping water from Big Stone Lake was not permitted, while retaining the original wet cooling system technology identified in Alternative 1. However, the chemical treatment systems would be changed to treat the make-up water (Big Stone Lake water or groundwater back-up) rather than the wastewater.

<u>Alternative 3: Wet/Dry Cooling with Groundwater Back-Up Water Supply</u>

Alternative 3 is designed to release heat from the plant steam cycle via a combined wet/dry cooling system. The dry portion would use an air-cooled condenser (i.e., air blown over tubes filled with hot steam) as a heat transfer mechanism and the wet portion of the system would be used in parallel to the dry system, as needed, to achieve full unit output on warmer days. The make-up water pretreatment system would be the same as described for Alternative 2. However, water consumption would be reduced since there would be less water loss due to evaporation.

Alternative 3 may be selected if the projected groundwater supplies prove to be inadequate following completion of all hydrogeological investigations. Under Alternative 3, the footprint of the proposed plant would include a smaller wet cooling tower than proposed in the proposed Project and the addition of a dry cooling system using an air-cooled condenser.

Under Alternative 3, proposed Big Stone II would use Big Stone Lake as the primary water supply and groundwater for the back-up water supply. The Alternative 3 water supply system would operate the same as the proposed Project. Based on the current water-use model estimates for Alternative 3, approximately 5,236 afy of surface water and 2,036 afy of groundwater would be needed for the existing and proposed plant operations. Maximum short-term groundwater use would typically be approximately 6,200 gallons per minute (gpm). There would be no differences in the description of the groundwater supply system or pipeline gathering system described in Section 2.2.1.5. Alternative 3 would also require 7 to 14 groundwater supply wells. There would be no differences in the description of water treatment or wastewater management than described in Section 2.2.1.4 for Alternative 3, except that fewer chemicals would be required, since less water would be treated and there would be less wastewater to manage.

Alternative 3 would have a smaller wet cooling tower than the proposed Project that would be used in combination with a dry cooling system. The footprints of the smaller cooling tower and the air-cooled condensers would be part of the final proposed plant design and are not known at this time. However, the combined footprint of the smaller cooling tower plus the air-cooled condensers would have a larger footprint than that of the cooling tower for the proposed Project.

Alternative 3 would incorporate the same actions to reduce impacts as those described in Section 2.2.4 for the proposed Project.

Alternative Comparison

The alternatives were compared using operating, economic, and environmental screening criteria. Comparisons of operating criteria included net power output, efficiency improvement, and auxiliary power uses. Economic criteria included capital and operating cost differences. Environmental criteria included comparisons of water consumption, air emissions, land use, and impact to wetlands. Appendix B2 describes the screening comparison criteria. Table 2.3-1 summarizes the results of the comparison of the proposed Project and Alternative 3. A more detailed comparison table is included in Appendix B2.

Table 2.3-1. Comparison of Proposed Project and Alternative 3

		Proposed Project	**Alternative 3**
Screening Criteria	**Units**	**Wet Cooling with Groundwater Backup**	**Wet/Dry Cooling with Groundwater Backup**
Capital Cost	Dollars ($)	Lowest Cost	$53 million more than Proposed Project
Operating Cost, including fuel		Lowest	Higher
Efficiency		Highest	Lowest
Average Water Consumption (Surface Water and Groundwater)	afy	13,033	7,291
New Land Use Impact (permanent)	Acres	39	39
Wetland Impacts (permanent)	Acres	0	0
Air Impacts		Lowest	2% Higher

Source: See Appendix B2, Table 1.

Economic Comparison

The alternative with the lowest capital cost is the proposed Project (Alternative 2 - wet cooling with groundwater back-up). Capital costs are approximately $53 million higher for Alternative 3. The proposed Project also has the lowest operating cost. Since it has the highest efficiency (i.e., less fuel is burned per kilowatt-hour produced), it therefore has the lowest overall operating cost (including fuel). Alternative 3 would have higher auxiliary power requirements and thus more non-fuel operating costs due to the size and number of fans that are associated with dry cooling.

Water Consumption Comparison

The proposed Project would require a supply of about 13,000 afy of surface and groundwater to the existing and proposed plants to make up for the evaporative losses associated with the wet cooling design for these alternatives. Alternative 3 would require less surface and groundwater (about 6,000 afy less) compared to the proposed Project. This reduction is the result of the inclusion of the dry cooling concept into Alternative 3.

Environmental Comparison

Air emission impacts would be highest for Alternative 3 due to the lower efficiency associated with these alternatives compared to the proposed Project. No wetlands would be lost from construction of the proposed plant facilities under the proposed Project or Alternative 3.

Cooling Alternatives Carried Forward for Analysis

Based on the alternative comparison results described in the preceding paragraphs, Alternative 2 and Alternative 3 would be carried forward for further analysis of environmental impacts, which are presented in Chapter 4. Alternative 2 (i.e., wet cooling alternative with groundwater back-up) is preferred, as it offers the best performance coupled with the lowest capital cost and has the least total annual air emissions.

Alternative 3 provides a substitute for plant cooling in the event that the projected groundwater supplies prove to be inadequate following completion of all hydrogeologic investigations. Thus, Alternative 3 is a cooling technology alternative that may be implemented for the proposed Project.

2.3.2 Interconnection Analysis

The process for determining impacts of new generation on the existing transmission system is performed by transmission planning professionals in accordance with industry standards. The local utility proposing to add new generation generally performs preliminary transmission system studies to determine impacts and cost benefits of different interconnection possibilities. These preliminary studies are a large factor in determining if a proposed generation project is feasible to meet the growing energy and capacity needs of their native load customers. If a proposed generation project seems favorable, the local utility proposing to add new generation submits an interconnection request to the regional transmission authority, which then develops a more detailed system study. For the proposed Project, this study was prepared by MISO. The MISO study is generally more extensive than the preliminary utility's study and identifies specific modifications, upgrades, or new components, including transmission lines, substations, and communication systems, required to accommodate the new generation on the system, including identifying the best interconnection locations, or endpoints.

The Co-owners applied for interconnection of the proposed Project at two Western substations (Morris and Granite Falls.) Western participated in the MISO study, and used the studies to support Western's review. Western's system studies determined available transmission and what modifications would be required to accommodate the additional power resource on the integrated transmission system. A facility study conducted by Western identified specific modifications required at its Morris and Granite Falls substations to accommodate the transmission alternative selected by the SDPUC and the MnPUC. (Western, 2007c).

The following sections summarize the studies performed by OTP and MISO for the proposed Project. A detailed discussion of these studies is found in Appendix B1.

Otter Tail Transmission Studies

A transmission system study was initiated in late-2003 by OTP Delivery Planning. The existing Big Stone Substation, located adjacent to the existing Big Stone plant, currently has four electrical outlets: two 115-kV lines and two 230-kV lines. Results of initial transmission studies indicate that lines from the facility to Hankinson (approximately 60 miles northwest of the existing plant site) and from the existing plant site to Morris Substation are currently at their maximum capacity limit. Transmission system analyses also indicated that the existing transmission lines from the existing plant site to Burr and Canby (approximately 30 miles south of the existing plant site) and to the Blair Substation are nearing their capacity. Analyses further indicated that outages of either the Browns Valley or Blair transmission lines or an outage of the Big Stone 230/115-kV transformer would limit output from the existing Big Stone plant to approximately 50 percent (250 MW) of its operating capability. Based on this analysis, it was determined that the addition of new generation at the existing Big Stone site would require additional transmission capacity.

OTP's transmission study identified 11 potential transmission interconnection locations that were studied at 230-kV and 345-kV levels of service. A series of analyses were performed through a screening study that identified the constraints on the transmission system within the MAPP region due to the injection of an additional 600 MW of power from the proposed Big Stone II power plant. The studies identified transmission system facility overloads in the system that would be associated with each of the 11 alternatives.

OTP performed a cost-benefit analysis to evaluate the capital costs for constructing and installing each of the 11 alternatives independently with the proposed Big Stone II power plant. This analysis estimated the total capital costs based on flat rates per total linear miles of line (by voltage); line termination requirements (by voltage and including breakers, bays, disconnects, and relaying); auto transformers (by voltage and size); and capacitors (by voltage and size). Results of the screening study indicated that capital costs to construct the various transmission alternatives would range from $53 million to $168 million and that almost all alternatives would require similar upgrades to the existing transmission system.

Midwest Independent System Operator Transmission Studies

Five of the 11 alternatives identified during the screening study were carried forward for presentation to an "ad hoc study group" formed by MISO during mid-April 2004 after the proposed Project participants submitted an interconnection request to MISO in early 2004. Two of the alternatives in the report were identical to those initially studied, while three included modifications to alternatives that were initially studied. These modifications reflected recent system improvements under consideration by other utility companies to fit with other prospective projects that would efficiently deliver additional power to large load centers.

The ad hoc study group included the Co-owners and potentially affected transmission owners. During the ad hoc study group meeting, a decision was made to use computer models to simulate 2007 summer peak conditions and 2007 summer off-peak conditions. Two of the five alternatives were considered somewhat representative of all five alternatives and were selected by the ad hoc study group for detailed evaluation. MISO hired OTP Delivery Planning to conduct further studies of the transmission system and they prepared an interconnection study report with guidance from the ad hoc study group.

The MISO Interconnection Study discussed two interconnection alternatives, which laid the foundation for corridor alternatives addressed in the EIS:

Alternative A

- Construct a new Big Stone-Ortonville 230-kV line and upgrade the existing Ortonville-Johnson Junction-Morris 115-kV line to 230 kV.
- Construct a new Big Stone-Canby 230-kV line and upgrade the existing Canby-Granite Falls 115-kV line to 230 kV.

Alternative B

- Construct a new Big Stone-Canby 230-kV line and upgrade the existing Canby-Granite Falls 115-kV line to 230 kV.
- Construct a new Big Stone-Willmar 230-kV line.

Western Transmission Studies

Because MRES and HCPD may take transmission service through the Western system, they submitted transmission delivery service requests to Western. In addition, MRES, on behalf of the Co-owners, submitted an interconnection request to Western for the proposed Big Stone II transmission lines at Morris and Granite Falls substations. The interconnection and transmission delivery service process for the transmission system owned and operated by Western is similar to, but separate from, the MISO process. To avoid redundant processes and duplicate studies, Western is participating in the MISO studies.

Western's review process is similar to MISO's. Western is currently addressing the request for interconnection in accordance with its large generator interconnection procedures. These procedures include conducting feasibility, system impacts, and facility studies. Once these studies are completed, Western would provide facility design and construction support for the interconnection request and associated facilities. Once construction has been completed, and before energizing the new lines and associated substations, Western would review and test the new facilities. When found to be in conformance with Western's criteria, Western would issue the requesting entity an Interconnection Agreement, which addresses long-term operation and maintenance issues for the interconnected facilities.

2.3.3 Transmission Alternatives

Several levels of alternative analyses were conducted for the transmission component of the proposed Project. OTP completed initial systems analyses to determine if the existing transmission lines could carry additional energy from the proposed Big Stone II plant. These studies also analyzed needed system additions and identified Alternatives A and B as discussed in Section 2.3.2.

OTP identified corridors for each segment of the alternatives: Big Stone to Morris, Big Stone to Willmar, and Big Stone to Granite Falls. During the EIS scoping process, Western undertook an independent alternatives analysis and identified additional corridor alternatives. The corridor development process is discussed in Section 2.3.3.1. Details of Western's alternatives analysis, including transmission system alternatives eliminated from detailed analysis, are provided in Appendix B1.

2.3.3.1 Corridor Development

Initial Corridor Development

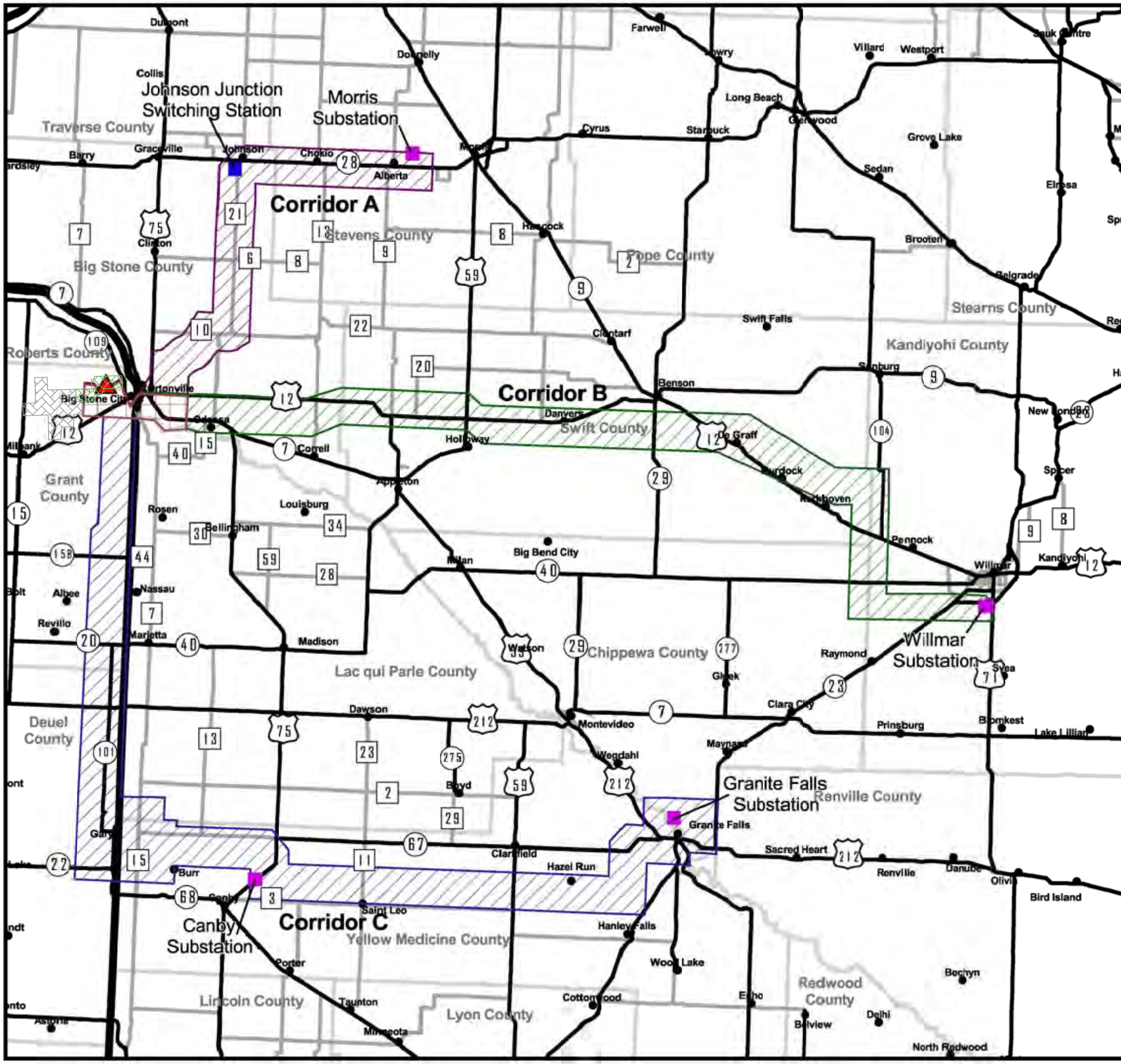
The Co-owners undertook an initial corridor development analysis for the proposed Project prior to applying for interconnection with Western. This analysis identified three alternative transmission corridors that could be used to interconnect the proposed Big Stone II facility to each of the three endpoints. These corridors are identified as Corridors A, B, and C on Figure 2.3-1. Western included these three corridors in its Notice of Intent to Prepare an EIS and in the EIS scoping process.

Western's Alternative Corridor Development Subsequent to Scoping

The range of comments received during scoping resulted in further analyses to identify additional areas that should be avoided and areas that may be suitable for transmission line routing. Scoping comments expressed concern regarding environmentally sensitive resources in the Ortonville area where the Co-owners have proposed rebuilding the existing Big Stone-to-Morris 115-kV Transmission Line to 230-kV service. Scoping comments also expressed concern about routing transmission lines along U.S. Highway 12, in the vicinity of Danvers, through Dovre Township (north of Willmar), and within the Willmar area. Corridor development and analysis was carried out as a result of proposed Project scoping, field analyses, and review of area maps.

Final Corridor Development and Analysis

Potential alternative transmission line corridors were identified using linear features, environmental constraints, and input received during the scoping process. Corridor opportunities typically include paralleling linear features such as roads, highways, section lines, mid-section lines, transmission lines, railroads, and pipelines. Corridor widths are typically three miles wide; some corridor widths were expanded to four miles wide to increase opportunities to route the lines or compressed to two miles wide due to environmental and engineering constraints. Wide transmission line corridors would maximize the range of opportunities that would be available for identifying one or more specific transmission routes within each corridor, as required by the Minnesota High Voltage Transmission Line Route Permit requirements. Existing transmission lines and/or transportation corridors (i.e., roads and highways) represent the centerline of most corridors. Constraints were mapped to identify areas that should be avoided. Constraints included population centers, incompatible land uses, and environmentally sensitive areas.



Big Stone II EIS

Figure 2.3-1

Transmission Corridors Identified by the Project Co-owners

Alternative corridors were identified and evaluated based on the corridor opportunities and constraints identified. The following screening criteria were applied to each corridor to determine which alternatives or segments to drop from further consideration and which to carry forward for further analysis in the EIS.

- Avoiding environmentally sensitive areas
- Avoiding population centers
- Compliance with regional transmission planning objectives
- Maximizing the availability of linear features
- Maximizing opportunities to upgrade existing transmission lines
- System reliability (both physical reliability and overall electric system integrity)

Based on the evaluations and studies summarized above, Western determined that two primary alternatives and two additional corridor variations would be carried forward for further detailed analysis in this EIS. These alternatives are illustrated in Figures 2.3-2 and 2.3-3 and include:

- Alternative A – Corridors A and C with corridor alternative C1
- Alternative B – Corridors B and C with corridor alternatives B1 and C1

Table 2.3-2 provides a comparative summary of all the corridors carried forward for detailed analysis in this EIS using the screening criteria listed above.

2.3.3.2 Transmission Alternative A

Transmission Alternative A is shown in Figure 2.3-2. Alternative A corridors would total approximately 136 linear miles and consist of Corridor A in combination with Corridor C or C1.

Corridor A begins at the existing Big Stone Substation and ends at Western's Morris Substation near Morris, Minnesota. Segments of Corridor A include: a new 230-kV line from the existing Big Stone plant to Ortonville Substation in Ortonville, Minnesota; an upgrade of the existing 115-kV transmission line from Ortonville Substation to Johnson Junction Switching Station located near Johnson, Minnesota; and an upgrade of the existing 115-kV transmission line from Johnson Junction Switching Station to a final termination at Western's Morris Substation.

Corridor C includes a new 230-kV line from the existing Big Stone Substation to the proposed relocated Canby Substation near Canby, Minnesota, and the conversion of an existing 115-kV transmission line to 230-kV service from Canby to Western's Granite Falls Substation near Granite Falls, Minnesota. Corridor C is located within South Dakota and Minnesota and is approximately 92 linear miles. As previously noted in Section 2.2.3, the Canby Substation would be relocated approximately one mile to the northeast from its existing location, which is within the 100-year floodplain of Canby Creek.

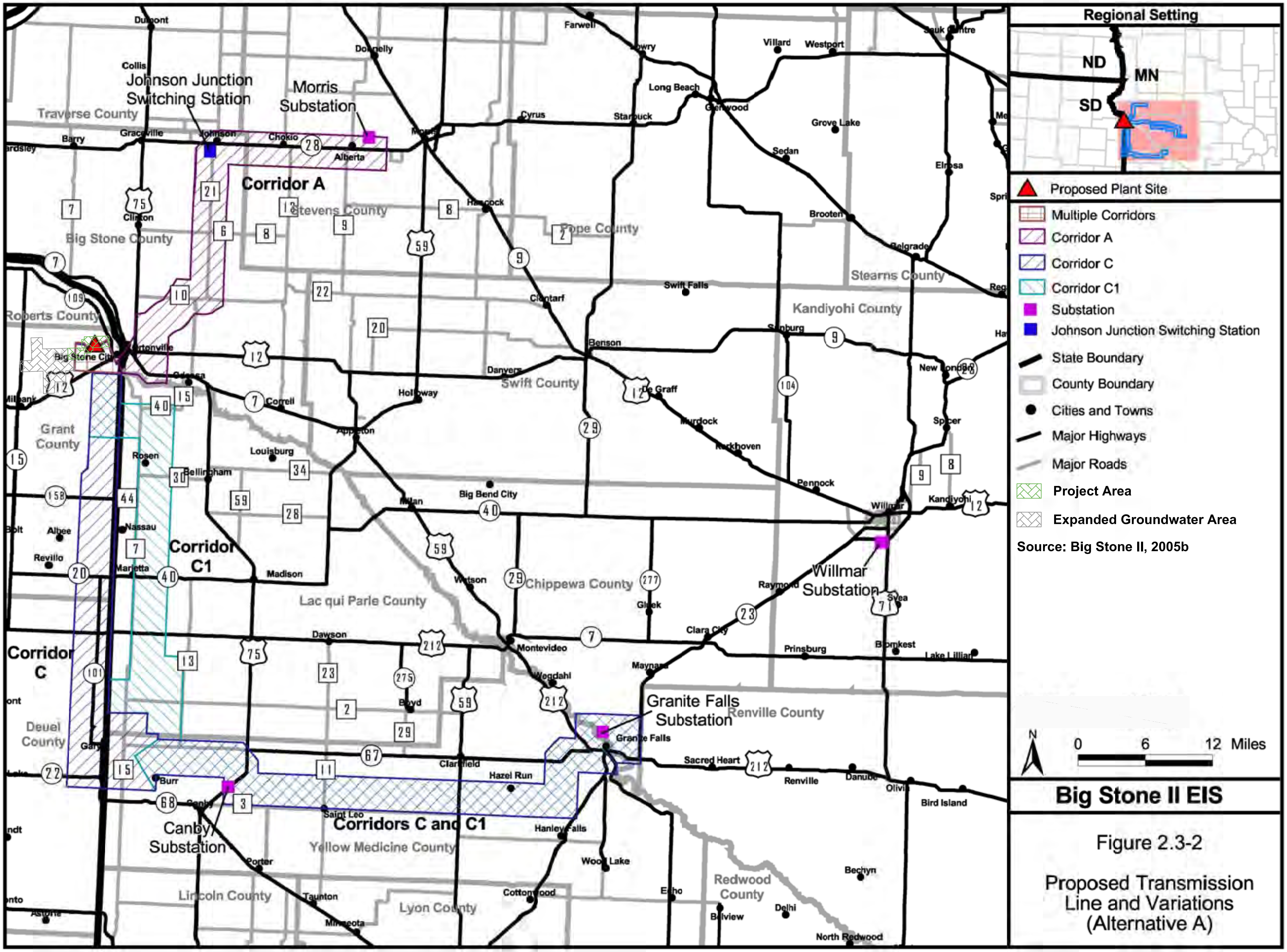
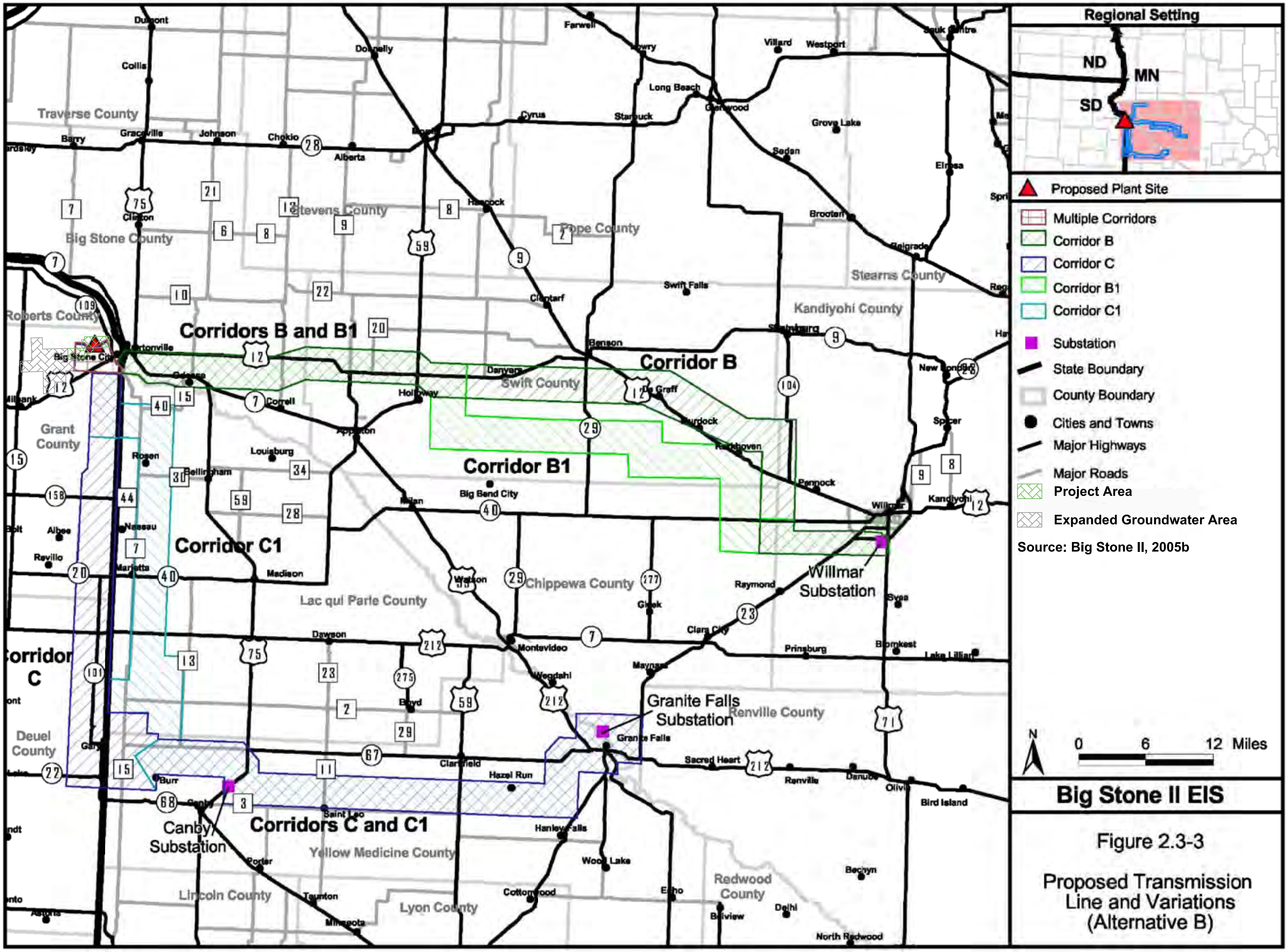


Figure 2.3-2

Proposed Transmission Line and Variations (Alternative A)



Big Stone II EIS

Figure 2.3-3

Proposed Transmission Line and Variations (Alternative B)

Table 2.3-2. Screening Criteria Evaluation of Corridors Carried Forward for Evaluation

Criteria	Corridor A	Corridor B	Corridor B1	Corridor C	Corridor C1
Avoidance of Areas of Environmental Sensitivity	The proposed corridor would not avoid areas of environmental sensitivity present immediately northeast of Ortonville. However, reconstruction of the existing transmission line would result in substantially less disturbance to area resources compared to constructing a new transmission line through undisturbed areas.	The proposed corridor would not fully avoid environmentally sensitive areas such as U.S. Highway 12 and the Willmar area.	The proposed corridor would partially avoid environmentally sensitive areas such as U.S. Highway 12 and the Willmar area.	Environmentally sensitive areas near Gary may be affected.	Environmentally sensitive areas are likely to be minimal. Sensitive resources in the vicinity of Gary would be avoided.
Avoidance of Population Centers	Johnson, Chokio, and Alberta are located within the proposed corridor. If the existing transmission line were to be rebuilt, potential impacts to population centers could be minimal.	The proposed corridor includes Danvers, DeGraff, Murdock, and the Willmar area.	The proposed corridor would avoid Danvers, DeGraff, and Murdock, but includes the Willmar area.	The proposed corridor avoids all population centers except Gary, St. Leo, Hazel Run, and Granite Falls.	The proposed corridor avoids all population centers except Marietta, St. Leo, Hazel Run, and Granite Falls.
Compliance with Regional Transmission Planning Objectives	Supports regional transmission planning objectives by alleviating a previously identified 115-kV line overload between Ortonville and Johnson Junction, which would have needed increased capacity in the near future due to previously studied generation projects outside of the proposed Big Stone II. It also has the potential to increase the ability of interconnecting new generation sources to a high-capacity transmission line along the proposed corridor.	The proposed corridors are oriented east – west and provide an opportunity to support regional transmission planning objectives by increasing reliability of the transmission system around the large load center of Willmar. They also have the potential to increase the ability of interconnecting new generation sources to a high-capacity transmission line along the proposed corridor.		The proposed corridors extend south from the proposed Big Stone II plant and east into Minnesota. These corridors would support regional transmission planning objectives by providing a high-capacity transmission path from the Dakotas to western Minnesota. They also have the potential to increase the ability of interconnecting new wind generation sources in the area.	

Table 2.3-2 (continued)

Criteria	Corridor A	Corridor B	Corridor B1	Corridor C	Corridor C1
Maximizing the Availability of Linear Features	The southern portion of the corridor includes an existing highway that angles northeast – southwest. The remainder of the corridor includes a variety of rural roads and highways that traverse north-south and east-west. Therefore, a portion of the proposed corridor provides limited opportunities to parallel roads, section lines, etc.	The proposed corridor largely provides opportunities to parallel linear features such as roads, highways, and section lines. Opportunities to parallel linear features would be limited within a portion of the corridor west of Willmar.	The proposed corridor largely provides opportunities to parallel linear features such as roads, highways, and section lines.	These proposed corridors would provide opportunities to parallel linear features such as roads, highways, and section lines throughout much of its alignment.	
Maximizing Opportunities to Upgrade Existing Transmission Lines	The proposed corridor includes an existing transmission line that could be upgraded for Project purposes.	Corridor B only has a minimal amount of existing transmission lines.	Existing transmission lines are present within the corridor from the vicinity of Benson to Willmar.	Existing transmission lines are present along all segments of the corridor.	Existing transmission lines are present within all segments except a limited area south of Big Stone National Wildlife Refuge.
Reliability	Single-circuit; reliability not an issue.	Single circuit; reliability not an issue.	Ample space between existing transmission lines to route new transmission lines away from existing transmission lines; reliability not an issue.		

Corridor C1 (Figure 2.3-2) is an alternate route for connecting the existing Big Stone Substation to the proposed relocated Canby Substation, with the majority of the corridor located within Minnesota. The corridor was identified in response to scoping comments that expressed concern regarding environmentally sensitive resources near Gary, South Dakota. Similar to Corridor C, this corridor includes a new 230-kV line from the existing Big Stone Substation to Canby, and the conversion of an existing 115-kV transmission line to 230-kV service from Canby to Western's Granite Falls Substation near Granite Falls. This 92-mile long corridor includes existing transmission lines and local county roads throughout much of its length. Existing lines could be paralleled. Use of the corridor would provide opportunities to route transmission lines around environmentally sensitive resources in the vicinity of Gary.

Additions to the existing Big Stone 230-kV Substation would be required to accommodate the two new 230-kV lines and a new connection to the proposed Big Stone II plant. Within Corridor A, a new substation would be constructed at the site of Johnson Junction Switching Station, which would require the addition of a transformer and other equipment necessary for substation operation. Substation changes would also be required to accommodate the upgraded line and the need for additional 230/115-kV transformer capacity at Western's Morris Substation. In Corridor C and Corridor C1, substation modifications to accommodate the upgraded line at Western's Granite Falls Substation would be required. Additionally, the existing Canby Substation would need to be relocated out of a floodplain zone and the relocated substation would incorporate a new 230/115/41.6-kV transformer and associated new line interconnections. Substation site expansions may be required at all locations. These system modifications would satisfy the improvements identified for this alternative in the MISO interconnection study.

An option under consideration for Alternative A is to remove the interconnection to the Ortonville Substation. Rather than building a new 230-kV line from Big Stone Substation, to Ortonville Substation, two new 230-kV transmission lines would be built to a location approximately 1.25 miles south of Big Stone Substation. One of the two lines would continue from this location to Canby Substation. The second of the two lines would continue to a location approximately 1.25 miles from Ortonville Substation where it would connect with the upgraded 230-kV line to Johnson Junction Switching Station.

Eliminating the Ortonville Substation connection for Alternative A would reduce transmission line congestion in the corridor leading to and from Ortonville Substation, and would allow for the removal of about 1.25-miles of an existing 115-kV line. Also, Ortonville Substation would not need to be expanded to accommodate a new 230/115-kV transformer that would have otherwise been needed. Contrary to the results published in the MISO interconnection study report that included an Ortonville connection for transmission Alternative A, subsequent study analysis has determined that the Big Stone to Highway 12 115-kV transmission line would not have to be reconductored without a connection into the Ortonville Substation. However, if the Ortonville Substation interconnection were removed, Canby Substation would be required to be an energy source to existing customer demands; and therefore, the Big Stone-to-Granite Falls 230-kV line would need to interconnect with Canby Substation.

For both Corridor C and Corridor C1, the proposed line from Big Stone Substation to Canby and the line proposed to be rebuilt from Canby to Granite Falls would be designed and constructed at 345-kV capability rather than 230-kV capability, to a location east of Hazel Run, Minnesota, where the existing line turns north to Granite Falls. Additionally, a portion of the relocated Canby Substation may be built to accommodate future 345-kV operation rather than 230-kV operation. The Hazel Run-to-Granite Falls segment would be constructed at 230-kV service. Constructing the Big Stone to Hazel Run portion of the transmission line at 345-kV service rather than 230-kV service, would be in response to regional transmission plans.

2.3.3.3 Transmission Alternative B

Transmission Alternative B is shown in Figure 2.3-3. Transmission Alternative B would total approximately 177 linear miles and consists of Corridor B or Corridor B1 in combination with Corridor C or Corridor C1. Corridor B, proposed by the Co-owners, includes a new 230-kV line from the existing Big Stone Substation to Willmar Substation, Willmar, Minnesota and is approximately 84 linear miles.

Corridor B1 is an alternate route from Big Stone to Willmar. The corridor was identified in response to scoping comments that expressed concern regarding the location of transmission lines along U.S. Highway 12 and in the Danvers area. Similar to Corridor B, this corridor also includes a new 230-kV line from the existing Big Stone Substation to Willmar Substation. A portion of Corridor B1 avoids U.S. Highway 12 and the Danvers area by extending the corridor from Holloway to an area west of Willmar. Corridor B1 would provide transmission line route flexibility to parallel existing rural roads along section lines and construction within mid-section lines. The corridor includes 69-kV transmission lines from the vicinity of Benson to Kerkhoven and from Kerkhoven to Willmar Substation. Use of this corridor would reduce potential impacts to population centers within the Co-owners' proposed Corridor.

As identified for Alternative A, Alternative B also includes Corridors C and C1 (a new 230-kV line from the existing Big Stone Substation to Canby, Minnesota and the conversion of an existing 115-kV transmission line to 230-kV service from Canby, Minnesota to Granite Falls, Minnesota). Corridor C and Corridor C1 would be the same as described for Alternative A.

The MISO interconnection studies identified the following transmission system improvements for Alternative B:

- Rebuild the Ortonville-to-Johnson Junction-to-Morris 115-kV lines to remedy line overload.
- Install a capacitor bank in Willmar Substation.

Based on further discussions with other local utilities about the proposed Big Stone II Project, it was decided that the following system modifications would be included in Alternative B:

- Removal of an existing 115/69-kV transformer, possible upgrade of an existing 230/69-kV transformer, and addition of a new 230/69-kV transformer at Willmar Substation.
- De-energize the existing Willmar-to-Kerkhoven Tap 115-kV transmission line and the Granite Falls to Willmar 69-kV transmission line.

To address system constraints for Alternative B identified during the MISO interconnection study, the 115-kV transmission line from Ortonville to Johnson Junction to Morris would be totally rebuilt with new structures and conductor in its existing right of way at the same voltage level (115-kV). The existing Willmar-to-Kerkhoven Tap 115-kV and the Granite Falls-to-Willmar 69-kV transmission lines would be de-energized and left in place.

Additions to the existing Big Stone Substation, Granite Falls Substation, and Canby Substation would be required, as described in Alternative A. In addition, modification of Willmar Substation would be required to accommodate the new 230-kV line and address the system constraints identified during the MISO transmission study. Willmar Substation is jointly owned by Willmar Municipal Utilities, Xcel Energy, and Great River Energy. Substation site expansions may be required at all locations.

2.4 No Action Alternative

CEQ NEPA regulations (40 CFR 1502.14) require evaluation of the No Action Alternative as part of the analyses. Under the No Action Alternative, Western would reject the application to interconnect to Western's transmission system. Changes to the Canby Substation (i.e., relocation out of the floodplain) and the upgrades to the Hankinson Line that are associated with the proposed Project would not occur. However, the existing Ortonville-Johnson Junction-Morris 115-kV transmission line to Morris Substation would need to be re-built to meet existing and future power delivery needs. Rebuilding the existing transmission line would have similar impacts to those described in Chapter 4. Additionally, the USACE would not issue any permits to the Co-owners related to the proposed Big Stone II Project. Three foreseeable courses of action that would be available to the Co-owners are described below. Each of these actions would include the rebuild of the Ortonville-Johnson Junction-Morris 115-kV transmission line.

No-Build Alternative:

Under this scenario, the Co-owners would not proceed with the proposed Big Stone II Project. The Co-owners would not secure alternate baseload generation and would not seek alternate transmission configurations. Under these circumstances, the Co-owners would not fulfill their purpose and need for the proposed Project, and the potential impacts (positive or negative) of the proposed Project would not occur.

Sub-alternative 1:

Under this scenario, the Co-owners would not proceed with the proposed Big Stone II Project. The Co-owners would likely fulfill their generation and transmission needs individually or cooperatively through alternative arrangements by seeking generation capacity and energy from other sources, if available. Under this No Action Alternative, beneficial and adverse impacts associated with constructing and/or operating the proposed Project would not be realized and existing conditions would continue during the foreseeable future. An additional source of electrical energy would not be available to the Co-owners from the proposed Big Stone II Project (refer to Section 1.2). The Co-owners would need to develop or secure alternate baseload generation to meet their customers' needs. Any new development of baseload generation would produce environmental impacts similar to the proposed plant, but at different locations. The decisions and determinations would be subject to the discretion and business decisions of each participating Co-owner, and Western is not in a position to evaluate the individual needs of each Co-owner to determine their potential courses of action with any certainty. For this reason, describing the potential impacts of this alternative is speculative; therefore, the Final EIS does not attempt to describe any potential impacts associated with this subset of the No Action Alternative. The emissions reductions contemplated for the existing plant as part of the proposed Project would not occur under this scenario.

Sub-alternative 2:

Under this scenario, the Co-owners would likely proceed with the construction and operation of the proposed Big Stone II plant in order to fulfill their purpose and need of meeting baseload requirements. Instead of obtaining the existing transmission interconnections on the Federal transmission system, the Co-owners would be required to seek an alternative transmission configuration that would provide firm transmission service on the MISO system. Another option would be to purchase non-firm transmission rights from MISO over the MISO system. Using non-firm transmission for a baseload generation resource is contrary to generally accepted industry standards. Under this sub-alternative, the environmental consequences for the proposed Big Stone II plant would likely be similar under this scenario to those described in this EIS. The environmental consequences associated with obtaining transmission capacity would likely be similar to those described in the Final EIS for the proposed Project, though those impacts may occur at different locations. Because the Co-owners have not explored the possibility of proceeding with the construction of the proposed plant without the interconnection to Western's transmission system, the locations of those potential transmission impacts are unknown.

2.5 Alternatives Considered but Eliminated from Detailed Analysis

Since the issuance of the Draft EIS and the Supplemental Draft EIS, Western has reexamined its alternatives analysis based on RUS' withdrawal as a cooperating agency. The reexamination of the alternatives analysis began with a screening of alternatives against Western's statement of purpose and need for agency action and continued with a comparison against feasibility factors that are based on cost, logistical, technological, social, environmental, and legal factors. Any alternatives that failed to meet Western's purpose and need were dismissed from further evaluation. During scoping and the Draft EIS and Supplemental Draft EIS review periods, the public, participating agencies, and special interest groups provided input into the alternative discussion and suggested additional alternatives.

2.5.1 Power Generation Alternatives Eliminated

The Co-owners' need for the proposed Project is to address their customers' anticipated baseload energy needs in an economical, environmentally responsible manner. As identified in Chapter 1, studies point to a potential shortfall of baseload generating capacity among the Co-owners and throughout the Mid-Continent Area Power Pool (MAPP) region by 2010.

When considering the most appropriate energy resource to develop, the Co-owners made a qualitative assessment of the available alternative technologies' ability to meet the proposed Project's objectives. Those objectives include:

- Reliably meet customer baseload energy and demand requirements.
- Commercially proven technology at the several hundred MW scale.
- Minimize environmental and community impacts by leveraging existing generation site and transmission infrastructure.

- Enhance customer value and reduce customer risk by implementing a proven, efficient technology.

Current and projected reliance on coal as a primary fuel for power generation, along with projected fuel costs, are fundamental factors that support the Co-owners' selection of coal as the fuel for the proposed Big Stone II plant. The use of coal as a fuel source offers long-term supply and price stability compared to natural gas, oil, and certain renewable energy sources (e.g., wood and wood waste, biomass, and municipal solid waste.) Table 2.5-1 shows that 20.74 quadrillion British Thermal units (Btu) were used by coal-fired power plants to generate electric power in 2005. This represents 52 percent of the total fuel sources for the electric power sector in the United States (U.S.) (DOE, 2008b). The importance of coal is expected to remain at the same level through the year 2025, increasing to 54 percent by the year 2025.

Table 2.5-1. Annual Energy Consumption for Electric Generation Sector by Source

Source	Energy Consumption[a]				
	2005	**2010**	**2015**	**2020**	**2025**
Distillate Fuel	0.21	0.18	0.18	0.20	0.21
Residual Fuel	1.03	0.38	0.39	0.39	0.40
Natural Gas	6.04	6.89	6.75	6.09	5.45
Steam Coal	20.74	21.01	22.18	23.67	25.51
Nuclear Power	8.16	8.31	8.41	9.05	9.50
Renewable Energy/Other (3)	3.49	4.53	5.05	5.64	5.94
Electricity Imports	0.08	0.05	0.04	0.04	0.05
Total	39.75	41.35	43.00	45.08	47.06
Steam Coal as % of Total	52	51	51	52	54

[a]Quadrillion (1×10^{15}) Btu, unless otherwise noted. Includes consumption of energy by electricity only and combined heat and power plants, whose primary business is to sell electricity, or electricity and heat, to the public. Includes small power producers and exempt wholesale generators. Includes conventional hydroelectric, geothermal, wood and wood waste municipal solid waste, other biomass, petroleum coke, wind, photovoltaic, and thermal sources. Excludes net electricity imports.

Source: DOE, 2008b.

The Energy Information Administration Annual Energy Outlook 2008 (DOE, 2008b) provides forecasts of fuel prices including fuel used by the Electric Power Sector to generate electricity. Data from those forecasts was used to develop Table 2.5-2, which shows the delivered fuel cost per million Btu for coal, residual fuel oil, distillate fuel oil, and natural gas. As can be seen from the data, the cost of coal as a fuel is significantly less than any of the other available fossil fuels. Prices (in constant 2006 dollars) of all fuels are projected to peak in 2005-2010 followed by a steady overall decline through 2020 with some year-to-year fluctuations. Natural gas prices are the most volatile, followed by distillate and residual fuel oil. After reaching the projected peak in 2010, coal prices are projected to be the most stable of all fuels, with price fluctuations of no more than 2 percent per year.

Table 2.5-2. Electric Power Sector Fuel Cost Projections

Fuel	Delivered Fuel Cost per million BTU (2006 Dollars)				
	2005	**2010**	**2015**	**2020**	**2025**
Coal	1.59	1.84	1.74	1.72	1.74
Residual Fuel	7.40	9.45	7.41	7.50	8.25
Natural Gas	8.44	6.96	5.93	5.95	6.26
Distillate Fuel	12.62	13.62	10.67	10.69	11.59
Ethanol	21.86	18.69	17.34	19.48	20.05

Source: DOE, 2008b.

Numerous comments were received requesting that Western address alternatives to the Co-owners' proposal to provide baseload generation from coal-fired generation, including the following comments that are specifically addressed in Volume II of the Final EIS: (1) Western should address demand side management (DSM) as an alternative to coal-fired generation; (2) Western should evaluate renewable energy alternatives to the Co-owners' generation plan, including wind, solar, and biomass; and (3) Western should evaluate Integrated Gasification Combined Cycle (IGCC) generation with CCS and wind in combination with coal or Combined Cycle Gas Turbine (CCGT).

Western considered the generation alternatives suggested to the Co-owners' generation plans and has determined that the EIS will not fully analyze them for the following interrelated reasons:

- The alternatives to the Co-owners' generation plan fall outside of Western's purpose and need (see Section 1.3.1). An analysis of alternatives to the Co-owners' generation plan is unreasonable because such alternatives do not fall within Western's purpose and need and have not been presented to Western in the application for interconnections.

- Western's decision is limited to whether to grant the interconnections at its Granite Falls and Morris substations. Any analysis of alternatives to generation lies outside the scope of Western's decision. Western has no discretion or approval authority over the Co-owners' planned generation facility. Western's sole decision is whether to interconnect the Co-owners' proposed Project. Thus, consideration of alternatives to the Co-owners generation is unreasonable and infeasible.

- Absent specific legislation, Western has no Congressional authority to participate in construction of a power generation project such as the proposed Big Stone II Project. Western's mission is to market and deliver reliable, cost-based hydroelectric power within a 15-State region of the central and western United States. Western provides transmission service and processes an Applicant's Interconnection request under its Open Access Transmission Service Tariff. Western's statutory authorization and Congressional directives are limited to marketing and delivering power. Western has no authority to participate in the design, construction, and operation of a power plant.

- The generation alternatives suggested by others are speculative. It is speculative and infeasible for Western to consider alternatives to generation that have not been proposed to Western and do not even exist. For example, addressing generation alternatives would require Western, a Federal agency that operates no generation facilities, to design an alternative generation facility and then evaluate the impacts of this hypothetical facility. Not only would the design be speculative, but also the impacts would be speculative. All the generation alternatives raised in the comments suffer this same flaw.

Considering the strong interest expressed by the public regarding alternative generation technologies, Western has provided information below on the reasonableness of the alternative generation alternatives as it relates to the Co-owners' needs for baseload generation. This information also gives perspective to the environmental effects of the proposed Project. Supplemental information regarding renewable energy resources and DSM are presented in greater detail in the Wind and Renewable Energy Response and Demand Side Management papers (see Response Papers B and C, Volume II of the Final EIS).

2.5.1.1 Sub-Critical Coal Technology

PC boiler technology is a mature and reliable energy producing technology used around the world. The operating pressure of conventional coal-fired power plants can be classified as sub-critical and super-critical. Sub-critical and super-critical technologies refer to the state of the water used in the steam generation process. (Super-critical boiler pressures and temperatures typically operate at 3,500 pounds per square inch absolute (psia) and 1,000 to 1,050 degrees Fahrenheit (ºF), whereas plants operating at or below a main steam pressure of 3,204 psia are considered sub-critical). Disadvantages of sub-critical technology include three to four percent lower efficiency over super-critical applications. Sub-critical technology results in increased fuel consumption, and therefore, higher emissions rates per MW hour of generation. Boiler operation also is less efficient at partial loads. At 75 percent load, the efficiency of a super-critical unit is reduced by two percent, whereas efficiency of a sub-critical unit would be reduced by four percent (Big Stone II, 2005a; 2005b; 2005c; 2005d; 2005e). The sub-critical boiler technology has lower efficiency, higher emission rates, and higher fuel consumption.

2.5.1.2 Wind Energy

Several comments received expressed an interest in wind energy as the primary source for power generation. According to the American Wind Energy Association (AWEA), North Dakota, South Dakota, and Minnesota rank 1, 4, and 9, respectively, among the States with the best wind resource (AWEA, 2008). However even in such a relatively windy region, wind turbines generate electricity only 30 to 40 percent of the time. Additionally, it is not possible to schedule the dispatch of wind turbines to match load, as their day-to-day operation is as unpredictable as the wind. The economics of using wind generation and compensating for the lack of dispatchability is specific to each utility. Therefore, each utility addresses the economics of wind on its own, and it is not part of this proposed Project.

Wind Reliability, Capacity Factor, and Capacity Value

Under current technologies, there is no perfect electrical generation resource. Each type of energy resource provides a predictable set of advantages and disadvantages. It is common practice for electric utilities throughout the U.S. to view their generation resources as a portfolio of different types of units, making use of baseload units[4], load following units[5], and peak load units[6]. Baseload plants are usually large generating plants that cannot be started and stopped quickly and are used to supply a minimum power level or baseload, 24 hours per day every day of the year. Baseload plants have the lowest costs per unit of electricity because they are designed for maximum efficiency and are operated continuously at high output. The generating plants that are the most economical to operate are used to supply baseload power. Therefore, since these are some of the least costly plants to operate, they are usually operating (i.e., dispatched) near their maximum available power level.

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[4] A baseload unit is an energy generating facility whose sole or primary purpose is to provide minimum power requirements for customers. Baseload units are typically the most reliable and lowest cost generating facilities within a given group of generating units.

[5] Load following is a utility's practice of adding additional generation to available energy supplies to meet moment-to-moment demand in the distribution system served by the utility, and/or keeping generating facilities informed of load requirements to ensure that generators are producing neither too little nor too much energy to supply the utility's customers.

[6] A peak load generating facility is constructed and operated expressly for the purpose of providing energy supply during periods of very high demand. Peak load stations are typically operated only during particular times of day or at times of the year when there is a spike in the demand for energy for heating or cooling systems.

As described in Section 1.4.2 of the Final EIS, a baseload generating unit is required to meet growing electricity demand. From an operating perspective, the most important characteristics of a baseload unit include a high degree of reliability and availability, which results in high capacity factors. Coal-fired generating facilities generally have capacity factors of between 80 to 85 percent. Since wind cannot be scheduled or predicted with a high degree of accuracy, the capacity factor for wind generators is much lower than that of coal-fired power plants. Therefore, wind power in a generation portfolio sacrifices dependability in the overall ability to deliver reliable electrical power to an energy provider's customers.

A utility's ability to schedule a power resource is especially critical for baseload generating units. The Co-owners have noted their commitment to the prudent utilization of renewable resources, such as wind power. However, the inherent characteristics of renewable resources, such as wind, constrain certain applications. The nature of wind power contains uncertainties associated with how much energy or capacity would actually be available during various times of day, or during periods of high demand, in event that the wind is blowing less than energy or capacity requirements. Additionally, winds can be too high for turbines to operate (DOE, 2008). For these reasons, wind energy is often considered an energy resource (rather than a capacity resource) which can be used to displace energy produced from other technologies and to reduce fuel costs from those technologies. With the recent significant growth in the wind energy generation market, there is interest and need to estimate the amount of capacity that wind generation provides. Capacity is generally quantified by examining a unit's capacity factor. The capacity factor of wind power generating units is assessed here by examining several independent sources of data:

- Comparisons of various power plants conducted by the National Renewable Energy Laboratory (NREL) assume that the capacity factors for wind plants are 25 to 35 percent (NREL, 2005).
- Wind power analysis conducted by the AWEA assumes that wind power facilities have a capacity factor of 35 percent (AWEA, 2005).
- The British Wind Energy Association (BWEA) reports that wind energy has a capacity factor of 25 percent to 40 percent (BWEA, 2008).
- The Energy Center of Wisconsin reports, "…a wind turbine may produce on average a third of the maximum power of the generator, or have a 33 percent capacity factor. Typical capacity factors are 20 to 25 percent." (Energy Center of Wisconsin, 2008).
- The MnDOC notes that wind generators have an average capacity factor of 35 percent (MnDOC, 2004).
- The U.S. Department of Energy (DOE) reports that actual wind generators at six different sources have experienced capacity factors between 25.2 to 35.5 percent (DOE, 2001).

Based on the above independent sources, it appears that an assumed capacity factor of 35 percent is reasonable for wind power units. Low capacity factors mean that wind power units cannot be scheduled in the same manner as traditional baseload units. Since coal-fired power plants have a capacity factor reaching 80 to 85 percent, its likelihood of being available during high load demand is also much greater. This increase in expected availability means that coal-fired plants can be scheduled with greater reliability and certainty.

MAPP and MISO do not assign any capacity factor to wind resources. MAPP does assign a capacity value to wind resources that is based on the actual historical performance of the wind resource during periods of peak demand. MAPP's computed capacity value represents a 50 percent probability that the wind resource will be operating at least at its accredited value.

Another issue, noted in a recent publication is that wind generation increases the amount of variability and uncertainty of the net load (PEM, 2006). This may introduce measurable changes in the amount of operating reserves required for regulation, ramping, and load-following. Operating reserves may consist of both spinning and non-spinning reserves. The addition of 1,500 MW and 3,300 MW of wind (15 percent and 10 percent, respectively, of a system peak load) increased regulation requirements by 8 MW and 36 MW, respectively, to maintain the same level of North American Electric Reliability Council (NERC) control performance standards at the same level (Utility Wind Integration Group, 2006).

As noted above, the costs of operating reserves and system regulation costs must be added to wind generation project costs for proper accounting and integration of wind generation into electric systems. In addition to the capacity factor of a wind power unit, it is a common industry practice to consider the capacity value of generation additions. In this context, capacity value is defined as the ratio of assumed available capacity versus the nameplate rating of the unit, during peak demand conditions. Commenters indicated that the Co-owners applied a zero capacity value to wind turbines in their resource addition studies. Western investigated this matter and found that the Co-owners utilized a capacity value of 15 to 25 percent in their most recent resource addition studies. Based on the considerations for capacity reserve requirements and system regulation requirements discussed above, these capacity value assumptions appear to be in the correct range. The following table summarizes the Co-owners' capacity value assumptions:

Table 2.5-3. Co-owners' Capacity Value Assumptions

Co-owner	Capacity Value (Percent)
CMMPA	22
HCPD	20 - 25[a]
MDU	22
MRES	15
OTP	15 - 20[b]

[a] HCPD assumes a summer capacity value or wind turbines of 20 percent and a winter value of 25 percent.

[b]OTP assumes a summer capacity value for wind turbines of 15 percent and a winter value of 20 percent, based on performance of existing facilities on the OTP system.

The Co-owners' intent is to interconnect a baseload generation unit to the system. Available studies from MAPP and the Co-owners demonstrate that a new generation resource is needed to address baseload requirements. Wind resources are not the Co-owners' first resource option for reliable baseload power generation. See the Wind and Renewable Energy Response Paper (Response Paper B, Volume II of the Final EIS) for more details on the relationship of the Co-owners' needs and wind generation.

2.5.1.3 Solar Power

Photovoltaic solar power was considered for power production, but was determined to be ineffective and unreliable for meeting the proposed Project's requirements of a baseload facility. Solar power would be available only during daylight hours when weather conditions are appropriate. Information derived from the Solar Electric Power Association (2005) indicate that a photovoltaic array that would be capable of producing 600-MW capacity facility (operating during daylight hours) would require panels totaling 6,000,000 square meters, or more than 1,400 acres, exclusive of additional area for access and infrastructure (Henderson, 2008).

Sandia National Laboratories and other research organizations have constructed experimental solar thermal electric generating stations. The National Solar Thermal Test Facility (Sandia, 2005) operates using an array of 222 heliostats (mirrors) to direct solar heat to a central tower. Heat produced at the nine-acre site can total as much as five MW; however, five MW of heat would generate only 1.5 MW of electrical power. Therefore, a system capable of producing 600 MW of electrical power would require 400 similar nine-acre sites totaling more than 3,600 acres. Like all solar power alternatives, solar thermal power is only effective during sunlight conditions. Additionally, solar power is less effective because of annual productivity in northerly latitudes, such as South Dakota, than locations in the southwestern U.S. (Henderson, 2008).

The Co-owners' intent is to interconnect a baseload generation unit to the system. Available studies from MAPP and the Co-owners demonstrate that a new generation resource is needed to address baseload requirements. Solar has large land requirements, a relatively poor solar resource at this location, less effectiveness of concentrating solar power at this latitude, and expected low capacity factor relative to baseload. Solar resources are not the first resource option to meet the Co-owners' needs for reliable baseload power generation.

2.5.1.4 Biomass

Biomass fuel was not considered to be appropriate due to fuel availability and environmental factors. Biomass fuels include animal waste, municipal landfill gas, and a variety of vegetation sources. Corn serves as the principal biomass fuel source for ethanol production. Although data pertaining to biomass requirements and electricity production were not available, ongoing application of the technology in India indicate that waste products from a total of 430 sugar mills provides an estimated 3,500 MW of power (Edugreen, 2005). The DOE indicates that slightly less than 1,000 acres of poplar (grown as a short-rotation crop at a usable yield of five dry tons per acre) are required to supply an electric power plant with a capacity of one MW (DOE, 2005c). On that basis, 600,000 acres of poplar would be required to support 600 MW of power generation.

2.5.1.5 Atmospheric Circulating Fluidized Bed Technology

Different types of coal-fired generation technologies were considered by the Co-owners. For the Atmospheric Circulating Fluidized Bed (ACFB) technology, construction of a 600-MW (net) electric generating station would require the use of two ACFB boilers and a single, reheat steam turbine (300 MW is the practical boiler size limit for commercially available ACFB boilers at the present time).

The combustion process within a fluidized bed boiler occurs in a bed of solid particles suspended in the lower section of the boiler. Combustion within the bed occurs at a slower rate and lower temperature than a conventional PC boiler. Deviations in fuel type, size, or Btu content have minimal effect on the furnace performance characteristics. Therefore, ACFB technology is well suited to burn fuels with a large variability in constituents. Plant sites with access to an abundant source of fuel that presents combustion challenges in a PC boiler are typically good prospects for application of fluidized bed technology. The bed also allows for re-injection of a sorbent, such as fly ash or limestone, to reduce SO_2 emissions.

Fluidized bed technology has historically been characterized as a "Clean Coal Technology." However, this perception is being challenged in many areas of the country by Best Available Control Technology (BACT) requirements. Achieving emission levels and meeting BACT requirements, require the addition of Selective Non-catalytic Reduction systems for NO_X control and a fly ash and/or a limestone re-injection system for SO_2 control. The re-injection system adds to the complexity of material handling systems.

The largest atmospheric fluidized bed boilers in operation are approximately 300 MW. Boilers in the 250-MW size range have significantly more operating experience compared to the larger 300-MW units. Using two 250-MW units supplying steam to a single steam turbine is the most cost-effective configuration using fluidized bed technology for 500 MW. Individual units larger than 250 MW could potentially encounter maintenance and operational issues associated with prototype development.

All ACFB boilers built to date are of a sub-critical design, which reflect lower efficiency compared to a super-critical PC boiler. Super-critical ACFB boilers are currently being offered by Foster Wheeler and Alstom; however, none are in operation at this time. Sub-critical and super-critical technologies refer to the state of the water used in the steam generation process (super-critical boilers typically operate at or above pressures of 3,500 psia and at temperatures of 1,000 to 1,050 ºF, whereas boilers operating at or below a main steam pressure of 3,204 psia are considered to be sub-critical). Advantages of super-critical technology include three to four percent increased efficiency over sub-critical applications which results in reduced fuel consumption and, therefore, lower emissions rates per MW hour of generation. Because of the lack of industry experience and increased risk associated with super-critical ACFB units, the Co-owners only considered sub-critical ACFB units.

Selective Non-catalytic Reduction is typically used for ACFB boilers to control NO_X emissions. The inherent design of an ACFB boiler allows SO_2 control with the addition of limestone and fly ash re-injection into the boiler combustion process. An ACFB using fly ash re-injection typically achieves a 95-percent SO_2 removal rate. SO_2 control in a fluidized bed boiler requires approximately 1.5 times the quantity of limestone to achieve a similar reduction level to that achieved in a wet limestone scrubber application on a conventional coal-fired boiler. A fabric filter is typically used to remove particulate from the flue gas. Mercury control issues on ACFB units are the same as PC units.

Atmospheric fluidized bed boilers produce waste product that is a combination of ash, limestone, and calcium sulfate, which typically has only a limited commercial value. If a suitable market could not be found, waste disposal would be required.

Since the largest ACFB in operation today is only 300 MW, applying ACFB to a 600-MW plant would require two ACFB units, which would be a prototype. Additionally, the power efficiency of the ACFB units is lower when compared to the super-critical unit proposed at Big Stone II.

2.5.1.6 Integrated (Coal) Gasification Combined Cycle

The evaluation of IGCC technology assumed construction of a 550-MW (net) electric generating station composed of two coal gasifiers, two "F" class gas turbines, each coupled to a heat recovery steam generator (HRSG), and a single reheat steam turbine referred to as a 2 on 1 configuration.

IGCC technology produces a medium energy value syngas from coal or solid waste, for firing in a conventional combined-cycle plant. Coal was assumed to be the feedstock for producing the syngas. The gasification process in itself is a proven technology having been previously used extensively for production of chemical products such as ammonia for use in fertilizer, synthetic natural gas, methanol, and Fischer-Tropsch liquid fuels. However, using coal as a solid feedstock in a gasifier for power generation has limited experience. DOE has jointly funded power plant facilities in the U.S., including two operating facilities as indicated in Table 2.5-4. There are several additional gasification projects in the U.S. that were not sponsored by the DOE. These include the Motiva petroleum coke based poly generation plant (Delaware City, Delaware, 2002), the Eastman Chemical coal to methanol plant (Kingsport, Tennessee, 1984), and the Farmland petroleum coke based ammonia plant (Coffeyville, Kansas, 1999). Additional projects have been constructed in Europe: at Buggenum in the Netherlands, Puertollano in Spain, and three in Italy. The Buggenum and Puertollano projects are IGCC projects using coal, the Italian projects are poly generation (power, steam, and hydrogen) at several refineries using heavy oil feedstocks. There are more than 15 large scale gasification units either under construction or just starting operations in China. The gasification process represents a link between solid fossil fuels such as coal and existing gas turbine technology.

A 550-MW net IGCC plant would typically be composed of two coal gasifiers, a coal handling system, an air separation unit, a gas conditioning system to remove sulfur and particulate, two gas turbines, two heat recovery steam generators with supplemental duct firing (with syngas), and a single steam turbine.

Table 2.5-4. U.S. IGCC Test Facilities

Facility	Owner	Capacity (MW)	Commercial Operation Date	Gasifier Manufacturer	Status
Polk County	Tampa Electric	252	1996	Chevron Texaco	Operating
Wabash River	PSI Energy	262	1995	Conoco Phillips	Operating

Source: GTC, 2008

IGCC technology has been operating for over 10 years and continues to be improved at existing DOE jointly funded power plants. Gasification-based power generation is a relatively new technology (in the utility time frame) with a limited number of operating plants. Its unique operating features and environmental performance capabilities are still being fully defined. For this reason, capital costs, operating and maintenance costs, environmental performance, and operating performance (i.e., reliability) are issues that are not fully defined and demonstrated as compared to conventional technologies such as PC technology, which is proposed for Big Stone II.

The current generation of coal gasifiers use entrained flow gasification design with coal as feedstock. In that process, coal is fed in conjunction with water and oxygen from an air separation unit into the gasifier at around 450 pounds per square inch gauge where the partial oxidation of the coal occurs. The raw syngas produced by the reaction in the gasifier exits at around 2,400 ºF, and is cooled to less than 700 ºF in a gas cooler, which produces additional steam for both the steam turbine and gasification process. Scrubbers then remove particulate, ammonia, hydrogen chloride, and sulfur from the raw syngas stream. The cooled and treated syngas then feeds into a modified combustion chamber of a gas turbine specifically designed to accept the low calorific value syngas. Exhaust heat from the gas turbine then generates steam in an HRSG, which, in turn, powers a steam turbine.

Three gasifier vendors have IGCC experience with various U.S. coals (General Electric, Conoco-Phillips, and Shell). Each of the vendors has a slightly different technology that has proven to work differently on different fuels. Of the currently operating U.S. IGCC units, none operate on low sulfur sub-bituminous PRB coal. Testing of various coals on the different gasifiers is continuing.

Significant design issues in the initial operating years of the existing IGCC plants (e.g., Polk County and Wabash River) have prevented operating coal gasification units from achieving industry acceptable availability levels. These design issues include fouling within the syngas cooler, design of the pressurized coal feeding system, molten slag removal from the pressurized gasifier, and durability of gas clean-up equipment. More recent operation of IGCC units has demonstrated better availabilities.

The following IGCC projects are currently in the development phase:

- 540-MW power station located in Lima, Ohio, for Global Energy, Inc.
- 530-MW Mesaba Energy Project located in Minnesota for Excelsior Energy.
- Duke Energy’s 630-MW plant located in Evansport, Ohio.
- AEP’s 630-MW plant located in West Virginia.

Commercial operation of these plants, assuming the projects proceed, is at least three to five years in the future.

Further, IGCC technology development will be supported through a combination of government funding of the Clean Coal Technology Initiative and within the private power industry. Also, the resurgence of coal-fired generation within the private power industry and the relative price of natural gas will influence the continuation and future development and commercialization of IGCC in the U.S. Many of the previous technical issues have been addressed through the operating facilities and revisions to the plant designs. Additional development on refractory life and critical parts life is expected to enhance reliability of these technologies and allow coal-fueled IGCC technology to have the potential to be a reliable clean-coal generation within the U.S. In today’s contracting environment, gasifier vendors and IGCC contractors have shown reluctance to provide firm pricing to engineer, procure, and construct a nominal 600-MW IGCC facility. The estimated cost of IGCC has escalated and DOE has stated that it is 10 to 20 percent more costly than a conventional PC-based coal plant (National Energy Technology Laboratory, 2007).

IGCC is considered a developing technology that has had initial reliability issues. Because of the reliability issues and the higher costs, IGCC is not considered commercially viable. It is recognized there is planned development of the gasification process for coal in the near future, and therefore, IGCC could potentially become a reliable, low-emission source of electrical energy in the future. IGCC, therefore, is an emerging technology is not yet commercially viable.

2.5.1.7 Combined Cycle Gas Turbine

The basic principle of the CCGT plant is to use gaseous fuels, such as natural gas, or liquid fossil fuels, such as No. 2 fuel oil, to produce power in a gas turbine, which is converted to electric power by a coupled generator and to use the hot exhaust gases from the gas turbine to produce steam in a HRSG. This steam is then used to create electric power with a steam turbine generator. Combined cycle generation is widely used and is a mature technology.

The gas turbine cycle is one of the most efficient cycles for the conversion of gaseous fuels to mechanical power or electricity. Adding a steam turbine to the cycle uses the steam produced by the HRSG to increase the efficiency to a range of 50 to 58 percent.

Output for combined cycle plants can be increased with the use of duct firing in the HRSG. This method employs burning fuel gas in the HRSG at an intermediate stage to reheat the exhaust gas stream after some energy has been removed for steam superheating. Though the output is increased, the heat rate also increases, and the plant becomes less efficient. Duct firing is limited (for economical reasons) by the HRSG materials of construction but can be used to increase the steam turbine output to equal that of the gas turbine(s). Without duct firing the steam turbine(s), output is typically half of the gas turbine total output.

As noted in Table 2.5-2, the cost of natural gas fuel is on the order of three to five times higher than coal fuel costs. The Co-owners evaluated the long-term economics of the fuel-source for a large baseload power plant, and determined that natural gas would be higher in cost over the life of the proposed Project. The Co-owners also concluded that CCGT would not meet the Co-owners' common need to reduce the reliance of energy production from the volatility of natural gas prices.

2.5.1.8 Wind Plus Combined Cycle Gas Turbine

The concept of wind plus CCGT was evaluated to determine if it would be suitable for the proposed Project's operations. A combination of wind energy and combined cycle gas turbine provides a logical combination for consideration. Although the combined generation of wind energy and CCGT could be operated to meet the proposed Project's objectives of producing 600 MW (net) power, output to meet baseload conditions could not be achieved without an increase in production costs of the CCGT. Variations in wind generation would require reliance on CCGT to meet wind generation shortfalls. Since wind generation would be highly variable, the CCGT would be required to operate at lower load levels when combined with wind generation. Partial load operation increases the heat rate of the CCGT, which, in turn, increases unit production costs.

For the reasons provided above for wind (see Section 2.5.1.2) and CCGT (see Section 2.5.1.7), wind plus CCGT was eliminated by the Co-owners.

2.5.1.9 Coal Plus Wind

The Co-owners investigated alternatives that combined coal-based resources and wind energy. A summary of these studies is provided below.

- CMMA investigated the combination of 40 MW to 50 MW of participation in the proposed Big Stone II and 90 MW to 150 MW of additional wind resources between the years 2012 and 2035 (Davis, 2007).
- OTP analyzed the combination of 25 percent of renewable resources (e.g., wind resources), 1.5 percent yearly conservation savings, and participation in the proposed Big Stone II. (Morlock, 2007 and Uggerud, 2007).
- HCPD studied participation in the proposed Big Stone II in combination with meeting Minnesota's Conservation Improvement Plan (CIP) (1.5 percent energy efficiency for its Minnesota customers) and renewable energy resources (25 percent renewable energy resources by the year 2025 for its Minnesota customers) (Knofczynski, 2007).
- Burns and McDonnell analyzed the busbar costs of the following scenarios (Greig, 2007).
  - Big Stone II at 630 MW
  - Big Stone II at 580 MW
  - Big Stone II at 500 MW
  - CCGT at 500 MW
  - CCGT at 500 MW plus market purchases of wind energy with an extension in the Production Tax Credit
  - CCGT at 500 MW plus market purchases of wind energy without an extension in the Production Tax Credit
- PA Consulting investigated the combination of the proposed Big Stone II, wind resources, and DSM (Heidell, 2007).
- MRES studied the combined effects of the proposed Big Stone II, Minnesota's renewable energy resources (25 percent renewable energy by the year 2025), and Minnesota's CIP (0.75 percent and 1.5 percent energy efficiency) (Schumacher, 2007).

One important finding of the above analyses is that additional renewable resources, such as wind, would be insufficient to meet the Co-owners' forecasted peak demand. Since the Co-owners are pursuing renewable energy resources, such as wind, the coal plus wind alternative has already been considered in the development of the proposed Project. Wind represents the dynamic ability to reduce system loading for unscheduled periods of time, but is not the first resource option to provide baseload generation needs.

2.5.1.10 Demand Side Management

DSM is an ongoing means to reduce generation requirements by helping customers reduce their need for electrical energy, and it has been included as a way to offset projected generation needs. Approximately 45 percent of the energy produced by the proposed Big Stone II Project would be used by Minnesota electric customers. OTP, and other utilities serving customers in Minnesota, are subject to laws and regulations requiring filing and approval of integrated resource plans by the MnPUC. Other regional States do not have such laws. OTP filed its resource plan on June 30, 2005, which included a fully integrated planning model that considers supply-side and demand-side alternatives on an equal basis to develop an optimized IRP. OTP filed an update to its resource plan in January 2008 that incorporated recent legislative changes to the conservation requirements.

Minnesota's investor-owned, municipal, and cooperative electric and gas utilities are legally required to invest a portion of their revenues to achieve cost-effective conservation through an approved CIP. CIP was initiated in the 1980s. Comprehensive CIP energy efficiency programs assist customers in managing their energy use. Investor-owned electric utilities, municipal electric utilities, and electric cooperative associations have all been required to annually spend at least 1.5 percent of gross retail revenues on conservation programs annually. In 2007, the Minnesota legislature changed the State statute covering conservation requirements to establish the utility conservation goal at 1.5 percent of the average retail kilowatt-hour sales over the prior three year period. This is one of the most aggressive conservation requirements in the country. Each affected utility is required to file a CIP periodically and must comply with the new legislative requirements by 2010.

The Co-owners are already subject to integrated planning and conservation requirements as a result of IRP and CIP processes. The need for the proposed Big Stone II generation by the participants was developed after the consideration and implementation of renewable energy and conservation resources. Therefore, additional conservation measures through DSM would not be the first resource option to meet the proposed Project's purpose and need.

Based on a review of available reports and filings, each Co-owner routinely assesses its available resources and makes plans to meet the future energy and capacity needs of its constituents, including use of DSM.

Each Co-owner's resource needs and commitments to utilizing DSM are addressed in their respective IRPs. The following table indicates whether or not each Co-owner's IRP includes DSM. HCPD does not have any retail customers, but does file a report with Western.

Table 2.5-5. Status of Co-owners' IRPs

Co-owner	IRP Filing Date (Latest)	IRP Includes DSM
CMMPA	October 2006 [a]	Yes
HCPD	September 2002 [b]	Yes
MDU	July 2007 [c]	Yes
MRES	May 2006 [d]	Yes
OTP	January 2008 [e]	Yes

[a] CMMPA is not required to file an IRP, but voluntarily submitted IRP information as a part of the proposed Big Stone II Certificate of Need Application to the Minnesota Department of Commerce (CMMPA, 2006).

[b] HCPD provided Western with its Cooperative Integrated Resource Plan dated September 2002 (HCPD, 2002).

[c] MDU does not file an IRP. Refers to MDU's "Ten Year Plan for South Dakota Electric Properties."

[d] Updates MRES' June 2005 filing.

[e] Updates OTP's June 30, 2005 filing and 2006 update.

Additional information on DSM may be found in the DSM Response Paper (Response Paper C, Volume II).

The Co-owners have been pursuing DSM as a part of their respective IRP and planning processes and making financial investments in DSM. The Co-Owners' objective to address energy supply deficiencies cannot be fully offset by DSM. DSM represents the dynamic ability to reduce system loading for predetermined periods of time.

2.5.1.11 Carbon Capture and Sequestration

CCS involves the capture of CO_2 emissions (e.g., in the stack emission after coal combustion), compressing it, and pumping (or injecting) the CO_2 into deep geologic formations for permanent storage. Technologies for burning fossil fuel more efficiently and with reduced CO_2 emissions, as well as post-combustion CO_2 CCS technologies, are all being researched. The pertinent issue at this time is that there are no feasible technologies or alternative technologies that are commercially available to reduce GHG emissions. Alternative combustion-technologies, such as IGCC, have not been adequately demonstrated on western coals and would require CCS in order to appreciably reduce emissions appreciably below a conventional PC unit. At the current time, one of the potential carbon capture technologies being investigated is the ECO_2™ process under development by Powerspan Corporation. A recent announcement by the company stated that a memorandum of understanding had been executed to allow for demonstration of the process at a commercial scale. The expected operational date for the demonstration unit is sometime in 2012. Thus, it would likely be after the proposed Big Stone II plant unit begins operation before a CO_2 capture technology is available in the marketplace.

Basin Electric currently operates The Great Plains Synfuels Plant near Beulah, North Dakota. This is the only commercial-scale gasification plant operating in the U.S. that produces synthetic natural gas from coal and captures a portion of its CO_2 emissions for use in enhanced oil recovery in two Canadian oilfields. The gasifier produces CO_2 in a concentrated stream, which allows for cost effective capture. The stream is in no way similar to the exhaust from a coal-fired power plant.

Information developed by R. W. Beck, Inc. and presented at PowerGen 2007 (R. W. Beck, 2007), reveals the impact the addition of CCS technology would have on a super-critical PC unit. It is expected that CCS technology would increase the capital cost of a super-critical PC by about 60 percent and increase operating and maintenance costs by as much as 110 percent. Another impact is an approximately 32 percent increase in the heat rate, meaning that if 1,000 MW of power is needed, a plant of about 1,320 MW would need to be built to compensate for the energy loss.

Although CCS technology is not expected to be commercially demonstrated in the foreseeable future, the Co-owners have conducted a "Carbon Capture Retrofit Ready Analysis." (OTP, 2008b) This analysis concludes that should a CCS retrofit be required, there is adequate area within the Big Stone property boundary to accommodate the process equipment. This analysis also indicates that the proposed configuration of ductwork and equipment would accommodate a retrofit of carbon capture technology.

Advances in CCS technology offer promising prospects to be part of the future solution regarding the control of GHGs. However, currently no commercial CCS technologies are available to the proposed Project.

2.5.2 Cooling Technology Alternatives Eliminated

The cooling alternatives selected for detailed analysis are discussed in Section 2.3.1. This section discusses the two cooling alternatives that were eliminated from consideration during the evaluation for the Supplemental Draft EIS. The alternatives not being carried forward for further analysis include Alternative 1 and Alternative 4 and are described below.

2.5.2.1 Alternative 1: Wet Cooling with Surface Storage Pond for Back-Up Water Supply

Alternative 1 is the original cooling option described in the Draft EIS. Big Stone Lake would be the only source of make-up water for the proposed plant, and the make-up water would be pumped to the existing plant cooling pond. The existing cooling pond would be kept at near maximum capacity and has adequate storage volume to serve as a make-up water storage pond for both the existing and proposed plants under normal operating conditions. Water from Big Stone Lake would be pumped to three on-site storage ponds: (1) a new 450-acre back-up water storage pond, (2) the existing cooling pond, and (3) the wastewater evaporation and holding ponds from the existing Big Stone plant converted to a single make-up water (fresh water) storage pond. The design would provide sufficient water storage for up to one year of water consumption by the proposed plant in the event the primary water supply from Big Stone Lake was not available.

Water Supply and Use

The discussion of water supply and use under Alternative 1 would be the same as that described above for the proposed Project in Section 2.2.1.4, except that all of the proposed plant's water supply would come from Big Stone Lake. Additionally, primarily due to losses of water due to evaporation from the 450-acre make-up water storage pond, the total annual water supply requirement would increase by about 800 afy (i.e., about 13,800 afy under Alternative 1 and about 13,000 afy under the proposed Project).

Water Treatment

Under Alternative 1, all make-up water for the proposed plant would come from Big Stone Lake and the total annual water requirement would be about 13,800 afy, instead of about 13,000 afy under the proposed Project. In contrast to the proposed Project and Alternatives 3 and 4, water treatment would not occur prior to introducing the make-up water into the storage ponds.

Wastewater Management

The existing plant wastewater management facilities would be used to the extent practical. The existing brine concentrator would remain as wastewater treatment facilities. The proposed Big Stone II plant would be a zero wastewater discharge facility (i.e., no wastewater would be discharged off-site), and would balance wastewater production by using evaporation, wastewater concentrating equipment (i.e., proposed new brine concentrator), and wastewater re-use to avoid discharges from the facility.

A new holding pond for cooling tower blowdown/scrubber supply water would be constructed adjacent to the proposed Big Stone II cooling tower under Alternative 1. This pond would be lined. An additional brine concentrator would be installed to handle the additional cooling tower blowdown stream flow from the proposed Big Stone II plant. Recovered water from the existing and the proposed brine concentrators would be used to supply boiler process water or would be pumped to the existing Poet Biorefining plant (formerly Northern Lights Ethanol) with excess brine concentrator product returned to the existing Big Stone cooling pond. The existing Poet Biorefining plant is located immediately south of the existing Big Stone plant. The existing plant supplies the ethanol plant with process steam as well as other support services including water for fire protection and process water.

The construction workforce's domestic wastewater would be handled by one or more of the following methods: holding tanks, portable treatment facilities, waste collection tank/drain field system, and/or the Big Stone City municipal sewage treatment system.

Plant Cooling System

The proposed plant's cooling system under Alternative 1 would be the same as that described for the proposed Project in Section 2.2.1.4.

Other Considerations Under Alternative 1

Alternative 1 would require construction of a 450-acre make-up water storage pond on the proposed plant site. A significant capital cost for construction of the 450-acre make-up water storage pond would be required. The capital cost is the highest of all alternatives and is estimated to be more than $84 million dollars above the cost of using wet cooling in combination with groundwater for the back-up water supply (the proposed Project). Significant energy would be lost through auxiliary power for evaporation of the wastewater stream (i.e., proposed new brine concentrator). Operating costs associated with the proposed new brine concentrator would be significantly higher than the operating costs associated with the new water treatment systems for the proposed Project and Alternatives 3 and 4.

New land use impacts are estimated to be higher for Alternative 1 than all other alternatives due to the required 450-acres for construction of the new pond and 25-acre cooling tower blowdown pond. Construction would impact 65-acres of wetlands, including approximately 58-acres of jurisdictional wetland areas. Air emission impacts for priority pollutants would be slightly higher due to a lower efficiency compared to using a sole groundwater back-up supply with wet cooling technology. This alternative was eliminated due to the high capital costs and environmental impacts.

2.5.2.2 Alternative 4: Dry Cooling with Groundwater Back-Up Water Supply

Water Supply and Use

Alternative 4 would use an air-cooled condenser as the sole heat transfer mechanism to cool process water for the proposed Big Stone II plant. The discussion of water supply and use under Alternative 4 would be the same as that described for the proposed Project in Section 2.2.1.4, except that the total water requirement would be about 7,065 afy, instead of about 13,000 afy under the proposed Project. Approximately 5,000 afy of this annual requirement would come from Big Stone Lake and about 2,000 afy would come from groundwater.

Water Treatment

There would be no differences in the description of water treatment described in Section 2.2.1.4 for Alternative 4, except that fewer chemicals would be required, since less water would be treated.

Wastewater Management

There would be no differences in the description of wastewater management described in Section 2.2.1.4 for the proposed Project. However, there would be less wastewater to manage.

Plant Cooling System

The cooling tower blowdown pond proposed in the Draft EIS would also be eliminated. Under Alternative 4, plant cooling would be provided by an air-cooled condenser as the sole heat transfer mechanism to cool process water for the proposed Big Stone II plant. The air-cooled condenser equipment would be sized to provide the required heat rejection on a hot summer day (95 °F). The other plant uses (i.e., boiler water make-up, WFGD system makeup, plant service water, and miscellaneous uses) would still use groundwater as the back-up water source. Water consumption would be reduced for this alternative since the make-up water demand for the site is reduced significantly by using air cooling technology.

2.5.2.3 Cooling Technology Alternatives Comparison

All cooling alternatives were compared using operating, economic, and environmental screening criteria. Comparisons of operating criteria included net power output, efficiency improvement, and auxiliary power uses. Economic criteria included capital and operating cost differences. Environmental criteria included comparisons of water consumption, air emissions, land use, and impact to wetlands. Appendix B2 describes the screening comparison criteria. Table 2.5-6 summarizes the results of the comparison of the four alternatives considered. A more detailed comparison table is included in Appendix B2.

Table 2.5-6. Comparison of Cooling Alternatives and Water Supply Sources

Screening Criteria	Units	Alternative 1	Alternative 2	Alternative 3	Alternative 4
		Wet Cooling with Surface Water Back-up	**Wet Cooling with Groundwater Back-up**	**Wet/Dry Cooling with Groundwater Back-up**	**Dry Cooling with Groundwater Back-up**
Capital Cost	Dollars ($)	$84 million more than Base	Lowest – Base Case	$53 million more than Base	$72 million more than Base
Operating Cost, including fuel		Highest	Lowest – Base Case	Higher	Higher
Efficiency		Slightly Lower	Highest- Base Case	Lowest	Lower
Average Water Consumption (Surface Water and Groundwater)	afy	13,817	13,033	7,291	7,065
New Land Use Impact (permanent)	Acres	532	39	39	39
Wetland Impacts (permanent)	Acres	65	0	0	0
Air Impacts		0.15% Higher	Lowest- Base Case	2 % Higher	2% Higher

Source: Appendix B2, Table 1.

Similar to the proposed Project and Alternative 3, there would be no requirements for additional land use with Alternative 4 for water storage ponds. Land requirements for the groundwater well sites would be less than the proposed Project or Alternative 3, as fewer wells would be needed. The capital cost for Alternative 4 is high compared to the proposed Project (about $65 million dollars above the cost of using wet cooling in combination with groundwater for the back-up water supply under the proposed Project. Similar to Alternative 3, this dry cooling alternative would have a lower efficiency, compared to the proposed Project, resulting in increased air emissions of uncontrolled pollutants on an annual basis. The increased emissions, the lower efficiency, and the higher capital costs relative to the proposed Project and Alternative 3 were the basis for eliminating this alternative.

2.5.3 Power Plant Location Alternatives Eliminated

Co-owners' Screening Process

Once a generation type was identified, OTP conducted an analysis of alternative power plant locations. Details of the analysis, including alternatives eliminated from detailed analysis, are provided in Appendix B1.

Potential sites for a new power plant were identified within South Dakota, North Dakota, and Minnesota. These sites are general locations that possess the necessary infrastructure and other characteristics that may make them suitable power plant sites. They are of sufficient size to accommodate plant development and allow sufficient buffer areas to mitigate some impacts on surrounding areas.

A total of 38 potential sites were identified by applying criteria that included consideration of potential impacts to Class I air quality sites, proximity to the regional power grid, proximity to reliable water sources, proximity to populated areas, and availability of coal transportation. The 38 preliminary site areas were then screened to eliminate those sites with more obvious development constraints. Through this process, 30 of the 38 preliminary site areas were eliminated for two primary reasons: limited water supply potential or nearby residential development. The remaining eight sites were:

- Big Stone – Grant County, South Dakota
- Coyote – Mercer County, North Dakota
- Dickinson – Wright County, Minnesota
- Fargo – Cass County, North Dakota
- Glenham – Walworth County, South Dakota
- Maple River – Cass County, North Dakota
- Split Rock – Minnehaha County, South Dakota
- Utica Junction – Yankton County, South Dakota

The Co-owners conducted a field reconnaissance of these eight sites in early March 2005. The reconnaissance consisted of an automobile survey along public roads in the vicinity of each site area. Information was collected on land availability, local land use, number of nearby residences, and other structures, suitability of terrain, and the condition of local transportation systems. Based on the information collected, the Co-owners eliminated the Maple River site because it is closer to nearby residences and other development than the nearby Fargo site. The Co-owners eliminated the Split Rock site because it lacks sufficient developable land area and because of encroaching residential development. The remaining six site areas were retained for further evaluation.

The Co-owners then used a numerical decision analysis process to further screen and rank each of the six sites. Seventeen criteria were identified and organized into six major categories: air quality, water supply, environmental, fuel supply, transmission, and other land use considerations. The major categories were assigned weights totaling 100 percent. Within each major category, the individual evaluation criteria were assigned subweights to define their relative importance within that category, and each criterion was assigned a weight based on its importance to the decision-making process. Criteria with the highest weights are considered the most important factors. Each of the six candidate sites was then evaluated against the criteria and resulted in Big Stone as the highest ranked site.

The Co-owners also tested the sensitivity of the evaluation scores to varying weights. The base weights assigned to each major category are considered an appropriate balance between these factors but each major category was emphasized in turn to determine what impact these changes might have on the overall ranking. The resulting site rankings generally showed that a site's rank was not sensitive to the assigned category weights.

Based on the power plant selection process, the Co-owners determined that the Big Stone site was the best to meet their unique requirements and objectives. The site would minimize construction costs and environmental disruption by allowing use of existing infrastructure, including the following existing plant features:

- Cooling water intake structure and supply line
- Plant access roads and site roads
- Rail spur
- Coal unloading facilities
- Solid waste disposal facility

In addition, the Big Stone site is centrally located within the geographic service territory of the Co-owners. This is an important attribute for the Co-owners.

The Big Stone site also meets the Co-owners' specific project goals by providing an opportunity to minimize operating costs by sharing the supervisory, operation, and maintenance workforce between the existing Big Stone plant and the proposed Big Stone II plant. This arrangement would provide for long-term cost savings for both units.

In selecting a plant location, the Co-owners recognized a unique opportunity to reduce mercury and SO_2 emissions from the existing Big Stone plant by installing one WFGD that would be shared by both the existing and the proposed Big Stone II plants. One scrubber that controls emissions from both plants would be less costly to construct, operate, and maintain than two individual scrubbers. Consequently, it would be less costly to reduce mercury and SO_2 emissions of the existing plant if the proposed Big Stone II is located on the same site rather than at some other location.

In addition to eliminating the need for initial site development, use of an existing site eliminates the need to develop roads, rail lines, pipelines, and other infrastructure at an undisturbed site. Use of an existing site results in fewer sources of fugitive air emissions from fuel handling along with reduced storage and handling of hazardous chemicals and petroleum products. There is also a corresponding reduced risk of releases, and avoidance of new visual and noise impacts.

2.5.4 Transmission Line Technology Alternative Eliminated

Underground transmission was eliminated by the Co-owners from detailed consideration because it is impractical at higher voltages, costly to install, and difficult to maintain. The use of underground transmission is typically limited to a maximum of 100 kV where underground installation can be accomplished without capacity limitations due to heat generated by the underground cables. Such systems are typically short distance and installed to mitigate overriding factors that warrant their application (e.g., underwater interconnections between land masses).

Available studies for underground transmission indicate that while such alternatives are technically feasible, cost estimates are approximately $15.3 million per mile for 230-kV transmission lines (Cooper, 2007), which is approximately 15 times more expensive than overhead line construction. This study also concludes that the availability of overhead transmission lines is typically better than their underground counterparts. Since the proposed Project's transmission lines would be 230-kV or larger, underground transmission would not be practical.

Alternative transmission structures were limited to H-frame and single-pole. Lattice structures (of various configurations) were eliminated from further consideration because they are costly to install and typically require larger land areas.

2.5.5 Transmission Line Corridor Alternatives Eliminated

Potential alternatives to corridors were developed during scoping. Alternative transmission line corridors were identified and evaluated applying the same screening criteria used to identify viable alternative corridors. The results of the analysis are summarized in Tables 2.5-7 and 2.5-8. Corridors that were considered, but eliminated from further consideration are shown on Figure 2.5-1.

Alternatives to Corridor A: Big Stone to Morris

Two alternatives were identified and evaluated. (The map referenced in parentheses is from Tables 2.5-7 and 2.5-8.)

<u>Bypass Route Northwest of Ortonville (1)</u>

Comments received by the USFWS indicated concern regarding environmentally sensitive resources along the southern portion of the Co-owners' proposed corridor. Consequently, a potential alternative route was considered along U.S. 75 and County Road 10 to bypass this portion of the corridor.

A review of resources along the proposed bypass route found that the route along U.S. Highway 75 would include commercial and retail land uses and would cross the approach patterns of two Ortonville Airport runways. Although construction of a transmission line through the area could be achieved, avoidance of the area was determined to be preferable for environmental and engineering reasons. Therefore, the bypass route northwest of Ortonville was not carried forward for further consideration.

Table 2.5-7. Screening Criteria Evaluation of Corridors Eliminated from Further Consideration Alternatives to Corridor A and Corridor B

Criteria	Alternatives to Corridor A		Alternatives to Corridor B	
	Bypass Route Northwest of Ortonville (1)[a]	Route to the East Alternative Corridor (2)[a]	Big Stone to Spicer (3)[a]	Big Stone to Ortonville to Appleton to Willmar (4)[a]
Avoidance of Areas of Environmental Sensitivity	Both alternatives would bypass environmentally sensitive resources along the southern portion of the Co-owners' proposed corridor. Upgrading the existing line would minimize impacts to sensitive areas.		The corridor crossed numerous lakes and wetlands around the Spicer area and through Dovre Township, north of Willmar.	This corridor would avoid environmentally sensitive areas around Danvers.
Avoidance of Population Centers	Commercial land uses and Ortonville Airport may be impacted.	The alternative avoids Johnson and Chokio but not Alberta.	The corridor would include population centers of Danvers, DeGraff, Murdock, and the Spicer area.	Population centers would include Ortonville, Appleton, and Holloway. Conflict with pivot irrigation in the Appleton-Holloway area is likely.
Compliance with Regional Transmission Planning Objectives	Both alternatives support regional transmission planning objectives by alleviating a previously identified 115 -kV line overload between Ortonville and Johnson Junction, which would have needed increased capacity in the near future due to previously studied generation projects outside of the proposed Big Stone II. It also has the potential to increase the ability of interconnecting new generation sources to a high-capacity transmission line along the corridors.		The corridor is oriented east – west and would provide an opportunity to support regional transmission planning objectives by increasing the reliability of the transmission system around the large load center of Willmar. It also has the potential to increase the ability of interconnecting new generation sources to a high-capacity transmission line along the corridor.	The corridor is oriented east – west and would provide an opportunity to support regional transmission planning objectives.
Maximizing the Availability of Linear Features	County roads could be paralleled in southern portion. State highways and county roads could be paralleled in northern portion.	The corridor would include county roads and highways that could be paralleled.	The corridor would provide opportunities to parallel linear features such as county roads and highways.	Existing county roads and highways, section lines, and mid-section lines would maximize routing opportunities with the corridor.
Maximizing Opportunities to Upgrade Existing Transmission Lines	Opportunities would be limited to the northern portion of the corridor.	No known transmission lines are present within the corridor; no opportunities to upgrade existing transmission lines.	Existing transmission lines are not present within the corridor.	Existing transmission lines are not present within the corridor.
Reliability	Both alternatives offer opportunities to construct new lines separate from existing transmission lines.		Both alternatives offer opportunities to construct new lines separate from existing transmission lines.	

[a]See Figure 2.5-1 for location of corridors.

Source: ENSR, 2006.

Table 2.5-8. Screening Criteria Evaluation of Corridors Eliminated from Further Consideration Alternatives to Corridor C

Criteria	Big Stone to Ortonville to Granite Falls (5)[a]	Big Stone to Bellingham to Hazel Run to Granite Falls (6)[a]	Big Stone to Benson to Granite Falls (7)[a]	Big Stone to Western's Corridor to Canby to Granite Falls (8)[a]	Big Stone to Western's Corridor to Granite Falls (9)[a]
Avoidance of Areas of Environmental Sensitivity	Environmental constraints occur along the Minnesota River.	Environmentally-sensitive areas are largely absent within the corridor.	Environmentally-sensitive areas are largely absent from the Benson/Danvers area to Granite Falls.	This corridor would avoid environmentally sensitive areas in the southwestern portion of the corridor.	Environmentally sensitive areas are likely to be minimal.
Avoidance of Population Centers	Population centers include Odessa, Correll, Appleton, Milan, Watson, Montevideo, and Granite Falls.	Population centers include Bellingham, Madison, Dawson, Boyd, Clarkfield, Hazel Run, and Granite Falls.	Population centers include the Benson/Danvers area and Granite Falls.	The corridor would largely avoid population centers.	The corridor would largely avoid population centers. Population centers include Boyd and Granite Falls.
Compliance with Regional Transmission Planning Objectives	The corridor would extend to the southeast and would not provide an opportunity to support regional transmission planning objectives.	The corridor would extend to the southeast and would not provide an opportunity to support regional transmission planning objectives.	The corridor would extend to the south and would not provide an opportunity to support regional transmission planning objectives.	The corridor would extend east-west and would provide an opportunity to support regional transmission planning objectives.	The corridor would extend east-west and would provide an opportunity to support regional transmission planning objectives.
Maximizing the Availability of Linear Features	Routing opportunities are limited to the existing Highway 59 and a railroad ROW that extends from the northwest to the southeast.	Routing opportunities are parallel to State Route 75 and an existing railroad ROW in a southeasterly direction.	Reduced potential to parallel rural roads, section lines, and mid-section lines along southern portion of the corridor.	The corridor would provide minimal opportunities to parallel county roads.	The corridor would provide opportunities to parallel linear features such as roads, highways, and section lines throughout much of its alignment.
Maximizing Opportunities to Upgrade Existing Transmission Lines	The corridor would not provide opportunities to upgrade existing transmission lines; lines are not present within the majority of the corridor.	The corridor would not provide opportunities to upgrade existing transmission lines; lines are not present within the majority of the corridor.	Although transmission lines are present, reliability concerns prevent opportunities for them to be upgraded.	Existing transmission lines are present; reliability concerns prevent opportunities for them to be upgraded.	Although transmission lines are present, reliability concerns prevent opportunities for them to be upgraded.
Reliability	The corridor offers opportunities to construct new lines separate from existing transmission lines.		Constrained by the presence of existing transmission lines.		

[a]See Figure 2.5-1 for location of corridors

Source: ENSR, 2006.

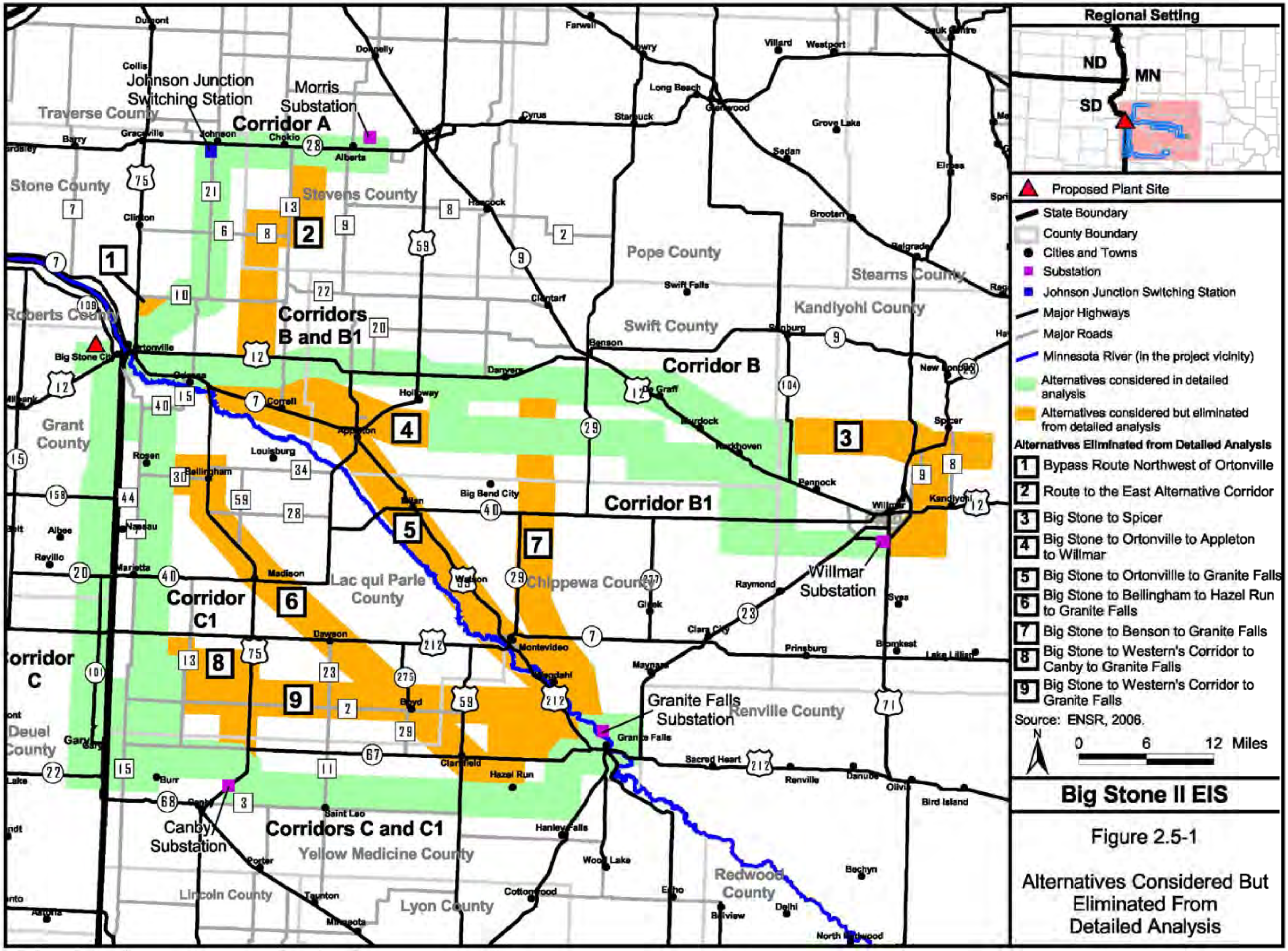

Figure 2.5-1

Alternatives Considered But Eliminated From Detailed Analysis

Route to the East Alternative Corridor (2)

An alternative corridor was identified east of the Co-owners' proposed corridor. Use of the alternative corridor would provide flexibility to route transmission lines along section lines, and existing roads and highways; existing transmission lines are not present within the alternative corridor. This alternative corridor was eliminated from further consideration because it would require more than 20 miles of new construction through an area that is presently absent of transmission lines.

Alternatives to Corridor B: Big Stone–Willmar

Corridor B originally extended from Big Stone to the Spicer area (3). Scoping comments expressed concerns about the numerous lakes and wetlands around Spicer as well as routing transmission lines through Dovre Township (north of Willmar). Corridor B was modified in response to these concerns and now terminates in the Willmar area.

One additional corridor, identified as the Ortonville to Appleton to Willmar Alternative (4), was identified south of the Co-owners' proposed corridor from Ortonville to Willmar. The alternative corridor would avoid population centers and many incompatible land uses that are present along the Co-owners' proposed corridor and would maximize the availability of routing opportunities such as the use of existing county roads and highways, section lines, and mid-section lines. Further analysis of this alternative corridor resulted in a segment from Ortonville to Holloway being eliminated from further consideration due to a high concentration of pivot irrigation systems in the area and an airport north of Appleton.

Alternatives to Corridor C: Big Stone–Granite Falls

Several potential corridor options were identified to provide interconnection from the proposed Big Stone II plant to Granite Falls and are described in the following text.

Big Stone to Ortonville to Granite Falls Alternative Corridor (5)

This alternative corridor would extend in a southeasterly direction from the vicinity of Ortonville to Granite Falls along the Minnesota River. The corridor would provide a relatively direct route from Big Stone to Granite Falls and would be less expensive to construct than the Co-owners' proposed alternative. However, the corridor has limited transmission routing opportunities due to the presence of population centers of Odessa, Correll, Appleton, Milan, Watson, and Montevideo and environmental constraints along the river. Routing opportunities would be further constrained to locating the transmission line parallel to an existing highway and a railroad. Therefore, the alternative was not carried forward for further consideration.

Big Stone to Bellingham to Hazel Run Alternative Corridor (6)

This alternative corridor would extend in a southeasterly direction from Bellingham to Hazel Run and would provide a more direct route from Big Stone to Granite Falls than that proposed by the Co-owners. Constraints within the corridor include population centers of Bellingham, Madison, Dawson, Boyd, and Clarkfield. Opportunities for transmission line routing would be largely limited to linear features within the corridor including State Route 75 and an existing railroad ROW. Since transmission line routing opportunities would be limited within the corridor due to the orientation of existing rural roads (north-south/east-west), and numerous population centers within the corridor, the alternative was not carried forward for further consideration.

Big Stone to Benson to Granite Falls Alternative Corridor (7)

This alternative corridor would include a portion of the Co-owners' Big Stone to Willmar Corridor from Ortonville to the Benson/Danvers area. The corridor would then extend southward and include a corridor occupied by a 230-kV double-circuit lattice structure transmission line (operated by Western) to Granite Falls.

This alternative would require two circuits between Big Stone and the Benson/Danvers area. One circuit would continue eastward to the Willmar area and one circuit would extend southward to Granite Falls. Although technically feasible, close proximity of parallel lines between Big Stone and the Benson/Danvers area would likely introduce system reliability issues that otherwise could be avoided. Furthermore, inclusion of the Western 230-kV lattice structure transmission line within the alternative corridor from the vicinity of Benson to Granite Falls would only provide parallel transmission line routing opportunities along the northern portion of the corridor; the southern portion of the corridor would angle to the southeast, reducing the potential for paralleling rural roads, section lines, and mid-section lines. The alternative would require a new transmission corridor from Big Stone to the Benson/Danvers area, presents reliability issues from the Benson/Danvers area to Granite Falls, and does not offer advantages over corridors that have been proposed by the Co-owners. Therefore, this alternative was not carried forward for further consideration.

Alternatives to Corridor C: Big Stone – Granite Falls Following Western's Transmission Corridor

Two potential alternative corridors were identified along the corridor occupied by Western's 230-kV double-circuit lattice structure transmission line, which extends in an easterly direction from South Dakota to Minnesota. Western's corridor would be accessible from the north by the Co-owners' proposed corridor segment of Corridor C in South Dakota or from the alternative corridor segment of Corridor C1 in Minnesota. The existing transmission line is located primarily along mid-section lines. Linear features such as rural roads, section lines, and mid-section lines would provide a range of opportunities for transmission line routing for each of the following alternatives.

Big Stone to Western's Corridor to Canby Area to Granite Falls Alternative Corridor (8)

This alternative corridor includes a new transmission line from Big Stone to Western's transmission line north of Gary, South Dakota, proceeds east following Western's corridor to an area north of Canby, then proceeds south into the Canby Substation, and then east to the Granite Falls Substation. The alternative corridor would avoid environmentally sensitive areas associated with the high wind region along the southwestern portion of Corridor C. The alternative offered no additional advantages over the two proposed Big Stone to Granite Falls alternative corridors (Corridors C and C1). In addition, a portion of the corridor presented reliability issues due to the presence of three existing transmission lines. Therefore, the corridor was not carried forward for further consideration.

Big Stone to Western's Corridor to Granite Falls Alternative Corridor (9)

This alternative corridor includes a new transmission line from Big Stone to Western's transmission line north of Gary, South Dakota, then proceeds east following Western's corridor to the Granite Falls Substation. This alternative corridor offered a more direct east-west route compared to the above alternative corridor. It was eliminated from further consideration primarily due to reliability concerns.

Western's Determination

Based on the summary of evaluations, impacts, and considerations discussed above, Western determined that none of the alternative corridors offered environmental and economic benefits, compared to Corridors A, B, B1, C, and C1, that would warrant further more detailed investigation. For this reason, the alternatives described above were not carried forward.

2.6 Summary of Impacts and Mitigation Measures

Table 2.6-1 summarizes the environmental impacts of the proposed Project, Alternative 3 (wet/dry cooling with groundwater supply back-up), and the No Action Alternative based on the analysis in Chapter 4. The table includes both the potential benefits and potential adverse impacts to each resource or environmental component.

A number of standard mitigation practices are proposed in Section 2.2.4 by the Co-owners as part of the proposed Project, and by Western for the proposed interconnections. Additional mitigation measures proposed in Chapter 4 to further reduce impacts are listed in Table 2.6-2, but are outside the jurisdiction of Western. The Co-owners have agreed to adopt the additional mitigation measures described in Table 2.6-2, and Western believes there is a strong likelihood that the additional mitigation measures would be implemented. As implemented by the Co-owners or enforced by other regulatory agencies, the additional mitigation measures would further mitigate adverse environmental impacts. However, despite application of all mitigation measures, some adverse impacts may still occur.

Table 2.6-1. Summary of Impacts

Resource	Proposed Project Alternative 2 – Wet Cooling with Groundwater Supply Back-Up	Alternative 3 – Wet/Dry Cooling with Groundwater Supply Back-Up	No Action Alternative
Air Quality	▪ Operation of the proposed Big Stone II plant would release an estimated 4.7 million tons of CO_2 into the atmosphere each year, which could have an undetermined effect on local, regional, or global climate change. The equivalent CO_2 emissions from the proposed Big Stone II plant would be on the order of 0.54 tons/MWh, which is lower than the 2005 U.S. average for power generation of approximately 0.68 tons/MWh. If Federal or State regulations are not promulgated and the conditions of the Settlement Agreement expire, the emissions of the proposed Big Stone II plant would be about 0.98 tons CO_2/MWh, which is lower than the national average for coal-fired plants of 1.18 tons CO_2/MWh. Numerous models produce widely divergent results, and there is insufficient information to be able to identify the specific impacts of the proposed plant's CO_2 emissions on human health and the environment. ▪ The annual projected actual emissions of SO_2 and NO_X from the existing and proposed plants would be approximately 2,000 tons of SO_2 and 16,448 tons of NO_X. SO_2 emissions would be reduced and NOx emissions would not increase compared to the annual average 2003 and 2004 SO_2 and NO_X emissions from the existing plant. ▪ To the extent that emissions of SO_2 would be less and emissions of NO_X would not increase, impacts to the environment due to acid deposition would be less if the proposed Big Stone II plant were constructed. ▪ The Co-owners have committed to install technologies that are most likely to result in removal of at least 90 percent of the mercury emitted from the existing plant and the proposed Big Stone II plant. This would result in mercury emissions of approximately 81.5 lb per year from the combined plants (compared to approximately 189.6 lb from the existing plant alone in 2004), which would contribute mercury to the environment. Although the combined plants would continue to emit mercury, the decrease in mercury emissions compared to the emissions of the existing plant would result in reduced impacts to the environment. ▪ Although PM_{10} would increase due to increased coal combustion, dispersion modeling shows that there would be no exceedances of the PSD Increment for PM_{10} or the NAAQS for PM_{10} and $PM_{2.5}$ for the proposed Big Stone II plant. ▪ The projected total emissions of all HAPs from the existing and proposed plants' boilers is projected to be approximately 63,460 lb per year, a reduction of approximately 61,848 lb per year from current emission levels for the existing Big Stone plant. This reduction of approximately 49 percent in total HAPs emissions would proportionately decrease any impacts attributable to HAPs emissions, and impacts to the environment would be less compared to emissions from the existing plant alone.	▪ The projected air emissions for SO_2, NOx, CO, PM, mercury, HAPs, and CO_2 would be increased by approximately 2.28 percent more than the proposed plant.	▪ Under the No-Build Alternative and Sub-alternative 1, none of the air impacts associated with the proposed plant site or the groundwater areas would be realized. The reduction of certain emissions (mercury, SO_2, and total HAPs) at the existing plant would not occur, and emission levels at the existing plant would continue at current levels. No CO_2 would be produced by the proposed plant. ▪ Under Sub-alternative 2, the air impacts would likely be identical to those presented for the proposed plant.

Table 2.6-1. Summary of Impacts

<table>
<tr><th>Resource</th><th>Proposed Project
Alternative 2 – Wet Cooling with Groundwater Supply Back-Up</th><th>Alternative 3 – Wet/Dry Cooling with Groundwater Supply Back-Up</th><th>No Action Alternative</th></tr>
<tr><td>Air Quality</td><td colspan="2">Short-term construction impacts resulting from increased vehicle emissions and dust would be localized and would be less than significant.
There are no Class I areas within 186 miles of the proposed plant. Therefore, no Class I visibility analysis was required or conducted. Visibility impacts were examined at the Pipestone National Monument (approximately 90 miles from the proposed plant), a Class II area. The results of modeling show that the proposed plant's emissions pass the Class I screening criteria at Pipestone National Monument.
The proposed Big Stone II plant would operate under an air emission permit from the SDDENR and would comply with NAAQS and PSD increments. Any short-term and long-term residual impacts would meet regulatory requirements and would be less than significant.</td><td></td></tr>
<tr><td rowspan="2">Groundwater Resources</td><td>Up to 14 permanent wells would be constructed in the groundwater areas. Average annual groundwater production would be approximately 3,720 af.
The predicted maximum drawdown of the Veblen Aquifer would be approximately 37 feet.</td><td>Up to 14 permanent wells would be constructed in the groundwater areas. Average annual groundwater production would be approximately 2,036 af.
The predicted maximum drawdown of the Veblen Aquifer would be approximately 24 feet.</td><td rowspan="2">Under the No Build Alternative, and Sub-alternative 1, groundwater pumping associated with the proposed plant would not occur.
Under Sub-alternative 2, groundwater impacts would likely be identical to those presented for the proposed plant.</td></tr>
<tr><td colspan="2">In addition to the maximum annual groundwater withdrawal of 10,000 afy, the Water Appropriation Permit authorizes a total beneficial use not to exceed 4,700 afy, averaged on a rolling 20-year period. Groundwater pumping from the Veblen Aquifer would not cause significant impacts to beneficial uses of the aquifer.
The greatest drawdown of the Veblen Aquifer from groundwater pumping would occur on the south side of the expanded groundwater area.
Groundwater modeling indicates that predicted drawdown of the Veblen Aquifer would not cause reductions in yield for wells near Milbank and areas to the south.
Groundwater pumping would not impact the aquifers within the Lake Traverse Indian Reservation of the Sisseton-Wahpeton Oyate.
Impacts to groundwater from construction and operation of the proposed plant, wells, and pipeline facilities would be less than significant.</td></tr>
<tr><td>Floodplains</td><td colspan="2">Small isolated flood hazard zones at the proposed plant site would be eliminated due to construction activities.
Construction and operation of the proposed plant facilities would not constrict or modify flow conveyances, or measurably add to flood flows.
Impacts to floodplains from construction or operation of the proposed plant, groundwater wells, and pipelines would be less than significant.</td><td>Under the No Build Alternative and Sub-alternative 1, impacts to floodplains and isolated flood hazard zones would not occur at the proposed plant site or the groundwater areas.
Under Sub-alternative 2, impacts to floodplains would likely be identical to those presented for the proposed plant.</td></tr>
</table>

Table 2.6-1. Summary of Impacts

<table>
<tr><th>Resource</th><th>Proposed Project
Alternative 2 – Wet Cooling with Groundwater Supply Back-Up</th><th>Alternative 3 – Wet/Dry Cooling with Groundwater Supply Back-Up</th><th>No Action Alternative</th></tr>
<tr><td rowspan="2">Surface Water Resources</td><td>▪ The existing plant and proposed Big Stone II plant combined annual consumptive water use would be about 13,000 af, which includes an annual average surface water appropriation of about 9,300 af from Big Stone Lake.
▪ Big Stone Lake's elevation would decrease by 0.15 feet on average. The worst effect would be a lake elevation reduction of 0.83 feet in two non-consecutive weeks.
▪ Minor episodic decreases in base flow to the Whetstone River would occur due to groundwater pumping. However, the pumping would not cause a substantial extension in the period of naturally occurring seasonal reduction of flow in surface water that results in insufficient quantities of water for downstream users. These impacts would be less than significant.</td><td>▪ The existing plant and proposed Big Stone II plant combined annual consumptive water use would be about 7,300 af, which includes an average annual surface water appropriation of about 5,236 af from Big Stone Lake.
▪ Big Stone Lake elevation would decrease by 0.14 feet on average. The worst effect would be a lake elevation reduction of 0.58 feet in two non-consecutive weeks.
▪ The impacts to surface water from operation of the groundwater wells would be less than those described for the proposed plant, since less water would be required.</td><td rowspan="2">▪ Under the No Build Alternative none of the surface water impacts associated with the proposed plant or groundwater areas would occur. The existing plant would continue to operate under current or renewed environmental permits as a zero wastewater discharge facility. Impacts to surface water resources would continue to occur, such as water withdrawals from Big Stone Lake for the existing plant and the ethanol plant. Additional surface water withdrawals associated with the proposed plant would not occur.
▪ Under Sub-alternative 2, surface water impacts would likely be identical to those presented for the proposed plant.</td></tr>
<tr><td colspan="2">▪ Short-term impacts to water quality could result from spills, leaks, or improper disposal of construction materials or sediment and other contaminants carried in downstream runoff.
▪ Short-term runoff and erosion impacts would occur during construction.
▪ The existing and proposed Big Stone II plants' combined surface water usage would reduce flows out of Big Stone Lake into the Minnesota River. These reductions would occur for short durations and would not significantly impact fisheries and water quality in the Minnesota River.
▪ Surface water quality impacts from acid rain or acid runoff caused by additional plant emissions from the proposed plant would not occur.
▪ Mercury would still be emitted from the existing and proposed plants and could cause mercury deposition. However, given the reduced mercury emissions owing to new emissions controls, it is expected that the combined plants would emit less mercury than the existing plant.
▪ Impacts to surface water resources from constructing or operating the proposed plant would be less than significant.</td></tr>
<tr><td>Geology and Minerals</td><td colspan="2">▪ No unique geologic features are located within the proposed plant or groundwater areas. Potential geologic hazards such as seismicity, landslides, and sinkhole development associated with karst formation are not present within the proposed plant or groundwater areas. Therefore, there would be no significant impacts to unique geological features or impacts associated with geologic hazards as a result of construction or operation of the proposed plant.</td><td>▪ Under the No-Build Alternative and Sub-alternative 1, none of the impacts to geological, mineral, paleontological, and soils resources would occur at the</td></tr>
</table>

Table 2.6-1. Summary of Impacts

<table>
<tr><th>Resource</th><th>Proposed Project
Alternative 2 – Wet Cooling with Groundwater Supply Back-Up</th><th>Alternative 3 – Wet/Dry Cooling with Groundwater Supply Back-Up</th><th>No Action Alternative</th></tr>
<tr><td></td><td colspan="2">▪ Mineral resources would not be precluded from development. Therefore, there would be no significant impacts to mineral resources from constructing or operating the proposed plant.</td><td rowspan="3">proposed plant site or groundwater areas. Existing resources would continue to be lost as a result of other activities in the region where land uses would change from agricultural to urban/industrial.
▪ Under Sub-alternative 2, the impacts would likely be identical to those presented for the proposed plant.</td></tr>
<tr><td>Paleontological Resources</td><td colspan="2">▪ Paleontological resources are either not exposed or do not exist beneath surficial glacial deposits at the proposed plant or groundwater areas. There would be no significant impacts to paleontological resources from the construction or operation of the proposed plant.</td></tr>
<tr><td>Soils</td><td colspan="2">▪ 150.1 acres of soils would be temporarily disturbed during construction activities.
▪ Proposed plant and groundwater system components would disturb a total of 189.4 acres of soils, of which 2.4 acres would be permanently removed from potential agricultural use.
▪ The long-term loss of soils would not be a significant impact, due to the stockpiling of topsoil and the extensive similar resources present in the vicinity of the proposed plant.</td></tr>
<tr><td>Vegetation Resources</td><td colspan="2">▪ Following implementation of standard and additional mitigation measures, no significant impacts to rare plants, native plant communities, or other sensitive features identified by a State or Federal resource agency are expected as a result of construction and operation activities. Residual impacts would include the long-term net loss of approximately 4.4 acres of forest and prairie type vegetation. There would be no losses of wetland/riparian areas.
▪ Although the existing and proposed plants would continue to emit mercury, the decrease in mercury emissions would result in reduced impacts to vegetation communities in the area.
▪ Numerous models produce widely divergent results, and there is insufficient information to be able to identify the specific impacts of the proposed plant's CO_2 emissions on vegetation.
▪ Mitigation measures would be implemented to prevent the introduction and spread of noxious weeds.</td><td rowspan="3">▪ Under the No Build Alternative and Sub-alternative 1, no additional disturbance or impacts would occur to vegetation, wildlife, or fisheries at the proposed plant site or groundwater areas. Ongoing emergency and routine maintenance activities would continue. Impacts to vegetation, wildlife, and fisheries, would continue to occur at current rates.
▪ Under Sub-alternative 2, impacts to vegetation, wildlife, and fisheries would likely be identical to those presented for the proposed plant.</td></tr>
<tr><td>Wildlife</td><td colspan="2">▪ Direct impacts to wildlife would include limited direct mortality from construction activities, habitat loss, alteration or fragmentation, animal displacement, and disturbance of breeding, nesting, and foraging habitat for small game and birds. These impacts would not be sufficient to cause a species to become listed or proposed for listing as threatened or endangered. Since species compatible with the existing use would likely be compatible with the proposed use, there would not be a significant long-term impact to wildlife due to habitat alteration.
▪ Although the combined plants would continue to emit mercury, the decrease in mercury emissions (and a corresponding decrease in methylmercury) would result in reduced impacts to the wildlife of the area.
▪ Numerous models produce widely divergent results, and there is insufficient information to be able to identify the specific impacts of the proposed plant's CO_2 emissions on wildlife.
▪ Residual impacts would include the long-term net loss of approximately 6.8 acres of wildlife habitat.</td></tr>
<tr><td>Fisheries</td><td colspan="2">▪ There would not be a loss of a population of aquatic species that would result in the species being listed or proposed for listing as threatened or endangered. Water intake would not result in a significant impact on fish populations.
▪ The proposed plant would not cause an increase in the rate of accumulation of methylmercury concentrations in fish, although bioaccumulation of methylmercury would continue at a reduced rate. The reduced rate of bioaccumulation suggests that the lower mercury emissions from the existing and proposed plant could contribute to lower mercury concentrations in fish over time.</td></tr>
</table>

Table 2.6-1. Summary of Impacts

<table>
<tr><th>Resource</th><th>Proposed Project
Alternative 2 – Wet Cooling with Groundwater Supply Back-Up</th><th>Alternative 3 – Wet/Dry Cooling with Groundwater Supply Back-Up</th><th>No Action Alternative</th></tr>
<tr><td>Fisheries</td><td colspan="2">▪ Numerous models produce widely divergent results, and there is insufficient information to be able to identify the specific impacts of the proposed plant’s CO_2 emissions on fisheries.
▪ No long-term impacts to fisheries are expected.</td><td></td></tr>
<tr><td>Special Status Species</td><td colspan="2">▪ Habitat for special status species has been identified on the proposed plant site; however, no individuals were present during surveys.
▪ Impacts to special status plants would include the long-term net loss of approximately 4.4 acres of suitable special status plant species habitat (prairie and forest). Following the implementation of standard and additional mitigation measures, no significant residual impacts to special status plant species are expected as a result of construction and operational activities.
▪ Sixteen terrestrial wildlife species (six special status species and 10 species of concern) may inhabit the proposed plant site and groundwater areas. Direct impacts from constructing and operating the proposed plant would include the loss or alteration of breeding and foraging habitats and increased habitat fragmentation. Mortality could also occur to less mobile or burrowing species. Abandonment of a nest site and the loss of eggs and/or young may also occur.
▪ One Federal special status bird species, the bald eagle, is known to occur in the vicinity of the proposed plant site and groundwater areas. Bald eagles remain a federally-protected species under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. There would be no direct impacts to bald eagle foraging habitat, since there would be no loss of wetland/riparian areas. Through implementation of SMM Bio-3, impacts to bald eagles in the proposed Project vicinity would not be significant. Western’s Biological Assessment included a Bald Eagle Mercury Exposure Assessment that assessed the potential impact of mercury exposure on eagles. Based on the assessment, Western determined that the proposed Project may affect, but is not likely to adversely affect, the bald eagle.
▪ No federally-listed aquatic species or designated critical habitat occur in water bodies within or downstream of the proposed plant site.
▪ Special status species that use the Whetstone River would not be adversely affected by minor episodic flow reductions caused by groundwater pumping.
▪ None of the anticipated impacts to special status species would result in an unpermitted violation of statutes or regulations pertaining to special status fish or mussel species. No impacts to special status fish and mussel species would occur.
▪ Western completed Endangered Species Act (ESA) Section 7 informal consultation with the USFWS for the proposed plant site and groundwater areas. The USFWS concurred with Western’s determination of no affect on listed species. Western will complete its obligations under the ESA for the transmission components for the proposed Project prior to authorizing interconnections with its system.
▪ Numerous models produce widely divergent results, and there is insufficient information to be able to identify the specific impacts of the proposed plant’s CO_2 emissions on special status species.</td><td>▪ Under the No Build Alternative and Sub-alternative 1, no impacts to special status species related to the proposed plant or groundwater areas would occur.
▪ Under Sub-alternative 2, impacts to special status species would likely be identical to those presented for the proposed plant.</td></tr>
<tr><td>Wetlands</td><td colspan="2">▪ Wetlands would not be lost or permanently de-watered by groundwater pumping. There are no anticipated losses of wetlands, no loss of riparian areas, and no degradation or loss of any Federal- or State-protected wetlands as defined by Section 404 of the CWA or other applicable regulations.
▪ By implementing the SMMs, no significant impacts to wetlands or riparian areas are expected as a result of construction and operation activities from the proposed plant. Short-term impacts could occur associated with groundwater activities; however, these impacts would be mitigated under a CWA Section 404 permit. Impacts to non-jurisdictional wetlands would be mitigated in accordance with applicable State or Federal requirements.</td><td>▪ Under the No Build Alternative and Sub-alternative 1, no additional disturbance to wetland/riparian areas would occur at the proposed plant site or groundwater areas. Ongoing emergency and routine maintenance activities would continue.</td></tr>
</table>

Table 2.6-1. Summary of Impacts

Resource	Proposed Project Alternative 2 – Wet Cooling with Groundwater Supply Back-Up	Alternative 3 – Wet/Dry Cooling with Groundwater Supply Back-Up	No Action Alternative
Wetlands	▪ Although the combined plants would continue to emit mercury, the decrease in mercury emissions would result in reduced impacts to wetland/riparian areas in the vicinity.		Impacts to wetland/riparian areas would continue to occur at current rates. ▪ Under Sub-alternative 2, impacts to wetland/riparian areas would likely be identical to those presented for the proposed plant.
Cultural Resources	▪ It is anticipated that by following the procedures outlined in Section 106 of the NHPA and the PA, adverse impacts to archaeological and historic resources eligible for inclusion to the NRHP would be avoided or mitigated. Unavoidable impacts to NRHP-eligible sites would be mitigated through implementation of a treatment plan in accordance with the PA. ▪ Impacts to NRHP-eligible sites would not be significant with implementation of the PA and SMMs. ▪ The proposed plant and groundwater areas are not located on any Native American lands. Any cultural and historic resources identified within the proposed plant and groundwater areas would receive the appropriate level of protection or recovery by implementing mitigation measures, treatment plans, or compliance actions (e.g., protection of burial sites) in accordance with the PA. Impacts to these resources would not be significant with implementation of the PA.		▪ Under the No Build Alternative and Sub-alternative 1, no cultural or historical resources would be affected at the proposed plant site or the groundwater areas. ▪ Under Sub-alternative 2, the cultural resource impacts would likely be identical to those presented for the proposed plant.
Land Use Resources	▪ The proposed plant would require various permits or land use approvals for construction and operation. With permits and land use approvals, there would be no conflicts with land use plans, zoning, or with special use areas. ▪ Increased growth and temporary increase in workforce would not overburden existing recreation resources nor would air pollutant emissions reduce recreational opportunities. No significant impacts from the construction and operation of the proposed plant are anticipated in terms of increased demand for recreation. ▪ Based on the modeled lake levels with proposed Big Stone II water withdrawals, essentially no change in the relative frequency of attaining the target recreational season pool elevation is expected for Big Stone Lake. ▪ The currently observed flows in the Whetstone River over the course of the recreation season (late spring-early fall) would not be noticeably altered by the proposed groundwater pumping. ▪ Total new land required for construction of the proposed plant would be 189.4 acres, of which 150.1 acres is a short-term impact due to construction. ▪ Total long-term impacts to land use from the proposed power plant construction and operation would be 39.3 acres.		▪ Under the No-Build Alternative and Sub-alternative 1, none of the land use impacts (including recreation and agricultural practices) associated with the proposed plant and groundwater areas would occur. In the short term, land uses would be likely to remain as they currently are in the absence of the proposed plant. In the long term, certain land uses unrelated to the existing plant would change with time (e.g., from agricultural to urban or commercial/industrial). ▪ Under Sub-alternative 2, the land use impacts would likely be identical to those presented for the proposed plant.
Agricultural Practices	▪ The permanent disturbance of 63.9 acres of prime farmland for the proposed plant site (61.8 acres) and groundwater areas (2.1 acres) would be a long-term and residual impact. This amount is only a small portion of the prime farmland in Grant County, and there would be no adverse affect on agriculture in the region. Therefore, it would not be a significant impact to prime farmland in the region. ▪ No pivot irrigation facilities would be affected by constructing the proposed plant.		
Public Facilities	▪ No public facilities would be affected by construction of the proposed plant or the installation of wells, pipelines or electrical distribution lines.		

Table 2.6-1. Summary of Impacts

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<tr><th>Resource</th><th>Proposed Project
Alternative 2 – Wet Cooling with Groundwater Supply Back-Up</th><th>Alternative 3 – Wet/Dry Cooling with Groundwater Supply Back-Up</th><th>No Action Alternative</th></tr>
<tr><td>Infrastructure, Public Health and Safety, and Waste Management</td><td colspan="2">
Construction of the proposed plant would occur over four years and would require approximately 1,400 workers at the peak of construction, causing a short-term increase in daily traffic counts.
The existing local roads and rail system would be able to handle the increase in road traffic and train numbers during operation of the existing plant and the proposed Big Stone II plant. Damage to roads due to construction activities would be repaired.
The existing and proposed plants would still have emissions, but not at levels expected to exceed thresholds established by the State and USEPA for protection of human health and the environment.
The proposed plant would not cause an increase in the rate of accumulation of methylmercury concentrations in fish, although bioaccumulation of methylmercury would continue at a reduced rate. The reduced rate of bioaccumulation suggests that the lower mercury emissions from the existing and proposed plant could contribute to lower mercury concentrations in fish over time.
Numerous models produce widely divergent results, and there is insufficient information to be able to identify the specific impacts of the proposed plant's CO_2 emissions on human health and the environment.
Construction and operation of the proposed plant would not cause a significant impact to public health and safety. Implementing a facility health and safety plan would ensure there would be no interference with local emergency response capabilities or resources and prevent serious injuries to workers. Controlling access to the proposed plant facilities and construction sites would prevent injury to the public and local land users.
Modification of the existing plant's emergency response plan and site security plan minimizes the impacts of any reasonably foreseeable accidents, natural disasters, or intentionally destructive acts.
Since no sensitive receptors or land use are located near the proposed plant site, there would be no impacts from electric and magnetic fields from the proposed plant. Because the plant is isolated, there would be no substantial interference or disruption of any emergency or health and safety communication system.
By implementing standard and additional mitigation measures, impacts from hazardous materials and waste management during construction and operation of the proposed plant would not be significant. Disposal of wastes would be conducted following State and Federal regulations and would not impact public health. Procedures to control spills or releases of hazardous materials or regulated substances would be established in the Co-owners' health and safety program, and the program would not interfere with any locally adopted emergency or response plan. Impacts from hazardous materials and waste management activities for constructing and operating the proposed Big Stone II plant would be less than significant.
</td><td>
Under the No Build Alternative and Sub-alternative 1, none of the impacts associated with the proposed plant and groundwater areas would be realized. Traffic would continue to change according to population trends. Emission controls for the existing plant included as part of the proposed plant would not be installed, and certain emissions (such as SO_2, HAPs, and mercury) that could affect public health would not be reduced. The existing plant would continue to use hazardous materials and generate solid waste.
Under Sub-alternative 2, the impacts to infrastructure, public health and safety, and waste management would likely be identical to those presented for the proposed plant.
</td></tr>
<tr><td>Visual Resources</td><td colspan="2">
Construction activities would result in temporary, short-term impacts from lighting.
Constructing and operating the proposed plant would result in additive long-term low to moderate visual impacts due to the addition of a stack, a water pretreatment building, and power plant building.
No significant long-term additive impacts would result from the proposed well installations, pipelines, pumphouse buildings, fences, and electrical distribution lines.
Additive sources of light or glare are expected as a result of operation of the proposed plant structures.
Residual visual impacts would be less than significant due to the influence of the existing Big Stone plant.
</td><td>
The No-Build Alternative and Sub-alternative 1would result in no additional visual impacts to existing visual resources at the proposed plant site and groundwater areas.
Under Sub-alternative 2, the visual resources impacts would likely be identical to those presented for the proposed plant.
</td></tr>
</table>

Table 2.6-1. Summary of Impacts

<table>
<tr><th>Resource</th><th>Proposed Project
Alternative 2 – Wet Cooling with Groundwater Supply Back-Up</th><th>Alternative 3 – Wet/Dry Cooling with Groundwater Supply Back-Up</th><th>No Action Alternative</th></tr>
<tr><td>Noise</td><td colspan="2">▪ Noise levels would increase during construction of the proposed plant, but would be considered short-term impacts.
▪ The addition of the proposed plant would result in a slightly noticeable increase over existing nighttime noise levels that are generated from the existing plant. There would be no incremental noise increases above five decibels on the A-weighted scale (dBA). Minnesota residential noise standards may be exceeded at one residence due to increased construction traffic. By implementing the additional mitigation measure for construction noise impacts to the nearest residence, this impact would be less than significant.</td><td>▪ Under the No Build Alternative and Sub-alternative 1, short-term noise that would be associated with the proposed plant and groundwater areas,-would not occur. Noise levels and related activities associated with the existing plant, such as rail operations and the existing substations would continue at the current frequency into the foreseeable future.
▪ Under Sub-alternative 2, noise impacts would likely be identical to those presented for the proposed plant.</td></tr>
<tr><td>Social and Economic Values, and Environmental Justice</td><td colspan="2">▪ The proposed Big Stone II plant would permanently displace three occupied residences on or near the proposed plant site. OTP has purchased these residences as voluntary/sale transactions.
▪ The short-term impacts on housing and public services would be significant. The direct and indirect economic benefits from construction-related expenditures to the surrounding four-county region and the State of South Dakota would be a significant beneficial impact. The creation of temporary and permanent jobs in the community would also be a beneficial impact.
▪ While approximately 2.4 acres of farmland would be used for the groundwater system, this would not create a long-term loss of economic viability of a farm or business.
▪ Based on the social and economic analysis, no significant short-term or long-term negative impacts are anticipated from uncompensated losses to existing businesses or residences, loss of economic viability of a farm or other business, permanent and irreversible loss of work for a major sector of the community, or the physical division of an established community.
▪ The existing and proposed plants would continue to emit mercury (although at a decreased rate); however, since the mercury emissions from the operation of the combined plants would be less than current mercury emissions from the existing plant alone, the proposed plant-would not produce any incrementally greater adverse economic effects on property values, lakes, or health.
▪ Since the rate of mercury deposition due to emissions from the combined existing and proposed plants would decrease (compared to the existing plant alone), declines in mercury emission and deposition suggests that the lower bioaccumulation rates of methylmercury in fish could contribute to lower methylmercury concentrations in fish over time. Therefore, it is reasonable to assume that the mercury impacts on minority and low income populations (who consume quantities of fish greater than advised in the consumption advisories) would also decrease over time.
▪ The poverty rate for the census tracts affected by the proposed plant site is 10.4 percent, while minorities comprise 1.2 percent of the population in the census block groups in which the proposed plant site is located. This poverty rate is less than the State of South Dakota's poverty rate of 13.2 percent and comparable to Grant County's poverty rate of 9.9 percent. The minority population for the affected area is lower than the State of South Dakota (11.3 percent) and comparable to Grant County (1.4 percent). The proposed plant</td><td>▪ Under the No-Build Alternative and Sub-alternative 1, none of the impacts associated with the proposed plant and groundwater areas would be realized. Growth in population and housing would likely continue along present trends. The increase in jobs and revenue to the local economy would not occur.
▪ Under Sub-alternative 2, social, economic, and environmental justice would likely be identical to those presented for the proposed plant.</td></tr>
</table>

Table 2.6-1. Summary of Impacts

Resource	Proposed Project Alternative 2 – Wet Cooling with Groundwater Supply Back-Up	Alternative 3 – Wet/Dry Cooling with Groundwater Supply Back-Up	No Action Alternative
Social and Economic Values, and Environmental Justice	would not have a disproportionate negative effect on minority or low-income populations in the area. No impacts to environmental justice communities would occur as a result of constructing the proposed plant or groundwater areas.		

Resource	Transmission Alternative A Big Stone – Morris Substation and Big Stone – Granite Falls Substation		Transmission Alternative B Big Stone – Willmar Substation and Big Stone – Granite Falls Substation			
	Corridors A and C	Corridors A and C1	Corridors B and C	Corridors B and C1	Corridors B1 and C	Corridors B1 and C1
Air Quality	▪ Construction of the transmission lines, modification of substations, relocation of the Canby Substation, and upgrades to the Hankinson line would result in short-term impacts (diesel fumes from construction vehicles and dust from corridor activities and vehicle operation). Impacts to air quality would not occur after initial construction activities. Short- and long-term impacts to air quality from constructing transmission lines within the proposed corridors, modifying substations, relocating the Canby Substation, and upgrading the Hankinson line would be less than significant. ▪ Western evaluates equipment annually to locate sulfur hexafluoride (SF_6) leaks, and either immediately repairs them, or schedules repairs or replacement. An annual SF_6 emissions reduction report is prepared and reported to the USEPA. ▪ OTP participates in USEPA's SF_6 Emission Reduction Partnership for Electric Power Systems and also has plans in place for handling SF_6, with a goal of maintaining annual losses at less than two percent of system capacity. A written policy specifies procedures for inventory control, monitoring and reporting of annual usage, and methods for handling of SF_6 gas while servicing substation equipment.					
Groundwater Resources	▪ Construction activities having a potential to impact groundwater would be limited to spills of fuel and oil. Impacts within the proposed transmission corridors, at the substations, the site of the relocated Canby Substation, and along the Hankinson line would be avoided or minimized by complying with the NPDES storm water permit for construction activities and the spill reporting and cleanup programs administered by South Dakota and Minnesota. ▪ Construction and operation of the transmission lines, substation modifications and other system improvements would not degrade groundwater quality or violate State and Federal standards. Impacts to groundwater resources within the corridors and substations would be less than significant.					
Floodplains	▪ Given the width of floodplains within the proposed corridors, some impacts due to construction activities and installation of transmission towers may occur. With the exception of the existing Canby Substation, the substations do not occur within FEMA-designated 100-year special flood hazard zones. The Canby Substation would be relocated approximately one mile to the northeast, out of the floodplain of Canby Creek. ▪ Upon completion of the engineering survey to determine which structures require modification or replacement along the Hankinson line, site specific environmental surveys would be conducted in accordance with the transmission-related standard mitigation measures SMMs. ▪ The proposed construction activities would not modify the floodplains or adversely affect the capacity of the floodplains, constrict or modify flow conveyances, or measurably add to flood flows. Impacts to floodplains would be less than significant.					

<table>
<tr><th rowspan="2">Resource</th><th colspan="2">Transmission Alternative A
Big Stone – Morris Substation and Big Stone – Granite Falls Substation</th><th colspan="4">Transmission Alternative B
Big Stone – Willmar Substation and Big Stone – Granite Falls Substation</th></tr>
<tr><th>Corridors A and C</th><th>Corridors A and C1</th><th>Corridors B and C</th><th>Corridors B and C1</th><th>Corridors B1 and C</th><th>Corridors B1 and C1</th></tr>
<tr><td>Surface Water Resources</td><td colspan="6">▪ Impacts within the proposed transmission corridors, at the substations, the site of the relocated Canby Substation, and along the Hankinson line would be avoided or minimized by complying with the NPDES storm water permit for construction activities and the spill reporting and cleanup programs administered by South Dakota and Minnesota.
▪ All jurisdictional stream and wetland crossings would be constructed according to CWA Section 404 permit requirements and the Section 401 Water Quality Certification requirements, which would include mitigation requirements to prevent erosion, sedimentation, and disturbances of stream banks and other impacts.
▪ By implementing the SMMs, construction activities would not result in a violation of Federal and/or State water quality standards or violate Section 404 of the CWA or other applicable surface water regulation. Impacts to surface water resources would be less than significant.</td></tr>
<tr><td>Geology and Minerals</td><td colspan="6">▪ No unique geologic features are located within any of the corridors, the substations, the proposed area for the relocation of the Canby Substation, and along the Hankinson line. Potential geologic hazards, such as seismicity, landslides, and sinkhole development associated with karst formation, are not present within nor are they identified in the vicinity of any of the corridors. Therefore, there would be no impacts to unique geological features or impacts associated with geologic hazards as a result of constructing or operating a transmission line within any of the proposed corridors, from modifying substations, relocating the Canby Substation, or upgrading the Hankinson line.
▪ Mineral resources would not be precluded from development. There would be no significant impacts to mineral resources from constructing or operating a transmission line within any of the proposed corridors, from modifying substations, relocating the Canby Substation or upgrading the Hankinson line.</td></tr>
<tr><td>Paleontological Resources</td><td colspan="6">▪ There is low potential for the presence of scientifically important fossils within the proposed corridors, substations, the proposed area for the relocation of the Canby Substation, and along the Hankinson line. There would be no significant impacts to paleontological resources from constructing or operating transmission line within any of the proposed corridors or from modifying substations.</td></tr>
<tr><td rowspan="2">Soils</td><td colspan="6">▪ Transmission line construction within any of the proposed corridors, modifications to substations, relocating the Canby Substation, and upgrading the Hankinson line would result in temporary impacts as well as permanent removal of soils. The long-term impact to soils for each transmission alternative is shown below.
▪ Small areas of soils may be permanently removed during modifications of substations if the substations require expansion, at the proposed area for the relocation of the Canby Substation (about 8.3 acres), and at affected Hankinson line structures.
▪ By implementing SMMs and additional mitigation measure S-1, impacts to soils would be less than significant.</td></tr>
<tr><td>▪ Long-term impacts to 71 acres of soils.</td><td>▪ Long-term impacts to 58 acres of soils.</td><td>▪ Long-term impacts to 80 acres of soils.</td><td>▪ Long-term impacts to 68 acres of soils.</td><td>▪ Long-term impacts to 79 acres of soils.</td><td>▪ Long-term impacts to 66 acres of soils.</td></tr>
<tr><td>Vegetation Resources</td><td colspan="6">▪ Short-term vegetation disturbances (totals shown below) associated with construction activities of the proposed corridors would occur during construction of structures and pads, access roads, turnarounds, pulling/tensioning sites, and staging areas. The majority of short-term impacts would be in agricultural areas, which would be returned to production after construction activities are completed.
▪ Long-term vegetation impacts (totals shown below) associated with transmission line construction activities would occur exclusively within the wetland/riparian, shrubland, and upland forested communities due to their extended recovery timeframes. All other vegetation types would return to pre-disturbance conditions following successful reclamation within two years after short-term disturbances depending on the sensitivity of the plant communities, the timing and extent of the disturbance, and the geographic and topographic location.
▪ Substation modifications would result in long-term removal of agricultural cropland if the substations require expansion. The relocated Canby Substation would be located on disturbed agricultural land (approximately 8.3 acres).</td></tr>
</table>

Resource	Transmission Alternative A Big Stone – Morris Substation and Big Stone – Granite Falls Substation		Transmission Alternative B Big Stone – Willmar Substation and Big Stone – Granite Falls Substation			
	Corridors A and C	**Corridors A and C1**	**Corridors B and C**	**Corridors B and C1**	**Corridors B1 and C**	**Corridors B1 and C1**
Vegetation Resources	▪ Regardless of the locations of the Hankinson line upgrades, the Co-owners would implement vegetation-related protection mitigation measures. With these measures, the improvements to the existing Hankinson Line would not cause any significant impacts to vegetation. ▪ There would be no loss of any plant population that would result in a species being listed or proposed for listing as threatened or endangered.					
	▪ Long-term loss of 71 acres of vegetation, including approximately 32 acres of wetlands, 15 acres of forest, and 3 acres of shrubland habitat. ▪ Short-term loss of 793 acres of vegetation.	▪ Long-term loss of 58 acres of vegetation, including approximately 23 acres of wetlands, 11 acres of forest, and 3 acres of shrubland habitat. ▪ Short-term loss of 818 acres of vegetation.	▪ Long-term loss of 80 acres of vegetation, including approximately 30 acres of wetlands, 18 acres of forest, and 5 acres of shrubland habitat. ▪ Short-term loss of 1,034 acres of vegetation.	▪ Long-term loss of 68 acres of vegetation, including approximately 20 acres of wetlands, 14 acres of forest, and 6 acres of shrubland habitat. ▪ Short-term loss of 1,059 acres of vegetation.	▪ Long-term loss of 79 acres of vegetation, including approximately 28 acres of wetlands, 18 acres of forest, and 5 acres of shrubland habitat. ▪ Short-term loss of 1,042 acres of vegetation.	▪ Long-term loss of 66 acres of vegetation, including approximately 19 acres of wetlands, 14 acres of forest, and 6 acres of shrubland habitat. ▪ Short-term loss of 1,067 acres of vegetation.
Wildlife	▪ Direct short-term impacts to wildlife would occur during construction due to elevated noise and increased human presence. Short-term and long-term impacts would occur from the loss of vegetation from construction activities. ▪ Most of the wildlife habitat that would be impacted is agricultural land. Between three to seven percent of the corridors' wetlands, forests, and shrublands would be impacted by constructing and operating the proposed transmission facilities. ▪ Nominal declines in wildlife populations, losses of economic or recreational opportunities, habitat fragmentation, and direct mortality would be expected. ▪ Long-term impacts to bird species would result from the increased potential for collision of migrating and foraging birds with overhead wires. An Avian Protection Plan would be developed to minimize impacts to nesting birds, as well as to minimize the electrocution and collision of migratory and resident bird species. ▪ There would be no loss of individuals that would result in the species being listed or proposed for listing as threatened or endangered. ▪ There would be no violation of any statute or regulation pertaining to wildlife. No constituents would be introduced into any waterbody that would cause an adverse effect on wildlife. ▪ By implementing standard and additional mitigation measures, there would be no significant impact to wildlife species.					
Fisheries	▪ There would be no loss of individuals of an aquatic species that would result in the species being listed or proposed for listing as threatened or endangered. ▪ By implementing mitigation measures and complying with permit requirements, there would be no significant impacts to fisheries from construction activities.					
Special Status Species	▪ A total of 27 special status plant species (nine special status species and 18 species of special concern) were identified as occurring within the proposed corridors. No special status plant species were identified as occurring within the proposed substations modification areas or the site of the relocated Canby Substation. ▪ A total of 16 terrestrial wildlife special status species (six special status species and 10 species of concern) may inhabit the proposed corridors. A total of four terrestrial wildlife species may occur within the substation areas. ▪ Construction work related to modifications at Granite Falls Substation could result in surface disturbance in the Minnesota River drainage, which supports special status fish and mussel species. Mitigation measures would ensure that no long-term loss, habitat alteration, or water quality changes would affect special status fish and mussel species.					

Resource	Transmission Alternative A Big Stone – Morris Substation and Big Stone – Granite Falls Substation		Transmission Alternative B Big Stone – Willmar Substation and Big Stone – Granite Falls Substation			
	Corridors A and C	**Corridors A and C1**	**Corridors B and C**	**Corridors B and C1**	**Corridors B1 and C**	**Corridors B1 and C1**
Special Status Species	▪ Upon completion of the engineering survey to determine which structures require modification or replacement along the Hankinson line, a survey for special status species would be conducted in accordance with the transmission-related SMMs. ▪ Impacts to special status plant and wildlife species would be similar to those identified for the proposed plant. In addition, the presence of a new transmission line may increase the potential for collision by special status birds. The collision potential would be minimized through design and implementation of mitigation measures. ▪ Western's determinations regarding effects to federally-listed species cannot be made until the selection of the transmission line routings and completion of a biological assessment. Western would complete its obligation under the ESA prior to authorizing interconnections with its system.					
Wetland/Riparian Areas	▪ The acreage of wetlands that may be impacted within each transmission alternative varies from approximately 18.8 to 32.3 acres. Impacts were calculated based on the percentage of wetland habitat within each corridor in proportion to the total land cover types. Actual impacts would likely be less than the above range, since in accordance with SMM Bio-3, all wetland and riparian areas would be avoided to the extent practical. ▪ No wetland/riparian areas were identified as occurring within the proposed substation modification sites. No wetland areas are anticipated within the area proposed for relocation of the Canby Substation. ▪ Regardless of the locations of the Hankinson line upgrades, mitigation measures would be implemented to protect wetland/riparian areas. ▪ A significant impact would not occur as a result of any loss or degradation of any jurisdictional wetland, since these impacts would be mitigated under a CWA Section 404 permit. Impacts would include the initial loss of wetland/riparian areas acreages, but these losses would be offset per Section 404 permit requirements. With implementation of the SMMs, impacts to wetland/riparian areas would be minimal.					
Archaeological Resources Historical Resources	▪ It is anticipated that by following the procedures outlined in Section 106 of the NHPA and the PA, adverse impacts to archaeological and historic resources eligible for inclusion to the NRHP would be avoided or mitigated. Unavoidable impacts to NRHP-eligible sites would be mitigated by implementing a treatment plan in accordance with the proposed PA. ▪ Impacts to NRHP-eligible sites would not be significant by implementing the proposed PA and SMMs. ▪ Any TCP identified within the proposed Project area would receive the appropriate level of protection or recovery by implementing mitigation measures, treatment plans, or compliance actions (e.g., protecting burial sites) under the proposed PA. Impacts to these resources would not be significant by implementing the proposed PA. ▪ The existing Hankinson line traverses across approximately 25 miles of the Lake Traverse Indian Reservation along a north-south corridor. The required improvements to the existing Hankinson line would cause a need for structure modifications, the extent of which are not yet known. For improvement activities, all provisions for the PA described for the transmission corridors would apply.					

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<tr><td rowspan="2">Land Use Resources</td><td colspan="6">▪ New land required for constructing the transmission lines (i.e., land that is not already within existing ROWs) would be acquired by negotiating easements with private landowners and/or with local, State, or Federal agencies. Since most of the land within the corridors is agricultural, the majority of land would be owned by private landowners. Long-term impacts are shown below for each transmission alternative.
▪ Substation expansions would require a minimal amount of land purchase. The Co-owners have acquired 57 acres of land for the relocation of the Canby Substation.
▪ No additional lands would be acquired for the upgrades to the existing Hankinson line.
▪ The proposed corridors and substations would require various permits, land use approvals, or zoning changes for construction and operation. With approval of zoning changes, there would be no conflicts with land use plans, zoning, or with special use areas.
▪ Short-term impacts to land use due to construction activities would occur from temporary interruption of farming activities due to the presence of heavy equipment and line stringing activities. Short-term impacts would not be significant, and the loss of the use of agricultural land during construction activities would be compensated. Short-term impacts are shown below for each transmission alternative.
▪ The impacts to the demands for recreation from constructing and operating the proposed transmission lines and modifying substations would be less than significant.</td></tr>
<tr><td>▪ Short-term impacts to 793 acres. Long-term impact to 71 acres.</td><td>▪ Short-term impacts to 818 acres. Long-term impact to 58 acres.</td><td>▪ Short-term impacts to 1,034 acres. Long-term impact to 80 acres.</td><td>▪ Short-term impacts to 1,059 acres. Long-term impact to 68 acres.</td><td>▪ Short-term impacts to 1,042 acres. Long-term impact to 79 acres.</td><td>▪ Short-term impacts to 1,067 acres. Long-term impact to 66 acres.</td></tr>
<tr><td rowspan="2">Agricultural Practices</td><td colspan="6">▪ Long-term impacts to prime and unique farmland include the loss of agricultural land for substation expansions, the relocation of the Canby Substation, and new transmission line structures. The loss of the use of agricultural land due to structure placement would be compensated. Long-term impacts are shown below for each transmission alternative.
▪ The permanent conversion of prime farmland to the proposed Project would be small in comparison to the amount of prime farmland in each corridor; therefore, there would be no adverse affect on agriculture in the region.</td></tr>
<tr><td>▪ Long-term impact to 21 acres.</td><td>▪ Long-term impact to 21 acres.</td><td>▪ Long-term impact to 27 acres.</td><td>▪ Long-term impact to 28 acres.</td><td>▪ Long-term impact to 28 acres.</td><td>▪ Long-term impact to 28 acres.</td></tr>
<tr><td rowspan="2">Center Pivot Irrigation Systems</td><td colspan="6">Center-pivot irrigation areas occur within the transmission line corridors (totals shown below). Temporary impacts could occur to non-fallow fields during construction that could remove some crops from irrigation. Potential interference with center-pivot irrigation systems would be a primary consideration when routing the transmission lines through irrigated areas. Landowners would be compensated for any disturbance to center-pivot irrigation agricultural areas.</td></tr>
<tr><td>1</td><td>10</td><td>19</td><td>28</td><td>26</td><td>35</td></tr>
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<tr><td rowspan="2">Public Facilities</td><td colspan="6">▪ Public facilities such as schools, day care facilities, hospitals, churches, and cemeteries exist within the corridors (totals shown below). Visual and health impacts could occur at these public facilities if the transmission line were to be routed close to them. Visual impacts to public facilities would occur from the presence of transmission structures.
▪ The substations included in the proposed Project are not located near any public facilities.
▪ No public facilities, such as day care centers, hospitals or airports, are located within the area that would be affected by the Hankinson line upgrade.</td></tr>
<tr><td>41</td><td>35</td><td>44</td><td>38</td><td>41</td><td>35</td></tr>
<tr><td>Infrastructure, Public Health and Safety, and Waste Management</td><td colspan="6">▪ After implementing the standard and additional mitigation measures, construction of the proposed transmission lines, substation modifications, relocating the Canby Substation, and upgrades to the Hankinson line would involve short-term localized traffic delays. Increases in traffic due to construction and operation would not exceed the service level of any roadway within the corridors. Impacts resulting from constructing or operating the proposed transmission lines, modifying substations, relocating the Canby Substation, and upgrading the Hankinson line would be less than significant for infrastructure.
▪ Implementing a health and safety plan would assure there would be no interference with local emergency response capabilities or resources and prevent serious injuries to workers. Implementing additional mitigation measures would control access to the proposed construction sites, and would prevent injury to the public and local land users. The transmission lines and substations would be designed to minimize electric and magnetic fields, corona effects, and interference with emergency communication and electronic health and safety devices. The transmission lines would be designed so as not to pose a health risk at sensitive receptors. Construction activities would not significantly change traffic patterns, so there would not be a hazardous situation for motorists or pedestrians. Construction and operation of the proposed transmission lines, substation modifications, the relocated Canby Substation, and upgraded Hankinson line would not cause a significant impact to public health and safety by implementing standard and additional mitigation measures. Residual impacts would be less than significant.
▪ By implementing SMMs, there would be no improper disposal of wastes, spills, and releases of hazardous material, hazardous substances, and oil would not be in excess of reportable quantities. There would be no impacts to public health from chemical management from constructing and operating transmission lines or substations for the proposed Project. The health and safety plan would ensure there would be no impacts to any adopted emergency hazardous materials spill response plans or emergency evacuation plans.</td></tr>
<tr><td>Visual Resources</td><td colspan="6">▪ The proposed corridors are located primarily on visual resource management (VRM) Class III lands, where proposed Project facilities (e.g., transmission line structures and conductor, ROW, and access roads) and activities may be visible but not dominate the landscape. Upgrading/rebuilding existing transmission lines or constructing new transmission lines would result in long-term low to moderate additive visual impacts, depending on the characteristics of each corridor. Transmission upgrades would have similar form, line, color, and texture as the existing lines. Additive impacts would occur where transmission lines are constructed parallel to existing lines. Generally, visual impacts may be higher where the new line does not parallel or is built away from the visual range of an existing line. Also, higher impacts may occur in areas where major highway crossings occur near water. Visual impacts to three potential substation expansions and the relocated Canby Substation would result in low additive long-term impacts. Implementation of standard and additional mitigation measures would reduce visibility of the proposed transmission line from sensitive viewpoints and visual impacts associated with installing the new line (e.g., structures, conductors, access roads). The Co-owners have committed to reducing visual impacts to sensitive travel and recreation corridors such as highway and trail crossings by placing the structures at the maximum feasible distance from the crossings, within limits of structure design. The substations would use similar form, line, texture, and color elements as the existing structures. Visual impacts along the existing Hankinson line after the upgrade would not be substantially different than existing conditions.
▪ Visual impacts from constructing and operating transmission lines, the substation modifications, relocating the Canby Substation, and upgrading the Hankinson line would be less than significant.</td></tr>
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<tr><td>Noise</td><td colspan="6">▪ Noise levels would increase during the construction of the transmission lines, the substation modifications, the relocated Canby Substation, and the upgrades to the Hankinson line, but are considered to be short-term impacts.
▪ Operational noise occurs from electrical current moving through transmission lines and conductors. This noise is only noticeable when standing directly under the transmission line and does not exceed five dBA; therefore, is not considered a significant long-term impact.
▪ The only incremental noise increases occur during opening and closing breakers, which would be infrequent instantaneous sounds. Constructing and operating the proposed substation modifications, the relocated Canby Substation, and the upgraded Hankinson line would result in less than significant noise impacts.</td></tr>
<tr><td>Social and Economic Values, and Environmental Justice</td><td colspan="6">▪ The construction of transmission lines and substation modifications would create approximately 40 jobs. Construction personnel would primarily use temporary housing at local motels in the area, although some personnel may be local. Activities associated with the upgrades to the existing Hankinson line would require one to two construction crews, each consisting of about two workers. The number of new employees would have a less than significant impact on the local population or housing in the proposed Project area.
▪ The poverty rates and minority population percentages for all proposed corridors are less than or comparable to rates for those counties and States through which they pass. There is not a disproportionate amount of minority or low-income populations in the proposed corridors. Constructing and operating the transmission lines within the proposed corridors, the substations modifications, relocating the Canby Substation, and upgrading the Hankinson line would not have a disproportionate negative effect on minority or low-income populations in the area.</td></tr>
<tr><td>No Action Alternative
(Addressed in Final EIS under each resource)</td><td colspan="6">▪ Under the No-Build Alternative of the No Action Alternative, the Co-owners would not proceed with the proposed Big Stone II plant, and therefore would not seek alternate transmission configurations. Changes to the Canby Substation (i.e., relocation out of the floodplain) and the upgrades to the Hankinson Line that are associated with the proposed Project would not occur. Existing resources within the proposed transmission corridors (such as agricultural land, prime farmland, wildlife, vegetation, wetlands, surface water, and visual) would not be impacted and current environmental conditions and trends would continue. Existing EMF levels and health and safety considerations from transmission lines and substations in the area would continue. Growth in population and housing would likely continue along present trends. Additionally, the Co-owners would not fulfill their purpose and need for the proposed Project, and opportunities to support regional utility needs would not be realized.
▪ Under Sub-alternative 1 of the No Action Alternative, the Co-owners would not proceed with the proposed Project. The beneficial and adverse impacts associated with constructing and operating the proposed transmission lines would not be realized and existing conditions would continue during the foreseeable future. Courses of action that might be taken by the Co-owners to develop or secure alternative baseload generation are uncertain and describing the potential impacts of this sub-alternative are speculative; therefore, the Final EIS does not attempt to describe any potential impacts associated with Sub-alternative 1.
▪ Under Sub-alternative 2 of the No Action Alternative, the Co-owners would not obtain transmission interconnections on the Federal transmission system. The Co-owners would seek an alternative transmission configuration that would provide firm transmission service on the MISO system or purchase non-firm transmission rights from MISO over the MISO system. The environmental consequences associated with obtaining transmission capacity would likely be similar to those summarized above for the transmission component of the proposed Project, though those impacts may occur at different locations. Because the Co-owners have not explored the possibility of proceeding with the construction of the proposed plant without the interconnection to Western's transmission system, the locations of those potential transmission impacts are unknown.
▪ Each sub-alternative would include rebuilding the existing Ortonville-Johnson Junction-Morris 115-kV transmission line to the Morris Substation to meet existing and future power delivery needs. Rebuilding the existing transmission line would occur at a later date and would have similar impacts to those summarized above for the proposed Project's transmission corridors.
▪ The Hankinson transmission line would not be upgraded under any of the sub-alternatives. Emergency and routine maintenance and current environmental conditions and trends would continue.</td></tr>
</table>

Table 2.6-2. Additional Mitigation Measures

Resource Area	Number	Additional Mitigation Measure
Water	W-1	The construction contractor would prepare a Pipeline Construction Work Plan consistent with industry standards and State, Federal, and local regulations. The plan would include protocols to address spill prevention, response equipment, guidelines for handling spills, and spill cleanup. The work plan would also require the construction contractor to check for underground utilities prior to construction and to provide flagmen to control traffic flow along county roads when needed.
	W-2	If permanent culverts or other crossing structures and their approaches are placed in channels or on floodplains, the type of structure, its size, location, erosion protection, and timing of construction would be reviewed beforehand with landowners, USACE, applicable State agencies, and county floodplain management officials. Typical drawings may be used to depict the type of structure and related erosion control. This measure would apply to all such placements, whether on perennial, intermittent, or ephemeral streams. Shallow crossings that could be accomplished by fording would be located, designed, and stabilized in coordination with these same entities. Periodic inspections would be conducted at all permanent instream crossings, and maintenance and reporting would be conducted as needed. In addition, no buildings (e.g., substations, storage warehouses, or maintenance facilities) or enclosures would be located on delineated or approximated floodplains, low stream terraces, or shorelines.
	W-3	The drilling and installation of wells would avoid wetland/riparian areas.
Geology and Minerals	GM-1	Transmission lines would be routed to avoid conflict with mineral extraction activities (e.g., active gravel pits and rock quarries), including access to these facilities that currently exist within the proposed transmission corridors. Also, lines would be routed to avoid State-designated rock outcrops.
Soils	S-1	In addition to implementing the SMMs and other practices required by NPDES/Storm Water Pollution Prevention Plan (SWPPP) permits and spill control regulations during transmission line design, the Co-owners would coordinate with the appropriate soil conservation district within each county or local area as necessary to incorporate specific local knowledge of existing soil conditions and drainage management practices within a locale, and to further develop site specific mitigation measures as needed (such as means of traversing or avoiding steep slopes), and site restoration programs (including goals, practices, and materials) for a particular area.
Vegetation Resources	V-1	Prior to construction, the Co-owners would prepare and implement an Integrated Weed Management Plan to prevent, control, and manage noxious and invasive weeds during construction and maintenance activities for the proposed Project. The Plan would identify actions to be taken by construction crews (including contractors) and operations personnel. Such actions would include surveys of construction areas for invasive and noxious weeds, prevention of the spread of invasive and noxious weeds and their seeds, appropriate monitoring, and other appropriate measures.
	V-2.	Sensitive habitats including remnant native prairie ecosystems, high value wetland/prairie complexes, State-identified rock outcrops, tree lines, windbreaks, and remnant hardwood forests, would be avoided, to the extent possible, during transmission line route selection.
Wildlife	WL-1	Prior to construction at the proposed plant site, biological surveys would be conducted within the plant site construction boundary. The surveys would be directed toward identifying sensitive species or their habitat that would be affected by construction activities. Depending on timing of construction, breeding bird surveys may be necessary to identify and locate nests. This information would be used to acquire the needed permits for taking migratory bird nests.
	WL-2	During preconstruction surveys, if eagles are found to be nesting within one-half mile of the approved ROW for the proposed transmission line, construction activities would not occur between January and August.
Special Status Species	SS-1	If instream construction activities are required for streams/rivers that may contain spawning habitat for game fish or sensitive fish species, a habitat survey would be conducted to determine if spawning substrates are present. Additional mitigation would be applied involving avoidance of the spawning period and returning bottom characteristics to pre-construction conditions.
	SS-2	If instream construction activities are required for streams/rivers that contain possible habitat for sensitive mussel species, a mussel survey would be conducted. If sensitive mussels are present, the crossing location would be moved to avoid impacting the habitat.
Land Use	LU-1	The transmission line centerline would be located, to the extent practicable, greater than 0.25 mile away from any identified recreational areas, churches, schools, hospitals, and registered day care providers.
	LU-2	The Co-owners would work with landowners to avoid and minimize impacts to agricultural land and operation. Transmission line routing would avoid impacts to center-pivot irrigation areas to the extent practical. Landowners would be compensated for any disturbance to center-pivot irrigation agricultural areas. The Co-owners would minimize temporary impacts and compaction during construction and would compensate landowners accordingly.
Transportation	TR-1	The construction contractor would be required to establish mitigation measures such as bus transportation or car pooling for workers from centralized locations to reduce the number of daily vehicle trips in the vicinity of the proposed plant.

Resource Area	Number	Additional Mitigation Measure
	TR-2	The construction contractor would be required to plan and execute delivery of heavy equipment in such a manner that would avoid traffic congestion and reduce dangerous situations along local roadways (e.g., slow-moving vehicles entering and existing roadways).
	TR-3	The Co-owners would coordinate with the appropriate County personnel to mitigate severe road damage that could create a hazardous situation for motorists and pedestrians.
Public Health and Safety	PHS-1	Fences and other metal objects on or near the proposed ROW would be grounded to reduce risk of electrocution during construction and operation. All maintenance workers would receive specific training on the appropriate procedures for equipment inspection and repairs, first aid training, and emergency response training with periodic refresher sessions. Maintenance vehicles would carry fire suppression equipment and communications equipment to facilitate contacting back-up emergency response personnel.
Visual Resources	VR-1	Where the new line parallels the existing line, similar structural design would be used to lessen the additive visual impacts to the greatest extent possible.
	VR-2	In areas of tree vegetation, consideration would be given to minimize clearing, yet maintain adequate conductor to ground clearance.
Noise	N-1	If noise complaints are received from local area residents during construction or operation of the proposed Big Stone II plant, the Co-owners would work with the local resident(s) to develop and implement mitigation of the noise impacts to acceptable levels. Mitigation would be as agreed with the landowner and may include screening at the proposed plant site or residence, erection of noise barriers, landowner compensation, or other appropriate measures.
	N-2	If noise complaints are received from local area residents during construction or operation of the groundwater activities, the Co-owners would work with the local resident(s) to mitigate their complaints.
Social and Economic Values	SE-1	For construction at the proposed plant, the Co-owners would consult with local authorities and the construction contractor prior to start of construction to identify specific mitigation measures to alleviate impacts to housing, transportation, law enforcement, and emergency, and other services. These mitigation measures would be consistent with the Local Review Committee's report to the SDPUC (Appendix J). Unanticipated housing and service issues that arise during construction would be mitigated in coordination with local authorities, as needed.

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Final Environmental Impact Statement

Volume I

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Big Stone II Power Plant and Transmission Project

Prepared for:

Lead Agency:
Western Area Power Administration

Cooperating Agency:
U.S. Army Corps of Engineers

AFFECTED ENVIRONMENT

CHAPTER 3

Chapter 3 Changes

The changes to Chapter 3 added and updated environmental information for the resource areas, particularly regarding the groundwater areas and results of recent groundwater exploration activities addressed in the Supplemental Draft EIS. A discussion of greenhouse gases/climate change and the recently vacated Clean Air Mercury Rule were also provided. Changes include:

- Added baseline information to all resource areas in the expanded groundwater area and made minor changes to several tables and text due to regulatory changes and corrections to baseline data. Made changes to figures to accommodate the groundwater areas.
- Provided information that on February 8, 2008, the Clean Air Mercury Rule was vacated by United States Court of Appeals for the District of Columbia Circuit.
- Added the results of the exploratory groundwater drilling program, aquifer testing, and groundwater modeling conducted by the Co-owners to support the use of groundwater as a backup water supply. Provided background information of groundwater uses near the proposed Project.
- Added background information on greenhouse gases and climate change.
- Provided additional information regarding mercury emissions affecting surface waters.
- Updated the archaeological investigations and information on historical resources conducted for the proposed Project (i.e., for both the proposed Big Stone II plant site and the transmission corridors) and discussed associated findings.
- Transferred the discussion of Native American consultations to Chapter 6.

3.0 Affected Environment

Chapter 3 provides descriptions of the existing environmental conditions of the areas that may be impacted by constructing and/or operating the proposed Project. This chapter provides the reader with an understanding of the affected environment for physical, biological, and human resources. Physical resources include air quality, water resources, geology, minerals, soils, paleontology, infrastructure, waste management, and noise. Biological resources include vegetation, wildlife, fisheries, special status species, and wetland/riparian areas. Human resources include social and economic values, environmental justice, visual resources, cultural resources, and Native American religious concerns. Federal, State, and local regulations that apply to managing these resources are also discussed in context to the existing environment. Specific impacts from constructing and operating the proposed Project are discussed in Chapter 4.

The geographical setting for each resource is defined in this chapter for the proposed Big Stone II plant, the proposed groundwater areas, and the proposed transmission corridors, the Hankinson transmission line, and modifications to existing substations within the proposed corridors. The geographical setting differs for each resource, and for each component of the proposed Project. The States of South Dakota and Minnesota have jurisdiction over determining the specific routes within the proposed corridors under their permitting processes. Therefore, the geographical settings for the proposed transmission lines are three- to four-mile-wide corridors instead of specific routes. As discussed in Section 2.3.3, each transmission alternative comprises several proposed corridors. The substations that would be modified and the relocation of the Canby Substation for the proposed Project are within the proposed corridors and in general, have the same geographic setting.

3.1 Air Quality

3.1.1 Introduction

This section presents a general overview of the existing climate and air quality of the region, serving as a basis for examining the effects of emissions from constructing and operating the proposed Big Stone II plant, groundwater wells, and pipeline system, and the proposed transmission lines and substation modifications. Long-term climatic factors and short-term weather fluctuations are both considered part of the air quality resource. Prevailing regional and local climatic conditions would affect the dispersion of air pollutants emitted from the proposed plant. Understanding the regional meteorology and climate is necessary to estimate the impact of the proposed Project's emissions on ambient air quality. The overview includes summaries of long-term patterns of winds, precipitation, and temperature; provides the national and State air quality standards that must be met at all times; and gives the current status of air quality in the proposed Project area at standard temperature and pressure.

This section also presents background information on greenhouse gas (GHG) emissions, including CO_2 emission statistics, causes of climate change, GHG definitions, status of domestic and international efforts to control GHG, and potential reduction options available to electric generators and other participants.

Regulatory Background

The Clean Air Act and its amendments (CAA) require the U.S. Environmental Protection Agency (USEPA) to set National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. Air quality standards specify acceptable upper limits of pollutant levels for each pollutant. The CAA established two types of NAAQS. Primary standards set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings.

Air quality is defined as a concentration of pollutants in the atmosphere compared to established standards. Both long-term climatic factors and short-term weather fluctuations contribute to air quality because they affect dispersion and pollutant concentrations. Physical effects to air quality depend on the characteristics of the receptors and the type, amount, and duration of exposure to any given air pollutant. Air quality standards specify acceptable upper limits of pollutant concentrations and duration of exposure. These standards differ with different pollutants.

The USEPA Office of Air Quality Planning and Standards has set NAAQS for six principal pollutants, which are called "criteria" pollutants. These pollutants are listed in Table 3.1-1. Units of measure for the standards are micrograms per cubic meter ($\mu g/m^3$) of air and parts per million by volume. For the listed pollutants, South Dakota and Minnesota air quality standards are the same as these Federal standards.

There are no State or Federal ambient air quality monitoring sites in the vicinity of the proposed Project.

Table 3.1-1. National Ambient Air Quality Standards

Pollutant	Primary Standards ($\mu g/m^3$)	Averaging Times	Secondary Standards ($\mu g/m^3$)
Carbon Monoxide (CO)	10,000	8-hour	None
	40,000	1-hour	None
Lead	1.5	Quarterly average	[a]
Nitrogen Dioxide	100	Annual[b]	[a]
Particulate Matter (PM_{10})[c]	150	24-hour	[a]
Particulate Matter ($PM_{2.5}$)[d]	15.0	Annual[b]	[a]
	35	24-hour	[a]
Ozone	157	8-hour	[a]
Sulfur Oxides	80	Annual[b]	[e]
	365	24-hour	[e]
	--	3-hour	1,300

[a]Same as primary standards.
[b]Arithmetic mean.
[c]PM_{10} – particulates with aerodynamic diameter less than 10 micrometers.
[d]$PM_{2.5}$ – particulates with aerodynamic diameter less than 2.5 micrometers.
[e]Secondary Standards for Annual and 24-hour averaging times do not exist.

Source: USEPA, 2008c.

Greenhouse Gas Emissions and Climate Change

Climate change refers to changes in many climatic factors such as temperature, precipitation, or wind lasting for an extended period. There continues to be a degree of uncertainty surrounding the contemporary causes of climate change, but it may result from:

- Natural factors such as solar and orbital variations.
- Natural processes within the climate system (e.g., ocean circulation changes).
- Human activities that change the atmosphere's composition (e.g., land use changes, burning fossil fuels) and the land surface.

A large number of scientists believe that global warming is occurring and causing climate change. They also believe GHGs are major contributors to global warming and climate change. Assessments by the Intergovernmental Panel on Climate Change (IPCC) suggest that the Earth's climate has warmed between 0.6 and 0.9 degrees Celsius over the past century and that human activity affecting the atmosphere is "very likely" an important driving factor.[1] The IPCC's Fourth Assessment Report (Summary for Policymakers) states, "Most of the observed increase in globally averaged temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations." It goes on to state, "The observed widespread warming of the atmosphere and ocean, together with ice mass loss, support the conclusion that it is extremely unlikely that global climate change of the past 50 years can be explained without external forcing, and very likely that it is not due to known natural causes alone."

GHGs are gases that trap heat in the earth's atmosphere by absorbing and re-emitting solar radiation. GHGs such as water vapor and carbon dioxide (CO_2) occur naturally and are emitted to the atmosphere through natural processes and human activities. The IPCC estimates that water vapor is responsible for 60 to 80 percent of the world's greenhouse effect (IPCC, 2001). Other GHGs (e.g., fluorinated gases) are created and emitted solely through human activities. The principal anthropogenic[2] GHGs and their origins are:

- CO_2 enters the atmosphere through the burning of solid waste, wood, and fossil fuels (oil, natural gas, and coal) and also as a result of other chemical reactions (e.g., manufacture of cement). CO_2 is removed from the atmosphere or "sequestered" naturally by plants, dissolved in the oceans, or stored below the earth's surface.
- Methane (CH_4) is emitted during the production and transport of coal, natural gas, and oil. Methane is also emitted from livestock, agricultural processes, and organic waste decay.
- Nitrous oxide (N_2O) is emitted during the combustion of fossil fuels and solid wastes, as well as during agricultural and industrial activities.
- Fluorocarbon gases such as perfluorocarbons, hydrofluorocarbons, and sulfur hexafluoride are some of the strongest GHGs known to man. They are emitted from a variety of industrial processes.

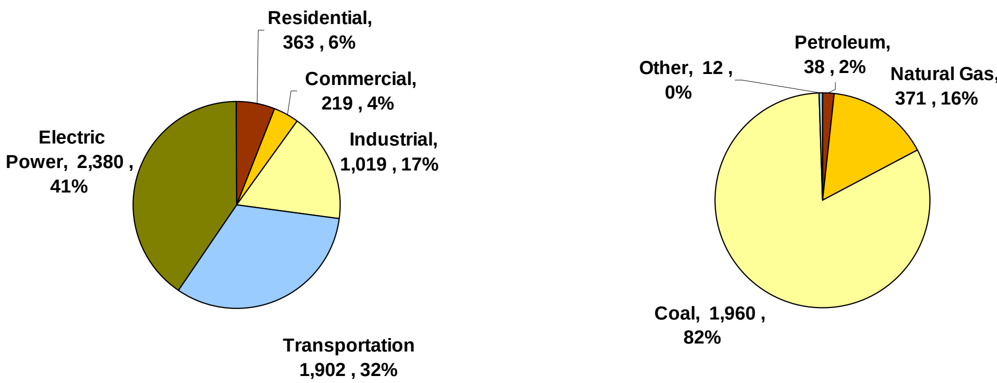
[1] According to the IPCC "very likely" indicates that there is a 90 percent chance that this is the case.

[2] Anthropogenic means those effects, processes, materials or objects that are derived from human activities, as opposed to those occurring in natural environments without human influences. A substantial increase in anthropogenic GHG emissions coincides with the Industrial Revolution.

According to the IPCC Fourth Assessment Report (IPCC, 2007) most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic GHG concentrations. The increase in GHG emissions related to human activities increased 70 percent from 1970 to 2004, according to the report.

At present, the U.S. emits approximately one-fourth of the world's GHGs (National Center for Public Policy, 2008). The nation's CO_2 emissions from energy consumption were estimated by the Energy Information Administration (EIA) to be about 5.9 billion metric tons[3] in 2006. Another 0.3 billion metric tons of CO_2 equivalent emissions came from energy-related GHGs other than CO_2. Total GHGs for the U.S. related to energy and non-energy sources were estimated to be over 7.1 billion metric tons in 2006 (EIA, 2007). CO_2 emissions from energy consumption is projected to rise to 6.4billion metric tons by 2030 (EIA, 2009). Further, worldwide, CO_2 emissions are projected to increase substantially, primarily as a result of increased development in China and India. Petroleum use primarily due to transportation is the largest fuel source of CO_2 emissions from energy consumption in the U.S., estimated by EIA to be approximately 2.5 billion metric tons, or 42 percent of the total, in 2006 (EIA, 2009).

Electricity generation and transportation are the biggest sources of energy-related GHGs in the U.S. Figure 3.1-1 below shows the 2008 EIA estimates of CO_2 emissions for the U.S. by sector and fuel source (EIA, 2009).



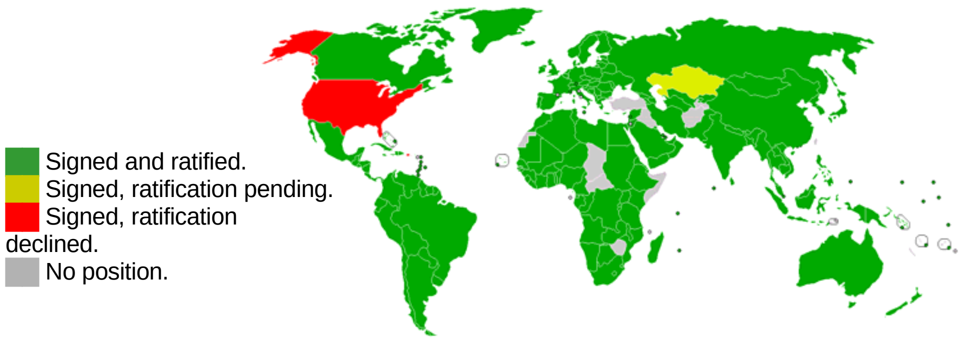
Source: EIA, 2009.

Figure 3.1-1 2008 CO_2 Emissions in Millions of Metric Tons

As the figure shows, the electric power sector emitted approximately 40 percent of total CO_2 emissions in the U.S. in 2007. Of the total electric power sector emissions, coal-fired generation contributed to approximately 83 percent of that total. CO_2 emissions, as well as other GHG emissions, would likely continue to grow if it were not for domestic and international regulatory and legislative efforts.

[3] A metric ton equals approximately 2,204.6 pounds. A ton equals 2,000 pounds.

GHG emissions and the impact on climate change are viewed as global problems with many parties taking action now to attempt to make significant reductions in the future. International efforts have been ongoing for many years. Under the Kyoto Protocol, 37 industrialized countries signed an international agreement linked to the United Nations Framework Convention on Climate Change. The agreement set binding targets for the industrialized countries and the European community for reducing GHG emissions by five percent below 1990 levels. Kazakhstan and the U.S. were the only two countries that did not ratify the treaty.

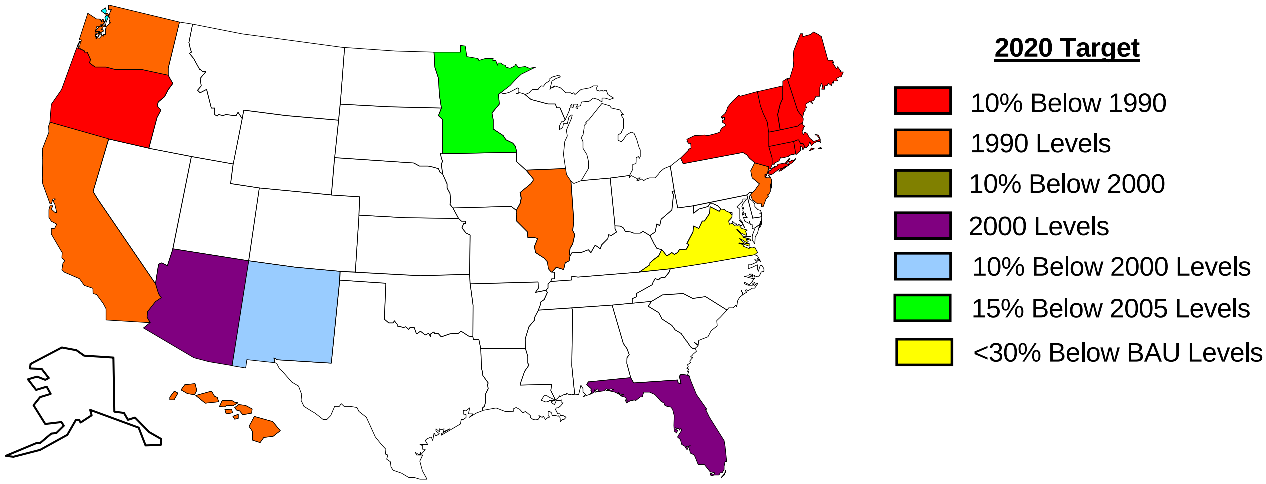


Source: UNFCCC, 2008

Figure 3.1-2 Kyoto Protocol Participation

In 2005, the Emission Trading Scheme was implemented. It was the world's first mandatory carbon trading program that caps the amount of CO_2 that can be emitted from large installations. The first phase ran from 2005 through 2007, and the second phase runs from 2008 to 2012. It consists of a cap-and-trade system allowing participants to trade allowances to meet compliance requirements. While the program has many problems, including the grandfathering of too many allowances and the lack of emission reductions in many countries, so far it has been viewed as a huge success by many measures. In December 2007, the Indonesian government hosted a two-week meeting focusing on a future agreement on how to tackle climate change. More than 10,000 participants, including representatives of more than 180 countries met and adopted a "road map" to negotiate a global climate change agreement for the post 2012 period by 2009. The U.S. was at the meeting and will be a party at future meetings. In June 2008, more than 2,000 participants from 170 countries met in Bonn, Germany to discuss commitments for parties to the Kyoto Protocol. The objective of these negotiations was to clarify tools and identify options regarding the rules available to industrialized countries under the Kyoto Protocol to reach their emission reduction targets beyond the first phase of the Protocol in 2012. The outcome was a better understanding on what countries would ultimately like to see written into a long-term agreement to address climate change. More targeted proposals to reduce GHGs were requested for the next meeting. Delegates reconvened in August 2008 in Accra, Ghana, and in Poznan, Poland, in December 2008. At least four more major conferences were scheduled for 2009, concluding in Copenhagen, Denmark, in December.

The U.S. is lagging behind international efforts, but is committed to future planning. Efforts by States and many market participants are well underway, while actions at the Federal level are somewhat further behind. More than half of the U.S. and many Canadian provinces have either set their own reduction targets or have joined regional initiatives focused on reducing GHGs. Figure 3.1-3 shows State GHG emission reduction targets and Table 3.1-2 shows State GHG emission targets.



Source: Pew, 2008.

Figure 3.1-3 State GHG Emission Reduction Targets

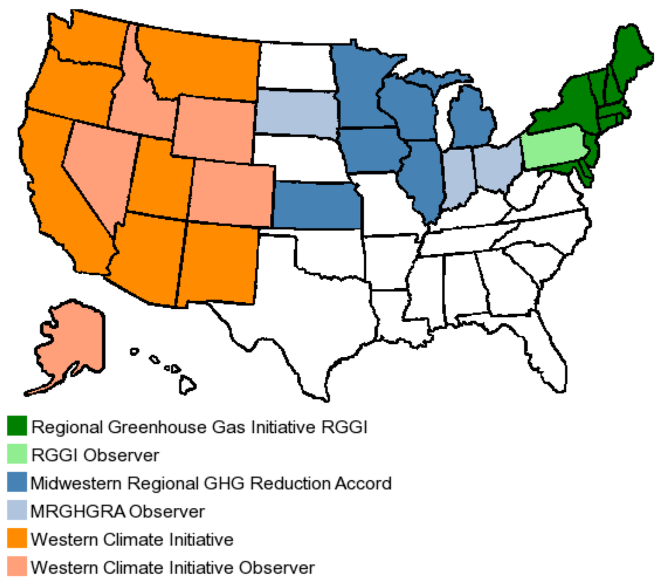
Table 3.1-2. State GHG Emission Targets

Entity	Target
Arizona: State-wide	2000 levels by 2020; 50% below 2000 by 2040
California: State-wide	2000 levels by 2010; 1990 levels by 2020; 80% below 1990
California: Major industries	1990 levels by 2020
Connecticut: State-wide	1990 levels by 2010: 10% below 1990 by 2020; 75-85% below 2001 levels in the long-term
Florida: State-wide	2000 levels by 2017; 1990 levels by 2025; 80% below 1990 levels by 2050
Florida: Electric Utilities	2000 levels by 2017; 1990 levels by 2025; 80% below 1990 levels by 2050
Hawaii: State-wide	1990 levels by 2020
Illinois: State-wide	1990 levels by 2020; 60% below 1990 levels by 2050
Maine: State-wide	1990 levels by 2010; 10% below 1990 by 2020; 75-80% below 2003 long-term
Massachusetts: State-wide	1990 levels by 2010; 10% below 1990 by 2020; 75-85% below 1990 long-term
Massachusetts: Electric Utilities	10% below 1997-1999
Minnesota: State-wide	15% below 2005 levels by 2015; 30% below 2005 levels by 2025; 80% below 2005 levels by 2050
New Hampshire: State-wide	1990 levels by 2010; 10% below 1990 by 2020; 75-85% below 2001 long-term
New Hampshire: Electric Utilities	1990 levels by 2006
New Jersey: State-wide	1990 levels by 2020; 80% below 2005 levels by 2050
New Mexico: State-wide	2000 levels by 2012; 10% below 2000 by 2020; 75% below 2000 by 2050
New York: State-wide	5% below 1990 by 2010; 10% below 1990 by 2020
Oregon: State-wide	Stabilize by 2010; 10% below 1990 by 2020; 75% below 1990 by 2050
Rhode Island: State-wide	1990 levels by 2010; 10% below 1990 by 2020
Vermont: State-wide	1990 levels by 2010; 10% below 1990 by 2020; 75-85% below 2001 long-term
Virginia: State-wide	30% below business as usual (BAU) levels by 2025
Washington: State-wide	1990 levels by 2020; 25% below 1990 levels by 2035; 50% below 1990 levels by 2050

Source: Pew, 2008.

Further, many State public utility commissions are requiring utilities to assess the impact of GHG regulations in Integrated Resource Plans. Moreover, the investment community and shareholders are also finally seeing that GHG regulation is coming and poses a risk to value for some assets. In addition, allowance trading markets and voluntary reduction programs like the Chicago Climate Exchange and The Green Exchange hosted by the New York Mercantile Exchange are seeing increased trading volume. Emission registries are also increasingly being established in various States and at the Federal level, forcing energy companies to report GHG emissions and develop baselines.

Many States have already joined regional initiatives to curb GHG emissions. Figure 3.1-4 shows the several regional initiatives that are in various stages of development.



Source: Pew, 2008.

Figure 3.1-4 Regional Initiatives

The Regional Greenhouse Gas Initiative, established in December 2005 for States in the northeast U.S., was the first mandatory U.S. cap-and-trade program for CO_2. The CO_2 emission caps are set to decrease GHG emissions over time and would result in levels that are 10 percent below 2009 levels by 2018. It regulates CO_2 emissions from electric generating stations located in 10 northeastern States, including Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont. Generators will comply with this program by holding allowances equal to annual emissions. For the most part, allowances will be auctioned off causing each generator to bear the full cost of emissions.

The Midwestern Greenhouse Gas Reduction Accord includes six States (Illinois, Iowa, Kansas, Michigan, Minnesota, and Wisconsin) and one Canadian province (Manitoba). The accord's current goals are to reduce GHG emissions between 15 to 25 percent below 2005 levels by 2020 and between 60 to 80 percent below 2005 levels by 2050. They plan to achieve these targets through the implementation of a multi-sector cap-and-trade system, as well as, additional steps such as low-carbon fuel standards, and regional funding and incentive mechanisms. Further, participants will also establish a GHG emissions reductions tracking system.

The Western Climate Initiative includes seven western States (Arizona, California, New Mexico, Oregon, Washington, Utah, and Montana) and three Canadian provinces (British Columbia, Manitoba, and Quebec). The group established an economy-wide GHG emissions target of 15 percent below 2005 levels by 2020 and agreed to establish market-based mechanisms by August 2008 to help achieve these targets.

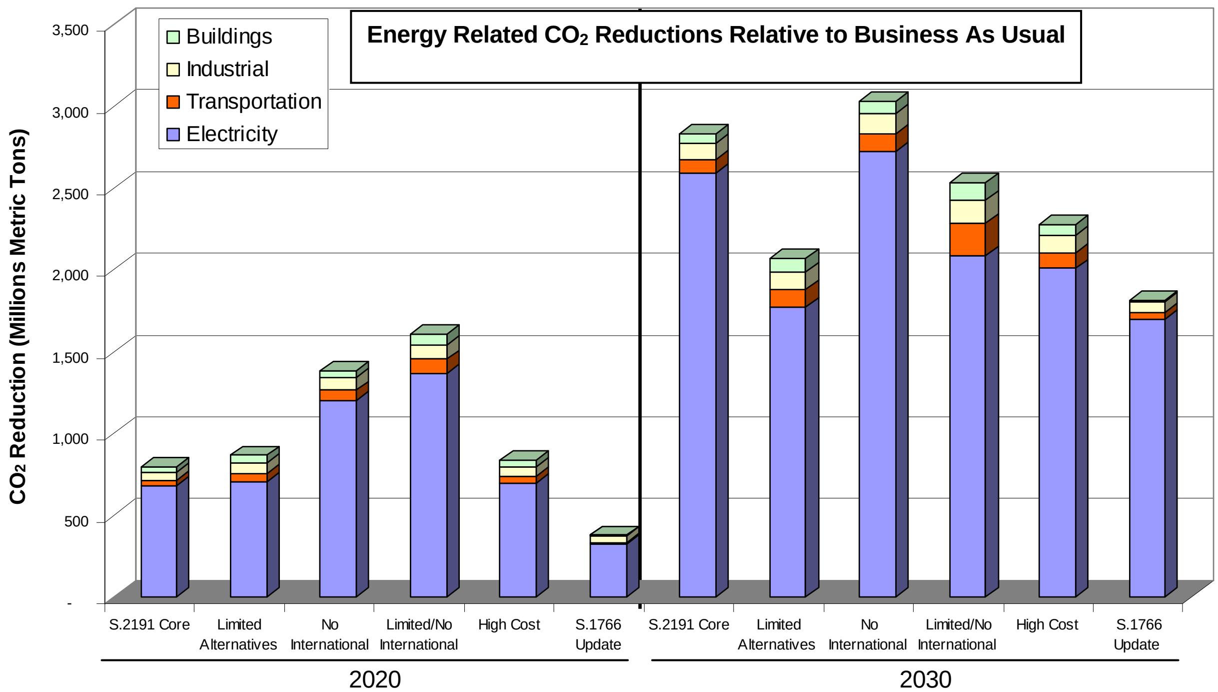
At the Federal level, there was very little action until 2007 to legislate GHG at the national level. In fact, many legislators did not acknowledge that GHGs were a problem until just a couple of years ago. Only a few proposals were issued by senators prior to 2007. Then in 2007, Federal legislators began moving more rapidly toward a national GHG program by introducing more than eleven proposals for national GHG legislation, and a few more were issued in 2008. A summary of currently proposed carbon legislation before the U.S. Congress is presented in Table 3.1-3 (in order of date introduced). Given the public awareness of GHG issues and the recent focus by Congress, it is reasonable to expect that some level of GHG legislation would be implemented by Congress within the next four years.

Each one of the proposals in Table 3.1-3 varies in the timing of implementation and the size of GHG emission caps. Some of these proposals strictly target the electric sector, but most target multiple sectors including electric, residential, commercial, industrial, and transportation. According to a recent EIA study of the Lieberman-Warner Climate Securities proposal (S.3036), the electric sector is expected to provide the vast majority of the GHG emission reductions. Figure 3.1-5 shows the projected CO_2 emission reductions by sector for each case relative to the EIA's reference case. In all cases, the reductions that are expected to be achieved by the electric sector are greater than 80 percent.

The projected GHG emission reductions for the electric sector are expected to be achieved in a number of different ways. In the short-term, reduction options for the electricity sector are limited, but they can be very effective. They include, among others, options such as energy efficiency, stand-by-loss reduction projects, renewable power installation, offset project development, and biomass. In the long run, more expensive options will be available, and these options will be able to provide significantly more reductions, although at a higher cost. These options include, among others, new nuclear capacity and carbon capture and sequestration for new and existing coal plants. Figure 3.1-6 shows an illustration of a marginal abatement curve with options to reduce GHGs for the electric sector highlighted. The vertical scale represents the marginal cost of abatement in dollars per ton of carbon dioxide equivalent (CO_{2e}), while the horizontal scale represents the amount of CO_{2e} emissions that each option can abate. Further reductions are also expected to be achieved through the retirement of older and less efficient natural gas, oil, and coal plants. According to the EIA study of the Lieberman-Warner Climate Securities proposal (S. 2191), well over 300 gigawatts of existing capacity would be expected to retire under this proposed national GHG regulation by 2030. The study projects that most of these retirements would be older, less efficient oil, gas, and coal units.

Table 3.1-3. Summary of Carbon Legislation Introduced in the U.S. Congress

Bill	Sponsor (Date Introduced)	Purpose
S.280: Climate Stewardship and Innovation Act of 2007 Lieberman-McCain Bill	Senator Joseph Lieberman (January 12, 2007)	Establish the Climate Change Credit Corporation. The USEPA would be charged with creating and maintaining the National Greenhouse Gas Database, as well as determining the rate of decline of the capped emissions. A large part of the bill's implementation requirements falls to the Secretary of Commerce, who would be in charge of various efforts to stimulate "technologies that result in reduced [GHG] emissions," as well as specific wording to further research in nuclear energy.
S.309: Global Warming Pollution Reduction Act	Senator Bernard Sanders (January 16, 2007)	To stabilize average global warming pollution concentrations globally at or below 450 parts per million in CO_2 equivalent, and creates a milestone schedule for reducing CO_2 through 2050.
S.317: Electric Utility Cap and Trade Act of 2007	Senator Dianne Feinstein (January 17, 2007)	Amends the Clean Air Act to require the USEPA to establish an allowance trading program to address GHG emissions from electric generating facilities that: (1) have a nameplate capacity greater than 25 megawatts; (2) combust GHG emitting fuels; and (3) generate electricity for sale. Provides for annual tonnage limitations for GHG emissions from such facilities for 2011-2020.
H.R. 620: Climate Stewardship Act of 2007	Representative John Oliver (January 22, 2007)	Sister bill to S. 280 - It seeks the same Climate Change Credit Corporation to moderate a trading scheme, as well as the USEPA to establish a National Greenhouse Gas Database, and set the declining cap on emission credits. Unlike S.280, it does not include a laundry list of GHG-reducing technological efforts on the part of the Secretary of Commerce.
S. 485: Global Warming Reduction Act	Senators John Kerry/Olympia Snowe	Economy-wide cap and trade program designed to reduce to 1990 levels by 2020. 2.5% reduction per year thereafter.
H.R. 1590: Safe Climate Act of 2007	Representative Henry Waxman (March 20, 2007)	Cap and trade bill directs the USEPA to establish a cap and trade system to achieve a two percent reduction in GHG emissions each year from 2010 through 2050. It also requires that 20 percent of America's electricity come from renewable sources by 2020 and that federal vehicular emissions standards match those set by the California Air Resources Board.
S.1168: Clean Air/Climate Change Act of 2007	Senator Lamar Alexander (April 19, 2007)	Establish a CO_2 allowance trading program for affected units in the U.S.
S.1177: Clean Air Planning Act of 2007	Senator Thomas Carper (April 20, 2007)	Establish a cap and trade program, along with addressing other pollutants.
S.1227: Clean Coal Act of 2007	Senator John Kerry (April 26, 2007)	Establish CO_2 new source performance standards for new coal-fired electric generating units.
S.1766: Low Carbon Economy Act of 2007	Senator Jeff Bingaman (July 11, 2007)	Establish an emissions trading scheme, but does not specify a cap, declining or otherwise, and would allow emitters to compensate any emissions credit shortage by depositing money into the Energy Technology Deployment Fund. It also says that the market for these credits, and all decision-making related to allowing international credits to be traded, would reside with the President.
H.R. 4226: Climate Stewardship and Economic Security Act of 2007	Representative Wayne Gilchrest (November 15, 2007)	It establishes the Carbon Market Efficiency Board, which can bail out any market sector that seems to be suffering under the cap and trade system.
H.R. 5575: Moratorium on Uncontrolled Power Plants Act of 2008	Representatives Henry Waxman and Edward Markey (March 11, 2008)	To establish a moratorium on coal-fired power plant approvals unless technology to capture and sequester CO_2 emissions is proposed.
S.3036: Climate Security Act of 2008 Lieberman-Warner Bill	Senator Joseph Lieberman (May 21, 2008)	Establish: (1) a GHG registry and (2) a GHG emission allowance transfer system for covered facilities, including specified facilities within the electric power and industrial sectors and facilities that produce, or entities that import petroleum- or coal-based transportation fuel or chemicals. Sets forth emission allowances for 2012-2050, with a declining cap on GHGs.
H.R. 6316: Climate MATTERS Act	Representatives Lloyd Doggett, Earl Blumenauer, and Chris Van Hollen (June 19, 2008)	Establish a GHG cap-and-trade scheme that caps emissions at 80 percent below 1990 levels by 2050. It also initially auctions 85 percent of all emission allowances and moves to 100 percent by 2020.
H.R. 2454: American Clean Energy and Security Act of 2009	Representatives Henry Waxman and Edward Markey (May 15, 2009)	Establish performance standards for coal plants, a cap and trade scheme that caps emissions at 83 percent below 2005 levels by 2050. The proposal also includes national renewable portfolio standard, provisions to deploy smart grid technology, greenhouse gas reporting requirements, and energy efficiency provisions.



Source: EIA, 2008b.

Figure 3.1-5 CO_2 Projected Emission Reductions by Sector

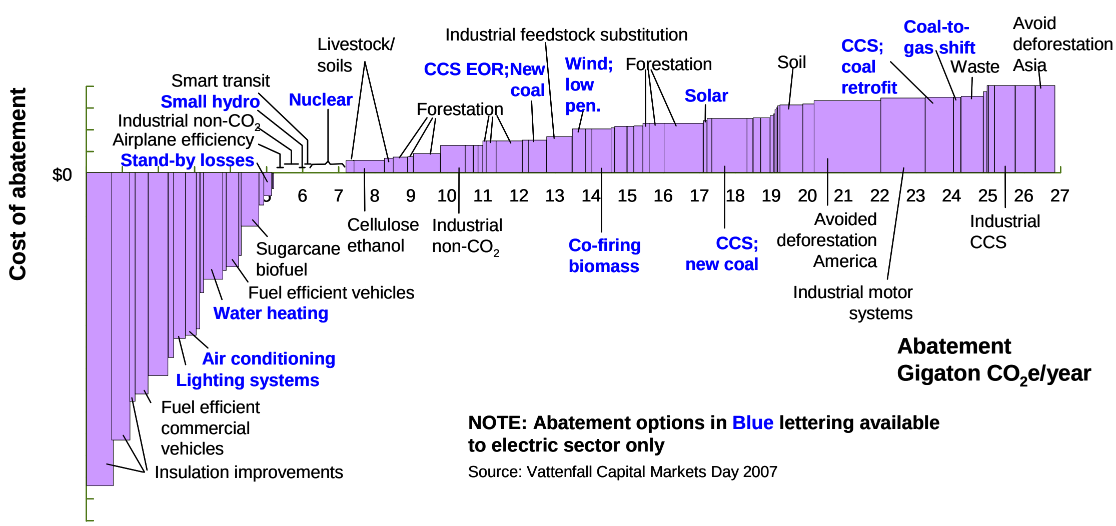


Figure 3.1-6 Global Marginal Abatement Cost Curve

The energy needs of the U.S. and the rest of the world are vast, and fossil fuels will likely continue to play a major role in serving those needs for decades to come. Fossil resources like coal and natural gas are abundant, especially in the U.S. Further, clean technologies are under development, and no single technology will provide all of tomorrow's energy. Some low-carbon energy technologies for the electric sector that are under development will likely be commercially available in the foreseeable future, including advanced nuclear generation, carbon capture, and sequestration technology, Integrated Gasification Combined Cycle (IGCC), and advanced solar, wind, and biomass technologies.

3.1.2 Big Stone II Plant Site and Groundwater Areas

The proposed Big Stone II plant site is located in eastern South Dakota, as illustrated in Figure 2.2-1. Figure 2.2-4 shows the location of the proposed groundwater areas. The terrain in these areas is characterized by a generally flat landscape consisting primarily of agricultural lands.
Milbank, South Dakota, has a second order climate station with a long history of observations in the area and is quite representative of the local and regional climate. The region has a continental climate classification and is subject to frequent intrusions of continental polar air throughout the year, with an occasional Arctic air mass outbreak during the winter. This particular region can experience great temperature extremes throughout the year, with the record low winter temperature reaching minus 41 degrees Fahrenheit (°F) and a record high summer temperature of approximately 109 °F.
Table 3.1-4 summarizes the normal temperatures for the region.

Table 3.1-4. 1971 - 2000 Normal Temperatures (Milbank, South Dakota)

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Max °F	21.6	27.6	39.1	55.7	70.1	79.2	84.2	82.0	72.9	59.7	39.5	26.3	54.8
Min °F	-0.3	7.3	20.1	32.9	45.3	55.0	59.2	57.1	46.8	34.1	19.6	5.8	31.9

Source: High Plains Regional Climate Center, 2005.

Similar extremes can be seen for precipitation patterns. Typically, summers provide abundant rainfall, while winters provide significant snowfall, both of which replenish the moisture content in the soil and contribute to groundwater recharge. However, it is not uncommon to have weeks during which limited precipitation may fall, resulting in drought conditions. Yet, occasional heavy precipitation events can result in lowland flooding; and when accompanied by high winds in the winter, extreme blizzards. Rainfall occurs predominantly from April through October. Precipitation averages 25.4 inches per year with an historic (1885 through 2001) annual maximum of 34.1 inches and an historic annual minimum of 8.3 inches. The highest historic one-day rainfall event was 6.9 inches on April 26, 1954. Snowfall generally occurs from November through March but has occurred as early as September and as late as May. Average annual snowfall is 47.4 inches with an historic annual maximum of 82.2 inches. The highest historic one-day snowfall event was 19 inches on March 4, 1985.
Table 3.1-5 summarizes the normal (defined as the average over 30 years) precipitation and snowfall for the region.

Table 3.1-5. 1971 - 2000 Normal Precipitation (Milbank, South Dakota)

Element (inches)	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Precipitation	0.53	0.43	1.36	2.16	2.47	3.46	3.44	2.64	1.91	2.15	1.10	0.40	22.05
Snow	7.8	7.5	7.2	2.4	0.1	0.0	0.0	0.0	0.0	0.5	3.9	5.5	36.9

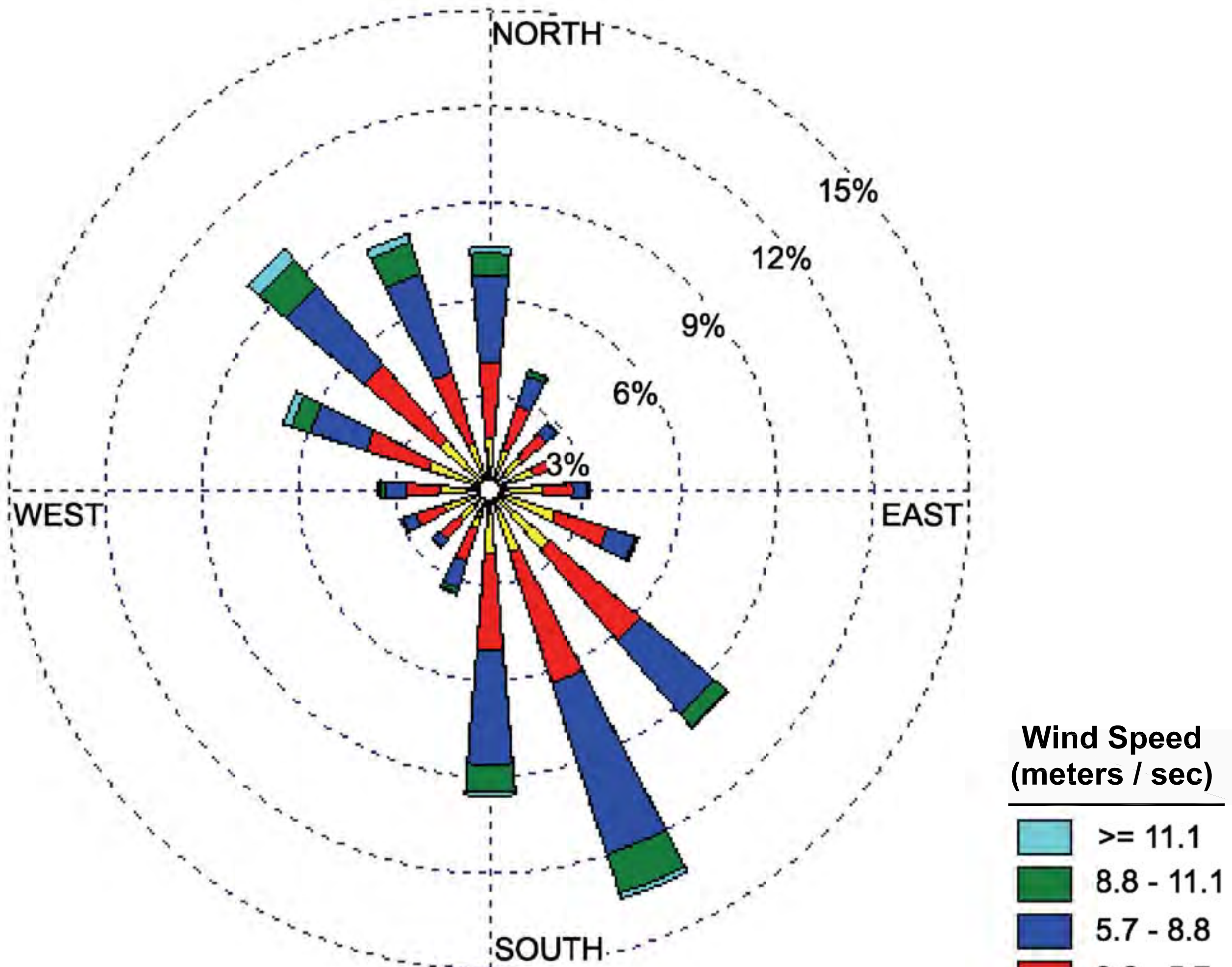
Source: High Plains Regional Climate Center, 2005.

A wind rose gives a very succinct but information-laden view of how wind speed and direction are typically distributed at a particular location. The wind rose shows the frequency of winds blowing from particular directions. The length of each "spoke" around the circle is related to the frequency of time that the wind blows from a particular direction. Each concentric circle represents a different frequency, emanating from zero at the center to increasing frequencies at the outer circles. The wind rose shown in Figure 3.1-7 is broken down into discrete frequency categories that show the percentage of time that winds blow from a particular direction and at certain speed ranges. The wind rose uses 16 cardinal directions, such as north, north-northeast, northeast, etc. The nearest meteorological station that provides data representative of the proposed Big Stone II plant area wind climate is Huron, South Dakota. The data for the wind rose in Figure 3.1-7 are for the five years, 1988-1992. As illustrated in this figure, the predominant wind directions are from the northwest to the southeast and from the south-southeast to the north-northwest. The northwesterly wind pattern occurs most often during the late fall, winter, and early spring. During the summer months, the wind direction tends to be from the south toward the north. Although calm or light wind conditions do occur, wind speeds are typically above 10 miles per hour, which yields good meteorological conditions to disperse pollutant emissions.

Three important meteorological factors influence the dispersion of pollutants in the atmosphere: mixing height, wind (speed and direction), and stability. Mixing height is the height above ground where air from the near surface mixes upward by convection (instability) and turbulence. The degree to which pollutants are diluted in this mixed layer up to the mixing height is determined by local atmospheric conditions, terrain, and source location. Mixing heights vary between day and night and with different weather systems and seasons. For the proposed Big Stone II plant area, conditions that lead to poor air quality are infrequent and short in duration (Holzworth, 1972). The mean annual afternoon convective mixing height is in excess of 1,400 meters (4,593 feet), and the mean winter morning mixing height is about 400 meters (1,312 feet) (Holzworth, 1972). Temperature inversions can occur any time of year due to nighttime radiation cooling or large-scale weather systems, causing cool air to be trapped near the ground. Inversion conditions near a source of pollutants can cause air pollutant levels to rise, as the pollutants are not being dispersed effectively. However, temperature inversions and low wind speeds are an infrequent and short-term occurrence (i.e., do not last more than a day or two in this area) (Holzworth, 1972).

The South Dakota Department of Environment and Natural Resources (SDDENR) determined that in the proposed Big Stone II plant area, the concentrations of the criteria pollutants for ambient air quality are currently below the NAAQS. Thus, the area is considered to be in “attainment” of the NAAQS.

Table 3.1-6 provides a summary of emissions from the boiler at the existing plant for the year 2004.



Windrose diagram shows the frequency of wind blowing from particular directions, and the relative frequency of the wind speed. For example, the wind blows directly from the south a little over 9 percent of the time; and approximately 3 percent of all observations indicate wind directly from the south with a wind speed between 3.6 to 5.7 m/sec.

Source: USEPA, 2005b.

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Figure 3.1-7

Windrose Diagram for Huron, South Dakota

Table 3.1-6. Emissions from the Existing Big Stone Plant

Pollutant	Actual 2004 Emissions (tons per year)
Nitrogen oxides (NO_x)	17,033
Sulfur dioxide (SO_2)	14,296
PM_{10}[a]	1
CO	558
Volatile organic compounds (VOC)	123
Lead	<0.01
Sulfuric acid (H_2SO_4) mist	11
Fluorides	35
Mercury	0.09

[a]Particulate matter with aerodynamic diameter less than 10 micrometers

Source: Burns and McDonnell, 2005b.

In addition, approximately 4.23 million tons of CO_2 were emitted from the existing plant in 2004. CO_2 is not a regulated pollutant.

Other activities at the existing Big Stone plant that contribute emissions of PM_{10} and affect the local air quality are:

- Coal delivery and handling
- Ash disposal
- Fugitive dust from roads

These existing non-point sources of PM_{10} are further assessed in the environmental impacts section.

Mercury emitted from coal-fired power plants comes from mercury in coal, which is released when the coal is burned. While fossil fuel-fired power plants are the largest source of human-generated mercury emissions in the U.S., they contribute a small amount (about one percent) of the total annual emissions worldwide. The USEPA has concluded that although mercury from U.S. coal-fired power plants is the largest remaining source of anthropogenic mercury emissions, emissions associated with coal-fired power plants are responsible for very little of the mercury present in U.S. waters, with the majority resulting from historical production and sources outside the U.S.

In March 2005, the USEPA issued two new air quality rules related to emissions from utilities. The first, the Clean Air Interstate Rule (CAIR), was intended to reduce the both nitrogen oxides (NO_X) and sulfur dioxide (SO_2) air emissions that move across certain State boundaries, primarily in the eastern U.S. USEPA's modeling suggests that CAIR would significantly reduce the majority of coal-fired power plant mercury emissions that deposit in the U.S. South Dakota was not subject to the CAIR. Thus, the proposed Big Stone II plant site would not have been subject to the requirements of the rule. The CAIR program was to take effect in 2009 and impose a cap-and-trade program for both NO_X and SO_2. However, the U.S. Court of Appeals for the District of Columbia Circuit decided on July 11, 2008, to vacate the CAIR in response to petitions for review challenging various aspects of CAIR. At that time, the Court vacated CAIR and its associated Federal Implementation Plan in its entirety and remanded both to the USEPA to promulgate a rule that is consistent with the Court's opinion. On December 23, 2008, the D.C. Court of Appeals issued an opinion in response to a petition for rehearing by the USEPA. The Court held that the CAIR shall remain in effect until USEPA promulgates a new regulation that addresses the flaws that led to the court's decision to strike down the CAIR in the first place. The specific changes to the rule to be made by USEPA and associated schedule for such changes are not known at the present time.

The second rule, the Clean Air Mercury Rule (CAMR), was intended to permanently cap and reduce mercury emissions from coal-fired power plants throughout the U.S. for the first time. However, the CAMR was vacated by the U.S. Court of Appeals for the District of Columbia Circuit on February 8, 2008. It should be noted that the Court's decision was not directed at the regulations themselves (i.e., the standards of performance and cap-and-trade program established by CAMR), but in the process USEPA used to promulgate the rule. If the USEPA reissues the same or similar mercury regulations in the future, the proposed Big Stone II plant would be subject to these regulations. Under CAMR, "standards of performance" limiting mercury emissions from new coal-fired power plants would have been established and a market-based cap-and-trade program would have been created to reduce nationwide emissions of mercury from all coal-fired power plants. The rule would have been implemented in two phases. The first phase would have been a cap of 38 tons per year (tpy). In the second phase, which would have been implemented in 2018, coal-fired power plants would have been subject to a second cap, to reduce emissions to 15 tpy upon full implementation. New coal-fired power plants (i.e., those constructed on or after January 30, 2004) would have to meet stringent new source performance standards in addition to being subject to the caps. USEPA considers the proposed Big Stone II plant a new coal-fired power plant.

The Federal Land Managers' Air Quality Related Values Work Group (FLAG) was formed to develop a more consistent approach to evaluate air pollution effects on their resources. The goals of FLAG have been to provide consistent policies and processes both for identifying air quality related values (AQRVs) and for evaluating the effects of air pollution on AQRVs, primarily those in Federal Class I air quality areas, but in some instances, in Class II areas. Federal Class I areas are defined in the CAA as national parks over 6,000 acres and national wilderness areas and memorial parks over 5,000 acres, established as of 1977. All other areas are designated Class II. The FLAG guidance recommends completion of visibility and regional haze analysis for any Class I areas within 186 miles (300 kilometers) of the proposed Big Stone II plant. There are no Class I areas within 186 miles of the proposed Big Stone II plant site.

3.1.3 Transmission Corridors, Substations, and Other System Improvements

The climate and meteorology associated with the proposed corridors, existing substations, the Hankinson transmission line, and the proposed Canby Substation relocation within the proposed corridors are similar to those described for the proposed Big Stone II plant site. Air quality standards are also the same as those described for the vicinity of the proposed Big Stone II plant site. No State or Federal ambient air quality monitoring sites exist within the counties crossed by the proposed corridors or the Hankinson line, in Minnesota, South Dakota, or North Dakota. Based on State-wide air quality data from Minnesota, South Dakota, and North Dakota, the air quality in the area of the proposed corridors and the Hankinson line is in attainment or is unclassified with respect to all criteria pollutants.

3.2 Water Resources

3.2.1 Introduction

This section describes the occurrence, characteristics, and existing uses of water in the proposed Project area and vicinity. The area assessed for determining the proposed Project's potential impacts on water resources includes the proposed plant site and groundwater areas, proposed transmission corridors, and substation locations, and nearby upstream and downstream water features that may influence the proposed Project or be affected by it. Both surface water and groundwater are included, as are features that govern the extent of these resources such as aquifers, lakes, and floodplains. The existing uses and qualities of water in the proposed Project area are summarized here, and additional detail is given for conditions of particular interest to impact and mitigation assessments. Federal, State, and local agencies have important roles in managing water and its quality. These roles are summarized in this section as needed to characterize existing conditions.

Related resources and their uses (e.g., wetlands or irrigation systems) are primarily described in other sections of Chapter 3. However, some overlap between sections is needed to describe existing water-related resources. Subsequently, Chapter 4 presents additional information about regulatory programs as they affect potential water resource impacts and mitigation.

<u>Groundwater</u>

Groundwater resources are widespread in the proposed Project area, and they typically occur in unconsolidated deposits of sand and gravel. Such zones are of glacial or alluvial (streamlain) origin, and may be surficial or buried. Bedrock aquifers, usually sandstones, also occur at greater depths (Hansen, 1990).

Groundwater withdrawals in the proposed Project area are primarily made from the unconsolidated aquifers. The use of bedrock aquifers is usually limited by water availability, poorer water quality, or the greater depth of pumping. Municipal supply and agriculture are the major groundwater uses. Private wells are also scattered throughout the area. Aquifers are primarily recharged by rainfall and snowmelt (Hansen, 1990). Recharge can occur at either short or long distances from a given point of use. Groundwater and surface water exchanges occur along streams where channels intersect aquifers.

At many locations in the proposed Project area, groundwater quality reflects contamination from agriculture, industry, or sanitation practices (Kume, 1985). Elevated nitrate concentrations are most commonly associated with human sources (MPCA, 1999). Apart from these influences, groundwater quality generally reflects the nature of geologic materials that serve as aquifers and recharge zones (Chadima, 1994; USEPA, 1998a; MPCA, 1999; Winter, 1974). Aquifers in the region are naturally enriched with sulfates, bicarbonate, iron, manganese, and boron (MPCA, 1999; Winter, 1974). Well construction practices and residence time (the length of time that water is in contact with aquifer materials) also influence groundwater quality (MPCA, 1999).

<u>Floodplains</u>

Floodplains are relatively low, flat areas of land that surround waterbodies and hold overflows during flood events. Floodplains are often associated with rivers and streams, where they consist of streamlain sediments forming levels (or "terraces") deposited at different times along the watercourse.

Protection of floodplains and related resource values was established by Executive Order (EO) 11988, "Floodplain Management."

From a policy perspective, the Federal Emergency Management Agency (FEMA) defines a floodplain as any land area susceptible to being inundated by waters from any source (FEMA, 2005a). Within the proposed Project area, zones of major interest from a potential flooding perspective are indicated on Figure 3.2-1. Appendix C of Volume III of the Final Environmental Impact Statement (EIS) further summarizes EO 11988, the FEMA floodplain program and appropriate uses of information presented in Figure 3.2-1.

Surface Water

As shown on Figure 3.2-2, surface water resources are densely distributed throughout the proposed Project area. They consist of rivers and streams (including channelized segments), lakes, and ponds in a wide variety of settings and sizes. Agricultural drainage systems are extensive throughout the area (USACE, 2004). They consist of ditches as well as buried tile drains.

Originating at Big Stone Lake, the Minnesota River is the major drainage in the proposed Project area. The U.S. Army Corps of Engineers (USACE) operates the Lac qui Parle Flood Control and Water Conservation Project along the river between Big Stone Lake and Montevideo, Minnesota. The project consists of three dams and associated diversions that influence water flows and levels. In addition to controlling floods, Lac qui Parle Project benefits include recreation and aquatic and wildlife habitats. State and Federal wildlife refuges occur along this upper reach of the river, as described in Section 3.4.

The Nationwide Rivers Inventory (NRI) is administered by the National Park Service (NPS). The inventory program is an outcome of the Wild and Scenic Rivers Act and the Outdoor Recreation Act of 1963. The NRI is a register of free-flowing river segments that potentially qualify as national wild, scenic, or recreational rivers areas (NPS, 2004). By presidential directive and related Council on Environmental Quality (CEQ) procedures, all Federal agencies must seek to avoid or mitigate actions that would adversely affect one or more river segments identified on the NRI. The listing includes free-flowing river segments believed to possess one or more "outstanding or remarkable" natural or cultural values judged to be greater than local or regional significance.

The State of Minnesota also has a Wild and Scenic Rivers program as set forth in Minnesota Rules Chapter 6105. The Minnesota Department of Natural Resources (MnDNR) administers the program, in association with local agencies.

Minnesota Special Waters are those for which the State requires additional protection, particularly to control potential pollution from construction site runoff. Special waters typically include scenic and recreational river segments, trout lakes, trout streams, scientific and natural areas, and others. Enhanced runoff controls and other practices are required for these areas.

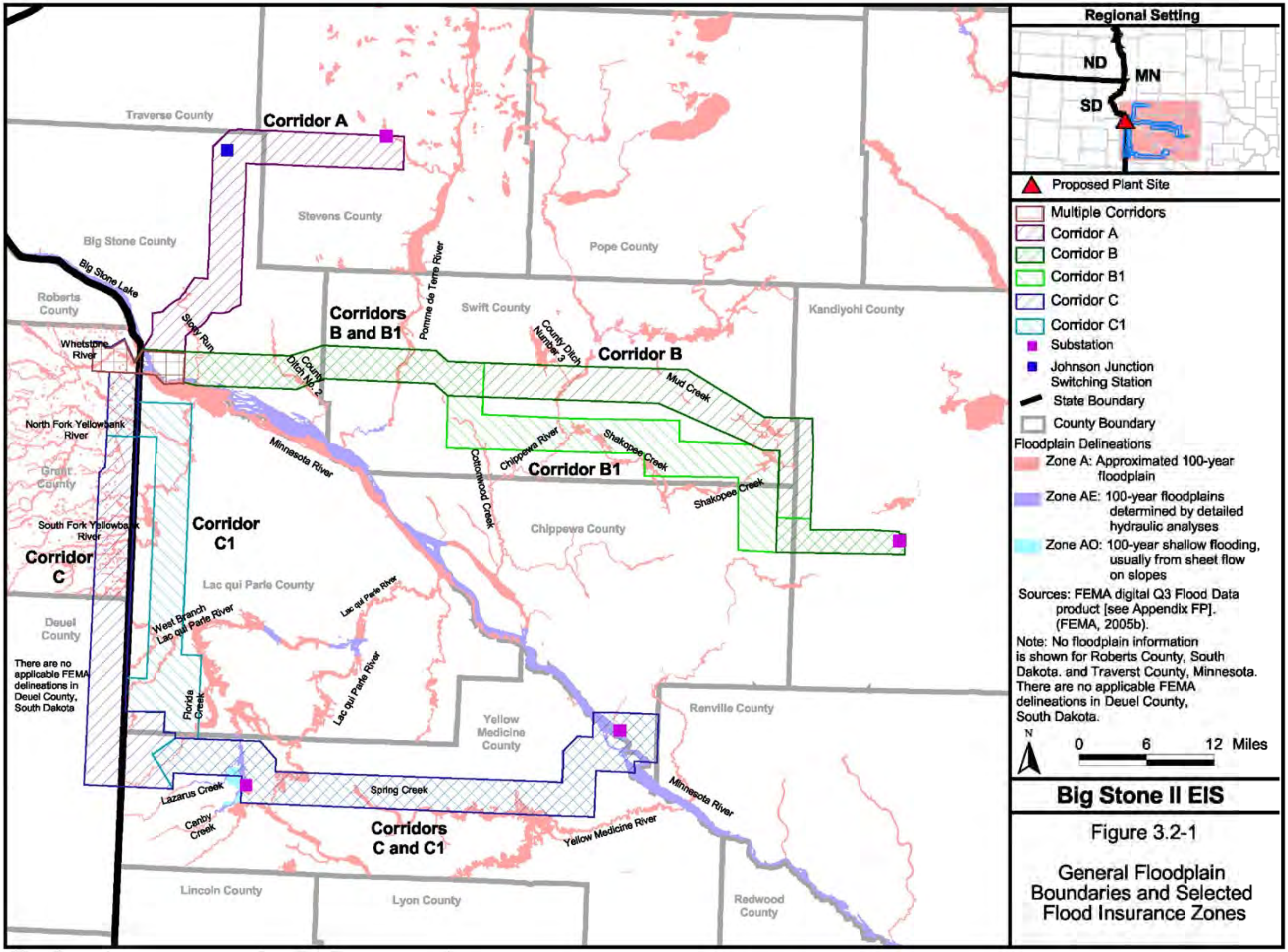

Figure 3.2-1

General Floodplain Boundaries and Selected Flood Insurance Zones

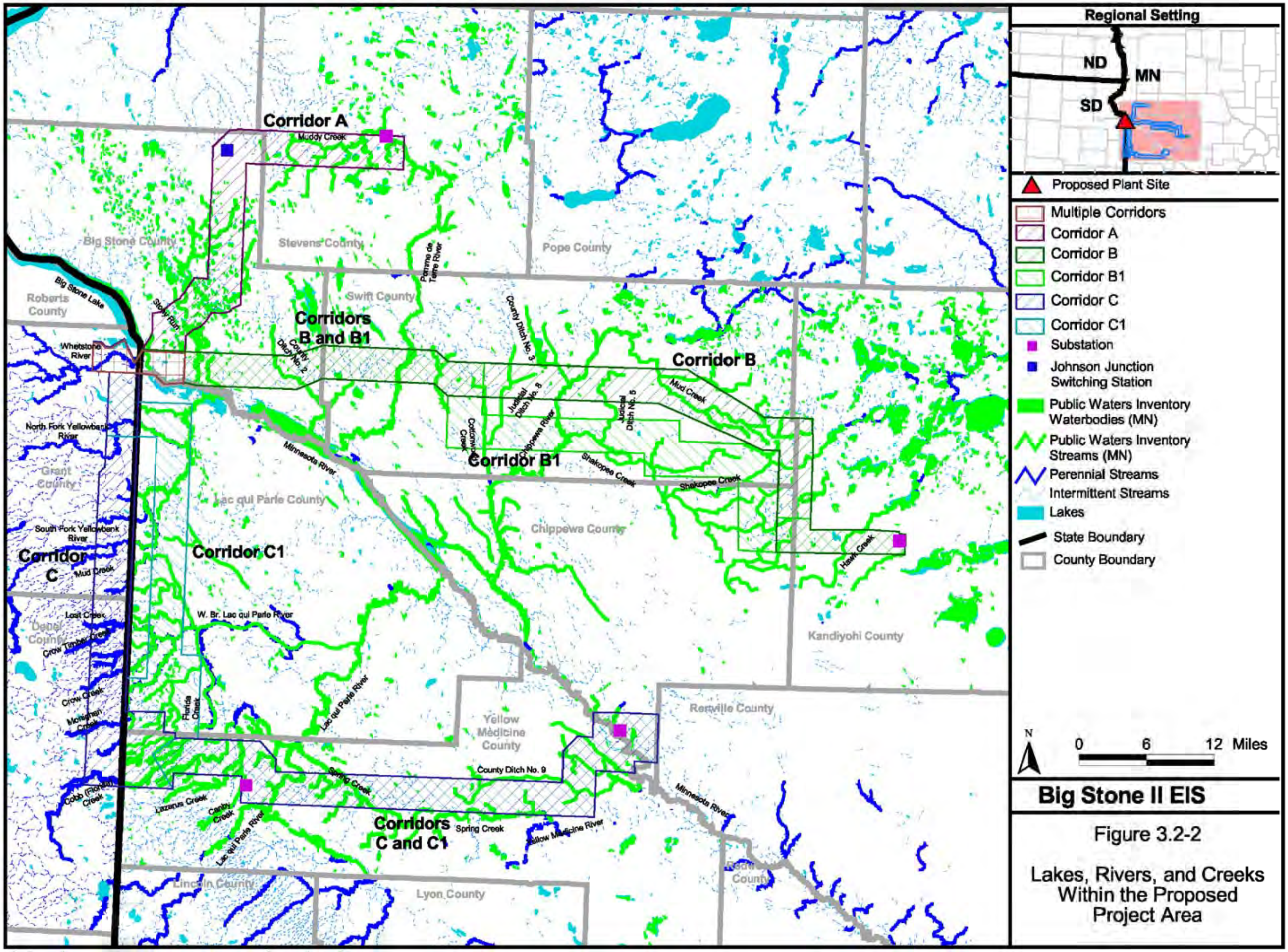

Figure 3.2-2

Lakes, Rivers, and Creeks Within the Proposed Project Area

Water Quality Standards

In addition to their abundant quantity, surface water, and groundwater resources in the proposed Project area have water quality characteristics that affect their uses. Water quality standards, and other regulatory programs to manage and protect water resources, are in place at both State and Federal levels. Because these programs are important for managing the existing and future uses of water, they are summarized here and in Appendix D, Volume III of the Final EIS.

The Federal Clean Water Act (CWA) requires States to adopt water quality standards to protect the nation's waters. Water quality standards and associated programs for South Dakota and Minnesota are discussed further in Appendix D, Volume III of the Final EIS. These standards define the physical and chemical characteristics of surface water and groundwater that allow them to meet designated uses. Examples of designated uses within the proposed Project area include drinking water, aquatic life and recreation, agriculture, wildlife, fishing, swimming, irrigation, or industrial purposes. South Dakota and Minnesota each assign numbers to their beneficial uses. These numbering systems are indicated in Appendix D, Volume III. Beneficial uses for surface waterbodies in the proposed Project area are indicated by a number on the tables in Appendix E, Volume III.

Water quality is assessed under State and Federal monitoring programs and regulated to the degree possible through permits issued for various water uses or other activities. Such permits typically have sampling, reporting, and compliance requirements. The CWA requires States to publish, every two years, an updated list of water-quality "impaired" streams and lakes that are not meeting their designated uses because of excess pollutants. The list, known as the 303(d) list, identifies surface waterbodies that do not meet water quality standards for their designated beneficial uses. Threatened waterbodies are those where water quality is trending toward not meeting applicable standards. These waters are also included on 303(d) lists. Impaired waters within the proposed Project area are described in the following sections.

3.2.2 Big Stone II Plant Site and Groundwater Areas

Overall water use in Grant County, South Dakota, has been summarized in an earlier investigation and is presented in Table 3.2-1 (Hansen, 1990). The information in the table provides a broad indication of comparative levels of uses.

Table 3.2-1. Consumptive Water Use in Grant County, South Dakota

Water User	Water Use (million gallons per day)	
	Groundwater	Surface Water
Livestock	0.24	0.36
Public water supply	0.67	0.0
Power generation	0.03	2.59
Self-supplied domestic	0.05	0.0
Self-supplied commercial, industrial, or gravel mining	0.10	0.0
Irrigation	1.50	0.02
Total	2.59	2.97

Source: Hansen, 1990.

The existing plant operates as a zero wastewater discharge facility and does not use groundwater. Water appropriated from Big Stone Lake is held in the existing holding pond. Site runoff discharges are permitted under existing State-wide General National Pollutant Discharge Elimination System permit number SDR00A145 issued by the SDDENR. The Grant-Roberts Rural Water System currently supplies domestic water needed by the existing plant, and the existing plant uses an on-site sanitary sewage treatment facility.

3.2.2.1 Groundwater

Local and Regional Aquifers

Groundwater occurs in alluvial aquifers along the Whetstone River and within deeper aquifers in the regional area. The alluvial aquifer occurs in an approximately 0.5-mile-wide band along the river floodplains in the vicinity of the proposed plant site. It consists of clay and silt with minor amounts of sand and gravel (Jensen, 2004). The depth to water in the alluvium is generally less than 50 feet.

Regional investigations indicate that deeper groundwater, generally greater than 100 feet below the ground surface (bgs), occurs under the proposed plant site, and proposed groundwater areas (Jensen, 2004). The Veblen Aquifer consists of unconsolidated coarse sand and gravel, and likely underlies the proposed plant site (Nelson and Wuolo, 2002). This aquifer has an approximate thickness of 150 feet near Milbank, South Dakota, southwest of the proposed Project area, but thins dramatically to the north and east, with a thickness of 20 to 30 feet at the Grant County and Minnesota boundary (Hansen, 1990). It is likely that a thinner section of the aquifer underlies the remainder of the proposed Project area. Pressures in the Veblen Aquifer are generally artesian, indicating confined conditions. Municipal wells for Milbank as well as domestic and stock water wells are supplied by this aquifer. Water in the aquifer is of mixed chemistry, with calcium and sulfate predominating, but with significant concentrations of magnesium and bicarbonate. Total dissolved solids (TDS) concentrations average 1,300 milligrams per liter (mg/l).

The Veblen Aquifer generally slopes from west to east at about 13 feet per mile. It is under confined conditions in most of its extent, but is under water table conditions and is at or near the land surface in the southern part of Township 121 North, Range 47 West (Hansen, 1990). Hydrogeological investigation activities conducted by Otter Tail Power Company (OTP) during November 2006 to June 2007 confirmed that some areas of the expanded groundwater area encountered shallow water table conditions in the unconfined portions of the Veblen Aquifer. Recharge to the Veblen Aquifer is by direct infiltration and percolation of precipitation where the aquifer is at the land surface, and possibly by leakage through the overlying glacial till (Hansen, 1990). Average annual recharge has not been quantified for the aquifer (SDDENR, 2007b). The influence of rainfall on well water levels has been noted at the existing plant (OTP, 2005f).

Veblen Aquifer Characteristics Near the Proposed Plant Site

OTP drilled exploratory and groundwater production test wells between November 2006 and June 2007 to assess the use of groundwater as a source of back-up water supply for the proposed plant. Figure 3.2-3 shows the location of the exploratory pilot test holes drilled within the proposed Project area. Wells PW1-2 and PW1-4 were drilled and installed during January 2007 as production test wells, which are also shown on Figure 3.2-3. Information from the exploratory wells and pump tests at the production test wells were used to characterize the groundwater resources in the proposed Project area (Barr, 2007a, Appendix M1, Volume III). The information obtained from the drilling program and well testing provides definitive information about the Veblen Aquifer in the vicinity of the

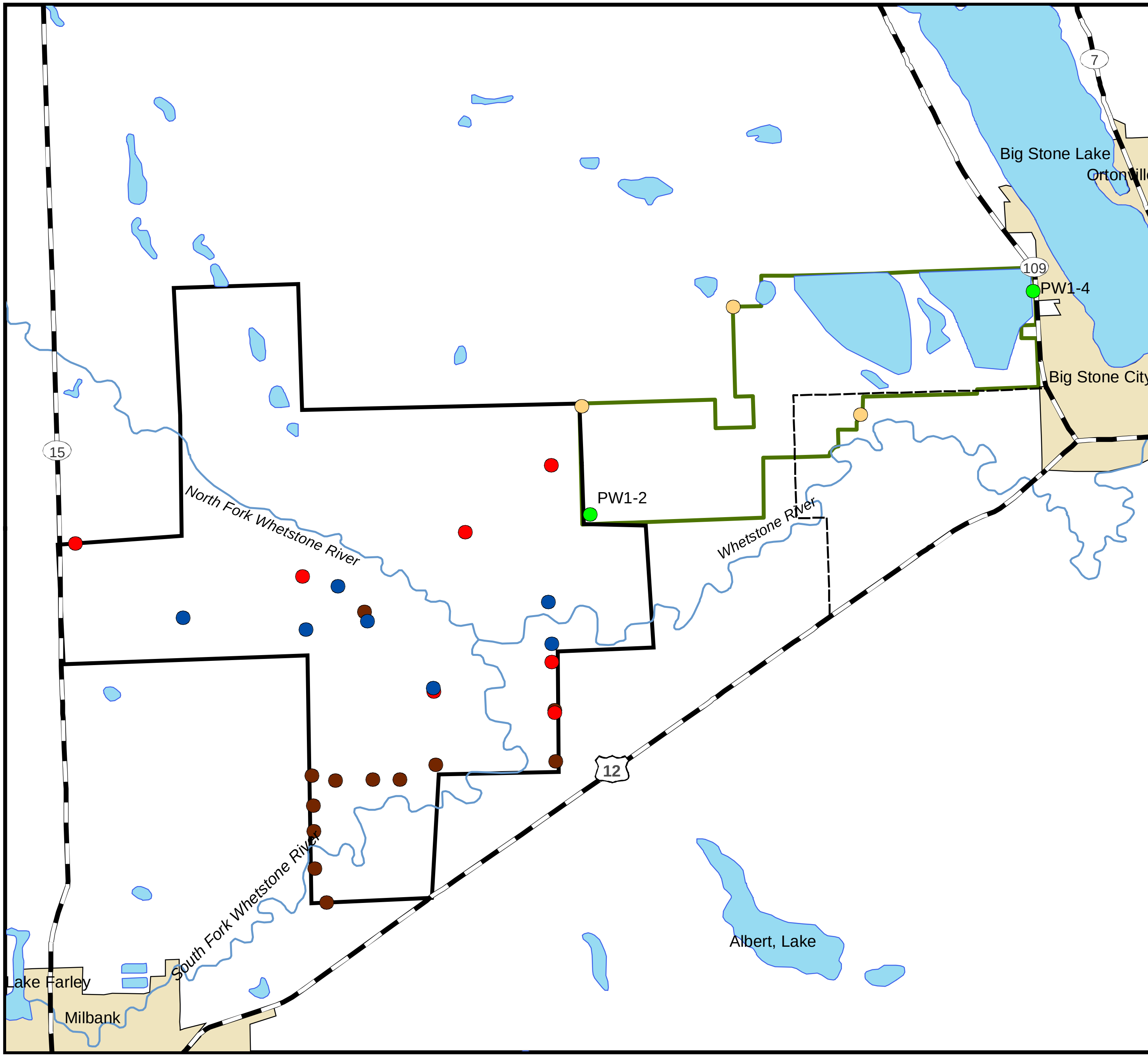

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Figure 3.2-3

Groundwater Exploration Activity and Production Well Locations proposed plant site, such as thickness of the overlying clay zone, variability in aquifer thickness, and transmissivity[4] characteristics at wells PW1-2 and PW1-4.

Well PW1-2 encountered an 81-foot thick, water-bearing sand, between 97 to 178 feet bgs. The Veblen Aquifer in the area surrounding this well is overlain by 97 feet of clay, containing layers of silty sand (up to five feet thick) and lenses of gravel, sand, and silt. The overlying clay serves to confine the aquifer in this area. The potentiometric water level encountered in the well was 74 feet bgs (i.e., 23 feet above the top of the aquifer) and is indicative of a confined aquifer. The potentiometric water level is the level to which water will rise in a tightly cased well. Transmissivity and storativity[5] are estimated at 96,600 gallons per day per foot and a storativity value of 0.00047 (dimensionless), which is indicative of a confined aquifer. The saturated thickness at Well PW1-2 is estimated to be 81 feet, based on the drilling information. Therefore, the estimated average hydraulic conductivity[6] for this portion of the aquifer unit is 157 feet/day. This value of hydraulic conductivity is characteristic of gravelly sand, which is the type of material encountered in the boring for Well PW1-2.

Well PW1-4 encountered a 64-foot thick, water-bearing sand, between 121 to 185 feet bgs. The aquifer in the area surrounding this well is overlain by 121 feet of clay, containing layers of sand (up to eight feet thick), silt (up to four feet thick), and lenses of cobbles, gravel, sand, and silt. The overlying clay serves to confine the aquifer in this area. The water level of 117 feet bgs encountered in the well (i.e., four feet above the top of the aquifer) is indicative of a confined aquifer. Transmissivity and storativity are estimated at 9,874 gallons per day per foot and a storativity value of 0.0147, which is indicative of a confined aquifer. The saturated thickness at Well PW1-4 is estimated to be 64 feet, based on the drilling information. Therefore, the estimated average hydraulic conductivity for this portion of the aquifer unit is 21 feet/day. This value of hydraulic conductivity is characteristic of fine to medium sand, which is the type of material encountered in the boring for Well PW1-4. The transmissivity of the aquifer materials at PW1-4 is about 10-times less than the transmissivity at PW1-2. This appears to be due to the finer-grained deposits at PW1-4 and the smaller saturated thickness.

Aquifers Underlying the Veblen Aquifer

Additional groundwater resources in the vicinity of the proposed plant site occur in the Milbank granite wash aquifer and the Dakota Formation (Hansen, 1990; Jensen, 2004; Nelson and Wuolo, 2002). The granite wash aquifer consists of uncemented coarse sand derived from weathering of the Milbank granite. The extent and water supply capability of this aquifer are relatively unknown; some stock watering and domestic wells withdraw water from it. Thickness of this aquifer at the proposed plant site is approximately 40 feet. Depth to the granite wash aquifer varies widely. Water quality is dominated by sodium and sulfate. The Dakota Formation, of Cretaceous age, consists of fine-grained sandstone and interbedded shale at depths of approximately 1,200 feet bgs regionally. It is separated from the overlying unconsolidated aquifers by younger Cretaceous rocks such as the Pierre and Carlile shales. These generally serve as confining units (Whitehead, 1996). Although the Dakota Formation presents a highly dependable water source, its depth and relatively poor water quality make it less attractive as a supply to wells.

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[4] Transmissivity is the rate at which water is transmitted through a unit of width of an aquifer.

[5] Storativity is the volume of water an aquifer releases or intakes per unit surface area of the aquifer per unit change in head.

[6] Hydraulic conductivity is a measure of an aquifer's ability to transmit water.

Groundwater Quality

Near-surface groundwater quality throughout the proposed Project area varies with land use, rainfall, and other factors that affect aquifer recharge. Groundwater quality in the Veblen Aquifer is characterized by fairly high concentrations of TDS and other water quality parameters or constituents. Published TDS values range from 880 to 3,000 mg/l, with an average of 1,300 mg/l (Hansen, 1990). The average exceeds the listed South Dakota water quality standard of 1,000 mg/l. Similarly, published groundwater background concentrations of sulfate range from 310 to 1,500 mg/l, averaging 590 mg/l, in comparison to the listed standard of 500 mg/l. Background concentrations published for chloride range from two to 96 mg/l, with an average of 22 mg/l. These levels are below the listed chloride standard of 250 mg/l. Water samples collected during exploratory well drilling indicate that the Veblen Aquifer meets South Dakota water quality standards and would provide good water quality as a supply source for the proposed Big Stone II plant (OTP, 2007a).

Historical monitoring programs indicate that for the most part, groundwater quality at the existing plant site and the northeastern portion of South Dakota is very mineralized and has naturally high concentrations of sulfates (OTP, 2005f). Sulfate concentrations naturally exceed State water quality standards (500 mg/l). Therefore, the ambient water quality (as an arithmetic mean of the data, plus one standard deviation) would be used as the maximum allowable limit in any approved groundwater discharge plan, according to State regulations.

Groundwater monitoring has been conducted at the existing plant site since 1971 (OTP, 2005f). Currently, 18 wells are included in the monitoring program. Groundwater occurs generally between 40 to 60 feet bgs, but may range from less than 10 feet to more than 100 feet. Wide ranges in groundwater elevations occur between wells and over the monitoring period of record at individual wells. This is to be expected due to well construction differences and the influences of climatic variation or regional withdrawals on aquifer recharge and water levels over time.

Groundwater monitoring at the existing plant site indicates that water quality at Well Number 1, which has been monitored for 33 years, is similar to ambient conditions in the Veblen Aquifer. All measured water quality constituents at Well 1 are within groundwater quality standards for regulated or reportable constituents except for nitrates and sulfates (OTP, 2005f). It does not appear unusual that these exceedances occur at Well 1, given the ambient water quality issues with nitrates and sulfates regionally. It should be noted that in such cases, South Dakota provides for the applicable water quality standard to be the ambient background condition.

The Co-owners have analyzed statistical trends in monitored water quality constituents in comparison to derived assessment benchmarks. With minor isolated exceptions, the analytical results are well within South Dakota groundwater quality standards. However, increasing trends against the statistical benchmarks were noted for several constituents at a number of wells.

At wells monitoring the brine concentrator sludge pond, there are some exceedances of listed standards. These concentrations are the result of past seepage from the pond, which has now been corrected. Remedial actions (including lining the pond) were undertaken in 1992 to the satisfaction of the SDDENR and no further leakage has occurred (Graumann, 2005). Increasing trends for chloride, sodium, specific conductance, and sulfates have been observed on the eastern and southeastern sides of the existing holding pond. Within the existing plant ponds (including the cooling pond, evaporation pond, and holding pond), significantly increasing trends are indicated for alkalinity, chloride, total hardness, sodium, specific conductance, and sulfates (OTP, 2005f). Water quality in these ponds fluctuates as a result of operational inflows and withdrawals, seasonal runoff contributions, and variations in precipitation and evaporation (OTP, 2005f). It should be emphasized that the monitored chloride concentrations are well below listed groundwater quality standards, and the sulfate concentrations mirror background levels in the historical data for the Veblen Aquifer.

Groundwater Uses

Several Water Rights and Appropriation Permits for water from the Veblen Aquifer in Grant County have been issued by the South Dakota Water Management Board. The SDDENR reports 33 water permits/rights appropriating water from the Veblen Aquifer in Grant County. Water permit uses in the vicinity of the proposed expanded groundwater area include: industrial (one permit); commercial (two permits); municipal (one permit – Big Stone City); and irrigation (12 permits) (SDDENR, 2007b). Domestic wells do not require permits from the State of South Dakota; therefore, the number of domestic wells drawing water from the Veblen Aquifer is unknown. Domestic water in the area surrounding the existing Big Stone plant is served by Big Stone City or the Grant-Roberts Rural Water System. Big Stone City's source of water is from the City of Ortonville, which secures its water from wells located on the south end of Big Stone Lake between the Whetstone River and the Minnesota River, and north of Highway 12. Grant-Roberts Rural Water System's source of water is from groundwater from the Antelope Valley aquifer, which is west-southwest of Milbank, approximately 14 miles or more.

The SDDENR indicates that from 1979 through 2005, the average groundwater permitted for irrigation from the Veblen Aquifer was 6,389 acre-feet annually. The reported average annual groundwater pumped from the aquifer for irrigation during that time period was 819.3 acre-feet. The total average withdrawal from all uses of the Veblen Aquifer in Grant County is expected to be less than 1,000 acre-feet annually (SDDENR, 2007b). Records on actual water use for the municipal, industrial, and commercial users are not available.

3.2.2.2 Floodplains

FEMA maps indicate that isolated Zone A (100 year) floodplains exist (1) within the eastern part of Section 11, Township 121 North, Range 47 West, near the coal delivery facility and coal storage pile for the proposed plant; (2) within the North Fork and South Fork of the Whetstone River drainages and other associated tributary drainages of the Whetstone River at the proposed plant site; and (3) within the expanded groundwater area. These areas have not been determined by hydraulic analysis, and were located by "approximate methods" (FEMA, 2004 and FEMA, 2007). The delineations are not connected to any mapped stream or river. Although officially mapped as Zone A, they appear to be isolated areas of ponding instead of zones (see Appendix C, Volume III of the Final EIS).

3.2.2.3 Surface Water

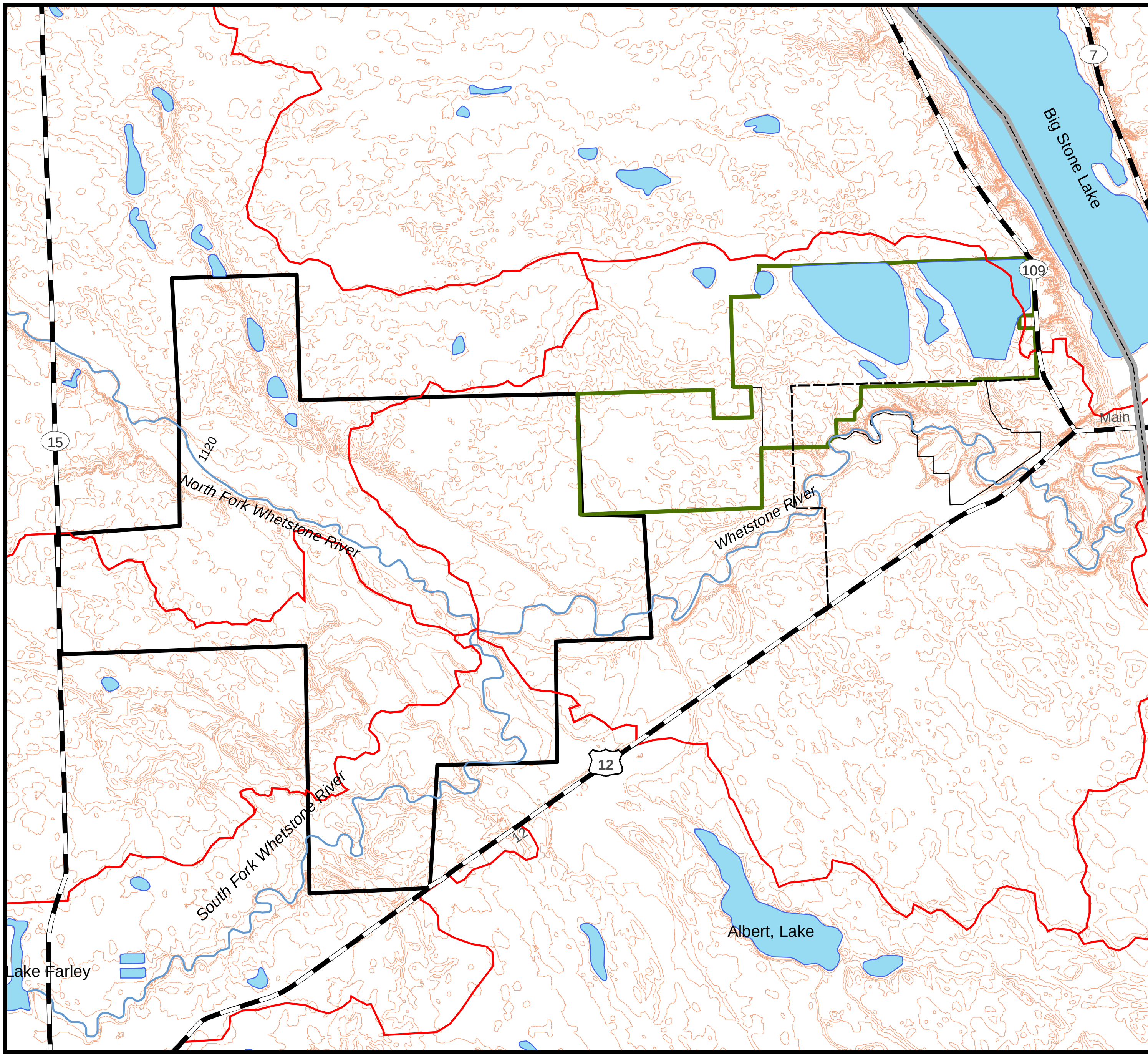
The proposed Project area is characterized by a subhumid continental climate, with mean annual precipitation ranging from 20 to 24 inches (National Atlas, 1970). At the existing plant site and at Milbank, the mean annual total precipitation is approximately 22.5 inches (OTP, 2005b). Total free water surface evaporation (such as from a lake or pond) is approximately 24 to 28 inches per year. Annual total values of both precipitation and free water surface evaporation vary widely between any given years. For example, in 2004 the total precipitation was 28.07 inches at the existing plant site, whereas in 2003 the total precipitation was 14.80 inches (OTP, 2005b).

Privately-owned pond features are associated with the existing plant. Major surface water resources within the proposed plant site or near it include Big Stone Lake, the lower reaches of the Whetstone River, and the upper Minnesota River. A number of wetlands, some isolated and some that may qualify for USACE jurisdiction as waters of the United States (WUS) occur within the proposed plant site. These features occupy a total of approximately 105 acres (including 82.4 potentially jurisdictional acres), and are comprised mostly of seasonally flooded inland freshwater basins or flats, meadows, and marshes. Further discussion of these resources and related issues is presented in Section 3.4.2.5.

The proposed plant site is located at the northern edge of the Whetstone River watershed such that there is minimal overflow from the north. The existing stream network within the proposed plant site and groundwater areas is shown on Figure 3.2-4. Overland flow drainage on the proposed plant site currently flows south, either directly to the Whetstone River or by an intermittent stream that flows from west to east. The overland flow path from the immediate watershed to the intermittent stream extends 1.1 miles from the north, 1.4 miles from the west, and 0.8 mile from the south. This intermittent stream also receives water from the Big Stone City, South Dakota, wastewater lagoon outfall. The existing plant site has a minimal amount of overland flow from the west. Overland flow patterns from the existing plant site are south through a series of wetlands to the intermittent stream and easterly to the Whetstone River.

The North Fork and South Fork of the Whetstone River and their associated smaller tributaries traverse the expanded groundwater area and areas south of the proposed plant site. The Veblen Aquifer is separated from most of the stream reaches of the Whetstone River either by low-permeability clay on top of the aquifer or an unsaturated zone where the elevation of the water table is below the Whetstone River. The North Fork Whetstone and South Fork Whetstone rivers join within the eastern portion of the expanded area. From this point, the Whetstone River flows about six miles east and northeast to its confluence with the Minnesota River. Several small ponds are located in the expanded groundwater area, primarily in the north and northwest portions. Scattered wetlands also exist within the area and are discussed in Section 3.4.2.5.

The Whetstone River near Big Stone City has a drainage area of 398 square miles. It flows eastward to join the Minnesota River below Big Stone Lake, passing approximately one mile south of the proposed plant site. Rainfall runoff and snowmelt dominate the flows in the Whetstone River. The average annual flow of the Whetstone River was about 57 cubic feet per second (cfs) over the period of record 1910 through 2004 (USGS, 2005a). Over the past 70 years, the months of April through July have typically had the highest flows, averaging 110 cfs. High flow months are typically March and April, with average flow rates of 153 and 219 cfs, respectively. January and February are low-flow periods when surface-water runoff contributions are small and groundwater inflows dominate. During this period, the Whetstone River's flow is about two cfs, or less. Several times over the past 70 years, extended dry conditions with low precipitation caused the water table to drop below the elevation of the Whetstone River, and there was no flow in the river.



Big Stone II EIS

Figure 3.2-4

Stream Network Within the Proposed Plant Site and Groundwater Areas

It should be noted that flow rates vary substantially from these average values. For example, recent monthly averages for December have ranged from 5.18 cfs in 2003 to 56.0 cfs in 1998. Similarly, average April flows recently ranged from 16.1 cfs in 2004 to 1,676 cfs in 1997. Only a very small portion of flow in the Whetstone River (about 1.8 percent of average flow) originates as groundwater inflows (i.e., a base flow of approximately two cfs). Water quality in the Whetstone River is impaired by elevated ammonia concentrations and depleted dissolved oxygen (USEPA, 2002a).

The existing plant site does not discharge any process water to the surface drainage system (OTP, 2005f). Currently, the existing plant operates with a South Dakota water appropriation permit that allows withdrawal of up to 8,000 acre-feet per year (afy) from Big Stone Lake. Big Stone Lake is located approximately 0.25 mile east of the northeast corner of the existing plant evaporation pond (OTP, 2005b). The lake has a controlled outlet structure and is operated jointly by the States of South Dakota and Minnesota. At normal pool (elevation 967 feet between May 1 and October 1), the lake has a surface area of about 12,600 acres and a storage volume of about 98,000 acre-feet. The outlet is regulated to typically avoid outflows exceeding 100 cfs. The existing plant obtains its water supply from the lake via a short delivery pipeline. Water pumped from Big Stone Lake provides make-up water to the existing plant cooling pond. Currently[7], the existing plant operation can appropriate up to 110 cfs from the lake whenever water levels are greater than 967 feet. When the lake level is below this elevation, no appropriations are allowed from May through September, and up to 35 cfs are allowed between October and April (OTP, 2005b). If lower lake levels occur between October and April, allowable withdrawals are reduced to 10 cfs at elevation 966 feet, and are further reduced to zero at 965 feet.

Big Stone Lake and its fisheries are an important recreation attraction in both Minnesota and South Dakota. Since 1970, land use practices within the Big Stone Lake watershed have increased the transport of phosphorous and sediment into Big Stone Lake. This has resulted in excessive algae blooms, poor water quality, degraded fish habitat, and reduced recreational opportunities. The Big Stone Lake Restoration Project was initiated in 1983 to restore Big Stone Lake. The long-term goal of the restoration project was to increase the recreation potential and the lifespan of Big Stone Lake. SDDENR data from 1987 to 2004 indicates the water quality has improved from hypereutrophic condition (extremely nutrient-rich) to eutrophic (nutrient-rich). Algae blooms still occur but they are less extensive and do not last as long. The restoration project has resulted in a 32 percent reduction of phosphorous and sediment to Big Stone Lake. Big Stone Lake is identified as water impaired, and improvement is still needed (Roberts Conservation District, 2007).

Big Stone Lake is approximately 30 miles long, relatively shallow, and is fed primarily by the Little Minnesota River and local watershed runoff. Historically, increasing lake sedimentation was an issue due to the artificial diversion of the Whetstone River into the lake. The diversion has since been removed. Outflows from Big Stone Lake form the Minnesota River at the confluence with the Whetstone River just downstream of the lake. The recorded average annual outflow from Big Stone Lake at Ortonville is 95,450 afy, with a minimum recorded annual outflow of about 1,560 afy (in 1981) and a maximum recorded annual outflow of about 373,820 afy (in 1997) (USGS, 2005a).

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[7] A correction has been made in the Final EIS to the reference elevations presented in this paragraph. The reference elevations in the Draft EIS were mean sea level values. However, since OTP's permits are based on Project datum elevations, the new referenced elevations in this paragraph differ by 2.3 feet from the reference elevations in the Draft EIS.

The Minnesota River at Ortonville, Minnesota, immediately below Big Stone Lake, has a drainage area of 1,160 square miles. The average annual flow is about 130 cfs over the period of record 1938 through 2004 (USGS, 2005a). High flow months are typically April and May, with average flows of 513 and 272 cfs. Low flow months are January and December with average flows of about 22.5 cfs. Similar to conditions described for the Whetstone River, large flow variations occur in the river. In April 1997, the average flow was over 4,100 cfs, whereas in April 2004, the average was 4.93 cfs.

Additional reservoirs and marshlands occur immediately below Big Stone Lake and farther downstream. USACE operates the Lac qui Parle Flood Control and Water Conservation Project, which involves three dams on the Minnesota River downstream of Big Stone Lake. The Highway 75 Dam is southeast of Odessa, Minnesota, approximately 10 miles downstream of Big Stone Lake. Marsh Lake Dam (near Appleton, Minnesota), Lac qui Parle Dam (due south of Milan, Minnesota), and a diversion from the Chippewa River are other project structures that control flows, provide recreation, and enhance wildlife habitats in and along the Minnesota River. The project was completed in 1951 and is administered by the St. Paul District, USACE.

Over much of the river reach between the Big Stone Lake outlet and the Highway 75 Dam, normal flows are confined to an artificial channel. Immediately downstream of Big Stone Lake, the Big Stone Wetland Management District operates several smaller impoundments to manage wetlands and water contributed to them by agricultural drainage (USFWS, no date; USFWS, 2003). Uncontrolled seepage from Big Stone Lake as well as varying groundwater contributions also supply water to the Minnesota River reach downstream of the lake (Hansen, 1990). Farther downstream, incoming tributaries such as the Yellow Bank and Pomme de Terre rivers also add to the flow.

Mercury in Surface Water

Elevated mercury concentrations in Minnesota streams and lakes are a documented water quality concern. The source of mercury emissions affecting Minnesota waters has been the subject of several studies, summarized in a publication by the Minnesota Pollution Control Agency (MPCA) (MPCA, 2007). MPCA concludes that the sources of atmospheric deposition of mercury in Minnesota are from the following sources: approximately 30 percent are from naturally-occurring sources and 70 percent are from anthropogenic sources (including approximately 30 percent from global emissions sources, 30 percent from non-Minnesota regional sources, and 10 percent from Minnesota sources). Anthropogenic sources include sources such as coal plants, taconite processing, volatilization from disposed products, municipal waste combustion, smelting, sewage sludge incineration, and medical applications. About 46 percent of the Minnesota sources are from coal combustion, resulting in about 4.6 percent of mercury deposition in Minnesota coming from coal combustion. The report further concludes that there are currently no sources causing locally elevated levels of atmospheric deposition. The report conclusions are further supported by data on mercury in fish from the Minnesota Department of Health (MnDOH) which indicate that mercury levels in most Big Stone Lake fish (i.e., next to the existing power plant) are not as high as mercury levels in fish within many other Minnesota lakes (MnDOH, 2008). Fish consumption advisories, supporting or non-supporting use categories, and impaired water quality of stream segments and lakes are on record in the proposed Project region as part of MPCA CWA Section 305(b) and Section 303(d) assessments. These assessments indicate that impaired stream reaches in the proposed Project region occur on the Minnesota, Lac qui Parle, Yellow Medicine, and Chippewa rivers, and other waterbodies (see Section 3.2.3.3 and Appendices D and E, Volume III). MPCA administers a mercury reduction program in the State as a result of the 1999 Voluntary Mercury Reduction Initiative (Minn. Stat. 116.915).

3.2.3 Transmission Corridors, Substations, and Other System Improvements

Water resources for the proposed corridors, existing substations, and the Canby relocation were identified by reviewing U.S. Geological Survey (USGS) topographic and watershed maps; the County Well Index administered by the Minnesota Geological Survey; well logs obtained from the database of the SDDENR; the NRI; the MPCA Special Waters list; and FEMA Flood Insurance Rate Maps (HDR, 2005a). Water resources along the Hankinson line would be identified once the structures needing modification or replacement are delineated.

3.2.3.1 Groundwater

All Corridors and Substations

Groundwater resources within all of the proposed corridors, including substations, occur in glacially-derived and bedrock aquifers. Depth to the first occurrence of waterbearing aquifer materials varies throughout the area, from the land surface in the Minnesota River Valley and associated tributaries and lacustrine areas, to 100 feet or more in upland areas (Hansen, 1990; HDR, 2005a; Jensen, 2004; Olcott, 1992; Whitehead, 1996). Depth to Cretaceous bedrock varies throughout the proposed corridors, but is generally between 100 to 300 feet. Typically, the depth to bedrock aquifer zones is greater than the depth to the uppermost Cretaceous contact, which is often a confining unit of shale. A regional crystalline rock aquifer of Precambrian age also occurs in scattered locations along the proposed corridors, particularly along the Minnesota River Valley. It generally does not yield large quantities of water.

Wells known to occur in the proposed corridors are indicated in Table 3.2-2. Quaternary sands and/or gravels are the primary zones that supply water to wells. A few wells withdraw water from Cretaceous bedrock aquifers. Groundwater resources at the substation locations consist of aquifers in glacially-derived sand and gravel deposits, similar to aquifers described for the region and the proposed Project area.

Table 3.2-2. Wells Located Within Proposed Corridors

Corridor	Number of Recorded Wells	General Range of Depths to Waterbearing Zones (feet below the ground surface)
Corridor A	74	54 to 291
Corridor B	324	9 to 395
Corridor B1	159	42 to 470
Corridor C	94[a]	24 to 200
Corridor C1	2[a]	28 to 184

[a]Georeferenced well logs were not available for the South Dakota portion of Corridor C or C1. However, review of lithologic logs from borings and wells in the eastern portions of Grant County, indicated that wells tend to be completed in Quaternary sand and gravel aquifers, with a few bedrock wells also being present. This is probably true in Deuel County, South Dakota, as well.

Source: HDR, 2005a.

3.2.3.2 Floodplains

Corridors A, B, and B1

Major floodplain zones are shown on Figure 3.2-1. Based on the review of 100-year floodplain maps, Corridor A includes three floodplain areas associated with two creeks and the Minnesota River (Appendix C, Table 1, Volume III). FEMA mapping indicates that Corridor B crosses the 100-year floodplains of eight streams and rivers (Appendix C, Table 2, Volume III). FEMA mapping shows that Corridor B1 crosses the 100-year floodplain of seven streams and rivers (Appendix C, Table 2, Volume III). In all but two cases (Stony Run and Swift County Ditch No. 3), the floodplain is wider than 1,000 feet.

Corridors C and C1

FEMA mapping shows that Corridor C is within the 100-year floodplain of ten different streams and rivers, with overlap between South Dakota and Minnesota delineations in the Lac qui Parle River basin (Figure 3.2-1 and Appendix C, Table 3, Volume III). In addition, numerous isolated flood zones have been delineated on FEMA maps for Grant County within both proposed corridors, as shown on Figure 3.2-1. It should be noted that FEMA mapping is not available for Deuel County, South Dakota, outside of Gary, South Dakota. It is probable that Corridor C crosses the 100-year floodplain of several streams and rivers in this county, including Lost Creek and Crow Timber Creek in Antelope Valley Township, Crow Creek, and Monighan Creek in Glenwood Township, and Florida Creek in Herrick Township.

Within Corridor C, there are several areas in Grant, Chippewa, and Yellow Medicine counties where the floodplain is wider than 1,000 feet (HDR, 2005a). FEMA mapping shows that the easternmost portion of Corridor C is within the 100-year floodplain of the Minnesota River (Section 36 of Granite Falls Township). The 100-year floodplain associated with Palmer Creek is also within Corridor C, in Section 16 of Granite Falls Township. The Palmer Creek floodplain is narrower than 1,000 feet, but the adjoining section of the Minnesota River floodplain is wider than 1,000 feet.

Waterbodies having floodplains within Corridor C1 would be essentially the same as those listed for Corridor C, except the crossings identified for South Dakota would be located further downstream in Minnesota.

Substations

The Canby Substation would need to be relocated because the existing Canby Substation is within the 100-year floodplain of Canby Creek (MnDOC, 2006). The new Canby Substation site would be relocated approximately one mile northeast of the existing Canby Substation, located adjacent to Highway 75. No other substation locations within the proposed corridors occur within FEMA flood zone delineations.

3.2.3.3 Surface Water

Lakes, rivers, and streams within the proposed Project area are illustrated on Figure 3.2-2. Table 3.2-3 presents a general inventory of surface waterbodies for South Dakota and Minnesota within each proposed corridor. It should be noted that depending on specific transmission line routing, the rivers and streams listed in the table may be crossed more than once. Additional details for waterbodies in each proposed corridor under consideration are presented in tables in Appendix E, Volume III. In addition to the rivers, streams, and lakes listed in the appendix tables, other waterbodies in South Dakota and Minnesota may be considered WUS. If so, they would be subject to jurisdiction by the USACE. The USACE determines if waterbodies are within its jurisdiction.

Table 3.2-3. General Surface Water Inventory

Corridor	Number of Perennial Streams	Total Miles of Perennial Streams	Number of Intermittent Streams	Total Miles of Intermittent Streams	Number of Lakes	Total Acreage of Lakes	Acreage of Minnesota Public Waters, Lakes, and Wetlands
Corridor A	11	14	84	65	108	3,612	4,410
Corridor B	18	27	175	125	91	2,990	3,276
Corridor B1	15	16	210	153	91	2,960	3,196
Corridor C	68	51	300	181	33	1,446	615
Corridor C1	104	80	366	240	30	1,484	1,126

Source: HDR, 2005a; USGS, no date.

Within Minnesota, public waters and special waters designations have been established to assist in managing and protecting surface water resources. Public waters are designated as such to indicate the lakes, wetlands, and watercourses over which the MnDNR has regulatory jurisdiction. These waterbodies can be referred to by a numbering system developed by the State, as indicated in accompanying tables (see Appendix E, Volume III). To summarize Minnesota Statute 103G.005, Minnesota Public Waters are defined as:

- Those basins having shoreland management classifications.
- Public waters or navigable waters as determined by a court of competent jurisdiction.
- Basins designated as scientific and natural areas.
- Waters with publicly owned and controlled access.
- Natural and altered watercourses with a total drainage area greater than two square miles.
- Natural and altered watercourses designated by the commissioner as trout streams.
- Public waters wetlands (MnDNR, 2006a).

In the Minnesota portion of the proposed Project area, the NRI includes the Minnesota River in Big Stone, Chippewa, Lac qui Parle, and Yellow Medicine counties. The river has Outstanding Resource Values listed for scenery, recreation, wildlife, and history. In the South Dakota portion of the proposed Project area, the NRI includes the South Fork of the Yellow Bank River in Grant County. Listed Outstanding Resource Values for the South Fork include scenery, recreation, geology, fish, wildlife, history, and cultural values (NPS, 2004). Table 3.2-4 identifies the proposed corridors that include these NRI-listed rivers.

Table 3.2-4. Special Waters Designations

Designation	Corridor A	Corridor B	Corridor B1	Corridor C	Corridor C1
NRI-listed Rivers	Minnesota River	Minnesota River	Minnesota River	Minnesota River, South Fork of the Yellow Bank River	Minnesota River
Minnesota Wild, Scenic, and Recreational Rivers				Minnesota River	Minnesota River
Minnesota Special Waters			Cottonwood Creek	Minnesota River	Minnesota River

Source: NPS, 2004; MPCA, 2004a.

In the proposed Project area, the Minnesota River is classified under Minnesota's State Wild and Scenic Rivers Program as a recreational river from the corporate limits of Montevideo to a point slightly downstream of Granite Falls. A short reach of the river near Granite Falls is classified by the State as a scenic river (MnDNR, 2006b).

Minnesota Special Waters in the proposed Project area include the Minnesota River (from the confluence with the Lac qui Parle River downstream beyond Granite Falls) and Cottonwood Creek (in Corridor B1 in Swift County, Minnesota) (MPCA, 2004a). Canby Creek is designated as a Special Water Trout stream upstream from the town of Canby (upstream and outside of Corridor C and Corridor C1).

Corridor A

Corridor A lies within the Mustinka River watershed of the Red River of the North Basin and the Pomme de Terre River watershed of the Minnesota River Basin. Surface water generally flows north within the Mustinka River Basin (northern Big Stone County, and extreme western Stevens County in Minnesota). Within the remainder of Corridor A, water flows south and east toward the Minnesota River. Major stream crossings in Corridor A include the Minnesota River, Whetstone River, and Stony Run Creek. Surface water resources within Corridor A also include tributaries to the Mustinka and Pomme de Terre rivers (many of which have been channelized), and county ditches.

Named major lakes within Corridor A include Otery (452 acres), Clear (159 acres), Larson Slough (145 acres), Mud (109 acres), and Gravel (100 acres). A large number of the lakes are unnamed, with sizes ranging from less than one to 160 acres. A large complex of lakes occurs within the northeastern quadrant of Big Stone Township in Big Stone County (HDR 2005a).

As identified in Table 3.2-4, the Minnesota River is listed in the NRI within Corridor A. Impaired waters listed by the county and State in Corridor A are indicated in Table 3.2-5. Public waters in Corridor A include numerous unnamed basins, several additional named basins, Stony Run Creek, and a number of unnamed streams as indicated in Appendix E, Table 1, Appendix III (HDR, 2005a).

Table 3.2-5. Impaired Waters Within the Proposed Corridors

County	Water Resource	Reason for Impairment	Corridor A	Corridor B	Corridor B1	Corridor C	Corridor C1
South Dakota							
Grant	Whetstone River	Ammonia	X	X	X		
Deuel	Cobb Creek	Temperature				X	
Minnesota							
Big Stone	Minnesota River	Mercury	X	X	X		
	Stony Run	Biota	X	X	X		
	Long Tom Lake	Mercury	X				
Swift	Pomme de Terre River	Fecal coliform, low oxygen, and turbidity		X	X		
	Chippewa River	Mercury		X	X		
	Judicial Ditch #8	Biota		X	X		
Yellow Medicine	Lac qui Parle River	Mercury				X	X
	Spring Creek	Biota				X	X
	Minnesota River	Mercury				X	X

Source: HDR, 2005a; SDDENR, 2005.

Corridors B and B1

Corridors B and B1 lie within the Minnesota River (Headwaters), Minnesota River (Granite Falls), Chippewa River, and Pomme de Terre River watersheds of the Minnesota River Basin. Surface water generally flows south and west toward the Minnesota River. Major streams within both proposed corridors include the Whetstone River, Minnesota River, Stony Run, Pomme de Terre River, and the Chippewa River. Corridor B also includes Mud Creek. Corridor B1 also includes Shakopee Creek. Generally, streams within these two proposed corridors have been channelized (HDR, 2005a).

Named major lakes include Horseshoe Lake (28 acres) and Hart Lake (125 acres). The southern tip of a large unnamed lake or swamp associated with the Danvers State Wildlife Management Area (SWMA) occurs within Corridor B. The Minnesota River is listed in the NRI within both proposed corridors (see Table 3.2-4). Impaired waters within Corridors B and B1 are shown in Table 3.2-5**.**

Minnesota Public Waters in Corridor B include several unnamed basins, and many additional named basins, rivers, streams as indicated in Appendix E, Table 2, Volume III (HDR, 2005a). Minnesota Public Waters in Corridor B1 include a number of unnamed basins, many additional named basins, rivers and streams, and several unnamed streams (Appendix E, Table 3, Volume III). The southern part of Cottonwood Creek is a Minnesota Special Waters trout stream. That segment borders Corridor B1 on the south.

Corridors C and C1

Within both Minnesota and South Dakota, Corridors C and C1 lie within the Minnesota River (Headwaters), Minnesota River (Granite Falls), and Lac qui Parle watersheds of the Minnesota River Basin. Surface water generally flows north and east toward the Minnesota River. Major stream crossings in Corridor C include the Minnesota River, North and South Forks of the Yellowbank River, Lac qui Parle River, Cobb (Florida) Creek, and Lazarus Creek. Most of the streams crossed in Corridor C are also crossed further downstream in Corridor C1. Some are tributaries that join in or are upstream of Corridor C1. Streams in the western portion of Corridors C and C1 have generally been left in their natural, meandering condition, whereas many of the tributaries further eastward have been channelized (HDR, 2005a).

Major lakes in Corridors C and C1 include Lanners Lake (127 acres) and two unnamed lakes, both about 375 acres in size. Waterfowl Production Areas (WPAs) and State wildlife management areas are associated with water resources in the vicinities of Gary, South Dakota, and Canby and Hazel Run, Minnesota.

The NRI lists two rivers within Corridor C and one in Corridor C1, as indicated in Table 3.2-4. In addition, Minnesota has designated the Minnesota River as a State scenic river in the Granite Falls area and as Minnesota Special Waters. Major South Dakota waterbodies and Minnesota Public Waters in Corridors C and C1 are listed in Appendix E, Table 4, Volume III. Impaired waters listed by the States within Corridors C and C1 are indicated in Table 3.2-5.

Substations

The Big Stone Substation and the substations in Minnesota at Big Stone, Morris, Willmar, and Granite Falls and the Johnson Junction Switching Station are all located in upland positions. The Canby Substation would need to be relocated because the existing Canby Substation is within the 100-year flood plain of Canby Creek (MnDOC, 2006). The new Canby Substation site would be relocated approximately one mile northeast of the existing Canby Substation, located adjacent to Highway 75. No surface waterbodies occur at these locations.

3.3 Geology, Minerals, Paleontological Resources, and Soils

3.3.1 Introduction

The geographical boundaries of the resources described in this section are the proposed plant site and groundwater areas, and the proposed transmission corridors and substation sites proposed for modification. Geology and minerals, paleontological resources, and soils provide the raw materials, scientific information, and foundation for other resources (e.g., groundwater, vegetation, visual resources, and wildlife). Geologic hazards may pose a risk to the stability of certain sites for the construction and operation of structures. Mineral resources may be commercially valuable as construction materials or for other uses. Paleontological resources are essential to ongoing scientific investigations. Soil characteristics influence commercial development, the viability of agriculture, hydrology, and the occurrence of native vegetation. Soils in the proposed Project region are relatively fertile and are primarily used for crop production.

Geology and Minerals

Regionally, the proposed Project area is located in the physiographic subdivision known as the Dakota Minnesota Drift and Lakebed Flats (Radbruch-Hall et al., 1982). Throughout the proposed Project area, Pleistocene glacial deposits generally overlie Precambrian and Cretaceous bedrock. These glacial materials were deposited by the Des Moines Lobe, glacial ice extended from North Dakota through eastern South Dakota, and northwestern, western, and southern Minnesota (Lusardi, 1997). The proposed Project area generally lies northeast of the Coteau des Prairies Plateau, which dominates the regional topography of southwestern Minnesota and eastern South Dakota (Ojakangas and Matsch, 1982). The eastern edge of the Coteau des Prairies is represented by a prominent escarpment formed by glacial deposits that extends from North Dakota to southwestern Minnesota.

The glacial River Warren floodplain (now occupied by the Minnesota River) defined large areas of the surficial geology in the region. Unconsolidated deposits in the area include glacial tills with intermittent boulder pavement sequences and abandoned river channel deposits (HDR, 2005a). Patchy glacial lake sediments overlying the local till are present in the area surrounding the river valley. Localized areas of gravel and sand have been observed in former meltwater channels and glacial lake outlets. Currently, during flood events, the Minnesota River deposits silt and fine sand on the floodplain.

Although glacial deposits cover the bedrock throughout most of the proposed Project area, bedrock outcrops occur in certain areas along the Minnesota River Valley and parts of the Coteau des Prairies Plateau. Three bedrock units underlie the glacial drift: (1) igneous and high grade metamorphic rock of Early to Middle Precambrian age; (2) Sioux Quartzite of Late Precambrian age; and (3) poorly consolidated marine and continental shales and sandstone of Cretaceous age (Ojakangas and Matsch, 1982; Morey and Meints, 2000). The major constituent of the metamorphic rocks is coarse-grained pink or white granite gneiss. An important igneous Precambrian rock is the Milbank granite that forms the bedrock surface in parts of northeastern Grant County, South Dakota, and also is found along the Minnesota River Valley in Minnesota (Rothrock, 1934). The Milbank granite outcrops to the south of the proposed Project area (Tomhave and Schulz, 2004). The Cretaceous rocks generally consist of shale, mudstone, and marl with minor occurrence of limestone and sandstone.

In the proposed Project area, crushed stone, sand, and gravel are important mineral commodities (Peterson and Hammond, 1994). In Grant County, the most important mineral commodity is dimension stone that is quarried from outcrops of Milbank granite. Granite has been mined since 1902 and is a major source of dimension stone. There are numerous quarries in Grant County. Finely disseminated gold has been reported in sands and gravels in both South Dakota and Minnesota, but these deposits are not considered an economically viable source of the metal (Rothrock, 1934).

Potential geologic hazards include seismicity, landslides, and the effects of karst (limestone dissolution) features. The proposed Project is located in a region that is not seismically active. A few historic earthquake epicenters are located near the proposed Project area, but the magnitudes were less than 5.0 on the Richter scale (Chandler, 1994; SDGS, 2007). Earthquake hazard mapping by the USGS (2005c) indicates that ground motion set off by a hypothetical maximum credible event would be very low. Landslides do not often occur in the Minnesota-Dakota Drift and Lakebed Flats physiographic subdivision because of the generally low relief (Radbruch-Hall et al., 1982). However, there are some documented slumps in the Crookston, Minnesota area along the Red River in northwestern Minnesota (Harris, 2003). No landslide-prone areas have been identified in the proposed Project area. Karst occurs when limestone or dolomite rocks are dissolved by the action of groundwater and if close to the surface, this dissolution would result in sinkholes, caves, and sinking streams. The development of sinkholes associated with karst can present hazards to structures and roads. There is no karst potential in the proposed Project area (Lively, 1995).

Paleontological Resources

Paleontology is the study of fossils and the interrelationships between the biological and geological components of ecosystems over time. Paleontological resources include the fossils of vertebrate and invertebrate animals, as well as fossilized remains of plants and traces (e.g., tracks and footprints).

They also include individual fossils and fossil-bearing geological formations or beds. Fossils and fossil beds can have historical or scientific significance. Paleontological resources constitute a fragile and nonrenewable record of the history of life on earth, but not all fossils are scientifically important.

There is a low potential for the presence or discovery of scientifically important paleontological resources. Milbank granite, being an igneous rock, would not contain any fossils. The Cretaceous bedrock, while made up of rock units that could contain fossils, is primarily covered by surficial glacial deposits and is not exposed in the proposed Project area in either Minnesota or South Dakota (Cretaceousfossils.com, 2005). The surficial glacial deposits result from erosion and deposition by ice and water and do not provide a favorable environment for the preservation of fossils.

Soils

Soil types in the proposed Project area were identified using information compiled by HDR Engineering, Inc. (HDR), Barr Engineering Company (Barr), and the Natural Resources Conservation Service (NRCS) (formerly the Soil Conservation Service (SCS)) soil surveys for Grant and Deuel counties, South Dakota, and Swift, Chippewa, Big Stone, Yellow Medicine, Stevens, and Kandiyohi counties, Minnesota. Much of the data for the proposed plant site were retrieved from NRCS Soil Survey Geographic database mapping and related descriptions, accompanied by more detailed data and information from the county surveys (NRCS, 2005a). For the proposed corridors, more general information from the State Soil Geographic database (STATSGO) was used. STATSGO soils maps are generally grouped for mapping into units known as soil associations. Typically, an association consists of one or more major soils and some minor soils. A soil association has a characteristic pattern of soils on the land surface, largely determined by relief, drainage, slope aspect, or other soil-determining factors.

Soils in the proposed Project area were predominantly formed from glacial deposits (i.e., till, outwash, or glacial lake sediments), with a relatively small proportion of soils forming from narrow deposits of streamlain alluvium. On glacial till uplands, soils are commonly deep with primarily loamy or clayey textures, and thick, dark fertile topsoils. In areas of glacial outwash, sand, and gravel deposits may occur within 1.5 to three feet of the surface. On bottomlands and stream terraces, soils are typically deep, with sandy to loamy textures. On steeper slopes, soils may have thinner topsoils and greater volumes of stones, gravel, or sand. Drainage varies widely within the proposed Project area; upland positions may be well-drained to somewhat excessively drained, whereas depressional positions have more restricted drainage.

The NRCS classifies the erodibility of certain soils. These soils are determined by the regional NRCS office and are defined as soils “that if used to produce an agricultural commodity, would have an excessive average annual rate of erosion in relation to the soil loss tolerance level.” (7 CFR § 657)

Soil characteristics that can affect construction or increase the potential for soil impacts include: significant erodibility, prime farmland suitability, drainage limitations, hydric (wet) characteristics, significant compactibility, the presence of stones or shallow depth to bedrock, depth of topsoil and subsoil, and steep slopes. Additional soil-related issues include revegetation potential, biochemical characteristics, and soil contamination.

3.3.2 Big Stone II Plant Site and Groundwater Areas

3.3.2.1 Geology and Minerals

The topography within the proposed plant site and groundwater areas is illustrated in Figure 3.3-1. The topography of these areas is hummocky, reflecting the surficial glacial till deposits. The proposed plant site is at an elevation of 1,110 to 1,130 feet above mean sea level (amsl) and the ground slopes slightly to the southeast toward the Whetstone River. The areas proposed for groundwater wells are at an elevation of approximately 1,000 to 1,150 feet amsl, with slopes also generally toward the Whetstone River. The bedrock and surficial geology of the proposed plant site and proposed groundwater areas are illustrated in Figures 3.3-2 and 3.3-3, respectively. The surficial geology of the proposed plant site and proposed groundwater areas is characterized by a combination of Quaternary alluvium (gravel outwash) along the Whetstone River valley and glacial till (Upper Wisconsin) on either side of the valley. The Big Stone Moraine is a terminal moraine that provides patches of rough topography in a band along the north side of the North Fork of the Whetstone River near its confluence with the South Fork (Rothrock, 1934). The till deposits north of the Big Stone Moraine and the materials south of the river are predominantly ground moraine, which exhibits a smoother, undulating topography (Martin et al., 2004). This combination of glacial tills, outwash, and alluvial deposits throughout the proposed plant site and proposed groundwater areas consists largely of clay with varying amounts of sand and gravel. Glacial deposits can have sand- to boulder-sized clasts of material in a largely clay matrix (Martin et al., 2004). The bedrock consists of the upper Cretaceous Carlisle Shale, Greenhorn Formation, and Graneros Shale. It is likely that Milbank granite lies underneath the Cretaceous rocks (Tomhave and Schulz, 2004).

Mineral resources and potential geologic hazards are as previously described in the introductory regional descriptions.

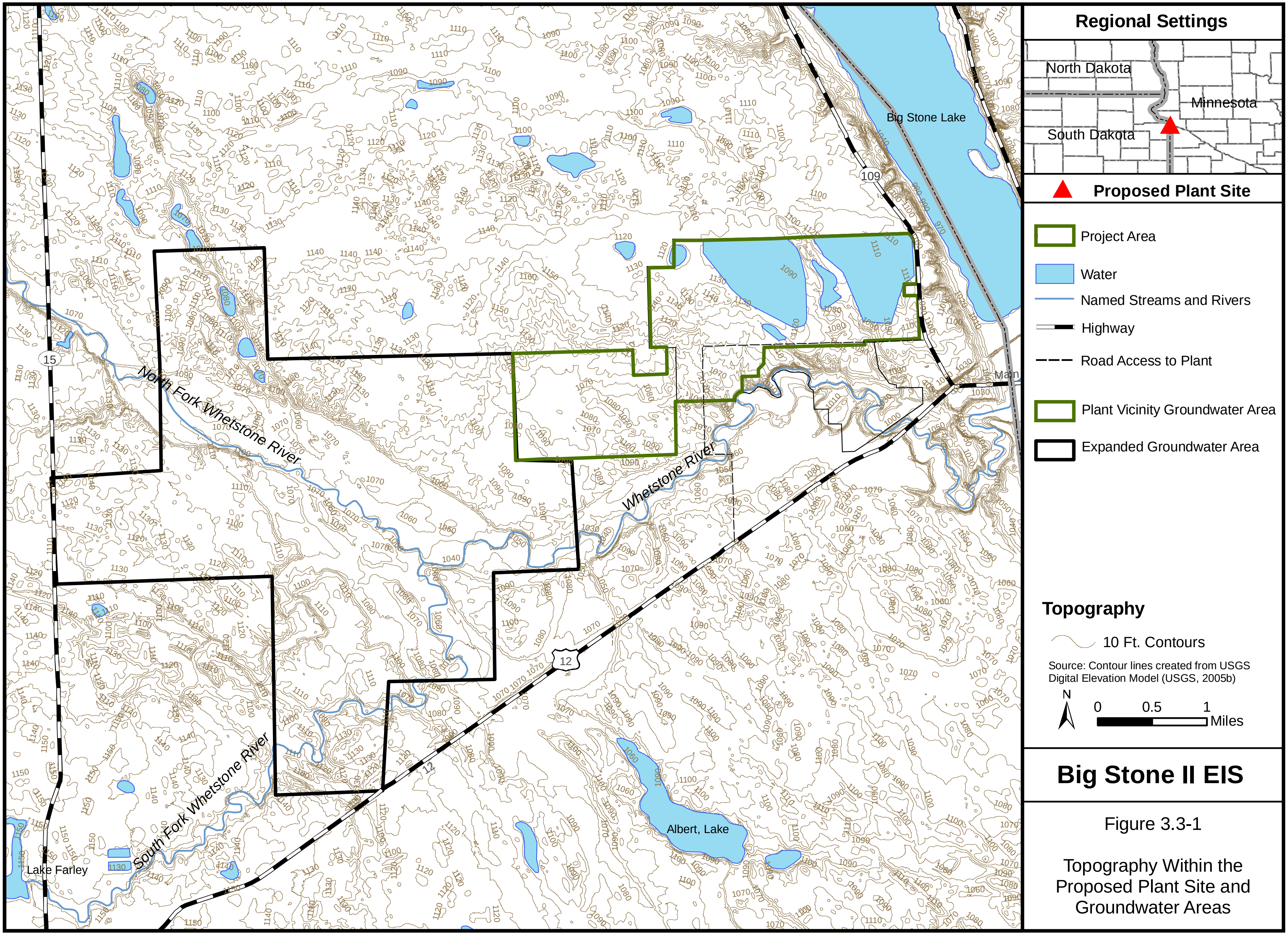
3.3.2.2 Paleontological Resources

As described in the introduction, the proposed plant site and groundwater areas contain low potential for paleontological resources.

3.3.2.3 Soils

Proposed Big Stone II Plant Site

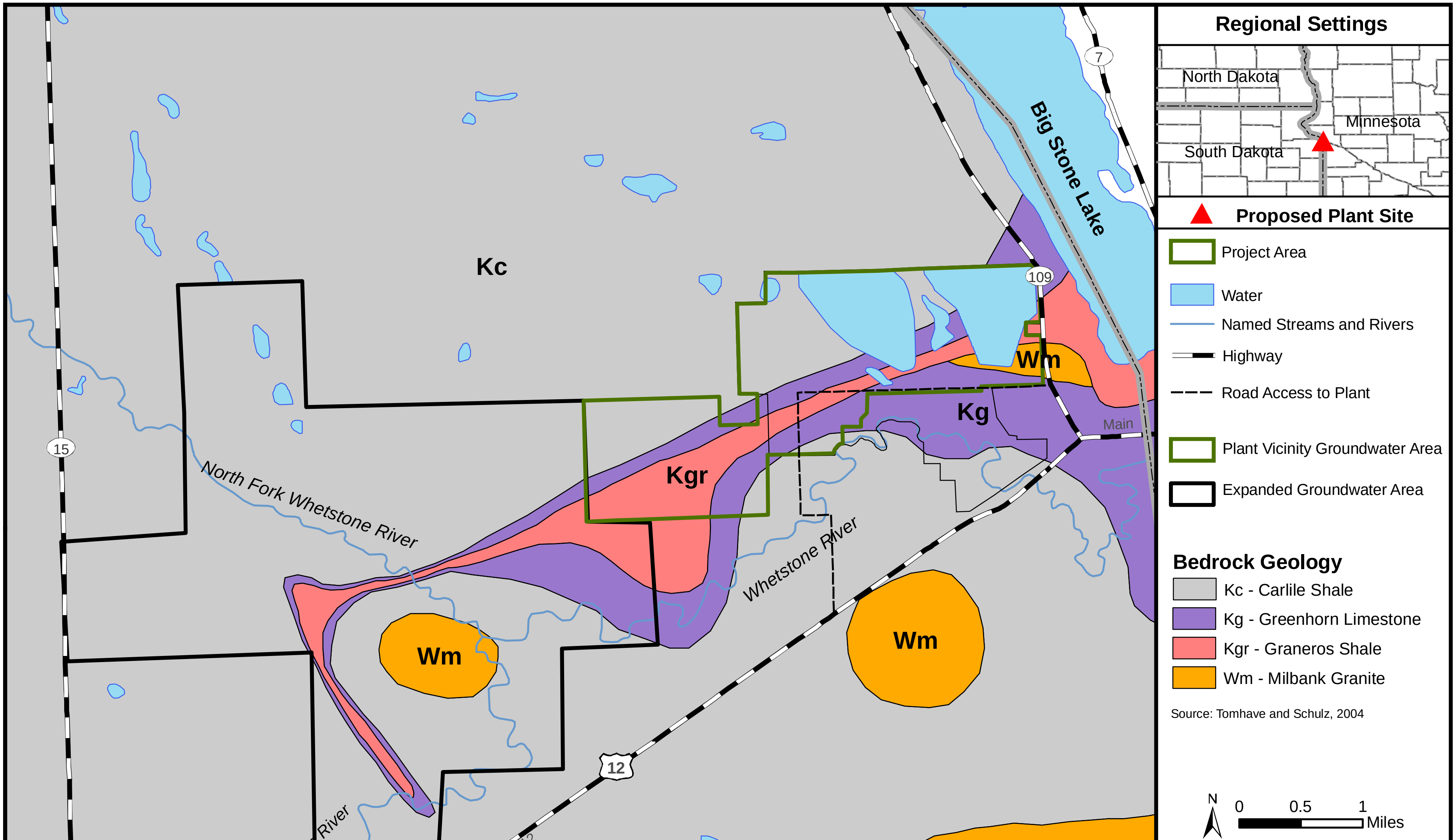
STATSGO information for the proposed plant site, shown in Figure 3.3-4, indicates that the Heimdal-Sisseton-Svea association dominates the landscape, generally on nearly level to gently rolling slopes between zero and six percent. This association occupies more than 90 percent of the proposed plant site. These soils are particularly extensive on uplands north of the Whetstone River and are deep and generally well-drained (SCS, 1979; NRCS, 2002). Shallow depressions are scattered in this mapping unit. Heimdal soils have dark-colored, organically-enriched loamy topsoils and subsoils overlying light gray or yellowish calcareous loam. Sisseton soils have thinner, less fertile topsoils than the Heimdal soils and occur on steeper locations such as terrace faces and breaks along the Whetstone River. The Svea soil has a thicker topsoil layer and occupies about 25 percent of the unit in the shallow depressions. This soil is moderately well-drained and is flooded frequently for brief periods. Fertility is medium or high in all of these soils.



Big Stone II EIS

Figure 3.3-1

Topography Within the Proposed Plant Site and Groundwater Areas



Big Stone II EIS

Figure 3.3-2

Bedrock Geology Within the Proposed Plant Site and Groundwater Areas

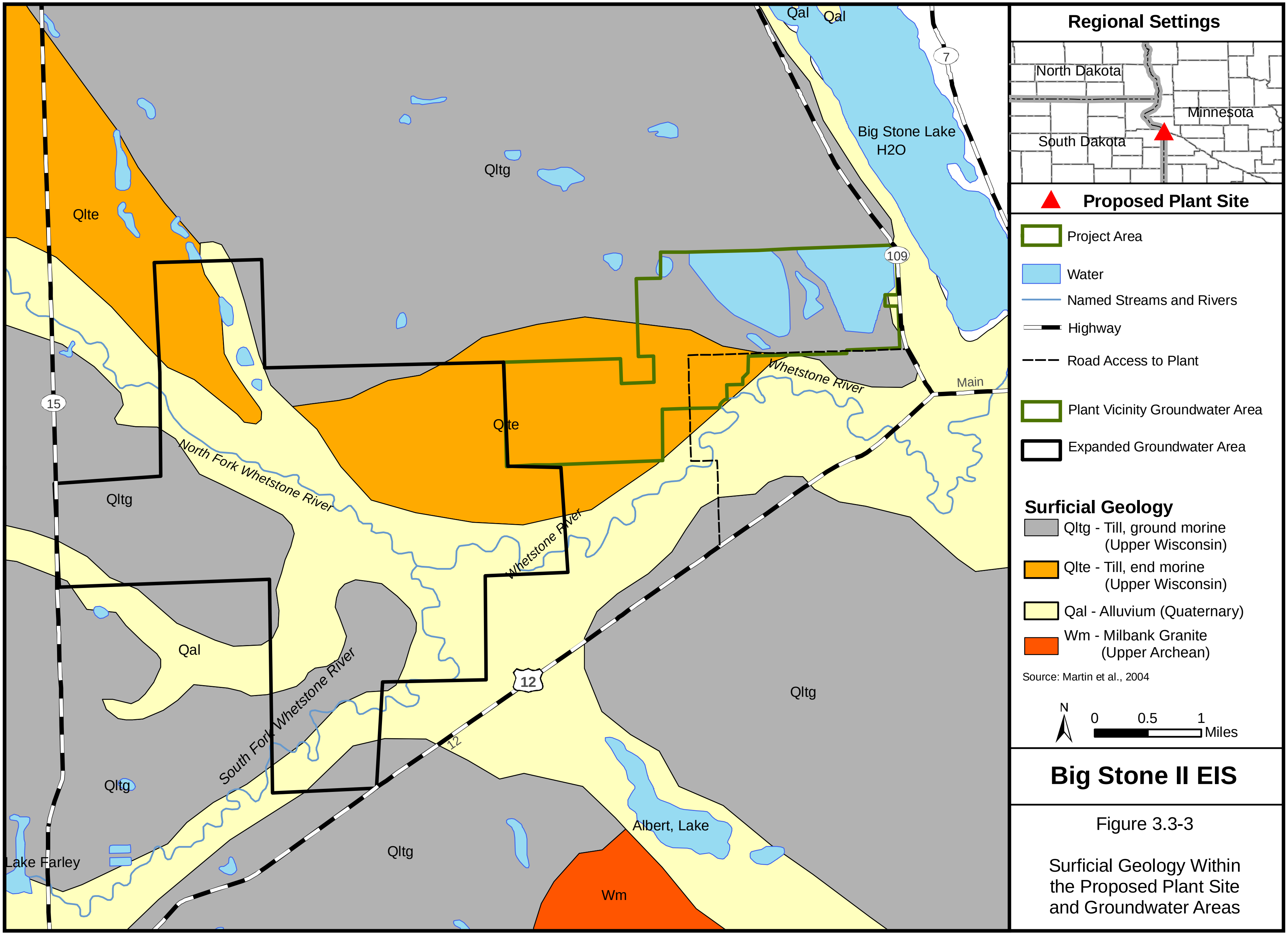


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Figure 3.3-3

Surficial Geology Within the Proposed Plant Site and Groundwater Areas

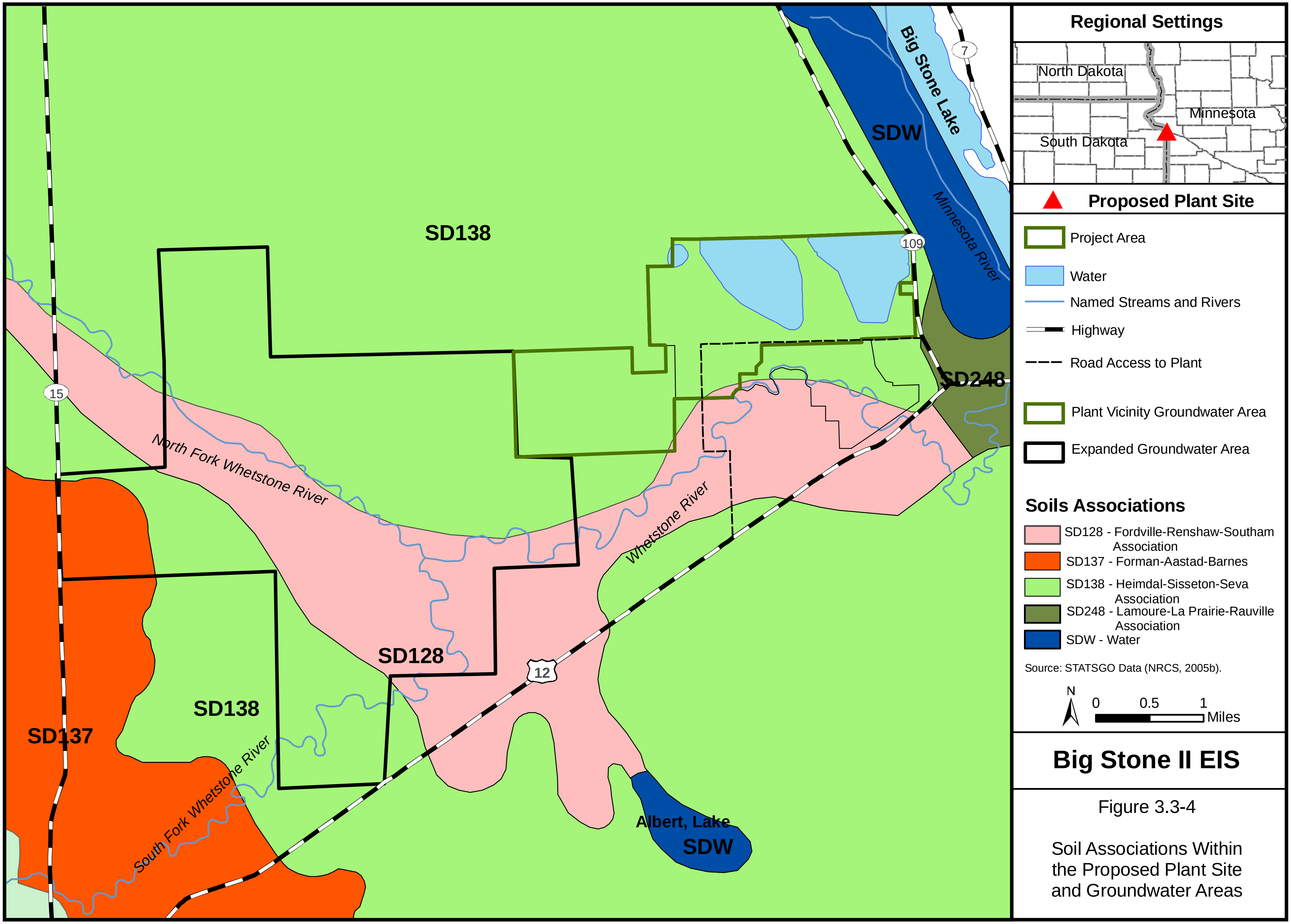


Figure 3.3-4

Soil Associations Within the Proposed Plant Site and Groundwater Areas

Other soils make up minor portions of the proposed plant site. More detailed soil surveys indicate that additional soil resources at the proposed plant site are primarily Ladelle, Parnell, and Vallers soils (SCS, 1979). Ladelle soils occur on stream terraces and bottomlands along the river and associated tributaries. They are deep, moderately well-drained soils with a very thick, dark, organically enriched loamy topsoil. The stream terrace settings are rarely flooded, and broader bottomlands (which may receive upland runoff) are frequently flooded for brief periods. Parnell soils are deep, very poorly drained (or ponded) soils that occur in large generally circular, closed depressions. They have silty clay loam textures and are frequently flooded. Parnell soils form wetland areas generally two to 15 acres in size, particularly in the northern part of Section 11, northwest of the existing plant site (SCS, 1979). Vallers soils are mapped in association with Parnell soils, occurring in swales and shallow depressions along upland drainages in the proposed plant site. Vallers soils are deep and poorly drained, and are subject to rare flooding. Both Vallers and Parnell soils have thick, dark topsoils and are hydric. Hydric soils generally have evidence of periodic or permanent saturation within one foot of the surface (or are inundated). Hydric soils at the proposed plant site are shown in Figure 3.3-5.

In the outer portions of the proposed plant site, the same soil associations occur. In addition, Estelline, Poinsett, and Renshaw soils occur extensively on the uplands south of the Whetstone River. The Estelline soils are moderately deep over sand and gravel from glacial outwash. They are silty, with thick, dark topsoils. Renshaw soils are loamy and shallow over glacial sand and gravel. Both Estelline and Renshaw soils are nearly level and well-drained. The Poinsett soils are deep, well-drained, silty soils occurring on nearly level, smooth uplands. All of these soils have relatively thick, dark, organically enriched, and fertile topsoils.

Groundwater Areas

As shown in Figure 3.3-4, the Heimdal-Sisseton-Svea association still dominates the landscape, but a large swath of Fordville-Renshaw-Southam association cuts through the expanded groundwater area. Fordville soils are very deep, well-drained soils formed in loamy sediments that are moderately deep over sand and gravel on outwash plains and terraces. Renshaw soils consist of very deep, somewhat excessively-drained soils formed in loamy sediments and the underlying sand and gravel on outwash plains and terraces. Southam soils are very deep, very poorly-drained, slowly permeable soils that formed in local alluvium from glacial drift. These soils are in basins and depressions on till plains, moraines, and lake plains.

In addition, an association of Forman-Aastad-Barnes soils dominates the area in the far western portion of the expanded groundwater area. Forman soils are very deep, well-drained, moderately slowly permeable soils formed in calcareous till. These soils are on till plains and moraines. Aastad soils consist of very deep, moderately well-drained soils that formed in calcareous till on moraines and till plains. Barnes soils consist of very deep, well-drained, moderately, or moderately slowly permeable soils that formed in loamy till. These soils are on till plains and moraines.

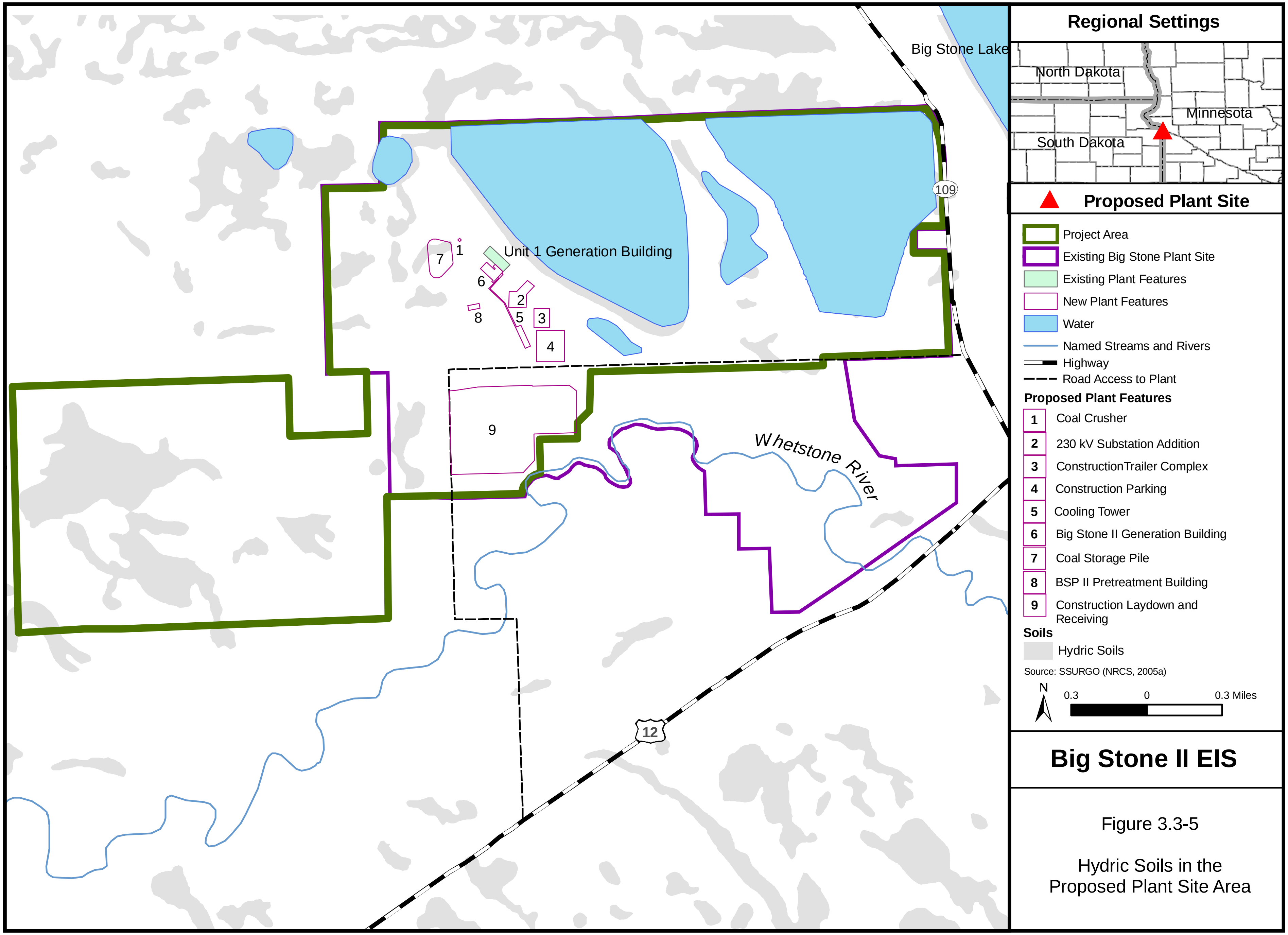


Figure 3.3-5

Hydric Soils in the Proposed Plant Site Area

3.3.3 Transmission Corridors, Substations, and Other System Improvements

3.3.3.1 Geology and Minerals

Corridor A

Corridor A lies in a glacial moraine that primarily consists of clayey, silty, and sandy till with some gravel. The area topography is typical of a glacial moraine, exhibiting many small hills and depressions. The glacial drift is fairly thick, ranging from 320 to 340 feet (HDR, 2005a). The bedrock geology consists of a thin layer of Cretaceous sediments overlying the Precambrian crystalline rock. Precambrian bedrock is present north of Corridor A in Stevens County and slopes steeply to the west in the vicinity of Johnson and Graceville, Minnesota. An inactive gravel pit is located adjacent to or slightly within Corridor A in Big Stone County (NE ¼ of Section 18 in Malta Township).

Corridors B and B1

In Corridors B and B1, glacial drift is composed primarily of till with a few areas of buried sand and gravel. The drift is approximately 50 to 100 feet in the western portion of the corridors near the Minnesota River and increases to a thickness of approximately 300 feet along most of the eastern portion.

Although Precambrian rocks underlie the entire proposed Project area, Cretaceous shale and sandstone deposits are found at variable locations and thicknesses along the corridors. The thickness of the Cretaceous bedrock ranges from zero to 50 feet in the western portion to 100 feet along the eastern half in Swift and Kandiyohi counties (HDR, 2005a).

With respect to mineral resources, a group of aggregate sites occur on the western end of the corridors (near Highway 75). The sites include three abandoned gravel pits, five active private gravel pits, one Minnesota Department of Transportation (MnDOT) gravel pit, two commercial aggregate sites, and a rock quarry. The rock quarry is located near the Minnesota River where there are Sioux Quartzite outcrops and only a thin covering of glacial overburden (HDR, 2005a). Several aggregate sites are grouped within the corridors on the western side of Swift County. They include two abandoned gravel pits, two active private gravel pits, and two MnDOT gravel pits. Several abandoned and active aggregate sites also lie immediately outside Corridor B. Three additional abandoned gravel pits are located in the corridors near Murdock, Minnesota (HDR, 2005a).

Corridors C and C1

The glacial deposits in Corridors C and C1 consist of approximately 100 to 200 feet of till overlying Cretaceous bedrock (approximately 150 feet) (HDR, 2005a). The glacial till is inundated with many surficial and buried sand and gravel lenses. The Cretaceous rocks are mainly composed of shale with a lower mantle of sandstone or sand. The southern half of the north-south portion of Corridor C located in South Dakota and the western half of the east-west portion of Corridors C and C1 located in Yellow Medicine County lie within the Coteau des Prairies region.

The Blue Devil Valley State Natural Area is located in Corridors C and C1. The Blue Devil Valley State Natural Area consists of 30 acres and is 0.5 mile southwest of Granite Falls, Minnesota (Section 4, Township 115 North, Range 39 West). State-designated granite outcrops at the site support a unique community of plants and animals (MnDNR, 2006b). These are the only known State-designated outcrops within the proposed Project area.

With regard to mineral resources, aggregate sites are located mainly in the vicinity of Granite Falls at the eastern end of both corridors. An abandoned gravel pit, two active gravel pits, the Cold Springs Granite rock quarry in South Dakota (Sections 6-8, 17-19, Township 120 North, Range 47 West), and the Yellow Medicine Quarry "Martin Marietta Aggregate" (Section 33, Township 116 North, Range 39 West) are located within Corridor C (HDR, 2005a). Several other aggregate sites are located adjacent to Corridor C. One aggregate site within the South Dakota portion of Corridor C and C1 was identified and is located six miles south of Big Stone City in Township 120 North, Range 17 West (Dexonline, 2006).

Substations

Geological features and mineral resources for Morris Substation and the Johnson Junction Switching Station would be the same as described for Corridor A. The Willmar Substation would be the same as described for Corridors B and B1. The Granite Falls Substation and relocated Canby Substation would be the same as described for Corridors C and C1, except that the Blue Devil Valley State Natural Area is not in close proximity to these substations.

3.3.3.2 Paleontological Resources

As described in the introduction, the proposed corridors and substations have low potential for paleontological resources.

3.3.3.3 Soils

Soil associations in the proposed corridors are shown in Figure 3.3-6. Areas with soil drainage restrictions (including hydric soils) that may have implications for construction activities in the proposed corridors are shown in Figure 3.3-7. Areas that have soils with greater susceptibility to water erosion in Minnesota are shown in Figure 3.3-8. There are no similar erodibility data available for the proposed corridors in South Dakota.

Corridor A

Soil associations as described by the STATSGO database are listed in Table 3.3-1 for Corridor A. Corridor A is known to consist of 46 percent prime farmland, with additional prime farmland if the soils are drained. Approximately three percent of the soils are listed as highly erodible, and approximately 43 percent of the soils would have substantial drainage limitations without artificial drainage. Hydric soils, which generally have evidence of periodic or permanent saturation within one foot of the surface (or are inundated), occur in scattered locations throughout Corridor A.

Corridors B and B1

Soil associations within Corridor B and Corridor B1 are very similar and are listed in Table 3.3-2. Approximately two percent of the soils in both corridors are listed as highly erodible. Approximately 66 percent of the soils in Corridor B and 67 percent of the soils in Corridor B1 would have substantial drainage limitations without artificial drainage.

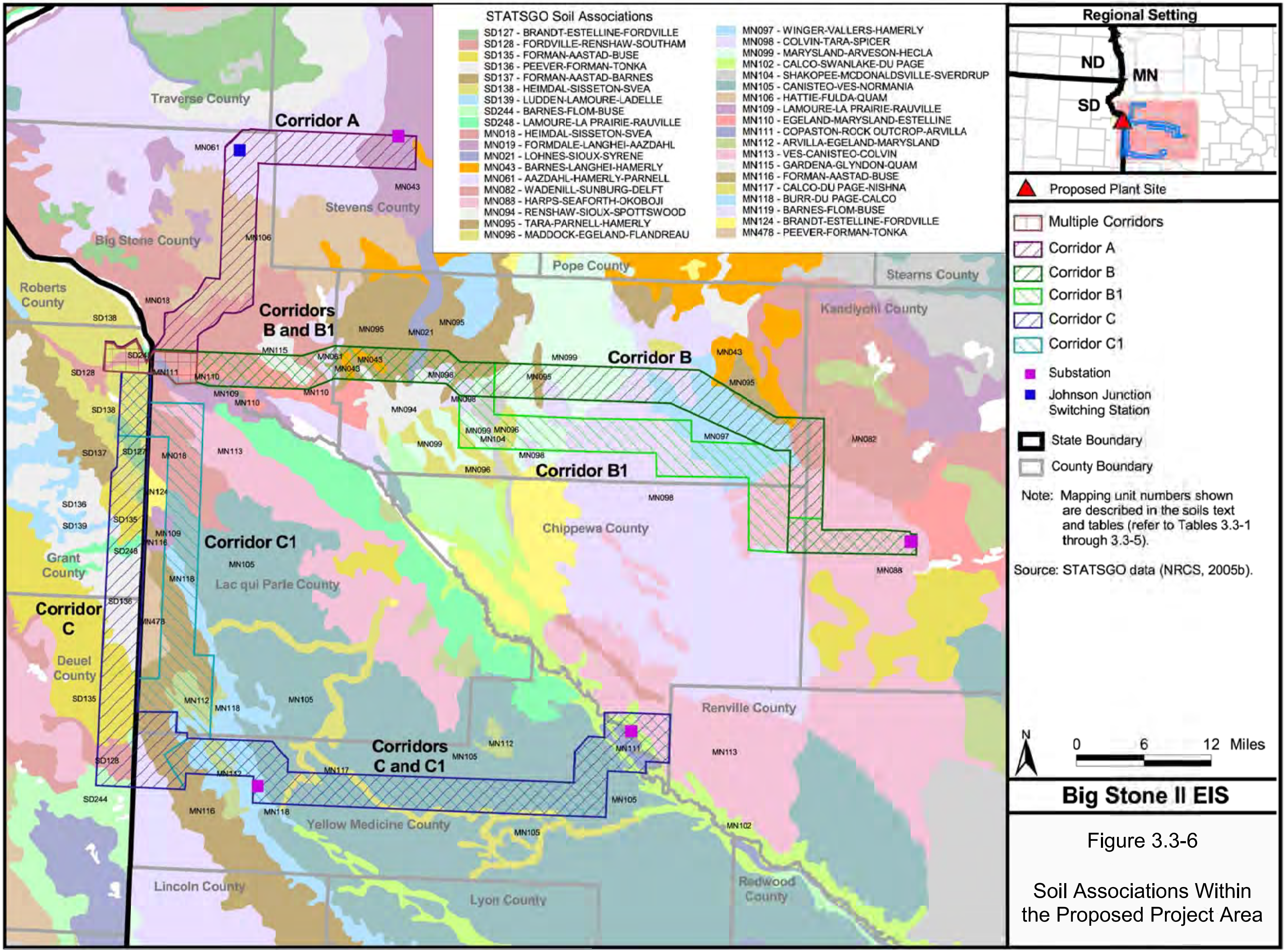
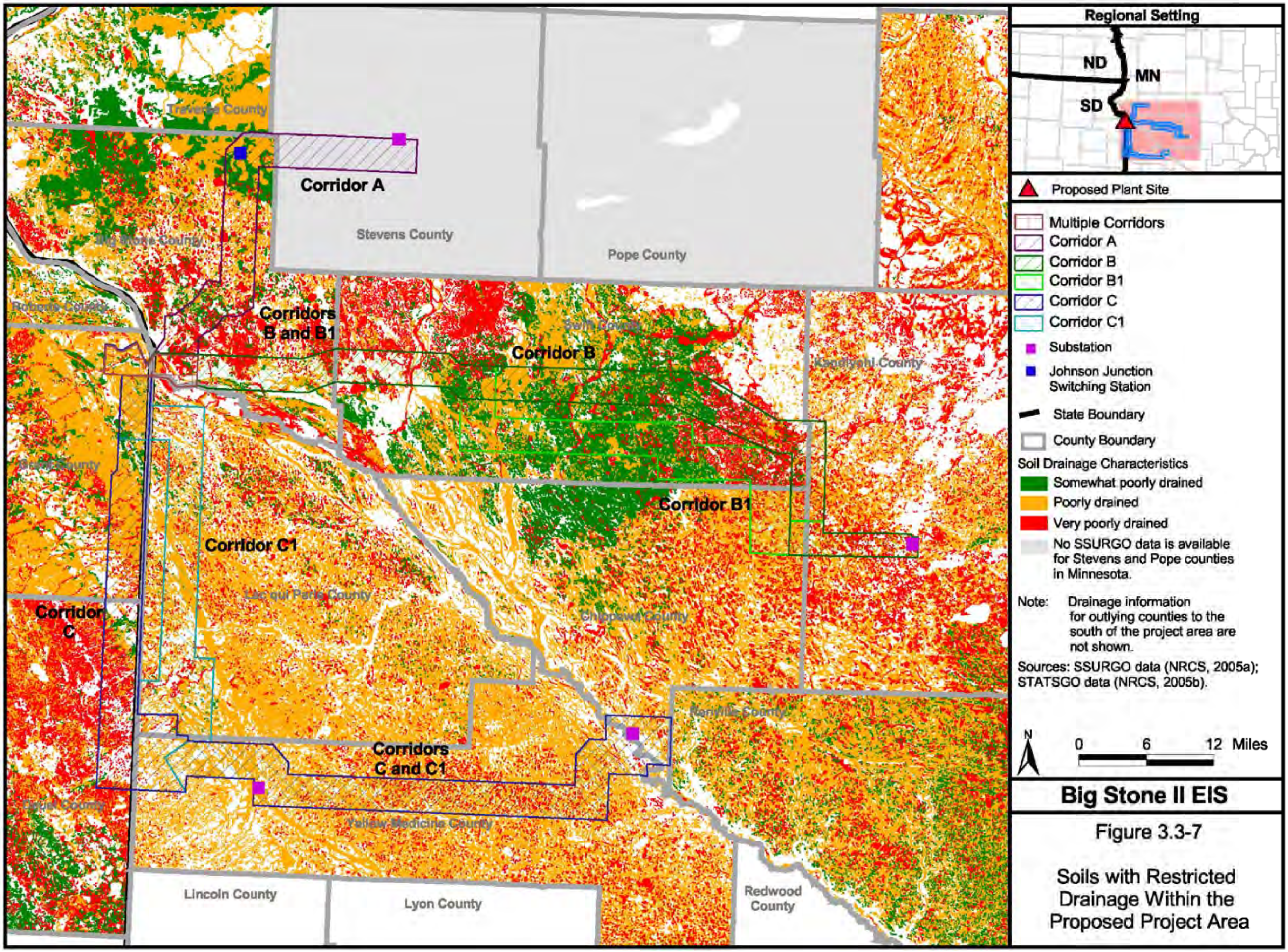


Figure 3.3-6

Soil Associations Within the Proposed Project Area



Big Stone II EIS

Figure 3.3-7

Soils with Restricted Drainage Within the Proposed Project Area

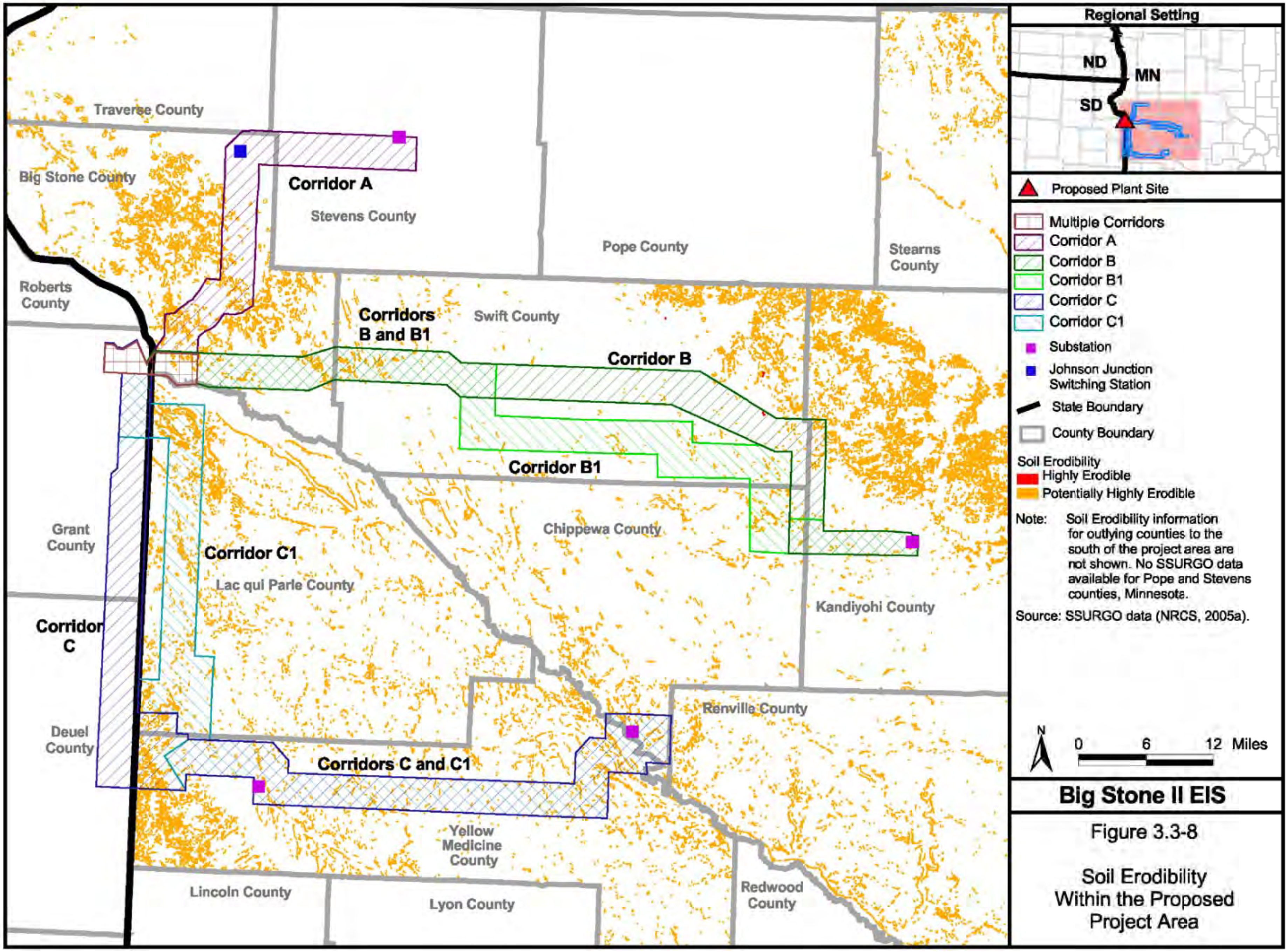


Figure 3.3-8

Soil Erodibility Within the Proposed Project Area

Corridors C and C1

Soil associations within Corridor C and Corridor C1 are very similar and are listed in Table 3.3-3. Approximately four percent of Corridor C soils in Minnesota are listed as highly erodible, and it is likely that six to eight percent of the overall corridor is highly erodible. Approximately 50 percent of the soils would have substantial drainage limitations if not artificially drained. Within Corridor C1, approximately four percent of the corridor is highly erodible. Approximately 48 percent of the soils would have substantial drainage limitations if not artificially drained.

Substations

Soil resources at Morris Substation consist of the Formadale-Langhei-Aazdahl association; those associated with Johnson Junction Switching Station are Aazdahl-Hamerly-Parnell. These consist of very deep, well-drained, moderately well-drained, to poorly drained loamy soils on uplands. At Willmar Substation, soils are mapped as the Ves-Normania-Webster association. These are very deep, well-drained loamy soils on upland sideslopes, interspersed with loamy soils in depressions and on glacial till plains that range from somewhat poorly to poorly drained loamy soils. The Ves-Canisteo-Colvin soil association occurs at the substation just north of Granite Falls. It consists of very deep, loamy, and silty upland soils that are well drained to very poorly drained soils. Soils at the proposed new Canby Substation site are classified as Burr-DuPage-Calco association and described as well-drained and moderately well-drained.

Table 3.3-1. Soil Associations – Corridor A

Soil Association	Area (acres)	Approximate Percent of Corridor	General Description
Aazdahl-Hamerly-Parnell (MN061)	27,311	33.0	Moderately well-drained and poorly drained soils that formed in loamy glacial till on undulating ground moraines.
Barnes-Langhei-Hamerly (MN043)	172	0.2	Well-drained and somewhat poorly drained, moderately, or moderately slowly permeable soils that formed in loamy till plains and moraines.
Copaston-Rock Outcrop-Arvilla (MN111)	1,028	1.2	Well-drained and somewhat excessively drained, undulating to steep soils formed in coarse glacial till and alluvium and colluvium over bedrock, with areas of rock outcrop.
Egeland-Marysland-Estelline (MN110)	1,011	1.2	Well-drained and poorly drained soils formed in silty materials overlying sand and gravel on outwash plains.
Fordville-Renshaw-Southam (SD128)	2,049	2.5	Loamy soils that are shallow and moderately deep over sand and gravel on outwash plains and terraces, and clayey soils in depressions.
Formdale-Langhei-Aazdahl (MN019)	9,259	11.2	Well-drained soils that formed in loamy glacial drift and calcareous till. These soils are located on undulating ground moraines.
Hattie-Fulda-Quam (MN106)	20,988	25.4	Nearly level to rolling, poorly drained, moderately well-drained, and well-drained soils on till plains.
Heimdal-Sisseton-Svea (MN018)	20,125	24.3	Well-drained and moderately well-drained soils that formed in loamy glacial drift.
Lamoure-La Prairie-Rauville (MN109)	790	1.0	Nearly level, moderately well-drained, and poorly drained soils on floodplains.

Source: NRCS, 2005a.

Table 3.3-2. Soil Associations – Corridors B and B1

Soil Association	Corridor B Area (acres)	Percent of Corridor B	Corridor B1 Area (acres)	Percent of Corridor B1	General Description
Aazdah - Hamerly - Parnell (MN061)	2,543	1.7	2,543	1.6	Moderately well-drained and poorly drained soils that formed in loamy glacial till on undulating ground moraines.
Barnes - Langhei - Hamerly (MN043)	3,549	2.3	2,913	1.8	Well-drained and somewhat poorly drained, moderately, or moderately slowly permeable soils that formed in loamy till plains and moraines.
Colvin - Tara - Spicer (MN098)	15,441	10.2	33,686	21.3	Nearly level and very gently sloping, poorly drained, very poorly drained, and moderately well-drained silty soils on glacial till.
Copaston - Rock Outcrop - Arvilla (MN111)	1,028	0.7	1,028	0.6	Well-drained and somewhat excessively drained, undulating to steep soils formed in coarse glacial till, and alluvium and colluvium over bedrock, with areas of rock outcrop.
Egeland - Marysland - Estelline (MN110)	9,368	6.2	9,368	5.9	Well-drained and poorly drained soils formed in silty materials overlying sand and gravel on outwash plains.
Fordville – Renshaw – Southam (SD128)	2,049	1.4	2,049	1.3	Loamy soils that are shallow and moderately deep on outwash plains and terraces, with clayey wet soils in depressions.
Gardena - Glyndon - Quam (MN115)	4,116	2.7	4,116	2.6	Gently sloping and nearly level, moderately well-drained, somewhat poorly drained, and very poorly drained silty soils on till plains.
Harps - Seaforth – Okoboji (MN088)	25,794	17.0	32,093	20.2	Deep, poorly drained to moderately well drained loamy soils in alluvium from glacial till.
Heimdal - Sisseton - Svea (MN018, SD138)	15,009	9.9	15,009	9.5	Well-drained and moderately well-drained soils that formed in loamy glacial drift.
Lamoure - La Prairie –Rauville (MN109, SD248)	2,017	1.8	2,017	1.3	Nearly level, moderately well-drained, and poorly drained soils on floodplains.
Lohnes - Sioux - Syrene (MN021)	1,868	1.2	1,864	1.2	Excessively to well-drained, rapidly permeable soils in sands on outwash plains; and very poorly drained soils consisting of a loamy mantle over sandy lake plain sediments.
Maddock - Egeland - Flandreau (MN096)	0	0	4,284	2.7	Well-drained or somewhat excessively drained sandy to loamy soils over sandy wind blown deposits on plains, terraces, and uplands.
Marysland - Arveson - Hecla (MN099)	18,151	12.0	12,210	7.7	Moderately well-drained, poorly and very poorly drained soils that formed in glacial lacustrine, alluvial, or outwash sediments.
Renshaw - Sioux - Spottswood (MN094)	2,398	1.6	2,398	1.5	Poorly drained and excessively drained, gravelly sandy loams, and loams underlain by sand and gravel on outwash plains.
Shakopee – Mcdonaldsville - Sverdrup (MN104)	1,652	1.1	4,859	3.1	Poorly drained and well-drained soils formed in clayey and sandy glaciolacustrine sediments.
Tara - Parnell - Hamerly (MN095)	17,277	11.4	13,736	8.7	Nearly level and depressional, moderately well-drained to very poorly drained clay loams, or silty clay loams on glacial moraines.
Wadenill - Sunburg -Delft (MN082)	7,496	4.93	0	0	Nearly level to very steep, well-drained, and poorly drained, loamy soils on ground moraines and till plains.
Winger - Vallers - Hamerly (MN097)	22,286	14.7	14,332	9.0	Poorly drained and somewhat poorly drained soils formed in silty sediments over loamy glacial till on glacial lake plains and moraines.

Source: HDR, 2005a; NRCS, 2005a.

Table 3.3-3. Soil Associations – Corridors C and C1

Soil Association	Corridor C Area (acres)	Percent of Corridor C	Corridor C1 Area (acres)	Percent of Corridor C1	General Description
Arvilla - Egeland -Marysland (MN112)	3,453	1.7	11,167	5.9	Somewhat excessively drained, well-drained, and poorly drained, nearly level and gently sloping soils formed in loamy material over sandy and gravelly outwash plains.
Barnes - Flom - Buse (SD244, MN119)	8,470	4.2	0	0	Nearly level to hilly and steep, poorly drained to well-drained soils that are loam or clay loam throughout on glacial till.
Brandt - Estelline - Fordville (SD127, MN124)	5,388	2.9	1,182	0.6	Well-drained soils formed in silty and loamy materials overlying sand and gravel on outwash plains.
Burr - Du Page - Calco (MN118)	10,525	5.2	16,702	8.8	Well-drained, moderately well-drained, and poorly drained soils (some with gypsic horizons) formed in calcareous clayey glacial lacustrine sediments and floodplain alluvium.
Calco - Du Page - Nishna (MN117)	6,334	3.2	6,334	3.3	Poorly drained and moderately well-drained, nearly level soils formed in alluvial deposits.
Calco - Swanlake - Du Page (MN102)	6,506	3.2	6,506	3.4	Nearly level, very steep, and very steep poorly drained, well-drained, and moderately well-drained silty and loamy soils in bottomlands and adjacent steep walls.
Canisteo - Ves - Normania (MN105)	64,940	32.4	74,593	39.2	Nearly level and undulating, well-drained, moderately well-drained, and very poorly drained loamy soils on till plains.
Copaston - Rock Outcrop - Arvilla (MN111)	3,812	1.9	3,812	2.0	Well-drained and somewhat excessively drained, undulating to steep soils formed in coarse glacial till and alluvium and colluvium over bedrock, with areas of rock outcrop.
Fordville - Renshaw - Southam (SD128)	7,985	4.0	2,049	1.1	Somewhat excessively drained, well-drained, and poorly drained, nearly level to strongly sloping, loamy soils over gravelly material on outwash plains and moraines.
Forman - Aastad - Barnes (SD137)	95	0.1	0	0	Nearly level to gently sloping, well-drained and moderately well-drained soils that are clay loam throughout on glacial till.

Table 3.3-3 (continued)

Soil Association	Corridor C Area (acres)	Percent of Corridor C	Corridor C1 Area (acres)	Percent of Corridor C1	General Description
Forman - Aastad - Buse (SD135, MN116)	38,285	19.1	27,429	14.4	Nearly level to hilly, well-drained, and moderately well-drained soils that are clay loam throughout on glacial till.
Heimdal - Sisseton - Svea (SD138, MN018)	17,223	8.6	27,940	14.7	Well-drained and moderately well-drained soils that formed in loamy glacial drift.
Lamoure - La Prairie - Rauville (SD248, MN109)	2,482	1.2	1,430	0.8	Nearly level, moderately well-drained, and poorly drained soils on floodplains.
Ludden - Lamoure -Ladelle (SD139)	276	0.1	0	0	Poorly or very poorly drained and moderately drained, slowly or moderately slowly permeable soils that formed in clayey and silty alluvium on floodplains.
Peever - Forman - Tonka (SD136, MN478)	19,072	9.5	978	0.5	Well-drained and poorly drained, nearly level to gently sloping, loamy soils formed on till plains.
Ves-Canisteo-Colvin (MN113)	5,508	2.8	10,009	5.3	Well-drained and poorly drained, undulating, and nearly level soils formed in glacial till and lacustrine deposits.

Source: NRCS, 2005a.

3.4 Biological Resources

3.4.1 Introduction

Biological resources discussed for the proposed plant site, the proposed groundwater areas, and for each proposed corridor in this chapter include vegetation, wildlife, fisheries, special status species, and wetland/riparian areas. These resources make this region one of the most diverse ecosystems in North America. The local biological resources each have one or more roles in the functioning of local ecosystems and are also valuable to society in economic, recreational, and other non-ecological ways. These functions and values[8] have been assessed and examples include diverse plant communities that provide habitat for game and nongame species; productive aquatic environments for fish, invertebrates, and terrestrial vertebrates (otters, beavers, waterfowl, etc.) that rely on aquatic habitats; special status species and their role as indicators of healthy communities; and wetland/riparian areas that support and protect water resources. The following sections address the existing conditions for each biological resource present within the proposed plant site, the proposed groundwater areas, substation sites, for each proposed transmission corridor, and where known, the Hankinson transmission line.

[8] "Functions" refer to the ecological role that a species or natural feature plays in the larger ecosystem. For example, wetlands and other natural features have functions including habitat, flood storage, and water quality enhancement. "Values" are more subjective, and include the economic, recreational, aesthetic, or other value that society places on species and natural features.

Vegetation

The proposed Project area is characterized by a mosaic of naturally occurring vegetation types including shrublands, prairie remnants, deciduous forests, and wetland areas interspersed with agricultural and developed landscapes. Naturally occurring vegetation types provide ideal habitat for ecologically significant and rare plant species. South Dakota and Minnesota each maintain a separate classification system for identifying vegetative communities. To best correlate the two sets of data, vegetative communities for South Dakota and Minnesota were identified based on field reconnaissance data and South Dakota Gap Analysis Project (GAP) and Minnesota GAP resources generated by the USGS. While both states use GAP resources, each maintains a separate classification system for identifying vegetative communities. The data sets were combined by similar vegetation type into broad categories presented in the vegetation section. Based on this analysis, seven land cover types were identified within the proposed Project area. These vegetation types are agriculture, wetland/riparian/open water, forest, shrubland, prairie grassland, and developed areas.

In addition to plant community classification, ecological quality was assessed using two different data sources. For the proposed plant site and groundwater areas, the assessment was completed based on field reconnaissance data and was divided into three categories (i.e., low, medium, and high). These categories were determined by the ratio of native plant species to noxious plant species and the extent to which human disturbance has altered the landscape (Barr, 2004a and 2006a). For the proposed corridors, ecological quality was determined by satellite imagery, ground-truthed Minnesota County Biological Survey (MCBS) data, and land cover types. For purposes of this Final EIS, biological importance was divided into the categories of low, medium, and high and is evaluated on the basis on the number of rare species, the quality of the native plant communities, size of site, and context within the landscape (MnDNR, 2005a). Based on incompatibility between these two data sources, ecological quality assessments were not compared.

Many similarities in vegetative communities exist among the proposed plant site, the proposed groundwater areas, and corridors; however, collectively, the proposed corridors encompass a much greater area with higher quality habitat. There are many State and/or federally-managed areas where native plant and animal species are being preserved for economic and recreational value. These areas include State Wildlife Management Areas (WMA), Game Production Areas (GPA), MCBS Sites of Biodiversity Significance, National Wildlife Refuges (NWR), WPAs, Scientific and Natural Areas (SNA), and high priority areas. The WMAs are managed for native plants to support game species (e.g., waterfowl, pheasant, and white-tailed deer) and other wildlife (e.g., songbirds, small game mammals, and nongame animals). The WPAs are managed for native plants to facilitate breeding, foraging, and migratory habitat for waterfowl, water birds, and small mammals and reptiles. WPAs are managed by the U.S. Fish and Wildlife Service (USFWS) to preserve wetlands and grasslands critical to waterfowl and other wildlife. These public lands were included in the National Wildlife Refuge System in 1966 through the National Wildlife Refuge Administration Act. Funding for the acquisition of wetlands as WPAs was created by the passage of the Duck Stamp Act in 1934, and amended by Congress in 1958. Additionally, some WPAs have been donated as gifts, while a few have been reserved from public domain lands. GPAs in the South Dakota region of the proposed Project area are State-managed for hunting game (e.g., prairies and grasslands). High priority areas, as defined by the MnDNR and USFWS, are grassland and wetland conservation areas, which identify priority grassland and wetland habitat for wildlife conservation. The joint assessment identifies areas suitable for conservation and is a measurement of the integrity of the landscape for a full array of grassland and wetland wildlife species. MCBS Sites of Biological Significance are

State-ranked areas of native biodiversity including native plants, rare plants, and animals, and/or animal aggregations (MnDNR, 2005a). These areas are ranked based on their level of biodiversity including number of species, size of area, and quality of native habitat (MnDNR, 2005a). MCBS areas are ranked with moderate, high, or outstanding biodiversity importance.

Surveys for native prairie remnants were conducted in June and October 2005 by HDR throughout the proposed corridors. Prairie vegetation indicator species were identified for each area and the areas were subsequently classified along a moisture spectrum that ranged from dry habitats to wet habitats, with three intermediate classes between the dry and wet extremes. The identified areas contain rare native prairie species and rock outcrop communities and were identified by State agencies as conservation areas of importance.

The terms “noxious weed,” “invasive weed,” and “exotic weed” are often used interchangeably to describe any plant that is unwanted and grows or spreads aggressively. However, the term “noxious weed” is legally defined under both Federal and State laws. Under the 1974 Federal Noxious Weed Act (7 USC § 2802(c)), a noxious weed is defined as “any living stage, such as seeds and reproductive parts, of any parasitic or other plant of any kind, which is of foreign origin, is new to or not widely prevalent in the U.S., and can directly or indirectly injure crops, other useful plants, livestock, or poultry or other interests of agriculture, including irrigation or navigation, or the fish or wildlife resources of the U.S., or the public health.” Federal noxious weeds include 19 aquatic and wetland weeds, 62 parasitic weeds, and 56 terrestrial weeds, for a total of 137 species.

The prevention of the spread of noxious weeds and invasive species is a high priority for nearby communities. Under EO 13112 of February 3, 1999, – Invasive Species, Federal agencies shall not authorize, fund, or carry out actions likely to cause or promote the introduction or spread of invasive species in the U.S., or elsewhere unless it has been determined that the benefits of such actions outweigh the potential harm caused by invasive species. In addition, all feasible and prudent measures to minimize the risk of harm will be taken in conjunction with the actions.

In addition to federally-identified or listed noxious weeds, the Minnesota and South Dakota Departments of Agriculture each maintain a list of regulated and prohibited noxious weed species, some of which may occur within the proposed Project area (Table 3.4-1). In general, noxious weeds are defined as species declared by law as undesirable because they conflict with, restrict, or otherwise cause problems under management objectives (SDSU, 1999). In Minnesota, prohibited noxious weeds are defined as species that are injurious to public health, the environment, public roads, crops, livestock, or other property. These weeds must be controlled or eradicated as required in Minnesota Statutes 2005, Section 18.78, Control or Eradication of Noxious Weeds (Minnesota Department of Agriculture, 1999). Restricted noxious weeds (i.e., species which are illegal to import, sell, or transport) in Minnesota are listed because the only feasible means of controlling them is to prohibit the importation, sale, and transportation of them within the State. In South Dakota, prohibited noxious weeds are defined as species of any plant that the South Dakota Weed and Pest Control Commission has found to be detrimental to the production of crops or livestock or to the welfare of persons residing within the State. These weeds must be controlled or eradicated as required in South Dakota Codified Laws 38-22. The weed and pest program was formulated by the Commission to implement a method of prevention, suppression, control, and eradication of weeds and pests in South Dakota (SDDOA, 2005).

Appendix F, Table 5, Volume III provides a list of State-, county-, and local-listed noxious weed species and invasive species in South Dakota.

Table 3.4-1. State-Listed Noxious Weed Species

Noxious Weed Species
Minnesota [a]
Bull thistle
Canada thistle
Field bindweed
Garlic mustard
Hemp
Leafy spurge
Musk thistle
Perennial sow thistle
Plumeless thistle
Poison ivy
Purple loosestrife
Common and glossy buckthorn
South Dakota [b]
Canada thistle
Field bindweed
Leafy spurge
Purple loosestrife

[a] Designated as State prohibited/restricted.
[b] Designated as State prohibited.

Sources: HDR, 2005a, 2005b.

<u>Wildlife</u>

The proposed Project area is located within the Northern Glaciated Plains ecoregion of the Northern Great Plains. Wildlife habitat within the proposed Project area is composed of a patchwork of wetlands, riparian habitats, prairie remnants, agricultural landscapes, pasture grasslands, and forest. These habitats provide year-long and seasonal habitat for a number of birds, mammals, fish, reptiles, amphibians, and insects. A list of common mammals, birds, reptiles, and amphibians that have been documented by the MnDNR; the Minnesota Ornithologists' Union; the Minnesota Herpetological Society; and the South Dakota Game, Fish and Parks Department (SDGFP) is presented in Appendix F, Table 1, Volume III.

Numerous wetlands are responsible for making this region one of North America's most important waterfowl breeding areas. These wetlands are also important stopovers for great concentrations of migrating waterfowl, songbirds, and shorebirds in spring and fall. The area's rivers and wetlands also provide habitat for mammals, including beaver and muskrat. The tall grass prairies of this region provide habitat for unique bird and mammal species, many of which have declined because of habitat loss. The valley bottoms provide a rich and diverse habitat for many species of wildlife, including large and small game animals, songbirds, waterfowl, and furbearers. Brushy, wooded hills bordering the river bottoms with agricultural fields, swamps, and wetlands provide both food and cover. Woodlands in the area provide breeding and seasonal habitat for warblers and other songbirds and serve as a wintering area for white-tailed deer. Woodlands along the rivers also provide nesting habitat for wood ducks and mergansers. Appendix F, Table 1, Volume III lists wildlife species that could be found in the proposed Project area.

Nongame birds encompass a variety of passerine (perching and song birds), water birds, and raptor species, most of which are protected under the Migratory Bird Treaty Act (MBTA) (16 USC 703-712). EO 13186, "Responsibilities of Federal Agencies to Protect Migratory Birds," was issued to ensure that environmental analyses of Federal actions evaluate the impacts of actions and agency plans on migratory birds. The EO also states that emphasis should be placed on protecting migratory bird species listed in the Code of Federal Regulations (CFR) 50, Article 10.13, priority habitats, and key risk factors. The Minnesota River Valley is recognized as a major component of the Central Flyway for migrating birds, and more than 320 species of birds have been recorded in the valley. Bird species that commonly occur in the proposed Project area are presented in Appendix F, Table 1, Volume III.

Many similarities in wildlife habitat and species composition exist between the proposed plant site, the proposed groundwater areas, and transmission corridors; however, collectively, the proposed corridors encompass a much greater area with higher quality habitat. Therefore, the discussion of game and nongame animals is more extensive for the proposed corridors than for the proposed plant site and proposed groundwater areas.

Fisheries

Waterbodies within the proposed Project area provide habitat for fish and invertebrate communities, which represent important components of the aquatic environment. Fish communities include a mixture of warm-water and cold-water species. As a result of management focus, important fisheries include game and native fish species. This section deals mainly with game fish, while special status species are discussed in the following section and in Sections 3.4.2.4 and 3.4.3.4. Aquatic invertebrates are also included in this section because of their importance as water quality indicators and role as food sources for fish.

An issue that has been identified for the proposed Project area is mercury levels in fish tissue. Minnesota has had a fish consumption advisory for mercury since 1999. Based on the 2004 Minnesota 305(b) Report (MPCA, 2004b), fish in the Minnesota River and numerous tributaries, such as Lac qui Parle, Yellow Medicine, and Chippewa rivers, contain levels of mercury contamination high enough to warrant fish consumption advisories. Fish consumption advisories for lakes and reservoirs located within the proposed Project area are discussed in Section 3.2.

Special Status Species

Sensitive species identified for the proposed Project include both special status species and species of concern. Special status species are those species for which State or Federal agencies afford an additional level of protection by law, regulation, or policy. Included in this category are federally-listed and -proposed species that are protected under the Endangered Species Act, or are considered as candidates for such listing by the USFWS, and those species that are State-listed as threatened or endangered. Minnesota and South Dakota species of concern are those that are uncommon or have unique or highly specific habitat requirements.

Plant Species

Special status plant species that may occur within the proposed Project area include 27 terrestrial and aquatic species (nine special status species and 18 species of special concern) (USFWS, 2005a; USFWS 2005b; USFWS 2005c; MnDNR, 2005a; MnDNR, 2005b;

SDGFP, 2005a; SDGFP, 2004a; SDGFP, 2004b). These species, their associated habitats, and their potential for occurrence within the proposed Project area are summarized in Appendix F, Table 2, Volume III. Occurrence potential within the proposed Project area was evaluated for each species based on its habitat requirements and/or known distribution. If no suitable habitat or recorded observations were available, the likelihood of a species occurring within the proposed Project area was decreased, allowing the species to be dropped from detailed analysis. Based on these evaluations, no special status plant species were eliminated from detailed analysis.

Terrestrial Wildlife Species

A total of 16 special status terrestrial wildlife species (6 special status species and 10 species of concern) were identified as potentially occurring within the proposed Project area (USFWS, 2005a; USFWS, 2005b; USFWS, 2005c; MnDNR, 2005a; MnDNR, 2005b; SDGFP, 2005a; SDGFP, 2004a; SDGFP, 2004b). Occurrence within the proposed Project area was evaluated for each species based on its habitat requirements and/or known distribution. If no suitable habitat or recorded observations were available, the likelihood of a species occurring within the proposed Project area was decreased, allowing the species to be dropped from detailed analysis. Based on these evaluations, no terrestrial species were eliminated from detailed analysis. Special status species, their associated habitats, and their occurrence within the proposed corridors are listed in Appendix F, Table 2, Volume III.

Aquatic Species

Special status aquatic species that may occur in the proposed Project area include fish and freshwater mussels. A total of 11 fish species may occur in waterbodies located within the proposed plant site, proposed groundwater areas, or corridors (USFWS, 2005a; USFWS, 2005b; USFWS, 2005c; MnDNR, 2005a; MnDNR, 2005b; SDGFP, 2005a; SDGFP, 2004a; SDGFP, 2004b). The list includes one federally-listed species, three State-listed species and seven species of special concern (Appendix F, Table 1, Volume III). In addition, 16 mussels (six State-listed species and 10 species of special concern) may occur in rivers or streams located within the proposed plant site, proposed groundwater areas, or corridors. No federally-listed mussel species occur in the proposed Project area. Known occurrences and habitat used by these species are summarized in Appendix F, Table 2, Volume III. The occurrence of these species in the proposed Project area was evaluated using known distribution and habitat requirements. Based on these evaluations, one fish species (Topeka shiner) was eliminated from further consideration.

<u>Wetland/Riparian Areas</u>

Wetlands provide many functions and values that directly or indirectly benefit society, such as flood storage and storm water control, stream baseflow (i.e., the usual, reliable, background level of a river or stream, maintained generally by seepage from groundwater infiltration) and groundwater support, erosion and shoreline protection, water quality improvement, biological support, wildlife habitat functions, and cultural values.

The relative amount of any given function provided by a particular wetland depends on many factors, such as the size of the wetland, topography, geology, hydrology, types and distribution of habitat present, relationship between the wetland and adjacent ecosystems, and surrounding land uses.

Wetlands in South Dakota and Minnesota are subject to regulation under Section 404 of the CWA, providing that such wetlands meet the definition of WUS (33 CFR 328). The USACE determines if wetlands are considered WUS, and therefore, under USACE jurisdiction.

In Minnesota, wetlands are also regulated under the Wetland Conservation Act (see Minn. Stat. §1036.222-.2373) requiring coordination with the Minnesota Board of Water and Soil Resources, and Section 404 of the CWA by the USACE. Public waters wetlands also are regulated by the MnDNR under Minn. Stat. Section103G.005, Subdivision 15a.

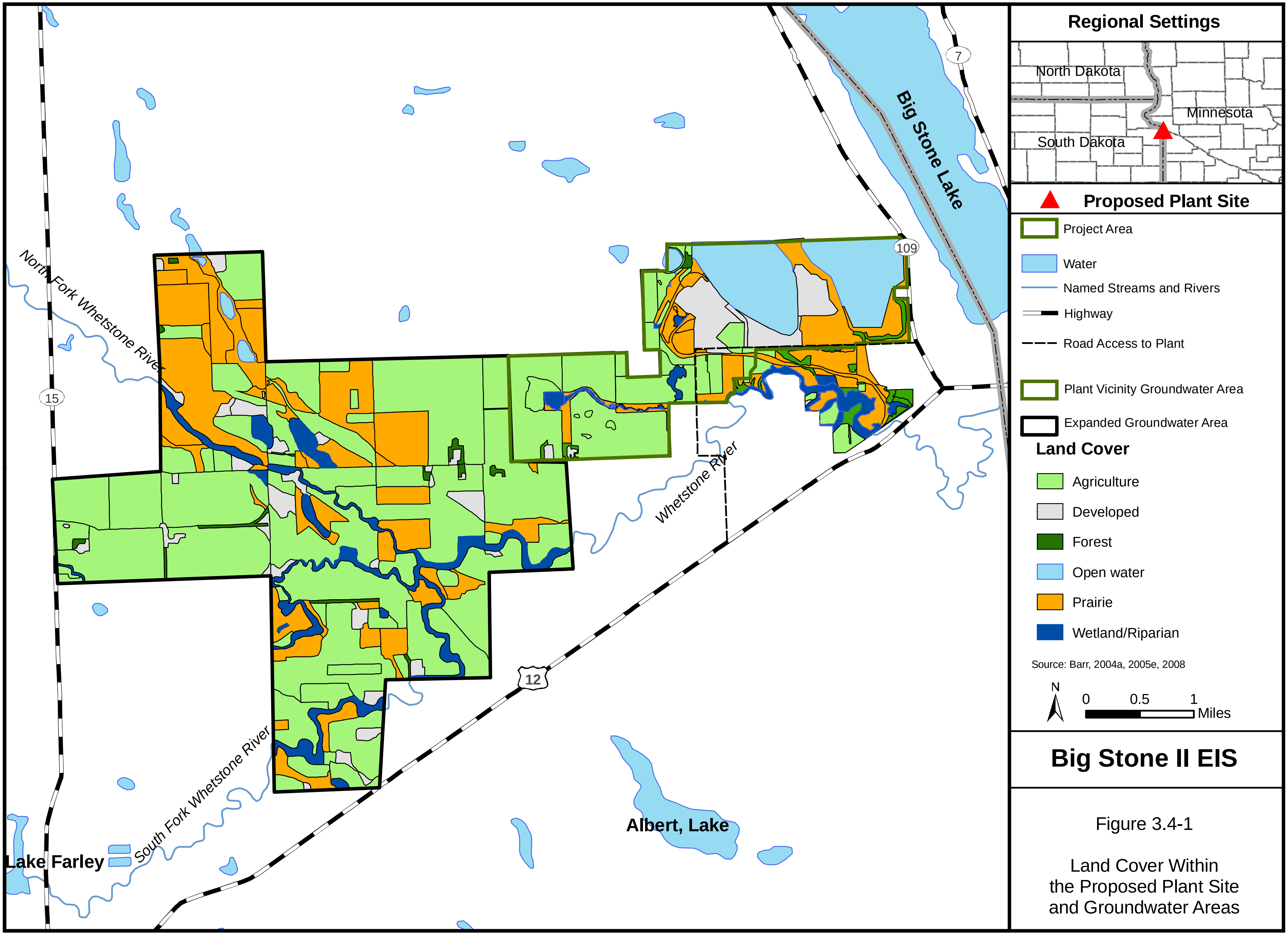
The USFWS maintains the National Wetlands Inventory (NWI) database where wetland areas of the U.S. are mapped from aerial imagery in accordance with the wetlands definition and classifications presented in Cowardin et al., 1979. The MnDNR, Division of Waters, maintains Public Waters Inventory (PWI) maps and database for waters within the State. The PWI maps include both public waters and public water wetlands as defined in Minn. Stat., Section 103G.005, Subdivision 15a. Public waters wetlands within Minnesota include the following types: three (inland shallow fresh marshes), four (inland deep fresh marshes), and five (inland open shallow fresh water ponds or reservoirs) wetlands as identified in Cowardin et al., 1979. Thus, while the NWI and PWI maps and databases are closely related, they represent slightly different sets of categories and data, and thus, map somewhat different areas. For purposes of this discussion of wetlands affected by the proposed Project, the NWI database and maps have been used as the primary data source to allow consistency of approach between affected areas in both States. For those portions of the proposed corridors that occur in Minnesota, the acreage of PWI waters/wetlands and mileage of stream segments are discussed in Section 3.2.

3.4.2 Big Stone II Plant Site and Groundwater Areas

3.4.2.1 Vegetation

Proposed Big Stone II Plant Site

The proposed plant site is located within the Northern Glaciated Plains/Minnesota River Prairie ecoregion (USEPA, 2003). Land cover types present within the existing and proposed plant sites were delineated in September 2004 and are illustrated on Figure 3.4-1. Seven land cover types were identified within the existing and proposed plant sites during field reconnaissance activities (Table 3.4-2). The area consists primarily of a fragmented patchwork of tallgrass and shortgrass prairie remnants, deciduous forests, wetland/riparian/open water habitats, agriculture, and developed areas. Figure 3.4-2 illustrates the various quality categories of the land cover types present within the proposed plant site.



Big Stone II EIS

Figure 3.4-1

Land Cover Within the Proposed Plant Site and Groundwater Areas

Most of the existing and proposed plant sites include disturbed and/or degraded land cover types, with perennial row crops and non-native grasslands accounting for over half of the total area. In general, more than 87 percent (2,814 acres) of the total vegetative cover is rated as low ecological quality based on land type and wetland delineation analysis (Barr, 2004a). Low ecological quality areas are widespread throughout the existing and proposed plant sites and consist of farmsteads, hayfields, impoundments, industrial areas, row crops, disturbed grasslands, roadways, and rail yards. Noxious and invasive species contribute approximately 40 to 100 percent of vegetative cover in low ecological quality areas. Overall, natural processes and human disturbances have altered the landscape, and the present plant communities do not resemble typical naturally occurring communities.

Plant communities with medium ecological quality comprise approximately 359 acres (11.2 percent) of the existing and proposed plant sites (Barr, 2004a). Medium ecological quality areas are concentrated in the southern and northwestern portion of the existing and proposed plant sites and consist of northern bur oak openings, northern bur oak mesic forests, grassland pasture, mixed deciduous woodlands, wooded pastures, and wetlands. In medium ecological areas, noxious and invasive species contribute approximately five to 40 percent of total vegetation cover and do not exceed the vegetation cover provided by native vegetation communities. In general, these plant communities have been affected by human disturbances, but the nature of the communities has not been altered beyond recognition.

Table 3.4-2. Land Cover Types – Existing and Proposed Plant Site

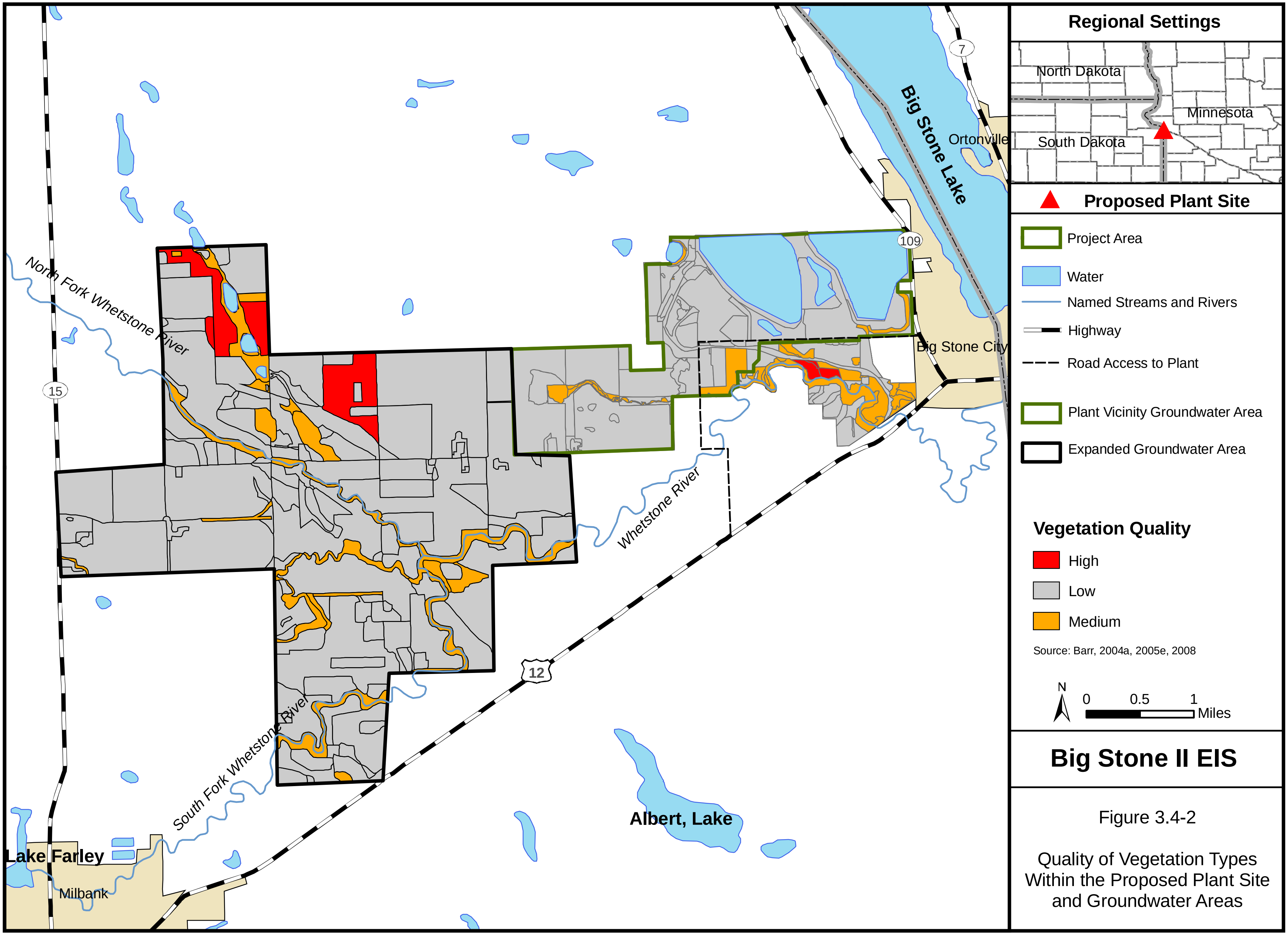
	Cover Types	Acres[a]	Percent
Vegetation Cover	Agriculture	1,116	35.0
	Wetland/Riparian	124	3.9
	Forest	234	7.4
	Shrubland	0	0.0
	Prairie	690	21.6
Non-vegetation Cover	Open Water	717	22.5
	Developed	307	9.6
Total		3,188	100.0

[a] Values are approximate due to rounding.

Source: Barr, 2004a

Areas of high ecological quality total approximately 27.5 acres (less than one percent) of the existing and proposed plant sites (Barr, 2004a). High ecological quality areas are concentrated near the Whetstone River in the southern portion of the existing and proposed plant sites and consist of native cordgrass wet prairie, northern bur oak mesic forest, and northern plains transitional bluestem prairie. Noxious and invasive species comprise less than five percent of the total vegetative cover in this area. Little or no evidence of human disturbances, such as logging or livestock grazing, are present within this area.

In addition to the State noxious weed species list outlined in the Biological Resources introduction above, Grant County, South Dakota, also maintains a county-specific list of species (i.e., absinth wormwood, spotted knapweed, and bull thistle) some of which may occur within the proposed plant site. Control and management techniques for these noxious weeds within Grant County would be determined through consultation with the Grant County Weed Supervisor.



Big Stone II EIS

Figure 3.4-2

Quality of Vegetation Types Within the Proposed Plant Site and Groundwater Areas

During field reconnaissance activities, several other non-native, invasive species were identified. In forested areas, invasive species include buckthorn, Tartarian honeysuckle, and garlic mustard (Appendix F, Table 5, Volume III). In prairie communities, invasive species include red cedar, leafy spurge, smooth brome, and Kentucky bluegrass. While these species are not recognized by the State of South Dakota as prohibited or restricted noxious weeds, they are rapid colonizers of disturbed plant communities and may demonstrate similar characteristics of weedy species.

Groundwater Areas

The expanded groundwater area is located within the Northern Glaciated Plains/Minnesota River Prairie ecoregion (USEPA, 2003). Land cover types were delineated within the expanded groundwater area by OTP in October 2006 and are illustrated on Figure 3.4-1. The area consists primarily of a fragmented patchwork of tallgrass and shortgrass prairie remnants, deciduous forests, wetland/riparian and open water habitats, agriculture, and developed areas.

Table 3.4-3. Land Cover Types – Expanded Groundwater Area

	Cover Types	Acres[a]	Percent
Vegetation Cover	Agriculture	4,920	63.9
	Wetland/Riparian	537	7.0
	Forest	72	0.9
	Shrubland	0	0.0
	Prairie	1,807	23.5
Non-vegetation Cover	Open Water	34	0.4
	Developed	325	4.2
Total		7,695	100.0

[a]Values are approximate due to rounding.

Source: Barr, 2008

Figure 3.4-2 illustrates the various quality categories of the land cover types present within the expanded groundwater area.

Most of the land within the expanded groundwater area includes disturbed or degraded land cover types, with perennial row crops and non-native grasslands accounting for over half of the total area. Over 86 percent (6,622 acres) of the total vegetative cover is rated as low ecological quality based on vegetation type. Low ecological quality areas are widespread throughout the area and consist of farmsteads, hayfields, industrial areas (quarries), row crops, disturbed grasslands, and roadways. Noxious and invasive species contribute approximately 40 to 100 percent of vegetative cover in those low ecological quality areas not devoted to agricultural production. Noxious and invasive species (see Appendix F, Table 5, Volume III) contribute less than 10 percent cover in agricultural areas; however, the presence of single species in agricultural areas creates greatly reduced ecological quality. Overall, natural processes and human disturbances have altered the landscape, and the present plant communities do not resemble typical naturally occurring communities. Plant communities with medium ecological quality comprise approximately 727-acres (9.5 percent) of the expanded groundwater area. Medium ecological quality areas consist of hardwood forest stands, pine plantation forest, grassland pasture, mixed deciduous woodlands, wooded pastures, and wetlands. In medium ecological areas, noxious and invasive species contribute 5 to 40 percent of total vegetation cover and do not exceed the vegetation cover provided by native vegetation communities. In general, these plant communities have been affected by human disturbances but the nature of the communities has not been altered beyond recognition.

Areas of high ecological quality total approximately 345 acres (4.5 percent) of the expanded groundwater area. High ecological quality areas are concentrated on the north side of the area and consist of northern plains transitional bluestem prairie. Portions of the 160-acre Federal VanHout WPA are located within the high ecological quality zone. WPAs are public lands managed by the USFWS, with an objective to preserve wetlands and grassland nesting areas critical to waterfowl and other wildlife. Noxious and invasive species comprise less than five percent of the total vegetative cover in this area. Little or no evidence of human disturbances, such as logging or livestock grazing, are present within this area.

3.4.2.2 Wildlife

Proposed Big Stone II Plant Site

With the exception of 387 acres of moderate to high quality habitat, wildlife habitat in the vicinity of the proposed plant site is primarily disturbed or degraded, providing little value to area wildlife. Of the 387 acres, approximately 28 acres represent high quality habitat near the Whetstone River in the southern portion of the proposed plant site with native cordgrass wet prairie, northern bur oak mesic forest, and northern plains bluestem prairie species. The remaining 359 acres of moderate quality habitat occur primarily in the southern and northwestern portions of the proposed plant site and include deciduous forest, wetlands, and open water.

Additionally, other quality areas within the vicinity of the proposed plant site include Marsh and Lac qui Parle lakes, which are WMAs and public hunting grounds. The nearby Big Stone NWR consists of wetlands and tallgrass prairie and is an important production and migration area for waterfowl, shorebirds, and other waterbirds. Several State parks are located within the Upper Minnesota River watershed including Big Stone Lake State Park, with three separate units along the headwater lake and Lac qui Parle State Park located at the lower end of Lac qui Parle Lake.

<u>Big Game Species</u>

Available hunting statistics for the proposed plant site and corridors are limited to estimated harvest projections (SDGFP, 2005b; MnDNR, 2005c). White-tailed deer are the only big game animal hunted in the vicinity of the proposed plant site. The projected 2004 harvest estimate for white-tailed deer in Grant County is 800 animals (SDGFP, 2005b). White-tailed deer are habitat generalists inhabiting farmlands, forests, and riparian areas (MnDNR, 2005c). The existing plant and the proposed plant sites combined equal approximately 3,201 acres with approximately 778 of those acres in State-managed GPAs.

<u>Small Game Species</u>

The Northern Glaciated Plains Ecoregion is known as one of the most important waterfowl production areas in North America (USEPA, 2003). A variety of ducks occur within the proposed plant site. As mentioned in the Big Game Species section above, the area encompassing the existing and proposed plant site has approximately 778 acres of GPAs.

Small game species that occur in the region include mourning dove, pheasant, wild turkey, rabbits, squirrels, and furbearers. Mourning doves prefer mowed, plowed, or disturbed agricultural fields with nearby available water. Pheasants roost in areas of short- to medium-height grass or weeds and commonly forage in grain and corn fields. Wild turkeys inhabit forest habitat interspersed with agricultural fields (Alsop III, 2001). The greater prairie chicken inhabits mid-grass to tallgrass prairie, often interspersed with cropland.

<u>Nongame Species</u>

Nongame species (e.g., small mammals, passerines, raptors, amphibians, and reptiles) occupy a variety of habitat types within the proposed plant site. Small mammals provide a substantial prey base for the area's predators including mammals, raptors, and reptiles.

Representative raptor species that occur in the proposed plant site include eagles and falcons (see Appendix F, Table 1, Volume III). The bald eagle is a special status species and is discussed further in Section 3.4.2.4.

Other nongame animals that occur in the proposed plant site include amphibians (toads and frogs) and reptiles (turtles, lizards, skinks, and snakes) (see Appendix F, Table 1, Volume III).

Groundwater Areas

Moderate to high quality wildlife habitat is present within the expanded groundwater area and provides year-long and seasonal habitat for a number of birds (including raptors), mammals, fish, reptiles, amphibians, and insects (see Appendix F, Tables 1 and 2, Volume III). Although much of the area is agricultural in nature and of low quality habitat, high quality habitat exists near the Whetstone River with northern bur oak mesic forest and northern plains bluestem prairie species. Moderate quality habitat occurs in the remaining areas and includes mixed hardwood riparian corridors, agricultural areas, deciduous forest, and wetlands.

Additionally, the expanded groundwater area is along the western edge of a merging route between the Atlantic and Mississippi migratory flyways. Waterfowl migrating along this route may use the wetlands within the expanded groundwater area as stopovers. Moreover, the expanded groundwater area is within an area used by waterfowl for travel between quality areas in the vicinity, including Marsh and Lac qui Parle Lakes, which are WMAs and public hunting grounds. The nearby Big Stone NWR consists of wetlands and tallgrass prairie. The Refuge is an important production and migration area for waterfowl, shorebirds, and other waterbirds. There are several State parks located within the Upper Minnesota River watershed. These State parks include Big Stone Lake State Park, with three separate units along Big Stone Lake, and Lac qui Parle State Park, which is located at the lower end of Lac qui Parle Lake.

<u>Big Game Species</u>

White-tailed deer is the only big game species hunted in the vicinity of the expanded groundwater area. The projected 2006 total harvest estimate for white-tailed deer in Grant County was 739 animals (SDDW, 2007). White-tailed deer inhabit farmlands, forests, and riparian areas (MnDNR, 2005c).

<u>Small Game Species</u>

The discussion of small game species (e.g., pheasant, ducks, geese, rabbits, squirrel, and fox) for the proposed plant site in Section 3.4.2.2 above applies to the proposed plant site and the expanded groundwater area. The Northern Glaciated Plains Ecoregion is known as one of the most important waterfowl production areas in North America (USEPA, 2003).

The expanded groundwater area provides diverse habitats that promote small game production. These habitats include upland grasslands and row crops for pheasant, marshes that support ducks and geese, and transitional areas between forests and grasslands that support cottontail rabbit, fox squirrels, and red and grey fox. Quail and mourning dove may also find suitable habitat in the expanded groundwater area.

3.4.2.3 Fisheries

Proposed Big Stone II Plant Site

Two waterbodies, Big Stone Lake and the Whetstone River, provide habitat for aquatic species within the vicinity of the proposed plant site; both contain a mixture of warm-water and cold-water fish species. Ten fish families are present in these waterbodies, with sunfishes, perches, and minnows containing the most species (Table 3.4-4). Scientific names of all fish species mentioned in this section are provided in Appendix F, Table 3, Volume III. Fish populations in Big Stone Lake are managed cooperatively by the MnDNR and SDGFP, with the primary game fish species being walleye and yellow perch. Stocking efforts during the past five years have included walleye and channel catfish (MnDNR, 2004). Other game fish populations in the lake are sustained by natural reproduction. Aquatic habitat consists of deep water and shallow bays. The primary game fish species in the Whetstone River include northern pike, smallmouth bass, and walleye (NPS, 2000). The river contains a mixture of riffles and pools and frequent sections of relatively dense wooded riparian vegetation.

Table 3.4-4. List of Fish Species – Big Stone Lake and Whetstone River

Families	Species
Sunfishes	Rock bass[a], pumpkinseed[a], orangespotted sunfish[a], bluegill[a,] smallmouth bass[a], largemouth bass[a], white crappie[a], black crappie[a]
Catfishes	Black bullhead[a], yellow bullhead[a], channel catfish[a], stonecat
Suckers	White sucker, shorthead redhorse, bigmouth buffalo[a]
Minnows	Carp, common shiner, golden shiner, emerald shiner, fathead minnow, creek chub
Perches	Johnny darter, yellow perch[a], logperch, walleye[a], sauger[a], saugeye
Temperate Basses	White bass[a]
Pike	Northern pike[a]
Sticklebacks	Brook stickleback
Drum	Freshwater drum
Eels	American eel

[a]Game fish species.

Source: Neumann and Willis, 1994.

Freshwater mussel surveys were conducted in Big Stone Lake in 1989 (Bright et al., 1990). Two species, floater and lilliput, were present. No special status mussel species were found in the collections.

Groundwater Areas

The North Fork of the Whetstone River and the South Fork of the Whetstone River merge into the Whetstone River within the expanded groundwater area. These tributaries provide the same habitat as described above. Fisheries in the portions of the Whetstone River and its tributaries within the expanded groundwater area are currently dominated by species considered rough fish. These species include rock bass, bullheads, bluegills, carp, sticklebacks, various species of shiners and minnows, largemouth and smallmouth bass, and crappies.

3.4.2.4 Special Status Species

Proposed Big Stone II Plant Site

Plant Species

Twenty-five special status plant species may occur within the proposed plant site. Of these 25 species, five plant species have been documented within the proposed plant site including slender milkvetch, black disc lichen, larger water-starwort, ball cactus, and tumblegrass (see Appendix F, Table 2, Volume III).

Terrestrial Species

Sixteen special status terrestrial species may occur within the proposed plant site including two mammals, five birds, three reptiles, and six invertebrates. Of these 16 species, the bald eagle is the only special status species documented in the vicinity of the proposed plant site. A bald eagle nest occurs approximately 0.3 miles from the proposed plant site boundary and approximately 1.3 miles from the primary construction area (see Appendix F, Table 2, Volume III). Bald eagles are known to winter in the open water areas of the vicinity of the proposed plant site (SDGFP, 2004a, 2006).

Aquatic Species

Known occurrences of special status aquatic species include six fish and five mussels (Appendix F, Table 2, Volume III). Lake sturgeon and blue sucker are known to occur in the lower portion of the Minnesota River and could use upper- and mid-portions of the river during movements. The other fish and mussel species have been collected in the North Fork Whetstone, Whetstone, or Minnesota rivers near or downstream of the proposed plant site.

Groundwater Areas

Plant Species

Twenty-five special status plant species may occur within the expanded groundwater area. These special status species are the same as described in Appendix F, Table 2, Volume III.

Terrestrial Species

Sixteen special status terrestrial species may occur within the expanded groundwater area, including two mammals, five birds, three reptiles, and six invertebrates (see Appendix F, Table 2, Volume III). Of these 16 species, the bald eagle, the northern river otter, and the spiny soft-shell turtle are the only special status species documented in the vicinity of the expanded groundwater area. A bald eagle nest north of the existing Big Stone II plant was destroyed during a storm on May 5, 2007, but was subsequently rebuilt in the same general area during 2007. Bald eagles are known to winter in the open water areas in the vicinity of the proposed plant site (SDGFP, 2004a, 2006). A northern river otter was observed in the Whetstone River in July 2006 and in the North Fork of the Whetstone River in 2004. Spiny softshell turtles have been observed in the North Fork of the Whetstone River during summertime surveys.

Aquatic Species

The special status aquatic species known to occur in the expanded groundwater area include four fish (blackside darter, rosyface shiner, hornyhead chub, and golden redhorse) and five mussels (threeridge, cylindrical papershell, Wahbas pigtoe, plain pocketbook, and fatmucket) (see Appendix F, Table 2, Volume III).

3.4.2.5 Wetland/Riparian Areas

Proposed Big Stone II Plant Site

Preliminary wetland delineations were conducted at the proposed plant site in September 2004. Delineation methods followed guidelines presented in the *U.S. Army Corps of Engineers Wetland Delineation Manual* (USACE, 1987). Wetlands were classified following the *Wetlands of the United States* ("Circular 39") guidance (Shaw and Fredine, 1971), USFWS NWI mapping system (USFWS, 1990), and the *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al., 1979).

Wetland boundaries were delineated and wetland acreages were calculated for wetlands observed at the proposed plant site. The wetland delineation survey identified 18 wetland areas totaling approximately 104.8 acres located within the proposed plant site (Table 3.4-5, Figure 3.4-3). Wetland types observed within the proposed plant site include:

- Palustrine emergent (PEM) – 14 wetlands totaling 100.1 acres.
- Palustrine forested (PFO) – four wetlands totaling 4.7 acres.

The delineation and jurisdictional determination for wetlands present within the proposed plant site was completed in June 2005 during a field inspection with a USACE representative. Of the 18 wetlands identified, three wetlands totaling 82.4 acres are tributary to WUS, and are therefore under the jurisdiction of the USACE. These wetlands are "part of a surface water tributary system," which implies that they are connected to surface water that discharges into a lake, pond, river, stream, or other surface water feature. The remaining 15 wetlands are isolated (i.e., they have no surface hydrologic connection to other wetlands or streams). Isolated wetlands are not considered jurisdictional wetlands under the regulatory authority granted to the USACE by Section 404 of the CWA. However, adverse impacts to isolated waters may also require mitigation.

The Minnesota Rapid Assessment Methodology (MnRAM) version 3.0 was used to assess wetland functions in the jurisdictional wetlands, including the three jurisdictional wetlands. The results indicate that the largest wetland, Wetland-8, provides moderate levels of all MnRAM-evaluated wetland functions except fishery habitat and commercial utilization. Wetland-8 functions primarily as a groundwater recharge area. Wetland-9 provides a high level of wildlife habitat function, and moderate levels of fishery habitat, flood storage, and downstream water quality. These wetlands, which are connected with a watercourse, are groundwater recharge/discharge areas. The results of the function assessment are summarized in Table 3.4-6.

Table 3.4-5. Wetlands Present at the Proposed Plant Site

Wetland Number	"Circular 39" Type[a]	Wetland Type[b,c]	Acres	USACE Jurisdictional Wetland
1	1	PEM	1.2	No
2	2/3	PEM	5.2	No
3	1	PEM	0.9	No
4	2/3	PEM	0.8	No
5	1	PEM	0.5	No
6	2	PEM	0.2	No
7	2/7	PFO	0.3	No
8	2/4	PEM	52.0	Yes
9	2	PEM	13.7	Yes
10	2/3	PEM	16.7	Yes
11	2	PEM	0.3	No
12	2/7	PFO	1.8	No
13	2/7	PFO	0.8	No
14	2/7	PFO	1.8	No
15	2	PEM	1.6	No
16	1	PEM	3.4	No
17	1	PEM	1.4	No
18	1	PEM	2.2	No
Total	—	—	104.8	—

[a]Type 1 = Seasonally flooded basins, Type 2 = Wet meadows, Type 3 = Shallow marsh, Type 4 = Deep marsh, Type 7 = Wooded swamp.
[b]A PEM wetland type refers to a wetland vegetation pattern in which persistent and non-persistent grasses, rushes, sedges, forbs, and other herbaceous or grass-like plants are the dominant vegetation (NJDEP, 2005).
[c]A PFO wetland type refers to a wetland vegetation pattern in which tree species with an average height greater than 20 feet are the predominant vegetation (NJDEP, 2005).

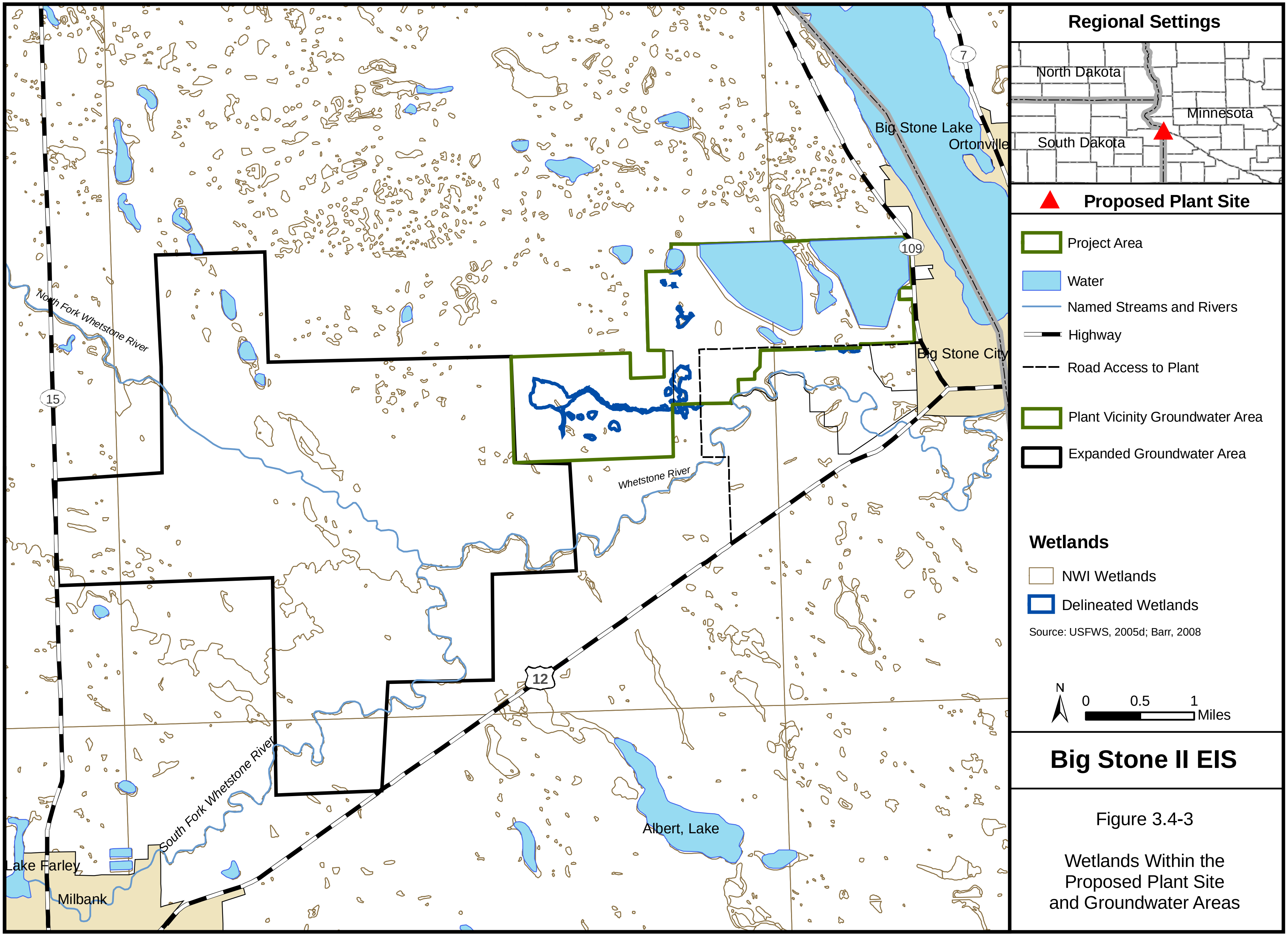
Source: Barr, 2004a.

Table 3.4-6. Assessment of Jurisdictional Wetlands[a]

Wetland Number	Hydrologic Regime	Flood Storage	Downstream Water Quality	Wetland Water Quality	Wildlife Habitat	Fishery Habitat	Amphibian Habitat	Aesthetics, Recreation, Education	Commercial	Groundwater Interaction
8	M	M	M	M	M	L	M	M	L	R
9	M	M	M	L	H	M	L	L	L	C
10	M	M	M	M	M	L	M	M	L	R

[a]H= High, M = moderate, L= Low, R=Recharge, C= Combination Recharge/Discharge.

Source: Barr, 2004a.



Big Stone II EIS

Figure 3.4-3

Wetlands Within the Proposed Plant Site and Groundwater Areas

Major public surface water resources in the vicinity of the proposed plant site include Big Stone Lake, the lower reaches of the Whetstone River, and the upper Minnesota River. These features are considered other WUS and are generally afforded the same protection as those granted to wetlands under the CWA. Further discussion of these resources and related issues is provided in Section 3.2.

USACE is the final regulatory authority for wetlands and other WUS identified within the proposed plant site boundary and would provide the final determination and approval of the WUS boundaries.

Groundwater Areas

Wetlands on the USFWS NWI within the proposed Project area and USACE delineated wetlands on the proposed plant site are shown in Figure 3.4-3. Wetlands that are part of the tributary systems to the Whetstone River are under the jurisdiction of the USACE. These wetlands are part of a surface water tributary system, which implies that they are connected to surface water that discharges into a lake, pond, river, stream, or other surface water feature. The Co-owners have not completed wetland determinations within the expanded groundwater area, nor has the USACE made any jurisdictional determinations within the area. Other wetlands within the area are isolated, meaning they have no surface hydrologic connection to other wetlands or streams. Table 3.4-7 shows a summary of wetland types within the expanded groundwater area.

Table 3.4-7. Wetland Types – Expanded Groundwater Area

Classification[a]	Number of Wetlands	Area (acres)	Percent of Total Wetlands	Percent of Total Area
Palustrine emergent, temporarily flooded	35	36.5	33.3	14.2
Palustrine emergent, seasonally flooded	47	134.5	44.8	52.4
Palustrine emergent, semipermanently flooded	6	69.6	5.7	27.1
Palustrine forested, temporarily flooded	6	8.6	5.7	3.4
Palustrine aquatic bed, semipermanently flooded	9	6.5	8.6	2.5
Palustrine unconsolidated bed, semipermanently flooded	2	0.9	1.9	0.4
TOTAL	105	256.6	100.0	100.0

[a] Summary of Cowardin Classifications and Hydrologic Regimes of All Impacted Wetlands in the Minimum two-foot drawdown boundary for the Revised Proposed Action (without special modifiers for draining, ditching, excavating). Palustrine wetlands in the expanded groundwater area are generally marshes that form in depressions on the landscape, with emergent (cattails, sedges), forested (black ash), or scrub-shrub (willows) plants as dominant vegetation. Palustrine wetlands are generally not directly adjacent to a river or lake.
Source: Barr, 2008.

3.4.3 Transmission Corridors, Substations, and Other System Improvements

3.4.3.1 Vegetation

GAP resources generated by the MnDNR and SDGFP, as well as field reconnaissance data collected in 2005, were used to identify specific land cover types within the proposed corridors. GAP data indicates that the land within the proposed corridors consists primarily of agricultural land (on average 94.7 percent). Other classifications include riparian/wetland/open water (3.0 percent), forest (1.4 percent), shrubland (0.4 percent), prairie remnants (0.04 percent), and developed land (0.5 percent). Table 3.4-8 lists the land cover types and associated acreages present within each proposed corridor. Specific information regarding land cover types that occur within the proposed corridors is provided in the following text. Figure 3.4-4 illustrates the land cover types within the proposed corridors.

Table 3.4-8. Land Cover Types for each Proposed Corridor

Land Cover Types	Corridor A (acres)	Corridor B (acres)	Corridor B1 (acres)	Corridor C (acres)	Corridor C1 (acres)
Agriculture	75,925	145,742	152,654	186,602	180,960
Wetland/Riparian	3,617	2,694	2,417	6,818	3,348
Open Water	1,736	484	493	608	1,060
Forest	576	1,467	1,507	4,309	2,823
Shrubland	62	702	652	1,011	1,011
Prairie	198	40	40	0	0
Developed	521	815	669	1,022	957
Total	82,635[a]	151,943[a]	158,431[a]	200,371[a]	190,159[a]

[a]Total values are approximate due to rounding.

Source: USEPA, 2003; USGS, 2002; MnDNR, 2002.

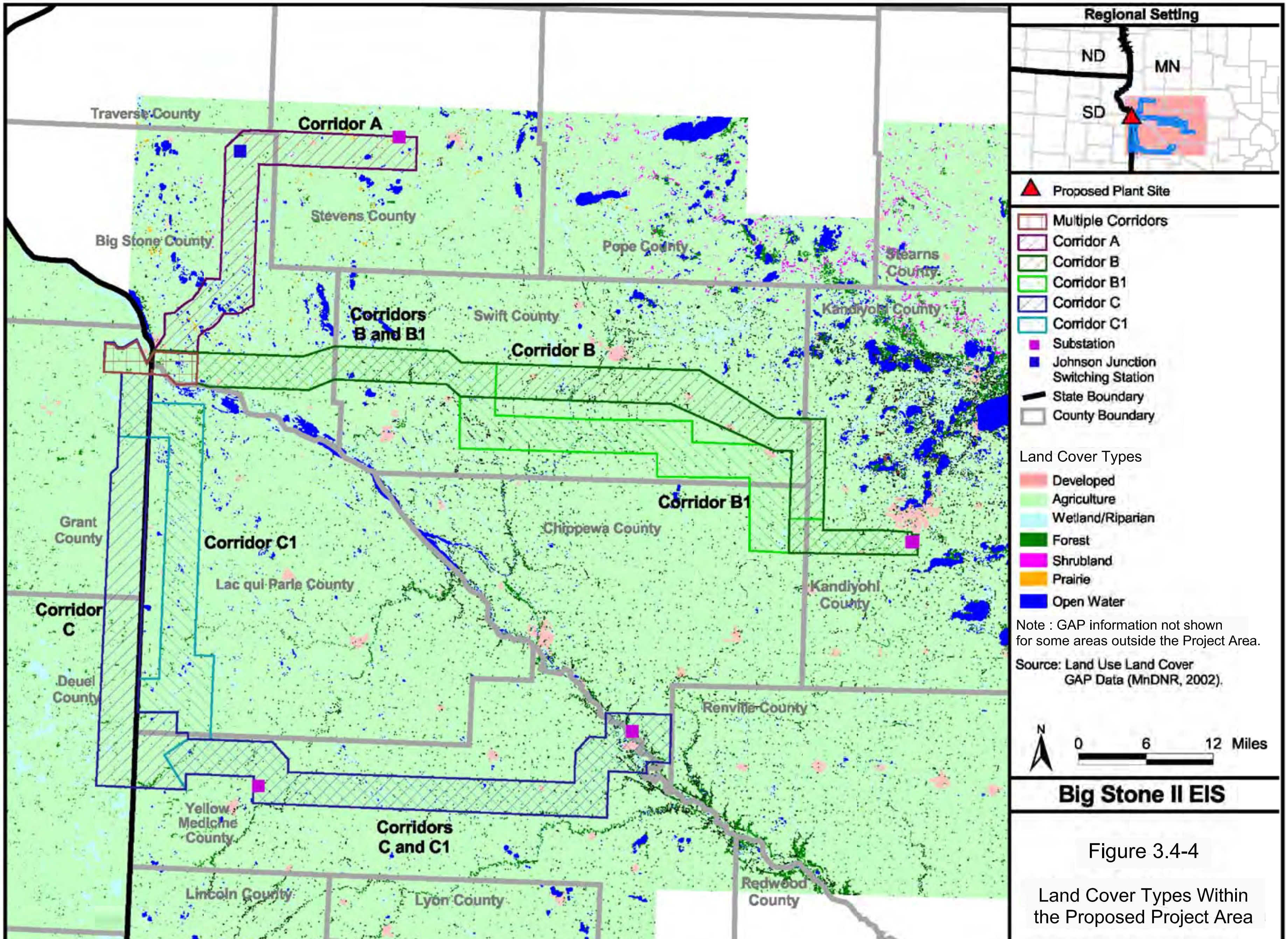
The proposed corridors are located primarily within the Northern Glaciated Plains ecoregion (USEPA, 2003). Native vegetation in this ecoregion is transitional between tallgrass and shortgrass prairie. Natural vegetation in prairie remnant communities includes western wheatgrass, green needlegrass, big bluestem, little bluestem, blue grama, and a variety of forbs including garden cornflower, lead plant, and European pasqueflower (see Appendix F, Table 4, Volume III).

The eastern portion of Swift County, Minnesota and southwestern portion of Kandiyohi County, Minnesota occur within the Western Corn Belt Plains ecoregion (USEPA, 2003). Dominant species that occur within tallgrass prairie remnants found within this region include big and little bluestem, Indiangrass, and green needlegrass. On steeper slopes, needle-and-thread, prairie dropseed, and deciduous woodland species are the dominant species.

The northeastern portion of Kandiyohi County, Minnesota, occurs within the North Central Hardwood Forest ecoregion (USEPA, 2003), which is dominated by wetlands and lakes. Natural vegetation associated with these lakes and wetlands include cattails, wild rice and sedges, and trees such as box elder, willow, and elm (see Appendix F, Table 4, Volume III).

As a result of settlement and farming in the 1800s, the majority of natural vegetation types that once occurred in this area has been converted to agriculture (approximately 94.7 percent). The dominant plant species in the agricultural areas include corn, soybeans, and wheat; in the grazed areas, dominant species include grasses such as smooth brome and sorghum. In Stevens and Swift counties, Minnesota, and the eastern portions of Big Stone and Yellow Medicine counties, Minnesota, many of the wetlands have been drained and streams have been channelized.

The western Minnesota and South Dakota portions of the proposed corridors have been left in a relatively natural state, as evidenced by the unditched streams and tributaries and prevalence of areas showing significant biodiversity. The South Dakota portion is characterized by gently rolling, agricultural land with isolated locations of prairie vegetation on the hillsides. Areas of Conservation Reserve Program (CRP) land also are interspersed with cultivated cropland.



Big Stone II EIS

Figure 3.4-4

Land Cover Types Within the Proposed Project Area

Wetland and riparian areas are interspersed within the proposed corridors. In general, the wetlands are palustrine with emergent, scrub-shrub, or forested vegetation. Undisturbed riparian corridors generally have relatively higher species diversity compared to cultivated cropland, and can provide valuable habitat for wildlife within the region. Wetland and riparian resources are discussed in more detail in Section 3.4.2.5.

Within the proposed corridors, there are several Federal- and State-managed and protected areas including WPAs, SNAs, and Federal- and State-funded WMAs. Table 3.4-9 provides a summary of these areas within each proposed corridor.

Yellow Medicine, Lac qui Parle, Chippewa, Kandiyohi, Big Stone, Stevens, and Swift counties in Minnesota, and Deuel and Grant counties in South Dakota maintain their own noxious weeds list in addition to the State-mandated noxious weeds list. Table 3.4-10 provides the county lists of prohibited noxious weed species, some of which may occur within each proposed corridor.

Corridor A

Ground-truthed GAP data generated by the MnDNR was used to identify specific land cover types within the Minnesota portion of Corridor A. South Dakota GAP resources were used to identify general land cover types within Corridor A; however, this data was lacking specific vegetation classifications. Table 3.4-8 lists the land cover types and associated acreages present within Corridor A.

Agricultural land comprises approximately 75,925 acres (91.9 percent) of Corridor A. This type consists of a combination of soybean, corn, and alfalfa fields. Upland forests comprise approximately 576 acres of Corridor A including seven acres of cottonwood forest, 114 acres of lowland deciduous forest, 89 acres of oak woods, 135 acres of aspen and white birch forests, 12 acres of maple and basswood forests, 198 acres of miscellaneous deciduous woodland forests, and 23 acres of red pine.

Corridor A also includes approximately 22 acres of upland shrubland and 41 acres of lowland shrubland. Lowland shrubland species would likely include willow and dogwood. The 521 acres of developed area consist of low and high-density urban areas, transportation routes, and have low percentages of vegetative cover. Wetland and riparian resources are discussed in more detail in Section 3.4.2.5.

GAP-listed prairie remnant communities comprise approximately 198 acres of Corridor A. In addition to these prairie grasslands, the MnDNR also identified railroad right-of-way (ROW) prairies. Corridor A intersects a one-mile segment of railroad ROW prairie associated with the Burlington Northern and Santa Fe (BNSF) Railroad.

Corridor A includes 30 sites identified by the MCBS database as native plant communities. The MCBS defines these plant communities as areas where populations of native plant species have remained relatively unaffected by human activity and relatively free of invasive species. These communities are distinguished by the plant species within them and the amount of moisture that they receive. Within Corridor A there are 27 mesic prairie communities (1,059 acres), nine dry hill prairie communities (156 acres), 16 bedrock outcrop communities (157 acres), and one wet prairie community (nine acres). These communities are located throughout Big Stone County, Minnesota.

Table 3.4-9. Protected Resource Areas Present Within the Proposed Corridors

Corridor	Protected Resource Areas		
	Federal[a]	State[b]	State[c]
A	Bentson Lake, Centennial, Chokio, Dismal Swamp, Jacobson, Johnson, Jorgenson, Larson Slough, Odden, Prairie, Redhead Marsh, Schultz, Stimmler, Tangen, Thomson, Twin Lakes	Prairied[d], Victory[d], Otrey[d], Malta, Thomson[d], Freed, Reisdorph[d], Brouillet[d]	
B	Akron, Hillman, Menzel, Persen, Broberg, Priam, Rambow, Raymond	Danvers[d], Claire Rollings[d], Jossart[d], Eagle, Kandi	
B1	Akron, Hillman, Menzel, Persen, Priam, Rambow, Raymond	Eagle, Tjossas[d], Sena[d], Eagle, Kandi	
C	Wang, seven unnamed	Salt Lake[d], Stokke[a], Tyro[d], Lanners[d], Omro[d], Kaibab[d], Big Rock[d], Oshkosh[d], Reserve[d]	Mound Springs[d], Blue Devil Valley
C1	One unnamed	Big Rock[d], Kaibab[d], Lanners[d], Omro[d], Oshkosh[d], Reserve[d], Stokke[d], Tyro[d], Florida Creek[d], Gollnick[d], Northeast Four Corners[d], Quilitz[d], Salt Lake[d], Sweetwater[d], Walter	Mound Springs[d], Blue Devil Valley

[a]WPA.
[b]WMA.
[c]SNA.
[d]Purchased either wholly or partly (>75 percent) with Federal aid.

Source: HDR, 2005a.

The 2005 prairie remnant survey identified two dry prairie communities (173 acres), seven mesic prairie communities (2,820 acres), and one bedrock outcrop community (870 acres), some of which overlap with the MCBS-identified habitats. Common species identified within these native communities are presented in Appendix F, Table 4, Volume III. Corridor A also includes 16 WPAs and eight WMAs consisting of 3,225 acres and 1,451 acres, respectively. These areas consist primarily of prairie grassland and wetland vegetation, with marsh and open water habitats. Further discussion on WPAs and WMAs that occur within Corridor A is provided in Section 3.6.3.3.

Noxious weeds that may occur in Corridor A are listed in Table 3.4.10

Table 3.4-10. Noxious Weed Species Present within Each Proposed Corridor

Location	Local	County
Corridor A		
Grant County, South Dakota	Absinth wormwood Spotted knapweed Bull thistle	
Big Stone County, Minnesota	Velvetleaf Wild sunflower Wild proso millet Black nightshade	Velvetleaf Wild sunflower Wild proso millet Black nightshade
Stevens County, Minnesota		Velvetleaf Wild sunflower Wild proso millet Black nightshade Cocklebur
Corridors B and B1		
Grant County, South Dakota	Absinth wormwood Spotted knapweed Bull thistle	
Big Stone County, Minnesota		Velvetleaf Wild sunflower Wild proso millet Black nightshade
Swift County, Minnesota		Velvetleaf Wild sunflower
Chippewa County, Minnesota		Velvetleaf Wild sunflower Cocklebur
Kandiyohi County, Minnesota		Velvetleaf Wild sunflower Cocklebur
Corridors C and C1		
Grant County, South Dakota	Absinth wormwood Spotted knapweed Bull thistle	
Deuel County, South Dakota	Absinth wormwood Bull thistle	
Lac qui Parle County, Minnesota		Velvetleaf Wild sunflower Wild proso millet Buffalobur Cocklebur
Yellow Medicine County, Minnesota		Velvetleaf Wild sunflower Cocklebur
Chippewa County, Minnesota		Velvetleaf Wild sunflower Cocklebur

Source: HDR, 2005a.

Corridor B

The GAP land cover types and associated acreages present within Corridor B are provided in Table 3.4-8.

Agricultural land comprises approximately 145,742 acres (95.9 percent) of Corridor B. Forested areas comprise approximately 1,467 acres (one percent) of Corridor B. Corridor B includes approximately six acres of coniferous forests, which are dominated by red pine. Deciduous forests comprise approximately 1,461 acres within Corridor B including 933 acres of oak woodland, 151 acres of lowland forests, 132 acres of cottonwood forests, six acres of maple/basswood forests, 43 acres of aspen/white birch forests, and 198 acres of miscellaneous deciduous woodland forests. Approximately 702 acres of upland shrubland habitat is present in Corridor B. The 815 acres of developed area consist of low and high-density urban areas, transportation routes, and have low percentages of vegetative cover. Wetland and riparian resources are discussed in more detail in Section 3.4.3.5.

In addition, approximately 40 acres of GAP-listed prairie occur in Corridor B, the majority of which is located in the Northern Glaciated Plains ecoregion. In addition to these prairie grassland remnants, the MnDNR also identifies railroad ROW prairies. Corridor B intersects four segments (approximately 14 miles) of railroad ROW prairie associated with the BNSF Railroad.

Natural vegetation is being managed in several areas within Corridor B. The 11,521-acre Big Stone NWR is located along the Minnesota River and consists of tallgrass prairie and wetland habitat and is managed to preserve fish, wildlife, and natural vegetation by the USFWS. The refuge includes more than 6,000 acres of grassland, including 1,700 acres of native tallgrass prairie. The downstream dam on the Minnesota River creates 4,250 acres of wetland habitat, and there are large tracts of woodlands including elm, ash, box elder, and silver maple. Corridor B includes 58 MCBS-listed native prairie communities consisting of 19 mesic prairie communities (950 acres), 16 bedrock outcrop communities (157 acres), 21 dry hill prairie communities (284 acres), and two wet prairie communities (150 acres). These native communities are located in Big Stone, Swift, and Kandiyohi counties, Minnesota. The 2005 prairie remnant survey identified 10 dry prairie communities (1,157 acres), nine mesic prairie communities (1,708 acres), one bedrock outcrop community (870 acres), and three wet prairie communities (459 acres) some of which overlap with the MCBS-identified habitats. Common species identified within these native communities are presented in Appendix F, Table 4, Volume III. Corridor B also contains eight WPAs and five WMAs totaling 1,102 acres and 646 acres, respectively. The WMAs all contain grassland, cultivated, and wetland vegetation. Detailed descriptions of other recreational resources are presented in Section 3.6.3.3.

Noxious weeds that may occur in Corridor B are listed in Table 3.4-10.

Corridor B1

The GAP land cover types and associated acreages present within Corridor B1 are listed in Table 3.4-8. Agricultural land comprises approximately 152,654 acres (96.4 percent) of Corridor B1.

Forested areas comprise approximately 1,507 acres (one percent) of Corridor B1. Forested vegetation type consists of approximately six acres of coniferous forests, which are dominated by red pine and 1,507 acres of deciduous forests. Deciduous forests are comprised of 1,018 acres of oak woodland, 151 acres of lowland forests, 86 acres of cottonwood forests, six acres of maple/basswood forests, 43 acres of aspen/white birch forests, and 198 acres of miscellaneous deciduous forests.

Shrubland vegetation type consists of approximately 652 acres of upland shrubland. Prairie vegetation type consists of approximately 40 acres of GAP-listed prairie grassland. In addition to these prairie grassland remnants, the MnDNR also identified railroad ROW prairies. Corridor B1 intersects four segments (approximately five miles) of railroad ROW prairie associated with the BNSF Railroad. The 669 acres of developed area consist of low and high-density urban areas, transportation routes, and have low percentages of vegetative cover. Wetland and riparian resources are discussed in more detail in Section 3.4.2.5.

Corridor B1 includes 58 MCBS-listed native prairie remnants consisting of 16 bedrock outcrop communities (157 acres), 21 dry hill prairie communities (284 acres), 19 mesic prairie communities (1,108 acres), and two wet prairie communities (163 acres). These communities are located in Big Stone, Swift, Kandiyohi, and Chippewa counties, Minnesota. The 2005 prairie remnant survey identified 10 dry prairie communities (1,157 acres), 10 mesic prairie communities (1,994 acres), one bedrock outcrop community (870 acres), and three wet prairie communities (468 acres), some of which overlap with the MCBS-identified habitats. Common species identified within these native communities are presented in Appendix F, Table 4, Volume III. The Big Stone NWR present within Corridor B1 is the same as described for Corridor B. Corridor B1 also includes seven WPAs and five WMAs consisting of 1,047 acres and 568 acres, respectively. These areas primarily consist of prairie grassland and wetland vegetation, with marsh and open water habitats. Further discussion on WPAs and WMAs that occur within Corridor B1 is provided in Section 3.6.3.3.

Noxious weeds that may occur in Corridor B1 are listed in Table 3.4-10.

Corridor C

Land cover types within Corridor C are provided in Table 3.4-8. Approximately 186,602 acres (93.1 percent) of the land in Corridor C is agricultural land. The majority (83 percent) of this land is primarily corn and soybeans. Approximately 0.2 percent of Corridor C consists of CRP land that has previously been grazed or farmed. The remainder of this agricultural land is being used either for livestock grazing or for the production of hay or other forage.

Forested areas comprise approximately 4,309 acres (2.2 percent) of Corridor C. Forests that occur within Corridor C are deciduous and consist of approximately 1,366 acres of oak forests, 332 acres of cottonwood forests, and 254 acres of lowland deciduous forests (likely containing willow, silver maple, and cottonwood) in Minnesota. South Dakota has 2,357 acres of deciduous forest, which likely consists of a mix of upland (oak-dominated) and lowland type forests. The Minnesota portion of Corridor C includes 1,011 acres of upland shrubland vegetation primarily consisting of black cherry, common elder, and hazelnut. Vegetation found in the 1,022 acres of developed land would likely be limited to grasses on manicured lawns, such as Kentucky bluegrass and isolated trees. Wetland and riparian resources are discussed in more detail in Section 3.4.2.5.

No GAP-listed prairie communities exist within Corridor C; however, MnDNR-identified railroad ROW prairies are present. Corridor C intersects a 0.03-mile segment of railroad ROW prairie associated with the Twin Cities and Western Railroad Company.

Corridor C includes 160 MCBS-listed native plant communities consisting of one basswood-bur oak-green ash forest (18 acres), 18 bedrock outcrop communities (101 acres), 84 dry hill prairie communities (1,045), 13 mesic prairie communities (1,045 acres), two mud flat (inland lake) communities (one acre), 31 rock outcrop-prairie complex communities (292 acres), six seepage meadow/carr communities (seven acres), and one spikerush-bur reed marsh community (less than one acre). These communities are located in Yellow Medicine and Chippewa counties, Minnesota. The 2005 prairie remnant survey identified 38 dry prairie communities (4,580 acres), 14 mesic prairie communities (4,897 acres), four bedrock outcrop communities (1,776 acres), and two wet prairie communities (50 acres), some of which overlap with the MCBS-identified habitats.

Within Corridor C, there are several sites where natural vegetation is being managed. The Mound Springs Prairie SNA is managed by the MnDNR and is located along the western edge of Florida Township in Yellow Medicine County, Minnesota. The purpose of the SNA program is to preserve rare and unique resources of exceptional scientific and educational value. The Mound Springs Prairie SNA preserves a prairie complex on the Prairie Coteau Region of western Minnesota. Unique floral resources within this SNA include white prairie clover, yellow-fruited sedge, black disc lichen, and other vegetation of calcareous seepage fens all of which are rare within Minnesota. The Blue Devil Valley SNA preserves a granite outcrop near Granite Falls, Minnesota. Unique botanical resources provided by this SNA include the opportunity to view rare plant species such as black disc lichen, ball cactus, cutleaf ironplant, and clustered broomrape.

Within Yellow Medicine County, Minnesota, there are nine MnDNR-listed WMAs. Vegetation within these WMAs is a combination of wetland and grassland with some areas containing native prairie ecosystems. Stokke and Kaibab WMAs consist of primarily wetland vegetation, which contains emergent, marsh plant species such as sedges and cattails. Lanners, Omro, and Big Rock WMAs contain wetland and grassland vegetation. Vegetation in the grassland areas consists of species found in idle pastureland and grassland, and may include remnant populations of native prairie species. Reserve and Tyro WMAs contain areas of cultivated land interspersed with wetlands. Mound Springs WMA contains grassland interspersed with cultivated land and Oshkosh WMA contains cultivated land, grassland, and some forested riparian areas, including cottonwood and silver maple.

Eight USFWS WPAs, nine WMAs, and two SNAs totaling approximately 1,030, 1,191, and 420 acres, respectively, also occur in Corridor C. WPAs are managed to provide ideal habitat for waterfowl, which includes a mixture of wetland and upland grassland vegetation. Wetland plant types would likely include cattail and bulrush, while the upland plants would include grasses such as smooth brome or other native species.

Noxious weeds that may occur in Corridor C are listed in Table 3.4-10.

Corridor C1

The land cover types within Corridor C1 are provided in Table 3.4-8. Based on GAP vegetation cover information, approximately 180,960 acres (95.2 percent) of Corridor C1 is agricultural land.

Forested areas comprise approximately 2,823 acres (1.5 percent) of Corridor C1. The forested vegetation type consists of approximately 14 acres of coniferous forests, which are dominated by red cedar, and 2,809 acres of deciduous forests. The deciduous forests are comprised of 1,352 acres of oak woodland, 697 acres of lowland forests, 340 acres of cottonwood forests, and 420 acres of miscellaneous deciduous forests.

The shrubland vegetation type consists of approximately 1,011 acres of upland shrubland. No GAP-listed remnant prairie communities exist within Corridor C; however, MnDNR-identified railroad ROW prairies are present. Railroad ROW prairies, which occur within Corridor C1, are the same as described for Corridor C. The 957 acres of developed area consist of low and high density urban areas, transportation routes, and have low percentages of vegetative cover. Wetland and riparian resources are discussed in more detail in Section 3.4.2.5.

Corridor C1 includes 118 MCBS-listed native plant communities: one basswood-bur oak-green ash forest (18 acres), 18 bedrock outcrop communities (101 acres), 35 dry hill prairie communities (412), three dry sand-gravel prairie communities (237 acres), 21 mesic prairie communities (555 acres), 31 rock outcrop-prairie complex communities (292 acres), eight wet prairie communities (792 acres), and one wet saline prairie complex (nine acres). These communities are located in Lac qui Parle, Yellow Medicine, and Chippewa counties, Minnesota. The 2005 prairie remnant survey identified 23 dry prairie communities (762 acres), nine mesic prairie communities (482 acres), four bedrock outcrop communities (1,776 acres), and one wet prairie community (39 acres), some of which overlap with the MCBS-identified habitats. Common species identified within these native communities are presented in Appendix F, Table 4, Volume III. Corridor C1 also includes one WPA and 15 WMAs consisting of six acres and 2,338 acres, respectively. These areas consist primarily of prairie grassland and wetland vegetation, with marsh and open water habitats. The Mound Spring Prairie and Blue Devil Valley SNAs totaling 32 acres are present within Corridor C1 and are similar to those described for Corridor C. Additional information regarding WPAs and WMAs that occur within Corridor C1 are provided in Section 3.6.3.3.

Noxious and invasive species are similar to those described for Corridor C (Table 3.4-10).

Substations and Other System Modifications

Transmission line interconnection may require modifications to existing substations (Morris Substation, Corridor A; Willmar Substation, Corridors B and B1; and Granite Falls Substation, Corridors C and C1 to support 230-kilovolt (kV) operations. Although the extent of such modifications cannot be determined without detailed engineering, they are likely to include replacement or upgrading of existing transformers, switching equipment, and other components. Such modifications may require the acquisition of additional land to accommodate expansion requirements. The Canby Substation would need to be relocated because the existing Canby Substation is within the 100-year floodplain of Canby Creek (MnDOC, 2006). The new Canby Substation site would be relocated within a disturbed agricultural area approximately one mile northeast of the existing Canby Substation, located adjacent to Highway 75. Currently, the vegetation types of the proposed substations are predominantly disturbed and/or degraded, similar to those discussed for the proposed plant site. The areas consist of perennial row crops and non-native grasslands, which are typically rated as having low ecological quality. Vegetation resources along the Hankinson line would be identified once the structures needing modification or replacement are delineated.

3.4.3.2 Wildlife

<u>Big Game Species</u>

The proposed corridors cross a variety of managed wildlife areas, including NWRs, WPAs, WMAs, high priority areas, and GPAs (Table 3.4-11). The MnDNR and USFWS have released the results of a joint assessment for the conservation of wetlands and grasslands in Minnesota, which identify grassland and wetland habitat priorities for wildlife conservation (USFWS and MnDNR, 2005). The joint assessment identifies areas for conservation and is a measurement of the integrity of the landscape for a full array of wetland and grassland wildlife species. The model that was developed for this joint assessment identifies 40-acre parcels within Corridor C that are high priority areas for the conservation of wetland and grassland wildlife species. The high priority areas, which could support a variety of wildlife (e.g., WPAs, WMAs), are illustrated in Figure 3.4-5, and Table 3.4-11. Available hunting statistics for the proposed corridors are limited to estimated harvest projections (SDGFP, 2005c; MnDNR, 2005c). White-tailed deer are the only big game animal hunted within the proposed corridors. In Corridor A, the MnDNR (MnDNR, 2005d) reported a harvest of less than 1.4 deer per square mile. In Corridor B, the western portion of Swift County, Minnesota, had relatively low numbers of deer taken (less than 1.2 per square mile). In 2004, the MnDNR permit areas in Big Stone County and western Swift County, Minnesota, reported a harvest of less than 1.4 deer per square mile. Eastern Swift County and Kandiyohi County, Minnesota, reported 1.4 to 2.8 deer harvested per square mile in 2004, within the permit areas in Corridor B. In Corridor C, the number of deer taken per square mile was 1.4 to 2.8 in the western portion of Yellow Medicine County, Minnesota, and the area near Granite Falls. The number of deer taken per square mile was less than 1.4 deer per square mile in the middle section of Corridor C (MnDNR, 2005c). Common furbearers (i.e., animals that have fur of commercial quality) that occur within the proposed Project area include raccoon, mink, skunk, weasel, coyote, red fox, badger, muskrat, and beaver (see Appendix F, Table 1, Volume III).

Table 3.4-11. Acreage in the Proposed Corridors of Wildlife Habitat by Category[a]

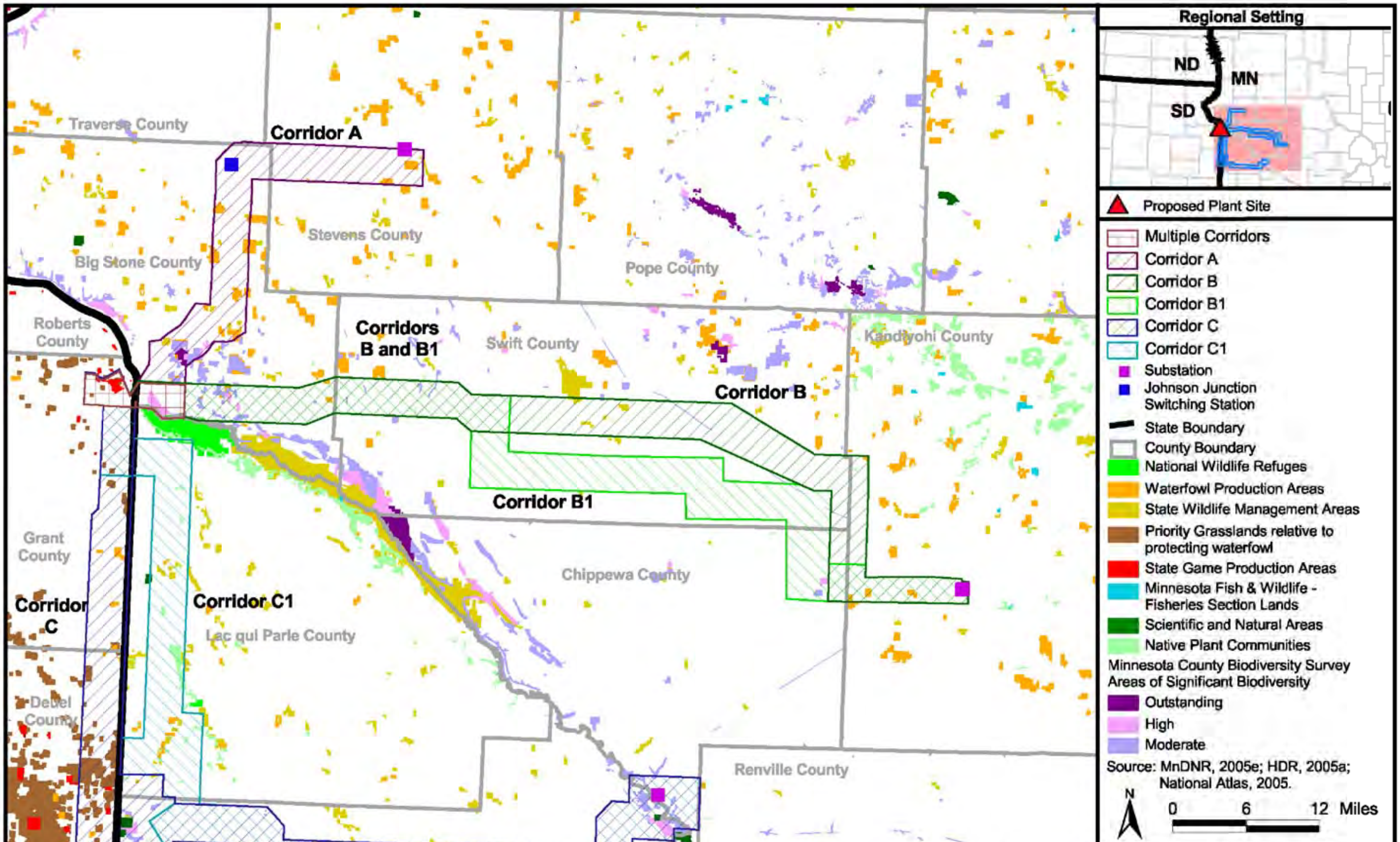
Site/ Corridor	National Wildlife Refuge	Waterfowl Production Area	State Wildlife Management Area	Scientific Natural Area	High Priority Areas	Game Production Areas	Minnesota County Biological Survey
Corridor A	531	3,225	1,451	0	506	640	3,616
Corridor B	807	1,102	646	0	506	640	2,904
Corridor B1	807	1,047	568	0	506	640	3,286
Corridor C	0	1,030	1,191	420	11,060	834	4,824
Corridor C1	172	6	2,338	32	696	640	3,032

[a]Wildlife habitat categories are not mutually exclusive as many wildlife habitats overlap (i.e., most WMAs are within MCBS areas).

Sources: National Atlas, 2005; HDR, 2005a; MnDNR, 2005d.

Small Game Species

The Northern Glaciated Plains Ecoregion is known as one of the most important waterfowl production areas in North America (USEPA, 2003). Approximately 50 percent of the continent’s waterfowl population is produced in the region (Smith, 1995). Waterfowl uses various ponds, reservoirs, marshes, streams, and rivers throughout the proposed Project area. The proposed Project area includes the Minnesota River Valley, a major migration corridor for many species of waterfowl moving from summer breeding grounds to southern wintering grounds. Migratory and resident waterfowl within the proposed Project area include dabbling ducks and diving ducks.



Big Stone II EIS

Figure 3.4-5

High Priority Vegetation Areas Within the Proposed Project Area

Small game species that occur in the region include rabbits, squirrels, mourning dove, pheasant, and wild turkey. Mourning doves prefer mowed, plowed, or disturbed agricultural fields, generally with available water. Pheasants roost in areas of short- to medium-height grass or weeds and commonly forage in grain and corn fields. Wild turkeys inhabit forest habitat interspersed with agricultural fields (Alsop III, 2001). Greater prairie chickens inhabit mid-grass to tallgrass prairie, often interspersed with cropland.

Nongame Species

Nongame species (e.g., small mammals, passerines, raptors, amphibians, and reptiles) occupy a variety of habitat types within the proposed corridors. Nongame mammal species include a variety of small mammals that provide a substantial prey base for the areas predators including mammals, raptors, and reptile species.

Nongame birds include a variety of passerine, waterbirds and raptor species including migratory bird species that are protected under the MBTA. The Minnesota River Valley is recognized as a major flyway for migrating birds, and more than 320 species of birds have been recorded in the valley. Common bird species that occur within the proposed Project area are presented in Appendix F, Table 1, Volume III.

Representative raptor species that occur within the proposed Project area include accipiters, buteos, eagles, and falcons (see Appendix F, Table 1, Volume III). The bald eagle is a special status species and is discussed further in Section 3.4.3.4.

Other nongame animals that occur within the proposed Project area include amphibians (toads, salamanders, and frogs) and reptiles (turtles, lizards, skinks, and snakes) (see Appendix F, Table 1, Volume III).

Large natural preserve areas, such as Big Stone NWR and Mound Springs SNA, are located in the western portion of the proposed corridors, and there are many WMAs and WPAs throughout the proposed corridors. Wildlife species that occur within the WMAs include game animals (e.g., white-tailed deer, squirrel, pheasant, turkey, and waterfowl) as well as a variety of nongame species (e.g., small mammals, birds, amphibian, reptiles, and invertebrates). The WPAs serve to protect breeding, forage, shelter, and migratory habitat for variety of waterfowl (e.g., ducks, geese) and water bird species (e.g., herons, egrets).

The MnDNR and USFWS recently released the results of a joint assessment for the conservation of wetlands and grasslands in Minnesota, which identify grassland and wetland habitat priorities for wildlife conservation (USFWS and MnDNR, 2005). The joint assessment identifies areas for conservation and is a measurement of the integrity of the landscape for a full array of wetland and grassland wildlife species. The model that was developed for this joint assessment identifies 40-acre parcels within Corridor C that are high priority areas for the conservation of wetland and grassland wildlife species. The high priority areas that could support a variety of wildlife are illustrated in Figure 3.4-5.

The following section describes in greater detail the wildlife resources found within the proposed corridors. Section 3.4.3.4, discusses special status wildlife species that have been identified as potentially occurring within the proposed corridors.

Corridor A

Within Corridor A, wildlife is managed in eight MnDNR-listed WMAs (Table 3.4-9) totaling 1,451 acres, and 16 WPAs totaling 3,225 acres.

The USFWS also has established several populations of greater prairie chickens within Corridor A. Sections 25, 26, and 36 of Big Stone Township include designated areas of prairie chicken habitat and several lookout locations. In general, these sites correspond to areas that have been determined by the MnDNR to have 3,616 acres of moderate to outstanding biodiversity. State- or federally-owned high priority conservation areas have also been identified in the Otrey and Malta townships. These areas also correspond to MCBS areas of high biodiversity significance.

Two colonial waterbird rookeries occur within Corridor A in Big Stone County, Minnesota. Colonial waterbirds in Minnesota include the horned grebe, eared grebe, western grebe, American white pelican, double-crested cormorant, great blue heron, great egret, snowy egret, little blue heron, cattle egret, black-crowned night heron, yellow-crowned night heron, Franklin's gull, herring gull, common tern, and Forster's tern. One of the documented rookeries contains western grebe, the other contains double-crested cormorants. Because of the high density of birds in such rookeries, any disturbance to the site could impact the reproductive success of large portions of a species' population.

Corridor B

Corridor B includes several areas where wildlife habitat is managed by the USFWS and MnDNR (Table 3.4-9) including the Big Stone NWR and five MnDNR-listed WMAs totaling 646 acres. Wildlife within these WMAs include white-tailed deer; small game species and a variety of nongame species. Eight WPAs totaling 641 acres occur within Corridor B.

One colonial waterbird rookery (Long Lake Rookery) occurs in Corridor B in Kandiyohi County, Minnesota. The rookery contains double-crested cormorants, great blue herons, great egrets, black-crowned night herons, and cattle egrets.

High priority areas of conservation also have been identified in Ortonville and Odessa townships. The areas in Ortonville and Odessa townships generally correspond to MnDNR areas of moderate to high biodiversity significance representing approximately 2,904 acres.

Corridor B1

Corridor B1 includes several areas where wildlife habitat is managed by the USFWS and MnDNR including the Big Stone NWR and five MnDNR-listed WMAs totaling 568 acres and 1,047 acres in seven WPAs.

One colonial waterbird rookery (Long Lake Rookery) occurs in Corridor B1 in Kandiyohi County, Minnesota. The rookery contains double-crested cormorants, great blue herons, great egrets, black-crowned night herons, and cattle egrets.

High priority areas of conservation also have been identified in Ortonville and Odessa townships. The areas in Ortonville and Odessa townships generally correspond to MCBS areas of moderate to high biodiversity significance representing approximately 3,286 acres.

Corridor C

Corridor C includes several areas where wildlife habitat is managed by the USFWS and MnDNR including the Mound Springs Prairie SNA, and nine MnDNR-listed WMAs, including Salt Lake, Stokke, Tyro, Lanners, Omro, Kaibab, Big Rock, Oshkosh, and Reserve totaling 1,191 acres and 1,030 acres in eight WPAs (Wang and seven unnamed). MCBS areas of moderate to high biodiversity significance represent approximately 4,824 acres.

The MnDNR-managed Mound Springs Prairie SNA is located in the Florida Township of Yellow Medicine County, Minnesota. Unique habitats, including dry prairie and a calcareous seepage fen, occur in this SNA, providing diverse habitat to wildlife including white-tailed deer, waterfowl, and a variety of nongame species (e.g., small mammals, birds, reptiles, and amphibians). Rare animal species that have been sighted in the SNA include the prairie vole and upland sandpiper. These species, as well as other special status species within Corridor C, are further discussed in Section 3.4.3.4.

The MnDNR and USFWS joint assessment identifies high priority conservation areas near the Minnesota/South Dakota border west of Canby, Minnesota (USFWS and MnDNR, 2005). Additionally, there are areas identified as high priority conservation areas near Granite Falls (Figure 3.4-5).

Corridor C1

Corridor C1 includes areas where wildlife habitat is managed by the USFWS and MnDNR including the Yellow Bank Hills SNA, Big Stone NWR, and 15 MnDNR-listed WMAs (Big Rock, Florida Creek, Gollnick, Kaibab, Lanners, Northeast Four Corners, Omro, Oshkosh, Quilitz, Reserve, Salt Lake, Stokke, Sweetwater, Tyro, and Walter) totaling 2,338 acres, and one unnamed WPA with approximately six acres of MCBS areas of moderate to high biodiversity significance representing approximately 3,032 acres.

Big Stone NWR is located along the Minnesota River approximately one mile southwest of Ortonville, Minnesota. The 11,521-acre refuge consists of tallgrass prairie and wetland habitats and is managed to preserve fish, mammals, waterfowl, shorebirds, and grassland birds. Wildlife found in this preserve includes big game species (white-tailed deer), small game species (e.g., rabbit, squirrel, pheasant, turkey, prairie chicken, gray partridge, waterfowl), and a variety of nongame species (e.g., small mammals, birds, reptiles, and amphibians).

High priority conservation areas are near the Minnesota and South Dakota border west of Canby, Minnesota, and near Granite Falls (Figure 3.4-5).

Substations and Other System Improvements

White-tailed deer and small game species may use the agricultural fields surrounding the substations for winter forage. Appendix F, Table 1, Volume III lists wildlife species that may be found outside the substation areas. Wildlife resources along the Hankinson line would be identified once the structures needing modification or replacement are delineated.

3.4.3.3 Fisheries

The proposed corridors contain numerous streams, rivers, ponds, and lakes that support fisheries and invertebrate communities. The following information describes aquatic communities in waterbodies located within the proposed corridors.

Corridor A

Fisheries resources within Corridor A include numerous lakes within Big Stone and Stevens counties, Minnesota, as well as the Minnesota River, Stony Run, and Muddy Creek. The MnDNR has documented black bullhead, black crappie, bluegill, common carp, largemouth bass, northern pike, orange-spotted sunfish, walleye, white sucker, and yellow perch in lakes within Big Stone County, Minnesota.

Most of the lakes and reservoirs located within Corridor A are relatively small, unnamed waterbodies. However, fisheries are managed in some of the larger lakes such as Long Tom and Otrey.
Long Tom Lake in Big Stone County (located in Section 6, Odessa Township), Minnesota, is managed for black crappie and walleye, with a lesser emphasis on northern pike and yellow perch. Otrey Lake (located in Otrey Township) has populations of bullhead, common carp, orangespotted sunfish, and white sucker. These species are tolerant of low concentrations of dissolved oxygen. The MnDNR has noted that Otrey Lake appears prone to winterkill due to low dissolved oxygen. The MnDNR does not have specific fishery information on the other lakes within Corridor A, but they likely contain many of the common species listed in Table 3.4-12.

Based on a fish survey conducted in the Minnesota River near Ortonville, Minnesota in 1998 by the MnDNR, 32 species were collected. Species considered to be game fish and the most abundant species in the survey are listed in Table 3.4-12.

The MnDNR conducted fish and macroinvertebrate surveys in 1996 on Stony Run. The survey documented six species of fish in the section of Stony Run, including black bullhead, brook stickleback, fathead minnow, Iowa darter, orangespotted sunfish, and yellow perch. Macroinvertebrate results indicated relatively low mayfly abundance and high midge abundance in this section of the creek. Most of the creek within Corridor A is channelized and lacks natural riparian vegetation. Ditching projects within the watershed have degraded the water quality, and erosion resulting from adjacent land uses and agricultural practices has increased sediment loading. No report was available for Muddy Creek, but it likely has similar fishery resources to those found in Stony Run.

No data were available for Stevens County Ditch No. 3, but it likely supports some fish populations. Due to their channelized nature, ditches generally have lower quality fisheries habitat than natural meandering streams.

Corridor B

Fisheries resources within Corridor B include numerous lakes in Kandiyohi County, Minnesota, as well as Shakopee Creek, Pomme de Terre River, Chippewa River, Minnesota River, and Stony Run. A summary of game fisheries for major lakes in the Kandiyohi County portion of Corridor B (as listed by the MnDNR) is provided in Table 3.4-13. Fish composition and relative abundance information is lacking for the remaining lakes within Corridor B, but they likely have similar fish populations to those lakes listed in Table 3.4-13.

Table 3.4-12. Fish Survey Results for the Minnesota River Near Ortonville, Minnesota

Species	Game Fish	Comprised ≥5 Percent of Catch
Bigmouth buffalo		
Black bullhead	X	X
Black crappie	X	X
Blacknose dace		
Blacknose darter		
Bluegill	X	
Bluntnose shiner		
Channel catfish	X	
Carp		X
Common shiner		
Emerald shiner		
Fathead shiner		
Freshwater drum		
Golden redhorse		
Golden shiner		
Green sunfish	X	
Hornyhead chub		
Largemouth bass	X	X
Northern pike	X	
Orangespotted sunfish	X	X
Pumpkin seed	X	
Quillback		
Rock bass	X	
Shorthead redhorse		
Slenderhead darter		
Spottail shiner		X
Stonecat		
Tadpole madtom		
Walleye	X	
White sucker		
Yellow bullhead	X	
Yellow perch	X	

Source: MnDNR, 1998a.

Table 3.4-13. Lake Fishery Resources - Corridor B

Lake	Location	Notes on Fishery Resources
Bass Lake	Township 120 North, Range 33 West and 34 West, Sections 18 and 13	Stocked for northern pike and black crappie. Species include largemouth bass, northern pike, walleye, black bullhead, bluegill, yellow perch, and black crappie. Population numbers for carp and white sucker show an increasing trend.
Diamond Lake	T120N, R33W, Sections 16, 19-21, 28-30	Species include largemouth bass, walleye, yellow perch, northern pike, black crappie, and black bullhead. Carp abundance shows an increasing trend.
Elkhorn Lake	T120N, R34W, Sections 9, 10, 15, 16	Stocked for black crappie. Species include largemouth bass, northern pike, bluegill, black bullhead densities, black crappie, yellow perch, and walleye.
Henderson Lake	T120N, R34W, Section 6	Stocked for walleye, black crappie, and yellow perch. Species include northern pike, yellow perch, bluegill, walleye, and black crappie.
Point Lake	T120N, R35W, Sections 23 and 24	Stocked for black crappie, northern pike, and walleye. Species include northern pike, walleye, bluegill, yellow perch, and largemouth bass.

Source: MnDNR, 2005e.

The MnDNR completed a stream survey for Stony Run in Corridor B (Table 3.4-14). A survey for a section of the Pomme de Terre River in Appleton, Minnesota (approximately six miles south of Corridor B), also was conducted. Fish species in the section of the river crossed by Corridor B are likely similar to those found in the surveyed section. However, the surveyed section of the river was degraded as a result of five to 10 feet of silt deposition above the Appleton Mill Dam. The surveyed river section also lacked meanders, pools and riffles, and had overall poor quality habitat. No surveys were completed for the Chippewa River, Mud Creek, or Shakopee Creek, but they are likely to have similar fishery resources to those found in the Stony Run and Pomme de Terre River. Fish composition in the Minnesota River is the same as discussed for Corridor A.

There are no specific fishery data available for Big Stone County Ditch No. 2 or Swift County Ditches No. 3 and 8 within Corridor B, but they likely support fish populations. Due to their channelized nature, ditches generally have lower quality fisheries habitat than natural meandering streams.

A 1990 survey conducted by the MnDNR collected 14 mussel species in the Pomme de Terre River and 16 mussel species in the Chippewa River, down from historical numbers (Bright et al., 1995). A list of rare mussel species found in streams crossed by Corridor B is provided in Section 3.4.3.4.

Corridor B1

Fisheries and macroinvertebrate communities in waterbodies located within Corridor B1 are similar to Corridor B. The only notable differences were that the Chippewa River and Shakopee Creek crossings were located approximately five miles south of Corridor B. However, fish composition and aquatic habitat are expected to be the same as the Corridor B stream segments.

Corridor C

Numerous streams/rivers (46) and lakes/reservoirs (76) are located within Corridor C. Although specific information is lacking on fisheries in lakes/reservoirs, the MnDNR (2005d) listed 18 fish species that typically occur in local standing water environments (Table 3.4-14). Game fish that may occur in Corridor C waterbodies are listed in Table 3.4-14.

The Minnesota River is the largest river located in the vicinity of Corridor C. Based on surveys conducted from 1990 to 1992, MnDNR reported 70 fish species (Native Fish Conservancy, 1992) throughout the Minnesota River. A fish population survey conducted in the Minnesota River near Appleton, Minnesota (approximately 35 miles upstream from Granite Falls), in 1998 by the MnDNR, documented 34 species of fish in this section of the river (Table 3.4-14). According to MnDNR, fish composition in Appleton, Minnesota, is expected to be similar to the Granite Falls area.

Other rivers within Yellow Medicine County, Minnesota, that support fish populations include Florida Creek, Lazarus Creek, Canby Creek, Spring Creek, and the Lac qui Parle River (Table 3.4-14). The MnDNR has completed stream surveys for Florida Creek, Canby Creek, and Lac qui Parle River. A population survey also has been completed for Yellow Medicine River, which is just downstream of the section of Spring Creek within Corridor C. Although no specific survey was completed for Lazarus Creek, it likely has similar fishery resources to those found in Canby Creek.

Table 3.4-14. Fish Occurrence – Corridors B and C

Fish Species	Game Species	Corridor B: Pomme de Terre R (1998)	Corridor B: Stony Run (1996)	Corridor C: Minnesota River (1998)	Corridor C: Canby Creek (1993 and 1994)	Corridor C: Florida Creek (1993 and 1994)	Corridor C: Lac qui Parle River (1994)	Corridor C: Yellow Medicine River (1997)	Corridor C: Lakes, Reservoirs
Bigmouth buffalo	X			X				X	X
Bigmouth shiner						X	X		
Black bullhead	X		X	X	X	X	X		X
Black crappie	X		X	X					X
Blacknose dace			X		X	X	X		
Blackside darter		X	X	X	X	X		X	
Bluegill	X			X					X
Bluntnose minnow			X	X	X	X	X		
Bowfin									X
Brassy minnow			X	X	X	X	X		
Brook stickleback			X	X	X		X		
Brown bullhead	X			X					X
Central mudminnow			X						
Central stoneroller					X	X	X		
Channel catfish	X			X				X	X
Common carp		X	X	X	X	X	X	X	X
Common shiner		X	X		X	X	X		
Creek chub			X		X	X	X	X	
Emerald shiner		X	X	X					
Fathead minnow		X	X	X	X	X	X	X	
Freshwater drum		X		X					X
Gar									X
Golden shiner			X	X					X
Golden redhorse				X				X	
Goldeye								X	
Greater redhorse				X					
Green sunfish	X		X		X	X		X	X
Hornyhead chub					X	X			
Iowa darter			X	X		X	X		
Johnny darter		X	X	X	X	X	X	X	
Largemouth bass	X		X	X	X				X
Logperch				X					
Northern pike	X	X	X	X	X	X		X	X
Orangespotted sunfish	X	X	X	X	X			X	X
Paddlefish									X
Pumpkinseed	X								X
Quillback				X				X	
Rock bass	X			X				X	
Rosyface shiner			X		X				
Sand shiner		X			X		X		
Sauger	X							X	
Shorthead redhorse		X		X				X	
Silver redhorse				X				X	
Slenderhead darter				X				X	
Smallmouth bass	X							X	
Spotfin shiner		X		X				X	
Spottail shiner		X		X					
Tadpole madtom				X					
Walleye	X	X	X	X				X	
White bass	X			X					
White sucker		X	X		X	X	X	X	
Yellow bullhead	X				X				
Yellow perch	X	X	X	X	X		X	X	X
Total		16	24	34	22	17	16	23	18

Sources: MnDNR, 1994a; MnDNR, 1994b; MnDNR, 1996a; MnDNR, 1996b; MnDNR, 1997; MnDNR, 1998b.

The Minnesota and Lac qui Parle rivers also provide habitat for mussel populations. A 1989 survey conducted by the MnDNR reported 20 mussel species in the Minnesota River. Mussel densities in this survey indicated lower numbers compared to earlier surveys (Bright et al., 1990). Mussel concentration areas have been documented in both rivers within Corridor C. A list of special status mussel species that may occur in Corridor C is provided in Appendix F, Table 2, Volume III.

Both the North Fork Whetstone River and the North and South Forks of the Yellow Bank River in Grant County, South Dakota, are listed on the National Park Service Nationwide Rivers Inventory database as having valuable fisheries resources. The Whetstone River is especially noted for its healthy northern pike population, while the Yellow Bank River supports an introduced brook trout population. There are no specific data available from the SDGFP for the other creeks within the South Dakota portion of Corridor C (Crow Timber, Crow, Cobb, Monighan, and Mud creeks; and West Branch of the Lac qui Parle River), but they likely have similar fish species reported in other streams of similar size within the other proposed corridors. Information available from the Watertown Office of the SDGFP regarding fish species documented in Deuel and Grant counties, South Dakota, indicated that bluegill, bullhead, crappie, largemouth bass, northern pike, perch, and walleye species are present in rivers and lakes within the counties.

Corridor C1

Approximately 72 perennial streams and 32 lakes/reservoirs are located in Corridor C1. Most of the additional stream crossings in Corridor C1 are small in size. Fish and macroinvertebrate communities are expected to be similar to waterbodies located within Corridor C.

Substations and Other System Improvements

Transmission line interconnections would require modifications to existing substations to support 230-kV operations, and the Canby Substation would need to be relocated. Fish resources occur in drainages near some of the substations such as Muddy Creek (Morris Substation) and the Minnesota River (Granite Falls Substation). Fish resources are not expected in waterbodies located near the other existing substations or the relocated Canby Substation due to a lack of perennial streams. Fisheries resources along the Hankinson line would be identified once the structures needing modification or replacement are delineated.

3.4.3.4 Special Status Species

Corridor A

<u>Plant Species</u>

A total of 27 special status plant species may occur within Corridor A. Of these 27 species, eight plant species have been documented within Corridor A including slender milkvetch, Missouri milkvetch, black disc lichen, larger water-starwort, prairie mimosa, ball cactus, mudwort, and tumblegrass (Appendix F, Table 2, Volume III).

<u>Terrestrial Species</u>

A total of 16 special status terrestrial species may occur within Corridor A including two mammals, five birds, three reptiles, and six invertebrates. Six species have been documented within Corridor A (burrowing owl, Arogos skipper, Dakota skipper, Powesheik skipper, regal fritillary, and red-tailed prairie leafhopper) (Appendix F, Table 2, Volume III).

<u>Aquatic Species</u>

Nine fish and six mussel special status species may occur within Corridor A (Appendix F, Table 2, Volume III). Lake sturgeon, blue sucker, paddlefish, and black buffalo potentially occur near the Minnesota River crossing, while pugnose shiner could be present in crossings of Minnesota River tributaries. The other four fish (blackside darter, rosyface shiner, hornyhead chub, and golden redhorse) and mussel species have been collected near the North Fork Whetstone River, Whetstone River, or Minnesota River crossings.

Corridor B

<u>Plant Species</u>

A total of 27 special status plant species may occur within Corridor B. Of these 27 species, nine plant species have been documented within Corridor B including slender milkvetch, black disc lichen, larger water-starwort, small white lady's-slipper, few-flowered spikerush, ball cactus, mudwort, hair-like beak rush, and tumblegrass (Appendix F, Table 2, Volume III).

<u>Terrestrial Species</u>

A total of 16 special status terrestrial species may occur within Corridor B including two mammals, five birds, three reptiles, and six invertebrates. Three terrestrial species have been documented within Corridor B including loggerhead shrike, Powesheik skipper, and regal fritillary (Appendix F, Table 2, Volume III).

<u>Aquatic Species</u>

Nine fish and nine mussel special status species may occur within Corridor B (Appendix F, Table 2, Volume III). Lake sturgeon, blue sucker, paddlefish, and black buffalo could occur near the Minnesota River crossing, while pugnose shiner could occur in Minnesota River tributary crossings. The other four fish species have been collected near the North Fork Whetstone, Whetstone, or Minnesota River crossings. Three mussels (spike, creek heelsplitter, and black sandshell) may be present near the Chippewa River crossing. The other six mussels have been collected near the North Fork Whetstone, Whetstone, or Minnesota River crossings.

Corridor B1

<u>Plant Species</u>

Occurrence of special status species would be the same as discussed for Corridor B. The only notable difference is one additional occurrence record for the small white lady's-slipper occurs along Corridor B1 (Appendix F, Table 2, Volume III).

<u>Terrestrial Species</u>

Occurrence of special status species would be the same as discussed for Corridor B.

<u>Aquatic Species</u>

The number of special status fish and mussel species that may occur in waterbodies crossed by Corridor B1 would be the same as listed for Corridor B. The only notable difference is that the Chippewa River crossing is a section that contains known records for three mussel species (spike, creek heelsplitter, and black sandshell).

Corridor C

Plant Species

A total of 27 special status plant species may occur within Corridor C. Of these 27 species, eight plant species have been documented within Corridor C including Sullivant's milkweed, Missouri milkvetch, black disc lichen, larger water-starwort, yellow-fruited sedge, plains prickly pear, clustered broomrape, and yellow prairie violet (Appendix F, Table 2, Volume III).

Terrestrial Species

A total of 16 special status terrestrial species may occur within Corridor C including two mammals, five birds, three reptiles, and six invertebrates. Eight terrestrial species have been documented within Corridor C including northern river otter, prairie vole, American woodcock, bald eagle, spiny softshell, five-lined skink, Pawnee skipper, and regal fritillary (Appendix F, Table 2, Volume III).

Aquatic Species

Corridor C contains suitable habitat for nine fish and 15 mussel special status species (Appendix F, Table 2, Volume III). Fish occurrence includes four species near the southern Minnesota River crossing (lake sturgeon, blue sucker, paddlefish, and black buffalo), one species in the Yellow Bank River (central mud minnow), one species in Monighan and Cobb creeks (northern redbelly dace), and two species in the Whetstone, North Fork Whetstone, or northern Minnesota river crossings (golden redhorse and rosyface shiner). Hornyhead chub has been collected in upper Minnesota, North Fork Whetstone and South Fork Yellowbank rivers, and Monighan Creek. The mussel species are associated with the Whetstone, North Fork Whetstone, Minnesota, and Lac qui Parle rivers.

Corridor C1

Plant Species

A total of 27 special status plant species may occur within Corridor C1. Of these 27 species, 10 plant species have been documented within Corridor C1 including Sullivant's milkweed, slender milkvetch, Missouri milkvetch, black disc lichen, larger water-starwart, cutleaf ironplant, plains prickly pear, clustered broomrape, soft goldenrod, and red three-awn (see Appendix F, Table 2, Volume III).

Terrestrial Species

A total of 16 special status terrestrial species that may occur within Corridor C1 include two mammals, five birds, three reptiles, and six invertebrates. Ten terrestrial species have been documented within Corridor C1 including bald eagle, burrowing owl, loggerhead shrike, Wilson's phalarope, five-lined skink, Spiny softshell, Arogos skipper, Dakota skipper, powesheik skipper, and regal fritillary (see Appendix F, Table 2,Volume III).

Aquatic Species

The number of special status fish and mussel species that may occur in waterbodies crossed by Corridor C1 would be the same as listed for Corridor C.

Substations and Other System Improvements

Although no special status species have been documented within the vicinity of the existing substations or at the proposed new Canby relocated site, several species may occur within the area and are discussed in Appendix F, Table 2, Volume III. The federally-listed or candidate species known to occur along the Hankinson line are listed in Appendix F, Table 6, Volume III. The State special status species that may occur near the existing Hankinson line are listed in Appendix F, Table 7, Volume III.

3.4.3.5 Wetland/Riparian Areas

Wetland and riparian resources in the vicinity of the proposed corridors and the existing Hankinson line were identified by reviewing USFWS NWI maps and land cover data. Many wetlands and riparian areas are located within the proposed corridors (Table 3.4-15; Figure 3.4-6). In general, the proposed corridors and the existing Hankinson line traverse the Prairie Pothole Region (PPR), an area that is characterized by gently rolling topography with shallow, isolated wetlands. The PPR wetlands are typically small (less than one acre) isolated depressions in the flat to gently rolling landscape, formed by the retreat of glaciers approximately 12,000 years ago. Wetlands in the PPR have water budgets that are driven principally, if not entirely, by surface water runoff and direct precipitation (Mitsch and Gosselink, 2000). The majority of PPR wetlands have water regimes that involve annual cycles of early season surface water followed by drying down. The amount of water in a given wetland depends on seasonal rainfall and spring snowmelt from surrounding agricultural fields and grasslands. In addition, PPR wetlands tend to go through 5-10 year cycles of drought and wet periods, resulting in vegetation patterns that vary with alterations in water depth (Richardson, 2000).

The majority of the wetlands are lacustrine type (associated with lakes), except in Kandiyohi County, Minnesota, where palustrine emergent type (i.e., isolated wetlands with emergent vegetation such as cattails) are common. Because the proposed corridors predominantly (>90 percent) consist of agricultural land, undisturbed riparian areas are confined to narrow bands along natural streams. Species typically associated with wetland/riparian areas are provided in Appendix F, Table 4, Volume III. Seasonal variations in precipitation and groundwater recharge primarily determine the stream and wetland elevations. Wetland delineations would be conducted after the transmission lines are designed.

Table 3.4-15. Summary of NWI Wetlands Within the Proposed Corridors

Wetland Type	Number of Wetlands	Total Area	Number of Wetlands	Total Area	Number of Wetlands	Total Area	Number of Wetlands	Total Area	Number of Wetlands	Total Area
	Corridor A		Corridor B		Corridor B1		Corridor C		Corridor C1	
Lacustrine	20	1,507	9	472	9	472	8	340	7	317
Palustrine										
Emergent	1,798	6,230	11	32	11	32	2,827	6,231	1,636	5,429
Forested	129	663	1,259	3,426	1,194	3,636	261	547	227	634
Scrub/Shrub	16	35	215	1,239	213	1,061	58	79	69	131
Aquatic bed	12	33	87	153	78	134	146	245	24	44
Unconsolidated bottom	227	370	245	190	235	180	225	281	333	390
Riverine	8	19	13	107	15	145	30	280	13	260
Total	2,210	8,857	1,839	5,619	1,755	5,660	3,555	8,003	2,309	7,205

Source: USFWS, 2005d.

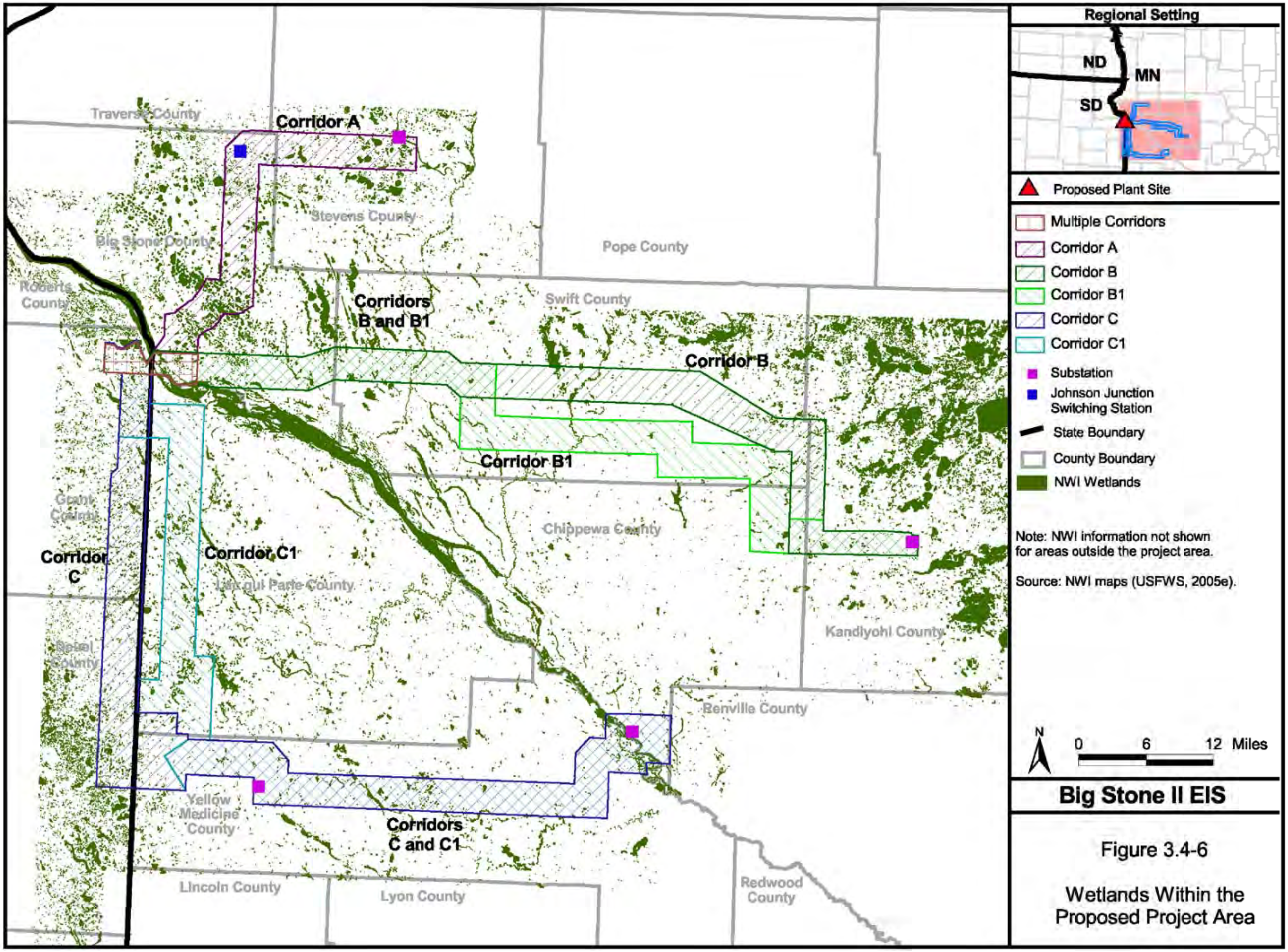


Figure 3.4-6

Wetlands Within the Proposed Project Area

Corridor A

NWI maps indicated that 2,210 wetlands occur within Corridor A totaling 8,857 acres. Approximately 70 percent of the wetlands are palustrine emergent type wetlands composed of broadleaf sedge/cattail and sedge meadow vegetation. Floating aquatic wetlands also occur within Corridor A and consist of water lilies, duckweed, and phytoplankton. The Ortonville and Otrey townships (Township 121 North, Range 45 West and Range 46 West) contain a particularly high concentration of wetlands. NWI data for Corridor A is summarized in Table 3.4-15.

USGS topographic and watershed maps indicate that Corridor A crosses 11 perennial streams. Riparian areas associated with major stream crossings include the Minnesota River, Whetstone River, North Fork Whetstone River, and Stony Run. Public and MPCA-impaired waters and FEMA 100-year floodplains that occur within Corridor A are discussed in Section 3.2.

Corridor B

NWI maps indicated that 1,839 wetlands occur within Corridor B totaling 5,619 acres. Table 3.4-15 summarizes the NWI wetlands within Corridor B. Palustrine emergent type wetlands comprise approximately 61 percent of the total wetland area in Corridor B and approximately eight percent of the wetlands are lacustrine type wetlands. A high concentration of the wetlands occurs in Mamre, Dovre, and Green Lake townships (Township 120 North, Range 34 West, Range 35 West, and Range 36 West).

USGS topographic and watershed maps indicate that Corridor B crosses 18 perennial streams. Major riparian areas are associated with the Minnesota River, Whetstone River, North Fork Whetstone River, Stony Run, Pomme de Terre River, and Chippewa River. Further discussion on these waterbodies as well as a list and discussion on public waters, MPCA-impaired waters, and 100-year floodplains are provided in Section 3.2.

Corridor B1

NWI maps indicate that 1,755 wetlands occur within Corridor B1 totaling 5,660 acres. Palustrine emergent type wetlands consist of approximately 65 percent of the total wetland area in Corridor B1. Table 3.4-15 summarizes the NWI wetlands within Corridor B1.

USGS topographic and watershed maps indicate that Corridor B1 crosses 15 perennial streams. Major riparian areas associated with Corridor B1 are the same as those listed for Corridor B. Further discussion on these waterbodies as well as a list and discussion on public waters, MPCA-impaired waters, and 100-year floodplains, are provided in Section 3.2.

Corridor C

NWI maps indicate that 3,555 wetlands occur within Corridor C totaling 8,003 acres (Table 3.4-15). Approximately 78 percent of the wetland area consists of palustrine emergent type wetlands. Two areas in Corridor C support a high density of the wetlands including: Omro Township (Township 115 North, Range 43 West) and an area adjacent to the Minnesota River near Granite Falls.

USGS topographic and watershed maps indicate that Corridor C crosses 68 perennial streams. Major riparian areas are associated with the Minnesota River, North Fork Whetstone River, North and South Forks of the Yellowstone River (each crossed multiple times), Lac qui Parle River, Florida Creek, and Lazarus Creek (the latter two crossed twice). Further discussion on these waterbodies as well as a list and discussion on public waters, MPCA-impaired waters, and 100-year floodplains are provided in Section 3.2.

Corridor C1

NWI maps indicate that 2,309 wetlands occur within Corridor C1 totaling 7,205 acres (Table 3.4-15). Approximately 75 percent of the wetland area consists of palustrine emergent type wetlands.

USGS topographic and watershed maps indicate that Corridor C1 would potentially intersect 104 perennial streams. Major riparian areas associated with Corridor C1 are the same as those listed in Corridor C. Further discussion on these waterbodies as well as a list and discussion on public waters, MPCA-impaired waters, and 100-year floodplains are provided in Section 3.2.

Substations and Other System Improvements

Alterations to existing substations (Morris Substation, Corridor A; Willmar Substation, Corridor B; and Granite Falls Substation, Corridor C) to support 230-kV operations may occur because of transmission line interconnections. The modifications will not be determined until engineering review and may include replacement and/or upgrading of existing transformers, switching equipment and other components, and land acquisition. The substation areas consists of perennial row crops and non-native grasslands (i.e., pastureland and hayland), which were not delineated as wetlands, and are typically rated as having low ecological quality.

No wetlands or riparian areas are known to occur near substations proposed for modification, or the new Canby Substation, as part of the proposed Project. There are 168 NWI-mapped wetlands totaling 99.7 acres within the 150-foot ROW of the existing Hankinson line. The majority of these, both in numbers and overall acreage, are palustrine emergent wetlands.

3.5 Cultural Resources

3.5.1 Introduction

Cultural resources are those aspects of the physical environment that relate to human culture, society, and cultural institutions that hold communities together and link them to their surroundings. Cultural resources include prehistoric and historic sites and ethnographic resources. Prehistoric and historic sites are the tangible remains of past activities that show use or modification by people. They are distinct geographic areas that can include artifacts; features such as hearths, rock alignments, trails, rock art, railroad grades, canals, and roads; landscape alterations; or architecture. In general, prehistoric and historic sites are the locations of purposeful human activity that have resulted in the deposition of cultural materials beyond the level of a few accidentally lost artifacts.

Ethnographic resources are associated with the cultural practices, beliefs, and traditional history of a community. Examples of ethnographic resources include the following: places in oral histories or myths, such as particular rock formations, the confluence of two rivers, or a rock cairn; large areas, such as landscapes and viewscapes; sacred sites and places used for religious practices; social or traditional gathering areas, such as dance areas; natural resources such as plant materials or clay deposits used for arts, crafts, or ceremonies; and places and natural resources traditionally used for

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Lead Agency:
Western Area Power Administration

Cooperating Agency:
U.S. Army Corps of Engineers

Florida Creek, and Lazarus Creek (the latter two crossed twice). Further discussion on these waterbodies as well as a list and discussion on public waters, MPCA-impaired waters, and 100-year floodplains are provided in Section 3.2.

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If a resource has been identified, through ethnographic research, to have importance in traditional cultural practices and the continuing cultural identity of a community, it may be considered a traditional cultural property (TCP). The term “traditional cultural property” first came into use within the Federal legal framework for historic preservation and cultural resource management in an attempt to categorize historic properties containing traditional cultural significance (Parker and King, 1989). “Traditional cultural significance” refers to those beliefs, customs, and practices of a living community of people that have been passed down through the generations, usually orally or through practice. The traditional cultural significance of a historic property derives its significance from the role the property plays in a community’s historically rooted beliefs, customs, and practices. Examples of properties possessing such significance include the following: a location associated with the traditional beliefs of a Native American group about its origins, its cultural history, or the nature of the world; or a location where Native American religious practitioners have historically gone, and are known or thought to go today, to perform ceremonial activities in accordance with traditional cultural rules of practice.

Other ethnographic resources also may need to be considered in consultation and coordination with Native American tribes. These may be sacred areas, traditional use areas, or other areas of traditional concern that may need to be considered under the American Indian Religious Freedom Act of 1978, EO 13007, Indian Sacred Sites, or other guidelines and regulations addressing Native American rights or trust responsibilities.

Cultural Resources and the Law

Federal historic preservation legislation provides a legal environment for documenting, evaluating, and protecting archaeological and historic sites that may be affected by Federal undertakings, or by private undertakings operating under Federal license, with Federal funding, or on federally-managed lands. The National Environmental Policy Act (NEPA) requires that major Federal actions take into consideration impacts to the natural environment with respect to an array of disciplines and that alternatives must be considered. The courts have been clear that archaeological and historic sites (i.e., cultural resources) are regarded as part of the natural environment. The National Historic Preservation Act (NHPA) of 1966, as amended, established the Advisory Council on Historic Preservation (Council) and the National Register of Historic Places (NRHP) (in its modern form). The NHPA mandates that Federal agencies consider projects’ effects on cultural resources that are listed or eligible for listing in the NRHP. Section 106 of the NHPA (36 CFR Part 800) establishes a four-step review process by which cultural resources are given consideration during the conduct of Federal undertakings. The Archaeological and Historic Preservation Act of 1974 further delineates the responsibilities of Federal agencies in the execution of undertakings with respect to impacts on cultural resources. The Archaeological Resource Protection Act of 1979, as amended, provides for a system of permitting for investigations on Federal land, which may involve removing artifacts or other archaeological resources. The statute also requires that agencies develop compatible regulations to manage cultural resources.

Section 106 of NHPA provides a variety of “program alternatives,” which are mechanisms that allow agencies to customize their Section 106 compliance for particular programs or projects or kinds of resources. One type of program alternative is a “programmatic agreement.” A programmatic agreement (PA) takes a negotiated approach to implementing Section 106 for a particular agency program or for a complex project. A PA for a complex project lays out the steps that the agency and the consulting parties agree will be taken to consider the effects of the project on historic properties and to resolve any adverse effects.

The NRHP, maintained by the NPS on behalf of the Secretary of the Interior, is the nation's inventory of significant cultural resources. The NPS has established three main standards that a resource must meet to qualify for listing on the NRHP: age, integrity, and significance. To meet the age criteria, a resource generally must be at least 50 years old (except in special circumstances). To meet the integrity criteria, a resource must "possess integrity of location, design, setting, materials, workmanship, feeling and association." (36 CFR 60.4) Finally, a resource must be significant according to one or more of the following criteria:

- Be associated with events that have made a significant contribution to the broad patterns of U.S. history (Criterion A); or
- Be associated with the lives of persons significant in U.S. history (Criterion B); or
- Embody the distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction (Criterion C); or
- Have yielded, or may likely yield, information important in prehistory or history (Criterion D) (NPS, 1995).

3.5.2 Big Stone II Plant Site and Groundwater Areas

From March 2005 through July 2007, the Co-owners' archaeological consultant conducted a series of archaeological and architectural history investigations of the proposed plant site and expanded groundwater area. The objective of the cultural resources investigations was to determine whether the proposed plant site or the expanded groundwater area contain any historic or archaeological resources and if those resources are eligible for listing on the NRHP. Additionally, the investigation addressed the effects of the proposed Project to architectural resources recommended as eligible for the NRHP.

Archaeological Investigations

On March 2 and 3, 2005, the Co-owners' archaeological consultant conducted a Class I inventory at the State Archaeological Research Center (SARC) and South Dakota State Historic Preservation Office (SHPO) for information on previously identified archaeological sites, architectural and historic resources, and previously conducted cultural resources surveys within one mile of the proposed plant site. Additionally, historical maps and aerial photographs of the site were examined. On April 5, 2005, deed records for surveyed properties were examined at the Grant County Recorder's office at the Grant County Courthouse. Portions of the 1915 and 1916 Big Stone Headlight newspaper were reviewed for information on the original construction of a nearby round barn. On April 6, 2005, a second visit to the SHPO was made to obtain copies of South Dakota's Round and Polygonal Barns and Pavilions Multiple Property Documentation Form (Ahrendt, 1995), and survey information on individual round barns. The Bureau of Land Management (BLM) General Land Office patent records also were examined (BLM, 2005).

On March 4, 2005, a windshield survey of the proposed plant site was conducted by the Co-owners' archaeological consultant to identify areas with moderate or high archaeological potential. All previously undisturbed portions of the proposed plant site with the following attributes were considered to have a moderate to high potential for archaeological sites:

- Within 500 feet of an existing or former water source of 40 acres or greater in extent, or within 500 feet of a former or existing perennial stream.
- Located on topographically prominent landscape features.
- Located within 300 feet of a previously reported site.
- Located within 300 feet of a former or existing historic structure or feature, such as a building foundation or cellar depression.

Areas defined as having a relatively low potential for containing intact archaeological resources included inundated areas, former or existing wetland areas, poorly drained areas, and areas with a 20 percent or greater slope. Low potential areas and areas in which Holocene (less than 10,000 years old) deposits have been significantly disturbed were defined as having little or no potential for containing intact archaeological resources (The 106 Group, 2007).

A Class III archaeological investigation was conducted for the proposed plant site. Historic and recent aerial photographs indicate that portions of the existing plant area have been disturbed by the construction of existing plant facilities, access routes, railroad spurs, and cooling ponds. Based on this documentation, it was determined that there is a low potential that any archaeological resources would be present at the proposed plant site (The 106 Group, 2007). In March 2006, Western recommended that no historic properties would be affected within the disturbed areas of the proposed plant site, and that a Class III archaeological investigation would not be required; the South Dakota SHPO concurred with Western's recommendations.

In 2006, a Class III archaeological investigation was performed of several boring sites located in undisturbed portions of the proposed plant site to support geotechnical investigations. In addition, a Class III archaeological survey was conducted in 2006 for the remaining undisturbed areas within the proposed plant site slated to be disturbed by the proposed Big Stone II plant construction. Areas identified as undisturbed portions of the proposed plant site were surveyed employing shovel testing and systematic surface reconnaissance dependant upon surface visibility.

In 2006, a Class I inventory was conducted within one mile of the expanded groundwater area and on cultural resources surveys previously conducted within the expanded groundwater area (The 106 Group, 2007). Additionally, historical maps and aerial photographs of the area were examined. A windshield survey of the expanded groundwater area was conducted by the Co-owners' archaeological consultant to identify areas with previous ground disturbance and to identify the extent and type of architectural and historical sites within the area.

In 2007, archaeological monitoring of the groundwater well drilling sites located within the expanded groundwater area was conducted. Monitors examined the sediments recovered from drill cores and cuttings.

No TCPs have been identified within these areas; however, through continued tribal consultations, a TCP study may be done at the tribes' request.

Archaeological Resources

Big Stone II Plant Site

Research during the Class I investigation indicated that two archaeological surveys have been conducted within the proposed plant site. One archaeological site has been recorded within the proposed plant site and three archaeological sites have been recorded within one mile of the proposed plant site (The 106 Group, 2007).

The Class III archaeological investigation for the proposed plant site identified one new archaeological site as well as an isolated find (39GT0052 and 39GT0053) and extended the boundary of previously recorded Site 39GT0024 (The 106 Group, 2007). These findings will be consulted on through the PA.

- Site 39GT0052 is recommended as not eligible for listing on the NRHP.
- Site 39GT0024 is almost entirely outside the proposed Project area and has not been evaluated for its eligibility for listing in the NRHP since it will be avoided by the proposed Project.

Expanded Groundwater Area

Research during the Class I investigation indicated that seven archaeological surveys have been conducted within the expanded groundwater area (The 106 Group, 2007).

Three archaeological sites have been recorded within the expanded groundwater area, and one archaeological site has been recorded within one mile of the expanded groundwater area (The 106 Group, 2007).

Former and active gravel pits within the expanded groundwater area appeared to be highly disturbed because of current or historic gravel extraction. Therefore, further archaeological investigation within these areas was not necessary because any archaeological resources that may have existed have most likely been destroyed.

In 2007, archaeological monitoring of the well drilling sites located within the expanded groundwater area was conducted. During February and March, the field conditions (frozen ground and snow cover) and Project schedule did not allow for a traditional Class III archaeological survey. As a result, and pursuant to the PA, an archaeological monitor was present at each of the drilling locations (Western, 2006c). During May and June 2007, an agreement with Western allowed for continued monitoring of the well drilling locations.

Thirty borings of four-inch diameter were drilled within the expanded groundwater area. For each of the 30 borings, at a minimum, the top 100 centimeters below ground surface from within the boring was examined to ensure that any possible cultural material was located. Of the 30 borings, none were found to contain archaeological material. In addition, no archaeological material was identified during the examination of any and all rutting incurred during the drilling operation.

Historical Resources

Proposed Big Stone II Plant Site

During the Class III architectural history survey, five historic standing structures were identified within one mile of the proposed plant site, but outside of the proposed Project area. Two of the structures are modern rural residences at the location of historic farmsteads; however, none of the historic farmstead buildings remain standing on these properties. The remaining three historic standing structures are farmsteads that include buildings over 49 years of age (The 106 Group, 2007).

- The first structure over 49 years of age is a farmstead, which consists of a four-square house and gambrel-roofed barn erected circa 1915. Other buildings in the farmstead include two hog houses, a chicken house, pump shed, and grease shed. Applying the NRHP criteria established by the NPS (as listed above), the farmstead was recommended by the Co-owners' archaeological consultant as not eligible for the NRHP.
- The second structure is a circa 1890 farmstead, currently unoccupied, with a mix of both early and old farm buildings. The farm buildings include a granary, wood-framed loafing shed, pole barns, grain bins, and garage. Applying the NRHP criteria, the farmstead was recommended by the Co-owners' archaeological consultant as not eligible for the NRHP.
- The third structure is a farmstead, now used as a rural residence. The farmhouse is a gable-front dwelling erected circa 1900 and clad with stucco during the 1930s. A 1915 wood-framed round barn with internal silo stands near the northwest corner of the farmstead and a circa 1917 gable-roofed livestock and hay barn stands west of the house. Other buildings include a Quonset building, a gothic-arched building, and grain bins. Applying the NRHP criteria, all of the farmstead buildings, except the round barn and livestock and hay barn, were evaluated as not eligible for the NRHP. The round barn and livestock and hay barn are recommended by the Co-owners' archaeological consultant as eligible for listing on the NRHP under Criterion C.

Expanded Groundwater Area

The Class I literature review noted a 2006 architectural survey in Grant County, including farmsteads, ranches, late nineteenth century dwellings, early-to-mid twentieth century dwellings, commercial and religious buildings, and cemeteries. Of the 1,053 sites, none of the sites fell within the expanded groundwater area (The 106 Group, 2007).

Within the expanded groundwater area, 11 architectural sites have been previously recorded; of these sites, none are listed on or recommended as eligible for listing on the NRHP.

During the 2006 windshield survey, 29 architectural sites over the age of 50 years were identified in the expanded groundwater area. Most sites are farmsteads, although other property types included bridges, rural residences, and isolated remnants of farmsteads. Five of these sites have been previously determined not eligible for listing on the NRHP. The remaining sites are unevaluated and will be consulted on through the PA.

3.5.3 Transmission Corridors, Substations, and Other System Improvements

At this time, the final alignments of the transmission lines within the proposed corridors have not been determined. Therefore, the analysis of each proposed corridor was conducted using a programmatic approach to identify cultural resources within each proposed corridor and evaluate potential impacts associated with routing within the proposed corridors. A Class I files and records search was conducted for each of the proposed corridors. The study area for the Class I files and records search encompassed the designated three- to four-mile-wide corridors in Minnesota and South Dakota. Class III intensive cultural resource inventory of the Area of Potential Effect (APE) of the transmission line routes (about 200 feet wide) is required in accordance with the PA.

Since the release of the Draft EIS, the route permitting processes have proceeded at a quicker pace in South Dakota than in Minnesota. In South Dakota, a single route is evaluated as part of the permitting process and requires cultural resource surveys to support the permit process; whereas, in Minnesota, route alternatives are developed and surveys are not completed until a route is designated by the Minnesota Public Utilities Commission (MnPUC). To support the transmission line route permitting process in South Dakota, Class III cultural resources surveys were undertaken in 2006 for the proposed routes.

3.5.3.1 Transmission Lines and Substations

Archaeological Investigations

During spring and summer of 2005, the Co-owners' archaeological consultant conducted a Class I files and records search through the Minnesota and South Dakota SHPOs and the SARC in Rapid City. Archaeological and architectural site forms, survey reports, and topographic maps were reviewed to determine the number of previously recorded sites and previously conducted inventories within a three to four-mile-wide corridor in South Dakota and within three-mile-wide-corridors in Minnesota. South Dakota Public Land Survey (PLS) maps, depicting natural and cultural features from the 19th century, also were reviewed. PLS maps for Minnesota were available as an Internet-based resource from the Minnesota Land Management Information Center. The Co-owners' archaeological consultant also reviewed the Geographic Research Information Display databases available on the Internet from the South Dakota Historical Society in Pierre, South Dakota. Other archival and environmental resources were available at repositories in Minneapolis, Minnesota and on the Internet.

The Co-owners' archaeological consultant conducted a windshield survey of selected portions of the proposed corridors The windshield survey confirmed the information identified in the Class I inventory regarding the relative periods of historic occupation within the proposed corridors. In general, construction dates of standing structures in the proposed corridors range from the later half of the 19th century to the 21st century. Some towns, such as Ortonville and Granite Falls, have greater densities of historic structures.

The most prominent standing structures along the length of each proposed corridor are farmsteads that are common throughout the region. Generally, most farmstead complexes post-date the 1880s; however, based on the structures observed during the windshield survey, most residential structures post-date the 1950s (Palmer et al., 2005).

An update on the records was requested from the South Dakota SHPO and the SARC in July 2006, and a Class III inventory was conducted of a 200-foot wide proposed route, a proposed new substation location, and two possible staging areas, within Corridor C in South Dakota from May to November, 2006.

No TCPs have been identified within these areas; however, through continued tribal consultations, a TCP study may be done at the tribes' request.

Archaeological Resources

<u>Corridor A</u>

A total of 15 archaeological resources have been previously recorded within Corridor A (Appendix G, Table 1, Volume III). The archaeological resources include prehistoric earthworks, cemeteries, and artifact and lithic scatters. One site was recorded as a probable Middle Prehistoric Period tradition artifact scatter. A single historic period artifact scatter also was recorded within Corridor A. One of the 15 archaeological resources is recorded as eligible for the NRHP. The remaining 14 sites have not been evaluated for NRHP eligibility, pending route selection by the MnPUC.

<u>Corridor B</u>

A total of 12 archaeological resources were previously documented within Corridor B (Appendix G, Table 2, Volume III). The archaeological resources include prehistoric earthworks, lithic scatters, artifact scatters, depressions, and rock alignments. Prehistoric resources with identified traditions include one Early Prehistoric artifact scatter, three Middle Prehistoric artifact scatters, and earthworks. One of the 12 archaeological resources is recorded as eligible for the NRHP.

<u>Corridor B1</u>

A total of 13 archaeological resources were previously documented within Corridor B1 (Appendix G, Table 3, Volume III). The archaeological resources include prehistoric earthworks, lithic scatters, artifact scatters, and rock alignments. One of the 13 archaeological resources is recorded as eligible for listing on the NRHP.

<u>Corridor C</u>

A total of 83 archaeological resources were previously documented within Corridor C (Appendix G, Table 4, Volume III). The archaeological sites include prehistoric earthworks, stone circles, a rock cairn, an earth lodge village, other occupation sites, artifact scatters, lithic scatters, single artifacts, and the 1870s location of Minnesota Falls. Archaeological investigations at one site in South Dakota recovered evidence of a Middle Prehistoric occupation. Nine sites in Minnesota have been identified with one or more prehistoric traditions: six were identified as Middle Prehistoric, two contained multiple components, including evidence of Early and Middle Prehistoric occupations, and one site represents occupation across the Early, Middle, and Late Prehistoric periods. The temporal periods of the remaining prehistoric sites are largely unknown. Four of the previously recorded archaeological sites include historic dugouts, artifact scatters, the remains of the early Euroamerican settlement at Granite Falls, and a farmstead. Of the 83 archaeological resources, 10 are recorded as eligible for the NRHP.

During the 2006 Class III survey, a total of 24 archaeological sites and isolated finds were identified within the APE. Nineteen of the 24 are previously unrecorded sites related to pre-contact Native American habitations or ephemeral use sites, twelve of which are defined by less than 10 artifacts. One of these sites was previously recorded (39GT0048); another contains dense deposits that may contain significant features (39GT0036). One site is a previously unrecorded abandoned historic-era farmstead with structural ruins (39GT0049), and three others are extensions of previously recorded historic railroad grades (39GT2000, 39GT2007, and 39GT2015).

- Twelve isolated finds were identified (39DE0087, 39DE0086, 39GT0041, 39GT0042, 39GT0043, 39GT0038, 39GT0044, 39GT0050, 39GT0040, 39GT0047, 39GT0039, 39GT0046). These isolated finds were located on private lands and recommended as not eligible for the NRHP.
- Site 39DE0085 is a small pre-contact site and is recommended as not eligible for the NRHP.
- Site 39DE0088 is a small pre-contact site and is recommended as eligible for the NRHP.
- Site 39GT0036 is a pre-contact site and is recommended as eligible for nomination to the NRHP.
- Site 39GT0037 is a small pre-contact artifact scatter and is recommended as eligible for nomination to the NRHP.
- Site 39GT0045 is a pre-contact artifact scatter and is recommended as not eligible for the NRHP.
- Site 39GT0048 is a large pre-contact site and is recommended as eligible for nomination to the NRHP.
- Site 39GT0049 is a late-historic site and is recommended as not eligible for nomination to the NRHP.
- Site 39GT2000 is an extension of a previously recorded railroad grade currently still in use by Burlington Northern Railroad. The SHPO considers this site eligible for the NRHP.
- Site 39GT2007 is a previously recorded Chicago, Northwestern, St. Paul & Pacific Railroad line that is still in use. The SHPO considers this site eligible for the NRHP.
- Site 39GT2015 is an extension of a previously recorded historic railroad grade. The SHPO considers this site eligible for the NRHP.
- Site 39GT2042 is an extension of a previously identified historic railroad grade. The SHPO considers this site eligible for the NRHP.

<u>Corridor C1</u>

A total of 60 archaeological resources were previously documented within Corridor C1 (Appendix G, Table 5, Volume III). The archaeological sites include earthworks, artifact scatters, lithic scatters, single artifacts, and a cemetery. Of the 60 archaeological resources, three are recorded as eligible for the NRHP.

<u>Substations</u>

Transmission line interconnections would require modifications to existing substations. The existing Canby Substation would be relocated on newly acquired land. Substation modifications may require the acquisition of additional land to accommodate expansion requirements. Archaeological resources that may be affected by substation expansions are included as part of the transmission line corridor analyses.

Historical Resources

Corridor A

A total of 145 historic standing structures have been previously recorded within Corridor A (Appendix G, Table 1, Volume III). Previously documented historic standing structures include community and commercial buildings, residences, cabins, churches, farmsteads, bridges, and a park. Construction dates range from 1872 to 1978. Of the 145 historic standing structures, two are recorded as eligible for inclusion on the NRHP, five are listed on the NRHP, and 20 are contributing properties to the NRHP-listed Downtown Ortonville Historic District.

The 1850s to 1870s PLS maps show historic period cultural features in Otrey and Moonshine townships in Big Stone County, Minnesota, and cultural features in Baker, Scott, and Darnen townships located in Stevens County, Minnesota. Cultural features include one railroad (St. Paul and Pacific Railroad), multiple unnamed trails/roads, and farmsteads (Palmer et al., 2005).

Corridor B

A total of 61 historic standing structures were previously recorded within Corridor B (Appendix G, Table 2, Volume III). Previously documented historic standing structures include commercial and community buildings, houses, farmsteads, bridges, and churches. Construction dates for these structures range from the 1870s to the 1950s. Of the 61 historic standing structures, three are recorded as eligible for the NRHP and three are recorded as listed on the NRHP.

The 1850s to 1870s PLS maps indicate multiple cultural features along Corridor B, particularly in areas adjacent to Big Stone Lake and the Minnesota River. Features are shown in Akron Township in Big Stone County and multiple cultural features are shown in Shible, Moyer, Marysland, Six Mile Grove, and Torning townships in Swift County, Minnesota. These historic features include railroad segments (St. Paul and Pacific Railroad), several unnamed trails/roads, and multiple farms/structures (Palmer et al., 2005).

Corridor B1

A total of 64 historic standing structures were previously recorded within Corridor B1 (Appendix G, Table 3, Volume III). Previously documented historic standing structures include commercial and community buildings, houses, farmsteads, bridges, schools, and churches. Construction dates for these structures range from the 1870s to the 1950s. Of the 64 standing structures, two are recorded as eligible for the NRHP and one is recorded as listed on the NRHP.

The 1850s to 1870s PLS maps indicate multiple cultural features along Corridor B1, particularly in areas adjacent to the Minnesota River. Multiple cultural features are shown in Shible, Moyer, Marysland, Six Mile Grove, and Torning townships. These historic features include railroad segments, several unnamed trails/roads, and multiple farms/structures (Palmer et al., 2005).

Corridor C

A total of 119 historic standing structures were previously recorded within Corridor C (Appendix G, Table 4, Volume III). Previously documented historic standing structures include active and abandoned farmstead complexes, schools, churches, bridges, commercial buildings, residences, other community buildings, parks, the now demolished Minnesota Falls Plant and Dam, and the 1900s Bernt Fredrickson House in Granite Falls Township. Construction dates of inventoried historic structures range from 1871 to 1970. Seven of the 119 historic standing structures are recorded as eligible for listing on the NRHP and three are recorded as not eligible for the NRHP.

The 1860 to 1880s PLS maps show multiple cultural features in Herrick and Glenwood townships in Deuel County and Alban and Big Stone townships in Grant County, South Dakota. Cultural features also are shown in Florida, Minnesota Falls, Hazel Run, Omro, and Stony Run East townships in Yellow Medicine County and in Granite Falls Township in Chippewa County, Minnesota. Cultural features include the Winona and St. Peters Railroad and Chicago Milwaukee Railroad, other unnamed railroad alignments, trails/roads, farms/structures, miscellaneous features, and the boundaries of the Upper Sioux Reservation (Palmer et al., 2005).

<u>Corridor C1</u>

A total of 131 historic standing structures were previously documented within Corridor C1 (Appendix G, Table 5, Volume III). Previously documented historic standing structures include farmstead complexes, schools, churches, bridges, commercial buildings, residences, other community buildings, and parks. Construction dates of inventoried historic structures range from 1871 to 1970. Three of the 131 historic standing structures are recorded as eligible for listing on the NRHP and two are recorded as listed on the NRHP.

The 1860 to 1880s PLS maps show multiple historic features in Florida, Minnesota Falls, Hazel Run, Omro, and Stony Run East townships and in Granite Falls Township. Cultural features include railroad alignments, other unnamed railroad alignments, trails/roads, farms/structures, and miscellaneous features (Palmer et al., 2005).

<u>Substations</u>

Historic standing structures that may be affected by substation expansions are included as part of transmission line corridor analyses. The existing Canby Substation would be relocated on newly acquired land that does not contain any historical standing structures.

<u>Architectural History Resource Survey, Deuel and Grant Counties, South Dakota</u>

An architectural history resource survey was conducted for the proposed construction of the new transmission line and new ROW in Deuel and Grant counties in South Dakota. The objective of the survey was to identify historic structures within the APE and evaluate the historic significance of the properties using NRHP criteria. The APE predominantly consisted of rural farmsteads and agricultural land with many of the historic age farm structures currently occupied or used and which have been significantly altered. Properties 45 years old and older were evaluated. Twelve previously recorded properties were re-evaluated for alterations that may affect integrity. The survey identified 29 new historic properties (Appendix G, Table 7, Volume III). One previously recorded property and one newly recorded property are considered eligible for listing on the NRHP. All other properties are considered not eligible for NRHP listing.

3.5.3.2 Other System Improvements

Based on preliminary investigations, improvements to the existing Hankinson line would be required due to the increased line rating resulting from overloads to the line after construction of the proposed Project. The Co-owners have identified the archaeological and historical resources within one-mile of the existing Hankinson line.

Archaeological Investigations

During October and November of 2008, the Co-owners' archaeological consultant conducted a Class I files and records search for previously recorded archaeological properties within one mile of the existing Hankinson line. Information was gathered from the North Dakota State Historical Society and the South Dakota State Historical Society. Archaeological and architectural site forms, survey reports, and topographic maps were reviewed to determine the number of previously recorded sites and previously conducted inventories near the Hankinson line.

Archaeological Resources

A total of 41 archaeological properties (both historic and prehistoric) were recorded in the State Historical Society files. The archaeological resources include prehistoric earthworks, cemeteries, and artifact and lithic scatters. Nineteen of the recorded sites are Native American Indian earthworks, burial mounds, or cemeteries. The remaining 22 archaeological sites consist of artifact scatters, village sites, rock art, a fort, farmsteads, and rock alignments. Three of the prehistoric sites are recorded as not eligible for the NRHP, while most remain unevaluated.

Historical Resources

A total of 54 historic structural properties (including cemeteries, buildings, railroads, and bridges) are recorded in the files within one mile of the Hankinson line in both the North and South Dakota State repositories. Properties listed as eligible for the NRHP include two bridges and a church in North Dakota, and two church-related structures and a school in South Dakota, itemized below. Most properties remain unevaluated.

- RO00000252 Hart School #3
- RO00000255 Walla Lutheran Church
- RO00000256 Walla Lutheran Church shed
- 32-RI-745 Bridge
- 32-RI-747 Bridge
- 32-RI-707 Church

3.6 Land Use

3.6.1 Introduction

This section discusses various aspects of land use, including the following: land use planning, public facilities, recreation, and agricultural practices. Each of these is important in terms of identifying aspects of the man-made environment that may be affected by the proposed Project. Land use planning is addressed to assess compatibility of the proposed Project with existing land uses, land use plans, special interest areas, and proposed developments. Public facilities are addressed to identify areas most likely to affect the public by the construction and operation of the proposed Project. Recreation and agricultural practices are addressed within this section because they are land uses that could be affected by the proposed Project.

The study area includes portions of the following counties located within the proposed Project: Grant and Deuel counties, South Dakota; and Big Stone, Chippewa, Kandiyohi, Lac qui Parle, Renville, Stevens, Swift, and Yellow Medicine counties, Minnesota.

Land Use Planning

Northeastern South Dakota and western Minnesota are characterized by rural farmland and small towns. The area has many recreational opportunities including swimming, boating, open water fishing, ice fishing, hiking, camping, hunting, exploring, biking, sightseeing, and photography. Area lakes provide year-round recreational opportunities to residents and visitors alike. A variety of non-lake recreational opportunities are provided not only in the primary study communities (proposed plant site, groundwater areas, and transmission corridors), but also in the secondary study communities (surrounding region).

Land uses have been identified using South Dakota GAP and Minnesota GAP resources generated by the USGS. Zoning was identified by examining county and city documents.

Public Facilities

Public facilities identified near the proposed plant site and corridors include cemeteries, hospitals, airports, schools, and licensed day care providers.

Recreation

Recreational resources identified near the proposed plant site and corridors include WPA, WMA, NWR, and other State and local recreational resources.

Prime Farmland

The NRCS defines prime farmland soils as having:

"…the best combination of physical and chemical characteristics for producing food, feed, forage, fiber and oilseed crops…" and "…an adequate and dependable water supply from precipitation or irrigation. They have a favorable temperature and growing season with acceptable levels of acidity or alkalinity, content of salt, or sodium and few or no rocks. They are permeable to water and air, are not excessively erodible and are not saturated with water for long periods of time. They do not flood frequently or are protected from flooding." (7 CFR § 657)

Soils listed as farmland of State-wide importance in Minnesota are defined as:

"…those that are nearly prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some may produce as high a yield as prime farmlands if conditions are favorable." (7 CFR § 657)

3.6.2 Big Stone II Plant Site and Groundwater Areas

3.6.2.1 Land Use Planning

Proposed Big Stone II Plant Site

The proposed plant site comprises two zoning types, as illustrated in Figure 3.6-1. As shown by Table 3.6-1, agriculture, primarily row crops, is the largest existing land use, and accounts for approximately 35 percent of the proposed plant site. The existing Big Stone plant comprises 31.5 percent of the proposed plant site.

<u>Land Use Controls and Compatibility with Existing Land Use and Zoning</u>

The existing plant site is zoned for commercial use (Grant County, 2004a) (Figure 3.6-1). This includes the property south of 144th Street to the Whetstone River. The proposed Big Stone II plant is within the boundaries of Grant County. The Grant County Planning Board regulates land use planning at the proposed Big Stone II plant site. The new plant site is in an area identified as an "Area of Development Transition," according to the Grant County Comprehensive Land Use Plan (Grant County, 2004b).

Table 3.6-1. Land Cover Types – Existing and Proposed Plant Site

	Cover Types	Acres[a]	Percent
Vegetation Cover	Agriculture	1,116	35.0
	Wetland/Riparian	124	3.9
	Forest	234	7.4
	Shrubland	0	0.0
	Prairie	690	21.6
Non-vegetation Cover	Open Water	717	22.5
	Developed	307	9.6
Total		3,188	100.0

[a]Values are approximate due to rounding.

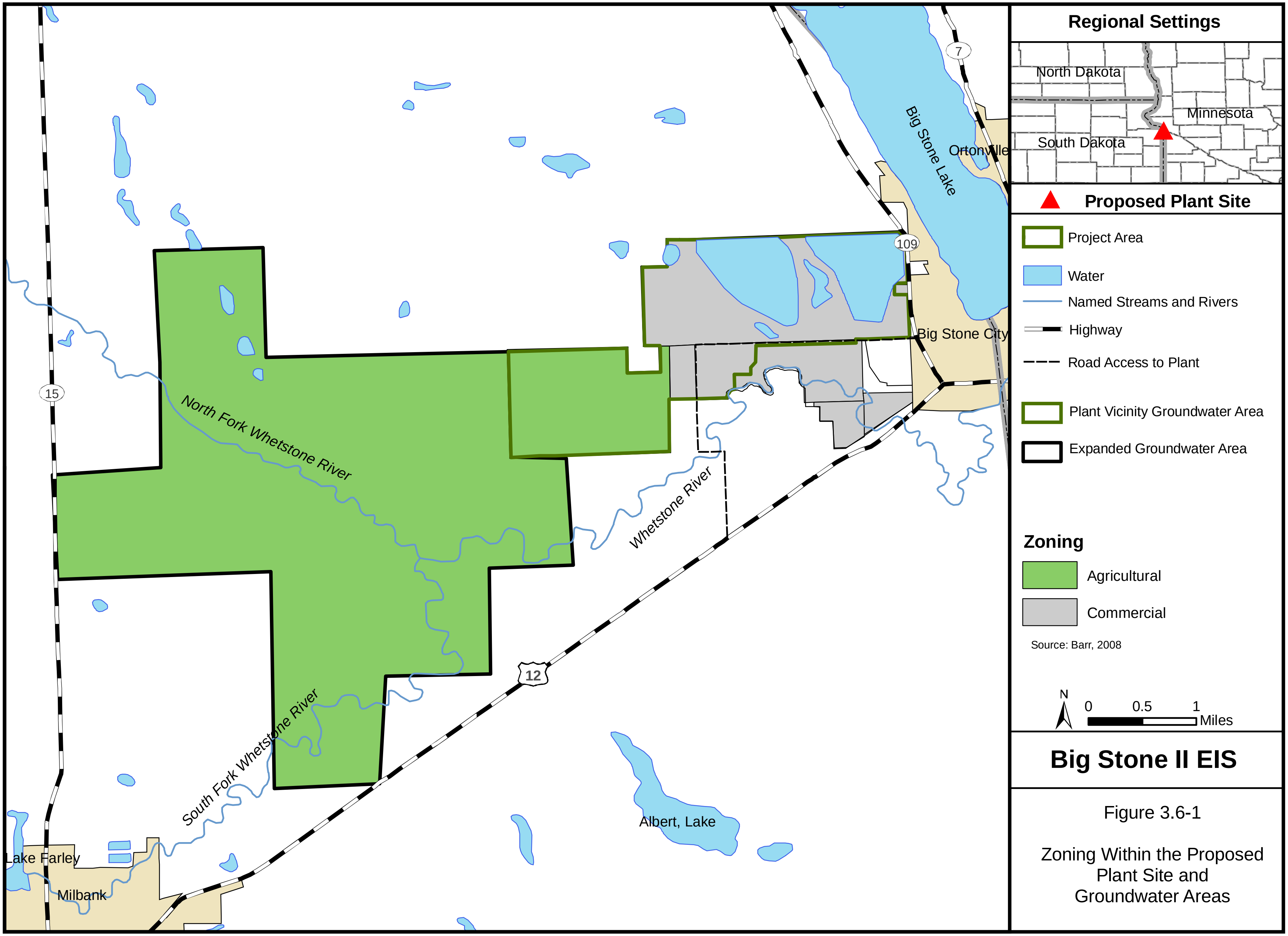
Source: Barr, 2004a

Groundwater Areas

The approximately 7,694-acre expanded groundwater area (see Figure 2.2-4) is composed of predominately of agricultural property. Other land cover types within the area include wetland/riparian, forest, shrubland, prairie, developed, and open water (see Figure 3.4-1). The North Fork and South Fork of the Whetstone River merge into the Whetstone River within the area.

Irrigation wells are located within the expanded groundwater area; limited areas of center pivot irrigation exist south of the North Fork of the Whetstone River. There are no towns in this area, but there are scattered rural residences with domestic wells. Minimal commercial operations exist, but gravel pits are present within the area.

The Co-owners do not own any land within the expanded groundwater area. The vast majority of the land is privately owned. There are no NWRs, WMAs, SWMAs, or SNAs within the expanded groundwater area. The VanHout WPA is the only known government-owned parcel and is located in the southeast quarter of Section 7, which is the northernmost portion of the expanded groundwater area.



Big Stone II EIS

Figure 3.6-1

Zoning Within the Proposed Plant Site and Groundwater Areas

Land Use Controls and Compatibility with Existing Land Use and Zoning

The proposed expanded groundwater area is within the boundaries of Grant County. The Grant County Planning Board regulates land use planning in the expanded groundwater area. Grant County has zoned the area for agricultural use, as shown by Figure 3.6-1.

3.6.2.2 Public Facilities

There are no cemeteries, hospitals, airports, schools, or licensed day care providers on the proposed plant site or in the expanded groundwater area. The nearest hospital and airport to the proposed plant site are Ortonville Municipal Hospital and Ortonville Municipal Airport, approximately four miles to the east of the site.

Several hospitals or clinics are located in Milbank, South Dakota, approximately three miles southwest of the south border of the proposed groundwater area, and the Milbank Municipal Airport is located about one mile southeast of the area's southern border.

3.6.2.3 Recreation

Proposed Big Stone II Plant Site

The proposed plant site has minimal recreational uses. The site is privately owned and is not accessible for recreation by the general public, with the exception of 491 acres of walk-in areas in the southeastern portion of the plant site. Walk-in recreation areas are private lands where hunters can walk in and hunt for game during the appropriate seasons. Big Stone Lake is located nearof the proposed plant site and is used for a variety of recreational purposes including camping, fishing, boating, and wildlife watching.

Groundwater Areas

A portion of the northernmost section of the expanded groundwater area is within the VanHout WPA, which allows hunting and also provides opportunities for waterfowl observation (bird watching). Big Stone Lake is located in the vicinity of the proposed plant site and is used for a variety of recreational purposes including camping, fishing, boating, and wildlife watching. There are no SDGFP walk-in areas within the expanded groundwater area.

3.6.2.4 Agricultural Practices and Prime and Unique Farmland

Proposed Big Stone II Plant Site

The proposed plant site is largely dry land agricultural. Prime farmland on the proposed plant site comprises agricultural and prairie vegetation cover. Approximately 1,638 acres of soils at the proposed plant site are identified by the U.S. Department of Agriculture/Natural Resources Conservation Service (USDA/NRCS) as prime farmland. There are approximately 227,700 acres of soils identified as prime farmland in Grant County.

Groundwater Areas

The expanded groundwater area is predominately dry land agricultural. Some center pivot irrigation is used south of the South Fork of the Whetstone River, near the center of the expanded groundwater area. Approximately 64 percent (about 5,000 acres) of the area is designated as prime farmland by the

USDA/NRCS. The percentage of prime farmland acreage within the expanded groundwater area is higher than the percentage of prime farmland in Grant County. Countywide, just over 50 percent of the land is designated as prime farmland.

3.6.3 Transmission Corridors, Substations, and Other System Improvements

3.6.3.1 Land Use Planning

The area for the proposed transmission corridors and substations is rural, composed mainly of rangeland, pasture, and other agricultural land. More than 90 percent of the land within the counties is used for agriculture. Land within the cities and towns is used for business and industries such as manufacturing, retail, construction, public and private services, residential areas, and public lands, such as parks. Table 3.6-2 provides acreages for the various land uses.

Table 3.6-2. Land Use Acreage Within the Proposed Corridors

Corridor	Agricultural Land	Developed[a,b]	Forest	Open Water	Prairie	Shrubland	Wetland/ Riparian	Total[c]
Corridor A	75,925	521	576	1,736	198	62	3,617	82,635
Corridor B	145,742	815	1,467	484	40	702	2,694	151,943
Corridor B1	152,654	669	1,507	493	40	652	2,417	158,431
Corridor C	186,602	1,022	4,309	608	0	1,011	6,818	200,371
Corridor C1	180,960	957	2,823	1,060	0	1,011	3,348	190,159

[a]Includes residential, commercial, industrial, and transportation.
[b]Includes substations.
[c]Totals are approximate due to rounding.

Source: USGS, 2000.

Transmission lines can be found within each of the corridors. Corridor A has existing transmission lines throughout its length. Corridor B has existing transmission lines in the easternmost 10 miles. About 35 miles of existing transmission lines occur in the eastern portion of Corridor B1. All but approximately 15 miles of Corridor C have existing transmission lines. Within Corridor C1, all but approximately six miles have existing transmission lines.

Land ownership within the proposed corridors and substations includes Federal, State, and private lands. Land ownership is illustrated in Figure 3.6-2 and summarized in Table 3.6-3.

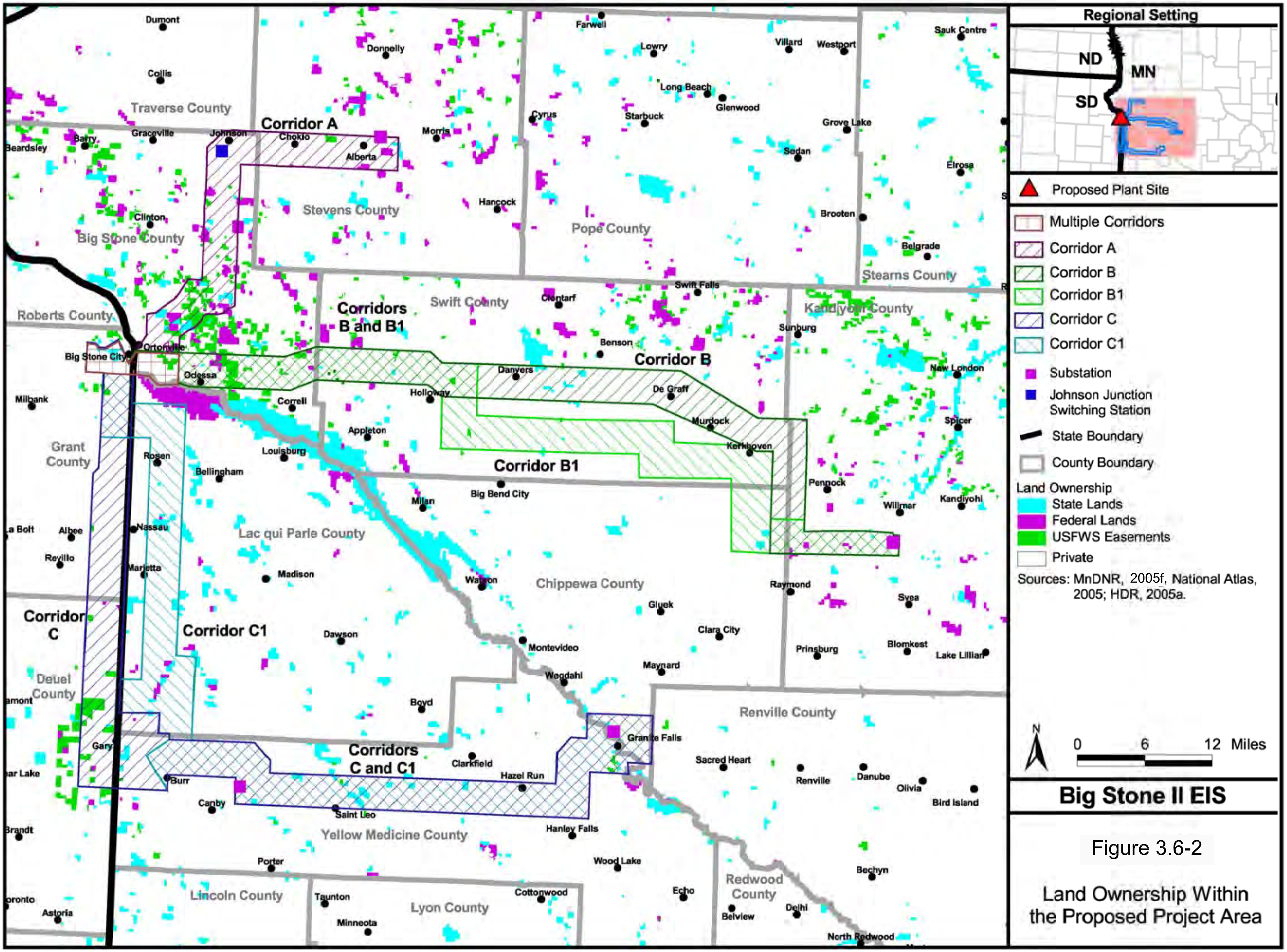


Figure 3.6-2

Land Ownership Within the Proposed Project Area

Table 3.6-3. Land Ownership Acreage Within the Proposed Corridors

Corridor	Federal[a]	State of Minnesota	State of South Dakota	Private	Total[a]
Corridor A	9,298	4,159	679	68,499	82,635
Corridor B	3,319	1,651	678	146,295	151,943
Corridor B1	3,222	1,345	678	153,186	158,431
Corridor C	308	5,089	873	194,101	200,371
Corridor C1	1,378	7,472	679	180,630	190,159

[a]Totals are approximate due to rounding.

Source: National Atlas, 2005; MnDNR, 2005f.

State- and Federal-Managed Lands

There are several areas of Federal- and State-managed lands within each proposed corridor. Resource protection areas are summarized in Table 3.6-4. USFWS WPAs serve to protect breeding, forage, shelter, and migratory habitat for game waterfowl such as ducks and geese. The purpose of State-managed WMAs is to manage for wildlife production and provide opportunities for hunting as well as wildlife observation. SNAs are designated to protect natural features and rare resources of exceptional scientific and educational value. Corridors C and C1 are the only corridors that include portions of two SNAs. SNAs are the only areas where the construction of transmission lines is prohibited. Other areas such as NWRs, WPAs, WMAs, and GPAs would require coordination with the appropriate agency or agencies.

Table 3.6-4. Acreage of Resource Protection Areas in the Proposed Corridors[a]

Management Area	Corridor A	Corridor B	Corridor B1	Corridor C	Corridor C1
Federal					
Waterfowl Production Area					
• Number	16	8	7	8	1
• Acreage	3,225	1,102	1,047	1,030	6
State					
Wildlife Management Area					
• Number	8	5	5	9	15
• Acreage	1,451	646	568	1,191	2,238
Scientific and Natural Area					
• Number	0	0	0	2	2
• Acreage	0	0	0	420	32

[a]See Table 3.4-9 for list of names and Table 3.4-11 for acreage totals.

The USFWS manages the Big Stone NWR, an 11,521-acre area located along the Minnesota River approximately one mile southeast of Ortonville, Minnesota. The northern portion of this refuge, totaling 523 acres, is within the southern part of Corridor A, 793 acres are within the western end of Corridors B and B1, and 178 acres are in the northern part of Corridor C1. USFWS land associated with easements within each proposed corridor is listed in Table 3.6-5.

Table 3.6-5. Acreage of U.S. Fish and Wildlife Service Easements

Type of Easement	Corridor A	Corridor B	Corridor B1	Corridor C	Corridor C1
Flowage[a]	80	0	0	0	0
Grassland/Habitat[b]	287	267	299	3,249	0
Wetland[c]	5,951	3,724	3,737	919	280
FmHA/Conservation[d]	0	0	78	378	274
Waiting List[e]	0	0	0	365	0
Total	6,318	3,991	4,114	4,911	554

[a]Flowage – USFWS has the right to impound water on the land.
[b]Grassland/Habitat – USFWS holds tillage, cropping, and disturbance rights to the upland, and protects the wetlands on these lands, which are used for waterfowl production. The landowner retains rights to graze and hay land.
[c]Wetland – USFWS holds rights to drain, burn, level, and fill all wetlands in these lands. The landowner retains all control over upland.
[d]Farmers Home Administration (FmHA)/Conservation – easements acquired under authority of Federal farm bills, on lands taken under Federal ownership after foreclosure. The USFWS then placed easements on the land before resale to a private owner.
[e]Waiting List – easements that qualify and have been approved for acquisition, but for which funding has not yet been secured.

Source: HDR, 2005c.

Zoning and Other Land Uses

Zoning and other land uses are summarized by corridor in Table 3.6-6. Many counties in South Dakota and Minnesota are crossed by one or more corridor. Therefore, information about zoning and land uses is presented by county rather than by corridor.

Grant County, South Dakota

The Grant County Comprehensive Plan (2004) and the Big Stone City Zoning Map (1999) are the relevant planning documents for Grant County. The westernmost portion of Corridors A, B, and B1 (approximately four miles), and the northern portions of Corridors C (approximately 20 miles) and C1 (approximately 7 miles) are located in Grant County. The corridors cross areas of several different existing and planned land uses, according to the 2004 Grant County Comprehensive Plan. The majority of the corridors are zoned for agricultural uses. The portion of the corridors outside Big Stone City is zoned as an area of development transition, meaning the county anticipates a change from the existing land use. Several areas are designated as shallow aquifer, with associated limitations to development, generally south of Big Stone City, in Adams, Vernon, and Alban townships. In Big Stone City, the corridors cross areas zoned for industrial use, agricultural use, and conservation (Big Stone City Zoning Map, 1999). Big Stone Substation is located on the existing Big Stone plant site and is zoned commercial.

Table 3.6-6. Zoning and Other Land Uses

County/State	Corridor A	Corridor B	Corridor B1	Corridor C	Corridor C1
Grant County, South Dakota	Agriculture is the primary zoning for all corridors within this county. Additional zoning includes industrial, conservation, development transition, and shallow aquifer with development limitations.				
Duel County, South Dakota	NA	NA	NA	Agriculture is the primary zoning. Areas designated for aquifer protection and wellhead protection.	NA
Big Stone County, Minnesota	Agriculture is the primary zoning for Corridors A, B, and B1. Additional zoning includes open space districts and shoreland management.			NA	NA
Stevens County, Minnesota	Agriculture is the primary zoning. Few areas zoned as shoreland protection districts.	NA	NA	NA	NA
Swift County, Minnesota	NA	Agriculture is the primary zoning for both corridors. Additional zoning includes shoreland management, urban development, residential, commercial, and industrial.		NA	NA
Kandiyohi County, Minnesota	NA	Agriculture is the primary zoning. Also crosses shoreland management zones.	In addition to agriculture and shoreland management uses, zoning includes residential and commercial uses.		
Chippewa County, Minnesota	NA	Both corridors cross lands zoned for agriculture.		Both corridors cross lands zoned for agriculture.	
Yellow Medicine County, Minnesota	NA	NA	NA	Agriculture is the primary zoning for both corridors. Additional zoning includes urban land, residential, commercial, industrial, and floodplain.	
Lac qui Parle County, Minnesota	NA	NA	NA	NA	Majority of the land is zoned for agriculture.

NA = Not Applicable.

Sources: Granite Falls Zoning Map, 2004; Grant County, 2004b; Big Stone County Zoning Map, 2003; Big Stone County Comprehensive Plan, 2002; Ortonville Zoning Map, 2003; Stevens County Zoning Ordinance, 1972; Swift County Zoning Ordinance, Section 12.27; Kandiyohi County Comprehensive Plan, 2001; Willmar Zoning Map, 1995; Chippewa County Comprehensive Plan, 2001; Deuel County Comprehensive Plan, 2004; Yellow Medicine County Zoning Map; Lac qui Parle Comprehensive Plan, 2002.

Big Stone County, Minnesota

The Big Stone County Zoning Map (2003), the Big Stone County Comprehensive Plan (2002), and the Ortonville Zoning Map (2003) are the relevant planning and zoning documents associated with Big Stone County, Minnesota. Portions of Corridors A, B, and B1 are located within this county. These corridors cross areas zoned as agricultural (the majority) and open space districts. Open space districts are areas that are managed to protect unique ecological resources, fish and wildlife habitat, and recreational resources (Big Stone County Comprehensive Plan, 2002). The open space districts generally correspond to the areas with medium to high biodiversity significance. Shoreland management zones are also crossed. These zones are defined at the following distances: 1,000 feet from the ordinary high water level of a lake, pond, or flowage; 300 feet from a river or stream; and the landward extent of a 100-year floodplain. Within Ortonville, Minnesota, the corridors cross areas zoned for industrial, residential, commercial, and agricultural uses (Ortonville Zoning Map, 2003). Johnson Junction Switching Station is located in the northeastern portion of this county. This site is zoned industrial and is surrounded by land zoned as agricultural.

Stevens County, Minnesota

The Stevens County Zoning Ordinance (1972) is the relevant planning document for Stevens County, Minnesota. Within Corridor A, the majority of the land in Stevens County is zoned as agricultural, with a few areas zoned as shoreland protection districts (Stevens County Zoning Ordinance, 1972). Shoreland protection districts are managed to minimize impacts to lakes and rivers zones and are defined at the same distances as used in Big Stone County for shoreland management zones. Morris Substation is located in this county and is zoned industrial use, surrounded by agricultural use.

Swift County, Minnesota

The Swift County Zoning Ordinances and the Murdock City Zoning Map are the relevant planning documents in Swift County, Minnesota. In Swift County, Corridors B and B1 cross districts zoned for agriculture (the majority), shoreland management, and urban development uses. The shoreland management zones are defined in this county as 40-acre parcels of land that contain shorelands associated with lakes and streams (Swift County Zoning Ordinances, Section 12.27). In Murdock, Minnesota, Corridors B and B1 cross districts zoned for agriculture, residential, commercial, and industrial land uses, according to the Murdock City Zoning Map.

Kandiyohi County, Minnesota

The Kandiyohi County Comprehensive Plan (2001) is the relevant planning document for Kandiyohi County, Minnesota. The majority of Corridors B and B1 within this county cross districts zoned for agricultural uses (Kandiyohi County Comprehensive Plan, 2001). They also cross shoreland management zones (same distances as defined for Big Stone County). Near Willmar, Minnesota, Corridor B1 also crosses areas zoned for residential, agricultural, and commercial uses (Willmar Zoning Map, 1995). The edges of Corridor B1 closest to Willmar, Minnesota, are zoned for small lot residential uses, whereas the areas of Corridor B1 farther from the city are zoned for agriculture and large lot residential uses. Willmar Substation is located in the easternmost portion of Corridors B and B1 in an area zoned as industrial.

Chippewa County, Minnesota

The Chippewa County Comprehensive Plan (2001) is the relevant planning and zoning document for Chippewa County, Minnesota. About 12 miles of Corridors B and B1 are located in this county along its eastern edge. A very small portion of Corridors C and C1 are also located in this county east of the Minnesota River near Granite Falls, Minnesota. In Chippewa County, the corridors cross districts zoned for agricultural uses (Chippewa County Comprehensive Plan, 2001). An ethanol processing plant is being built in Corridor C, north of U.S. Highway 212. Western's Granite Falls Substation is located in this county on industrial zoned property surrounded by agricultural zoned land.

Deuel County, South Dakota

The Deuel County Comprehensive Plan (2004) is the relevant planning document for Deuel County, South Dakota. Corridor C is the only corridor located within this county. The majority of Corridor C in Deuel County is within land zoned for agricultural uses. Several designated aquifer protection areas are within Corridor C. These areas generally correspond to the many streams and tributaries that occur in Corridor C. A designated wellhead protection area is within and south of Gary, South Dakota (Deuel County Comprehensive Plan, 2004).

Yellow Medicine County, Minnesota

The southernmost portions of Corridors C and C1 are located in Yellow Medicine County where the Yellow Medicine County Zoning Map is applicable. At the eastern end of the corridors near Granite Falls, the Granite Falls Zoning Map (2004) is applicable. Within Corridors C and C1, the majority of the land is zoned agricultural, with a few areas zoned as urban land (Yellow Medicine County Zoning Map). In Granite Falls, Minnesota, areas are zoned for agriculture use, low-and medium-density and multiple-dwelling residential uses, commercial uses, industrial uses, and floodplains. Canby Substation is located in this county and is zoned for industrial use surrounded by agricultural zoned land.

Lac qui Parle County, Minnesota

The Lac qui Parle Comprehensive Plan (2002) and the Lac qui Parle Zoning Ordinances are the relevant planning and zoning documents for Lac qui Parle County, Minnesota. Corridor C1 is the only corridor located within this county. The majority of the land within this corridor is zoned agricultural.

3.6.3.2 Public Facilities

Public facilities include schools, child care providers, churches, cemeteries, and airports. The presence or absence of public facilities are described in this section. The information is presented by county and summarized in Table 3.6-7 for each proposed corridor.

Grant County, South Dakota

No public or private schools are located within the corridors, although Big Stone City, South Dakota, K-12 public school is nearby. There are no registered childcare providers within these corridors, although there are four outside of them in Big Stone City. Although there are no churches present, there are several outside the corridors. St. Charles Cemetery in Big Stone Township, St. John's Cemetery in Alban Township, and Swedish Mission Cemetery in Vernon Township are present within the corridors. Milbank Municipal Airport is the closest airport to Corridors C and C1, but corridors are outside of the safety zones for this airport.

Big Stone County, Minnesota

No cemeteries, public, or private schools or registered child care providers are within Corridors A, B, or B1 within Big Stone County. Ortonville Public School and Knoll Elementary School are located near Corridor A in Ortonville. One registered child care provider is located outside Corridor A in the Ortonville Public School.

Two churches (Eids Kog and Jehovah's Witnesses) are within Corridor A, and several others are near Corridor A. No churches are located within Corridor B. A Jehovah's Witnesses Church is within Corridor B1.

Ortonville Municipal Airport (Martinson Field) is located within Corridor A and within 0.5 mile of Corridors B and B1. The Ortonville Airport flight path to the south crosses Corridors B and B1. Three safety zones are associated with the airport. Zone A extends one mile (5,280 feet) from the approach ends of the runways. Zone B extends two miles (10,560 feet) from the approach ends of each runway and is not included in Zone A. Zone C includes all land within two miles of the airport boundary that is not included in Zones A or B. The height restrictions described in Ortonville Airport Hazard Areas Ordinances (Chapter 154, Section 154.15) apply to these safety zones. Appleton Municipal Airport is located approximately 2.5 miles south of Corridors B and B1. Corridors B and B1 are outside of the safety zones for this airport.

Stevens County, Minnesota

Corridor A is the only corridor within this county. One school, the Chokio Alberta Elementary School in Chokio is located within Corridor A. There are no registered child care providers within Corridor A in Stevens County. One church (Our Saviour's Lutheran Church in Chokio, Minnesota) and two cemeteries (Chokio Cemetery and St. Mary's Cemetery, both in Baker Township) are located in Corridor A.

The Morris Municipal Airport is within 0.5 mile of Corridor A. The eastern end of Corridor A is within the safety zones of the airport, where the following height restrictions apply: no structure may be built within this zone that has a greater than 1:20 ratio, where for every 20 feet of horizontal distance from the runway, the structure can have no more than one foot of vertical height, up to a total distance of 10,000 feet (Hippchen, 2005).

Table 3.6-7. Public Facilities within the Proposed Corridors

<table>
<tr><th></th><th>Corridor A</th><th>Corridor B</th><th>Corridor B1</th><th>Corridor C</th><th>Corridor C1</th></tr>
<tr><td>Grant County, South Dakota</td><td colspan="5">No public or private schools, registered child care providers, or churches are located within these corridors. Three cemeteries occur within corridors. Lundin Airfield is located in Corridor C. Tribbit Airfield is approximately 1.5 miles west of Corridor C. Milbank Municipal Airport is approximately 2.9 miles west of Corridors C and C1. The corridors are outside of the safety zones for Tribbit Airfield and Milbank Municipal Airport. No safety zone information is available for Lundin Airfield.</td></tr>
<tr><td>Duel County, South Dakota</td><td>NA</td><td>NA</td><td>NA</td><td>No public or private schools or registered child care providers within corridor. Two churches and three cemeteries within corridor.</td><td>NA</td></tr>
<tr><td>Big Stone County, Minnesota</td><td colspan="3">No public or private schools, registered child care providers, or cemeteries within these corridors. Churches within Corridor A (two) and Corridor B1 (one). The Ortonville Municipal Airport (Martinson Field) occurs within Corridor A, within 0.5 mile of Corridors B and B1. Appleton Municipal Airport approximately 2.5 miles south of Corridors B and B1.</td><td>NA</td><td>NA</td></tr>
<tr><td>Stevens County, Minnesota</td><td>This corridor includes one school, one church, and two cemeteries. No registered child care providers. Morris Municipal Airport is within 0.5 mile of the corridor.</td><td>NA</td><td>NA</td><td>NA</td><td>NA</td></tr>
<tr><td>Swift County, Minnesota</td><td>NA</td><td>One public school, two churches, and six cemeteries within the corridor. No registered child care providers. Benson Municipal Airport about two miles north; Murdock Airport immediately south of corridor. Home-Base Airport is approximately two miles south of the corridor and Lorenz Airport is immediately north of the corridor.</td><td>No schools, registered day care providers, or cemeteries within corridor. Three churches and Schwenk Airport within corridor. Home-Base Airport is approximately two miles south of the corridor.</td><td>NA</td><td>NA</td></tr>
<tr><td>Kandiyohi County, Minnesota</td><td>NA</td><td colspan="2">No public or private schools, registered child care providers, cemeteries, or churches are located within these corridors. Willmar Municipal Airport is within five miles of Corridor B and within one mile of Corridor B1.</td><td>NA</td><td>NA</td></tr>
<tr><td>Chippewa County, MN</td><td>NA</td><td colspan="4">No schools, child care providers, churches, or cemeteries are located within these corridors. Paynes Airport is within two miles (south) of Corridor B1.</td></tr>
<tr><td>Yellow Medicine County, Minnesota</td><td>NA</td><td>NA</td><td>NA</td><td colspan="2">Two public schools, one community college, two registered child care providers, one hospital, and eight cemeteries are located within these corridors. Ten churches are located within Corridor C. Nine churches are located within Corridor C1. Three airports are nearby (Canby Municipal, W. Johnson Field, and Granite Falls Municipal Airport). The Granite Falls, Minnesota Municipal Airport is approximately 1.2 miles south.</td></tr>
<tr><td>Lac qui Parle County, Minnesota</td><td>NA</td><td>NA</td><td>NA</td><td>NA</td><td>No schools, child care providers, churches, cemeteries, or airports are located within this corridor.</td></tr>
</table>

NA – Not Applicable.

Source: HDR, 2005a.

Swift County, Minnesota

Corridors B and B1 are the only corridors located within this county. One public school, Murdock Elementary School in Murdock, is located in Corridor B. There are no schools within Corridor B1. There are no registered child care providers within Corridors B or B1.

Two churches (the Catholic Church of Visitation in Danvers and St. Bridget's Catholic Church in De Graff) are located in Corridor B. Three churches located within Corridor B1 including Bethel Baptist, Evangelical Free, and Kerkhoven Lutheran.

Six cemeteries are located in Corridor B (Calvary Cemetery and West Salem in Pillsbury Township, St. Bridget's Cemetery in Kildare Township, Six Mile Grove Cemetery in Six Mile Grove Township, and Smith-Kepmer Cemetery and Immanuel Cemetery). No cemeteries are located within Corridor B1.

Benson Municipal Airport is approximately four miles north of Corridor B. Corridor B is outside of the safety zones for this airport. Murdock Airport is immediately south of Corridor B. Murdock Municipal Airport has an out-of-date (or does not have an) Airport Layout Plan. City-adopted ordinances (adopted in 1988) identify a runway of 3,350 feet. The MnDOT aeronautics map shows a 3,415-foot-long runway (runway 12-30). This 3,415-foot-long runway has a 40:1 approach zone slope. Based on the orientation of the runway and the 40:1 approach zone slope, Corridor B would be out of the safety zone for Murdock Municipal Airport.

Schwenk Airport is within Corridor B1. Home-Base and Lorenz Airports are immediately north of Corridor B and two miles north of Corridor B1. Because these are private airports, they are not required to register zoning maps, approach zones, safety zones. Therefore, no information is available for these airports.

Kandiyohi County, Minnesota

Corridors B and B1 are the only corridors located in this county. No public or private schools, registered child care providers, cemeteries, or churches are located within either corridor.

Willmar Municipal Airport is located within 1.5 miles of Corridor B and Corridor B1. Corridor B is outside of Safety Zones A, B, and C. However, height restrictions would apply to those portions of Pillsbury and Dublin townships (in Swift County) within the approach surface of the airport. Corridor B1 is within Safety Zone C for the airport. Height restrictions also would apply to portions of Kandiyohi and Willmar townships within the approach surface of the airport. The approach surfaces extend 50,000 feet from the end of the runways, and no structure may be built within this zone that has a greater than 1:40 ratio; where for every 40 feet of horizontal distance from the runway, the structure can have no more than one foot of vertical height.

Chippewa County, Minnesota

No schools, child care providers, churches, or cemeteries are within the portions of Corridors B, B1, C, or C1 located in this county. Paynes Airport is a private airport within two miles of Corridor B1.

Deuel County, South Dakota

Corridor C is the only corridor located within this county. No public or private schools or registered child care providers are within Corridor C. Two churches are located in Gary (First Lutheran Church and a Methodist Church). Three cemeteries also are present within Corridor C, Antelope Valley Cemetery in Antelope Valley Township, Calvary Cemetery in Herrick Township, and Grandview Cemetery in Herrick Township.

Yellow Medicine County, Minnesota

Corridors C and C1 are the only corridors within this county. Two public schools, Bert Raney Elementary School and Granite Falls Senior High School, and West Community and Technical College, a two-year college, are located in Granite Falls. Two registered child care providers (Granite Falls Head Start and Prairie Land Daycare/Head Start) are also located in Granite Falls.

Ten churches are located in Corridor C: Assembly of God Church, First Baptist Church, Open Door Baptist Church, St. Andrew Catholic Church, Grace Evangelical Free Church, Bergen Lutheran Church, Granite Falls Lutheran Church, St. Paul's Lutheran Church, Bethany Evangelical Lutheran, and Granite Falls United Church. Corridor C1 includes the same churches except for Bethany Evangelical Lutheran.

Eight cemeteries within the corridors include Bethlehem Cemetery in Hammer Township, Fridhem Cemetery in Tyro Township, Granite Falls City Cemetery in Granite Falls, Hillcrest Cemetery in Hazel Run Township, Nicolai Cemetery in Oshkosh Township, St. Andrews Cemetery in Minnesota Falls Township, St. Leo Cemetery in Omro Township, and Zion Lutheran Church Cemetery in Tyro Township.

Canby Municipal Airport is approximately 1.7 miles south of Corridors C and C1. Safety Zone C of the Canby Municipal Airport is within Corridors C and C1 (Sections 20-25 and 29 of Hammer Township), and no structure may be built within this zone that has a greater than 1:40 ratio, where for every 40 feet of horizontal distance from the hard surface runway, the structure can have no more than one foot of vertical height, up to a total horizontal distance of 10,000 feet.

The Granite Falls, Minnesota Municipal Airport is approximately 1.2 miles south of the corridors and outside of the existing Safety Zones for the airport. However, there is a planned extension of the existing runway to the south, and Safety Zone C would be extended from the existing 6,000-foot radius to a 10,000-foot radius. The corridors are outside of the proposed "ultimate" Safety Zones A and B, but would cross the proposed Safety Zone C.

Lac qui Parle County, Minnesota

Corridor C1 is the only corridor within this county. No schools, churches, cemeteries, or airports are within this corridor.

3.6.3.3 Recreation

Recreational resources in the proposed corridors are shown in Figure 3.6-3. The following paragraphs describe the recreational resources found within each proposed corridor. Big Stone Lake is located in the vicinity of all of the proposed corridors and is used for a variety of recreational purposes including camping, fishing, boating, and wildlife watching. All of the proposed corridors include portions of numerous WPAs and WMAs (see Tables 3.4-9 and 3.6-4). WPAs provide opportunities for hunting, trapping, fishing, and wildlife observation, in compliance with State laws. WMAs provide opportunities for hunting, fishing, and wildlife observation.

Corridor A

Big Stone NWR is located along the Minnesota River approximately one mile southeast of Ortonville, Minnesota. The 11,521-acre refuge consists of tallgrass prairie and wetland habitats, and is home to many species of wildlife, including waterfowl, turkey, deer, and river otter. Recreational resources include hiking trails, an auto tour route, snowshoeing and cross-country skiing, hunting and fishing opportunities, wildlife observation, and educational opportunities. Approximately 523 acres of this NWR is within the southern part of Corridor A.

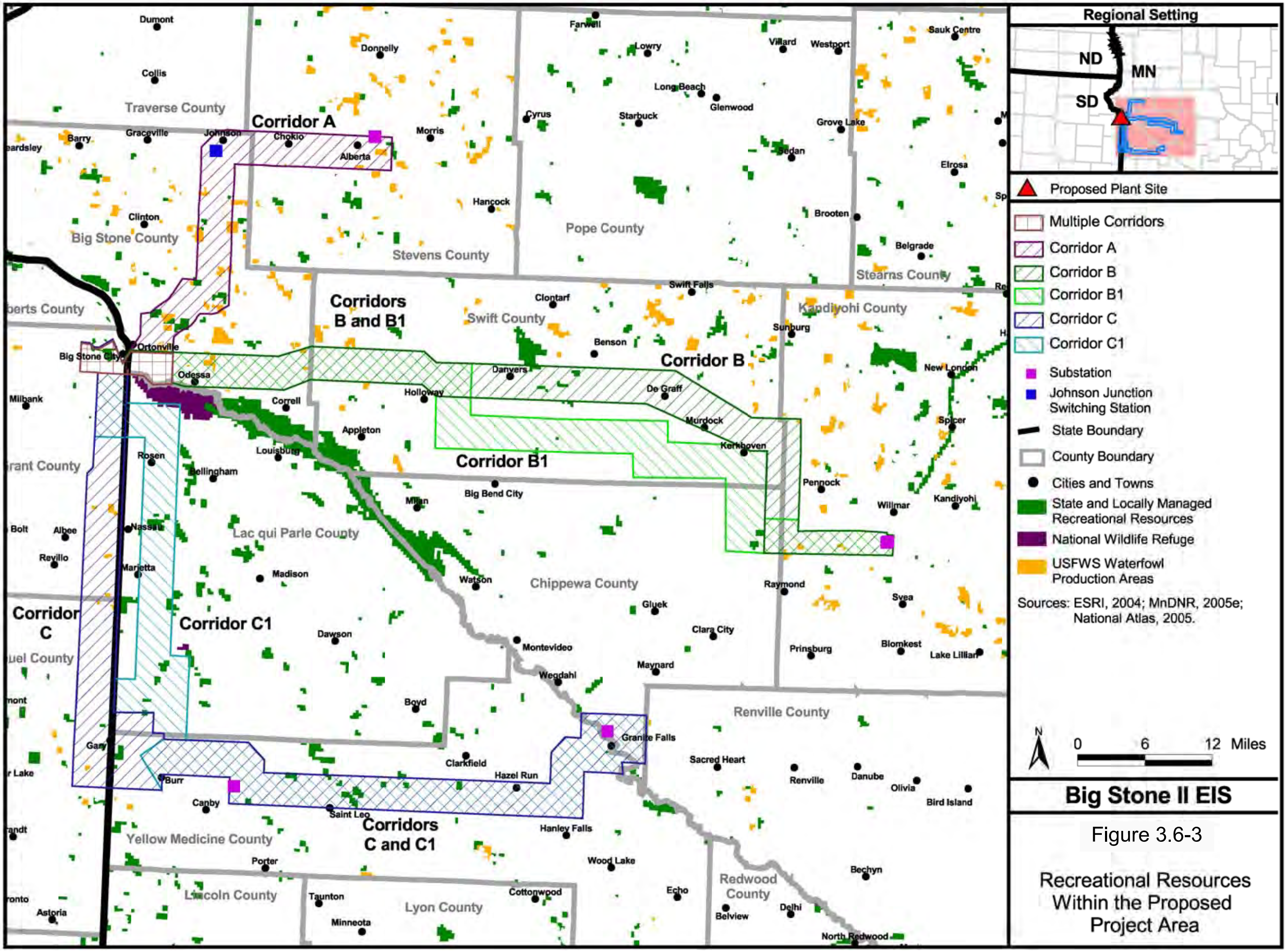
The many large lakes in Big Stone County within Corridor A are used for fishing and recreational boating (see Section 3.2, Water Resources). The Minnesota River is an NRI-listed river where the corridor crosses it south of Big Stone Lake. Recreational opportunities on the Minnesota River include fishing, canoeing, and sightseeing. Additional recreational resources within Corridor A include the Big Stone County Historical Society Museum, Minnesota River Valley Birding Trail, Ortonville Golf Course, and Highway 75 – "Historic King of Trails."

Big Stone County Historical Museum, in Ortonville, Minnesota, displays local geology, archaeology, and wildlife taxidermy exhibits. Paul Bunyan's 110-ton anchor, two log cabins, and a historic Muskegon Boat are on the grounds for viewing. The Minnesota River Valley Birding Trail crosses Corridor A on Highway 10. The trail is a project of Audubon Minnesota and connects the best birding sites within the Minnesota River Valley providing opportunities for birdwatching and enjoying wildlife.

Highway 75 was designated the "King of Trails" by the 2001 Minnesota legislature for its historic features and opportunities for recreation along the way. Corridor A also includes three snowmobile trails, located in Moonshine Township in Big Stone County, and Baker and Scott townships in Stevens County.

Corridors B and B1

There are many large lakes in Big Stone County within Corridors B and B1 used for fishing and recreational boating (see Section 3.2, Water Resources). Big Stone Lake is also located in the vicinity of both corridors. The northern portion of the Big Stone NWR (approximately 793 acres) is located at the western end of Corridors B and B1. The Minnesota River is an NRI listed river where the corridors cross it south of Big Stone Lake. Recreational opportunities on the Minnesota River include fishing, canoeing, and sightseeing. The Chippewa and Pomme de Terre rivers offer canoeing opportunities as well as sites for viewing wildlife. Additional recreational resources located within each corridor are listed in Table 3.6-8. Some of these recreational resources are the same as found in Corridor A and are discussed there.



Big Stone II EIS

Figure 3.6-3

Recreational Resources Within the Proposed Project Area

Table 3.6-8. Recreational Resources – Corridors B and B1

Management	Corridor B	Corridor B1
State	Highway 75 – "Historic King of Trails"	Highway 75 – "Historic King of Trails"
County/Regional	Minnesota River Valley Birding Trail Chippewa and Pomme de Terre Rivers Big Stone County Historical Society Museum Snowmobile Trails	Minnesota River Valley Birding Trail Chippewa and Pomme de Terre Rivers Snowmobile Trails
Local	Sabin S. Murdock House (Murdock, Minnesota)	None identified

Source: HDR, 2005c.

Several snowmobile trails are found in Odessa and Akron townships in Big Stone County, Shible, Marysland, Six Mile Grove, and Torning townships in Swift County. The Sabin S. Murdock House is located in Murdock within Corridor B. Sabin Murdock was an entrepreneur who platted Murdock in 1876. The house has been preserved and is available for viewing.

Corridors C and C1

Recreational resources within Corridors C and C1 are listed in Table 3.6-9. Unlike the other proposed corridors, Corridors C and C1 include recreational opportunities along a national scenic byway, a State-designated wild and scenic river, and two SNAs.

The Minnesota River Valley National Scenic Byway runs through Ortonville on Highway 7 and through Granite Falls on Highways 212 and 67. The nationally designated byway offers opportunities along its 287-mile length for enjoying historic sites, natural areas, camping, and canoeing.

The South Fork of the Yellow Bank River in Grant County has been classified as National Park Service Nationwide Rivers (see Section 3.2, Water Resources). These rivers are recognized for their wildlife, fishery, and recreational values, and are resources for canoeists, birdwatchers, fishermen, and hunters.

The Minnesota River is a State-designated wild and scenic river from the Lac qui Parle Dam to Franklin, which includes Granite Falls. Recreational opportunities within this stretch of the river include canoeing, hiking trails, camping, boat access, and wildlife observation.

Another MnDNR-managed site, Mound Springs Prairie SNA, is located along the western edge of Florida Township of Yellow Medicine County. The Mound Springs Prairie SNA preserves a prairie complex on the Prairie Coteau region of western Minnesota. Unique recreational resources provided by this SNA include the opportunity to see the white prairie clover and calcareous seepage fens, both of which are rare within Minnesota.

Blue Devil Valley SNA is located in Minnesota Falls Township near Granite Falls. The Blue Devil Valley SNA contains a granite outcrop community that supports the five-lined skink, a State special concern species. Recreational opportunities at this SNA include wildlife viewing and hiking along trails through the bedrock outcroppings.

Table 3.6-9. Recreational Resources – Corridors C and C1

Management	Corridor C	Corridor C1
Federal	Minnesota River Valley National Scenic Byway South Fork of the Yellow Bank River NPS Nationwide River	Minnesota River Valley National Scenic Byway South Fork of the Yellow Bank River NPS Nationwide River
State	Minnesota River (Wild and Scenic Designation) Mound Springs Scientific and Natural Area Blue Devil Valley Scientific and Natural Area	Minnesota River (Wild and Scenic Designation) Mound Springs Scientific and Natural Area Blue Devil Valley Scientific and Natural Area
County/ Regional	Yellow Medicine Historical Museum (Granite Falls) Volstead Museum (Granite Falls)	Yellow Medicine Historical Museum (Granite Falls) Volstead Museum (Granite Falls)
Local	Granite Falls Golf Course Big Stone Lake (Ortonville and Big Stone) Riverside Campground (Ortonville) Prairie's Edge Casino Resort (Granite Falls) Memorial Park (Granite Falls) Volstead Museum (Granite Falls) Lende Plaza (Granite Falls) Sorlein Park (Granite Falls)	Granite Falls Golf Course Big Stone Lake (Ortonville and Big Stone) Prairie's Edge Casino Resort (Granite Falls) Memorial Park (Granite Falls) Volstead Museum (Granite Falls) Lende Plaza (Granite Falls) Sorlein Park (Granite Falls)

Source: HDR, 2005c.

Historical museums within the vicinity of Corridors C and C1 include the Yellow Medicine Historical Museum and the Volstead Museum in Granite Falls. The Yellow Medicine Historical Museum displays Native American artifacts, and includes a log cabin, a church, and a heritage research center on its grounds. The Volstead Museum is the former home of U.S. Congressman Andrew J. Volstead, who wrote the 1920 Prohibition Act and was instrumental in creating farmer cooperatives through the 1922 Capper-Volstead Act. The front parlor is available for viewing and displays memorabilia related to Congressman Volstead.

Other recreational opportunities within the cities in Corridors C and C1 include golf courses, a casino and resort, local recreation centers, and campgrounds. Granite Falls, Minnesota, hosts Western Fest in mid-summer, which features a parade, street dancing, and a rodeo; and Ole and Lena Days in midwinter, featuring a Scandinavian food fair, medallion hunt, and snow sculpting.

3.6.3.4 Agricultural Practices and Prime and Unique Farmland

Prime farmlands are extensive in the proposed corridors, along with center pivot irrigation locations, as shown in Figure 3.6-4.

Corridor A

Land uses within Corridor A are shown in Table 3.6-2. Approximately 92 percent of the land within Corridor A is used for agriculture. According to the 2002 Census of Agriculture in Grant County, the number of full-time farms has increased by three percent between 1997 and 2002 while the average farm size has decreased by five percent. Crop sales in 2002 were $39,309,000 (48 percent of agricultural products sold) and livestock sales were $42,867,000 (52 percent). Crops in Grant County primarily are corn, soybeans, and wheat. Commonly sold livestock includes cattle and hogs.

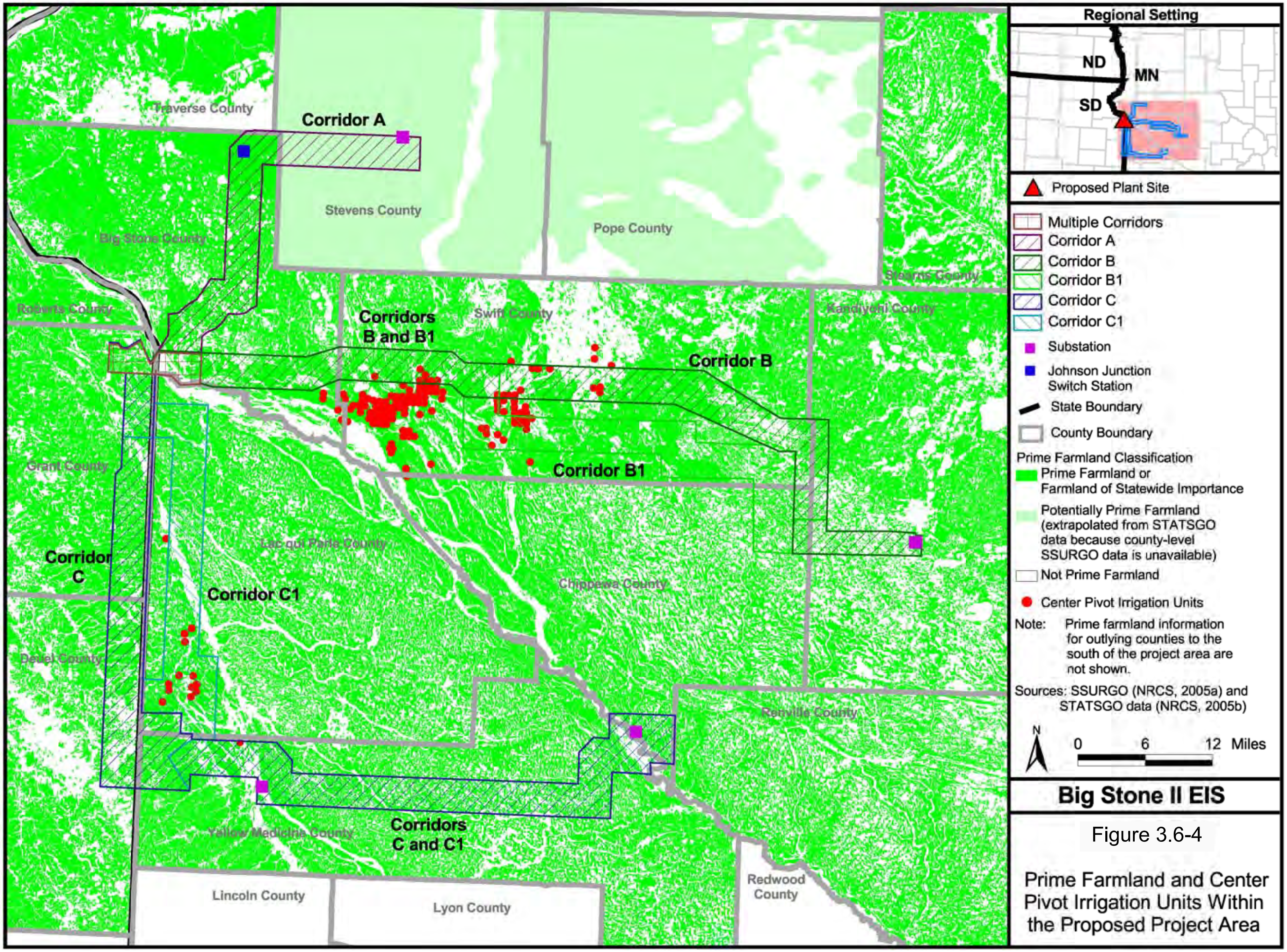


Figure 3.6-4

Prime Farmland and Center Pivot Irrigation Units Within the Proposed Project Area

The average farm size in Big Stone County has increased by one percent between 1997 and 2002. The number of full-time farms has decreased by two farms during that time period. Crop sales in 2002 for Big Stone County were $44,923,000 (78 percent of agricultural products sold) and livestock sales were $12,747,000 (22 percent). Crops in Big Stone County are primarily corn and soybeans.

In Stevens County, the number of farms has increased by six percent and the average farm size has decreased by six percent between 1997 and 2002. The total land in farms in the county is down approximately one percent. Crop sales in 2002 for Stevens County were $65,116,000 (54 percent of agricultural products sold) and livestock sales were $55,093,000 (46 percent). Crops in Stevens County are primarily corn and soybeans. Livestock primarily includes hogs, cattle, and poultry.

Field visits completed within Corridor A identified nine cow pastures. There are no center pivot irrigation units within Corridor A. There are approximately 38,059 acres of prime farmland within Corridor A.

Corridor B

Within Corridor B, approximately 96 percent of the land is used for agriculture. Agricultural activity for Grant and Big Stone counties is the same as described for Corridor A.

In Swift County, the number of farms increased by four percent and the total amount of land in farms increased by two percent from 1997 to 2002. The average size of farms decreased three percent to 515 acres. Crop sales in 2002 for Swift County were $87,385,000 (55 percent of agricultural products sold) and livestock sales were $70,333,000 (45 percent). Crops are primarily corn and soybeans. Swift County was the number two turkey producer in the State in 2002.

In Kandiyohi County, the number of farms increased by five percent and the land in farms increased by three percent from 1997 to 2002. The average size of farms decreased two percent to 317 acres.

Crop sales in 2002 were $83,050,000 (36 percent of agricultural products sold in the county) and livestock sales were $147,845,000 (64 percent). Kandiyohi County was the number one ranked county for poultry production (chickens and turkeys) in Minnesota in 2002. Crops in Kandiyohi County are primarily corn and soybeans.

The average farm size in Chippewa County decreased by five percent and the total land in farms increased by seven percent between 1997 and 2002. The number of full-time farms increased by 76 during that time period. Crop sales in 2002 were $87,784,000 (85 percent of agricultural products sold) and livestock sales were $15,097,000 (15 percent). Crops in Chippewa County are primarily corn and soybeans.

Field visits completed within Corridor B identified 10 cow pastures, six poultry farms, and one sheep pasture. There are 18 center pivot irrigation units and approximately 75,626 acres of prime farmland within Corridor B.

Corridor B1

Approximately 96 percent of the land in Corridor B1 is used for agriculture. Agricultural activity for Grant and Big Stone counties is the same as described for Corridor A, and activity for Swift, Kandiyohi, and Chippewa counties is the same as described for Corridor B.

Field visits completed within Corridor B1 identified 13 cow pastures, three horse pastures, six poultry farms, three sheep pastures, and one hog farm. There are 25 center pivot irrigation units within Corridor B1. There are approximately 80,985 acres of prime farmland within Corridor B1.

Corridor C

Within Corridor C, approximately 93 percent of the land is used for agriculture. Agricultural activity for Grant County is the same as described for Corridor A and for Chippewa County the same as described for Corridor B.

Between 1997 and 2002, the number of full-time farms in Deuel County decreased by three percent while the average farm size increased by two percent. Crop sales in 2002 were $22,325,000 (34 percent of agricultural products sold) and livestock sales were $43,409,000 (66 percent). Crops in Deuel County are primarily corn, soybeans, and wheat. Commonly sold livestock include cattle and hogs.

The average farm size in Yellow Medicine County decreased by three percent while the average land in farms increased by seven percent between 1997 and 2002. However, the number of full-time farms increased by 85 during that time period. Crop sales in 2002 for Yellow Medicine County were $86,631,000 (62 percent of agricultural products sold) and livestock sales were $52,218,000 (38 percent). Crops in Yellow Medicine County are primarily corn and soybeans.

During field visits to Corridor C, approximately 42 cow pastures, 11 horse pastures, 13 poultry farms, and one hog farm were observed. There is one center pivot irrigation unit within Corridor C. There are approximately 102,183 acres of prime farmland within Corridor C.

Corridor C1

Within Corridor C1, approximately 95 percent of the land is used for agriculture. Agricultural activity for Grant County is the same as described for Corridor A, Chippewa County is the same as described for Corridor B, and Yellow Medicine County is the same as described for Corridor C.

The average farm size in Lac qui Parle County decreased by five percent, and the total land in farms increased by seven percent between 1997 and 2002. The number of full-time farms increased by 101 farms during that time period. Crop sales in 2002 for Lac qui Parle County were $78,189,000 (69 percent of agricultural products sold) and livestock sales were $34,963,000 (31 percent). Crops in Lac qui Parle County are primarily corn and soybeans. Commonly sold livestock includes cattle and hogs.

During field visits to Corridor C1, approximately 46 cow pastures, 15 poultry farms, six horse pastures, and one sheep pasture were observed. There are 10 center pivot irrigation units within Corridor C1. There are approximately 96,467 acres of prime farmland within Corridor C1.

Substations and Other System Modifications

The expansion area for the Johnson Junction substation is used only for agriculture, and the soil is classified as prime farmland. The Canby Substation relocation is also all agricultural land, and the soil is classified as prime farmland. Agricultural practices and prime farmland resources along the Hankinson line would be identified as needed, once the structures needing modification or replacement are delineated.

3.7 Infrastructure, Public Health and Safety, and Waste Management

3.7.1 Introduction

This section includes information regarding transportation, public health, hazardous materials, and waste management that pertains to the area of the proposed Project. Infrastructure includes the existing highways, roads, and railroads used by the public for transportation. Public health includes existing public facilities, such as hospitals, fire departments, and police departments, used to benefit public health and safety. Hazardous material sites within the proposed Project area are important to identify and describe since they may be hazardous to human and ecological health if disturbed. Waste management is discussed to identify any potential health and safety risks to workers and citizens living near the proposed Project area.

<u>Infrastructure</u>

The transportation network in the proposed Project area that may be used to develop and operate the proposed Project is comprised of largely rural “farm-to-market” or section line roadways with various county and trunk highways. Few urban areas exist within the proposed Project area; six of the primary cities are Morris, Willmar, Ortonville, Granite Falls, and Big Stone City, Minnesota, and Milbank, South Dakota. Various active railroad lines service the existing plant site and also are present within the proposed corridors.

<u>Public Health and Safety</u>

This section discusses workplace health and safety regulations and the availability of emergency services in the proposed Project area. The Occupational Safety and Health Administration (OSHA) and South Dakota’s Department of Health have jurisdiction over most occupational safety and health issues within South Dakota. Industrial construction and routine workplace operations are governed by the OSHA of 1970, particularly including 29 CFR 1910 (general industry standards) and 29 CFR 1926 (construction industry standards). The State of South Dakota has supplemental worker safety and public health standards, as codified under Title 34 of South Dakota’s State laws, which govern worker safety in South Dakota as well.

<u>Hazardous Materials and Waste Management</u>

Hazardous materials, defined in various ways under a number of regulatory programs, can represent present potential risks to both human health and to the environment when not managed properly. Hazardous materials include materials that may be used or disposed of in conjunction with the proposed Project. These materials and associated regulatory programs include:

- Substances covered under the OSHA Hazard Communication (Hazcom) Standard (29 CFR 1910.1200). Materials and substances covered under the Hazcom Standard may be used in a variety of industrial and commercial activities and also may be subject to the regulations listed below.
- Hazardous materials as defined under the U.S. Department of Transportation (USDOT) regulations in 49 CFR Section 170-177.
- Hazardous substances as defined by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and listed in 40 CFR Section 302.4. CERCLA regulations also govern cleanup of contaminated sites. Sites evaluated under CERCLA that pose serious threats to human health and the environment are placed on the National Priorities List and are commonly referred to as Superfund sites.
- Hazardous wastes as defined in the Resource Conservation and Recovery Act (RCRA), 40 CFR, Part 261.
- Hazardous substances and extremely hazardous substances that are subject to reporting requirements (Threshold Planning Quantities) under Sections 311, 312 and 313 of the Superfund Amendment and Reauthorization Act (SARA). Petroleum products defined as “oil” in the Oil Pollution Act of 1990 (OPA) (33 USC 27.02 et seq). The materials defined under OPA include fuels, lubricants, hydraulic oil, and transmission fluids. Petroleum products such as gasoline, diesel, or propane are included in these requirements.
- A number of other Federal regulations and programs regulate substances such as asbestos and polychlorinated bi-phenyls (PCBs).

In conjunction with the definitions previously noted, the following lists provide information regarding management requirements during transportation, storage, and use of particular hazardous chemicals, substances, or materials:

- SARA Title III List of Lists (USEPA, 2006c) or the Consolidated List of Chemicals Subject to the Emergency Planning and Community Right-to-Know Act and Section 112(r) of the CAA.
- USDOT listing of hazardous materials in 49 CFR 172.101.

RCRA governs handling and disposal of solid wastes (USEPA, 1998b). Solid wastes comprise a broad range of materials that include garbage, refuse, sludge, non-hazardous industrial waste, municipal wastes, and hazardous waste. Solid waste includes solids, liquids, and contained gaseous materials. Hazardous wastes are those materials that exhibit certain characteristics (as defined by laboratory analysis), are generated from specific industrial processes, or chemical compounds, that if abandoned, could pose a threat to human health and the environment.

The presence of hazardous materials and solid wastes poses three primary problems during the planning and construction of major infrastructure projects. These include:

- Potential health and safety issues for workers during the construction of the proposed Project.
- Potential health and safety issues for citizens living near the proposed Project area.
- Liability issues associated with obtaining easements over, or working at, a contaminated site.

Therefore, it is important to assess the potential for hazardous materials, wastes, and contaminated properties within the proposed Project area.

3.7.2 Big Stone II Plant Site and Groundwater Areas

3.7.2.1 Infrastructure

Proposed Big Stone II Plant Site

The existing Big Stone plant currently uses railroads, roads, and highways to transport the materials needed for operation. Figure 3.7-1 illustrates roads, railroads, and transmission lines in the vicinity of the proposed plant site. County Road 109 defines a portion of the eastern property line of the proposed plant site.

<u>State and County Roadways</u>

During the construction phase of the existing plant, which came online in 1975, the immediate road infrastructure to and from the facility consisted of a series of gravel roads. Since the construction of the existing plant, these have been upgraded to hard surface roadways.

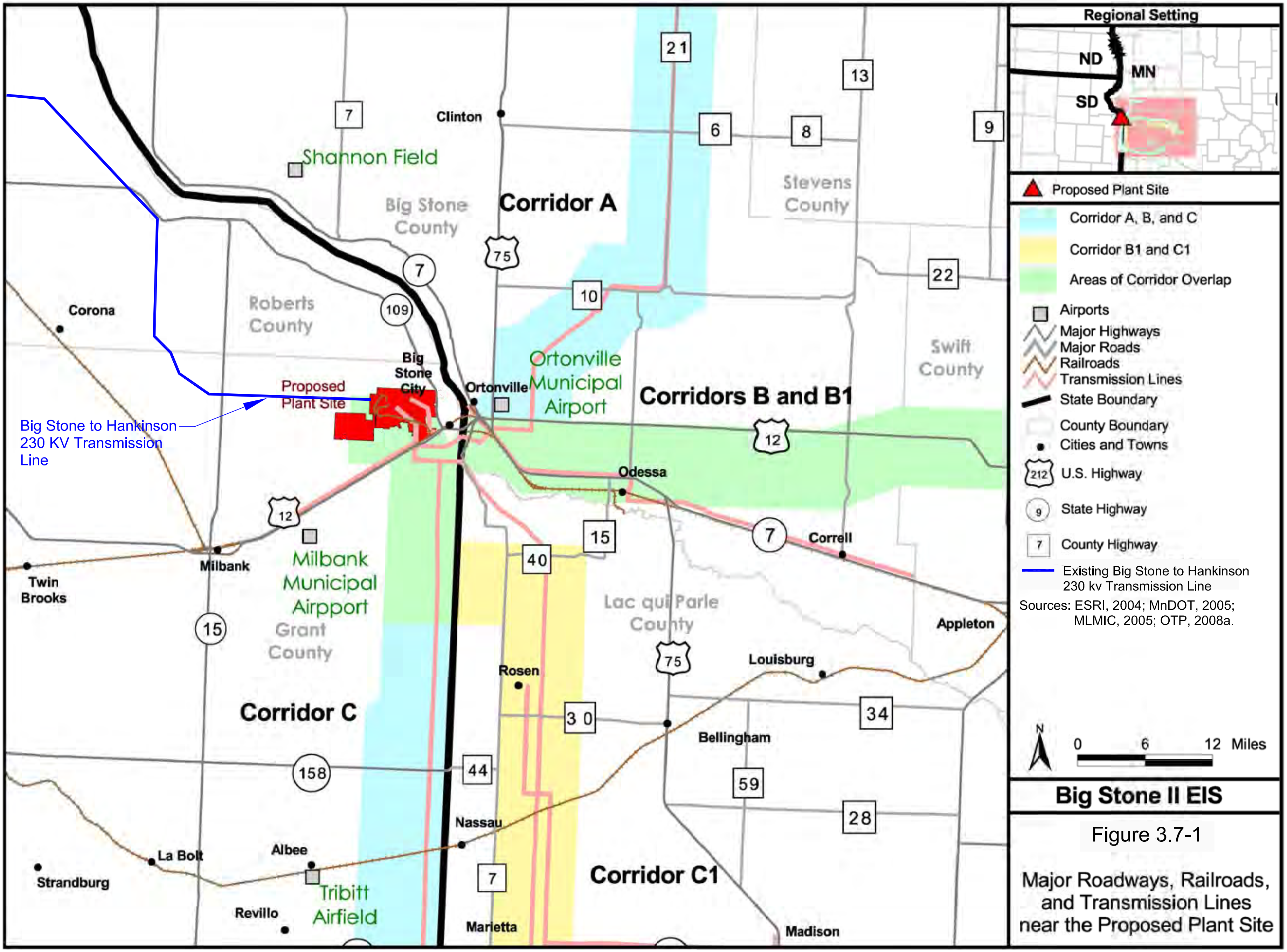
Traffic counts were conducted in 2004 at two locations in Grant County, South Dakota, near the existing plant, specifically on U.S. Highway 12 and County Road 109. The average daily traffic count was 5,665 vehicles per day at the U.S. Highway 12 location and 970 vehicles per day at the County Road 109 location (SDDOT, 2005). These roads have a through flow of 1,600 vehicles per hour while maintaining a level of service of D or better (Petrick, 2006). County roads have recently been improved, are being improved, or are scheduled for long-term maintenance and improvements.

<u>Railroad Traffic</u>

The BNSF rail line crosses 484th Street and 485th Street, approaching the plant from the west. Currently, the railroad provides three to four coal train deliveries per week to the existing plant. Each of these coal train deliveries consist of approximately 120 coal cars, which is approximately the industry standard for coal unit trains.

<u>Airports</u>

There are two airports in the vicinity of the proposed plant site (Figure 3.7-1). Ortonville Municipal Airport is approximately six miles from the proposed plant site. Milbank Municipal Airport is approximately 12 miles from the proposed plant site.



Big Stone II EIS

Figure 3.7-1

Major Roadways, Railroads, and Transmission Lines near the Proposed Plant Site

Groundwater Areas

State and County Roadways

The groundwater areas are located between Big Stone City and Milbank in rural South Dakota. State Highway 109 is located just east of the proposed plant vicinity groundwater area, as shown in Figure 2.2-4. U.S. Highway 12 is immediately southeast of the expanded groundwater area, and State Highway 15 borders a portion of the west side of the expanded groundwater area. County roads traversing the area include 143rd Street to 148th Street (east and west) and 479th Avenue to 482nd Avenue (north and south) as shown by Figure 2.2-4.

Railroads

The BNSF rail line parallels U.S. Highway 12, southeast of the groundwater areas, between Big Stone City and Milbank.

Airports

The airports in the vicinity of the groundwater areas are the same as those described for the proposed Big Stone II plant site.

Underground Utilities

Underground utilities within and adjacent to the groundwater areas include water lines and natural gas lines. Water lines in the groundwater areas are part of the Grant-Roberts Rural Water System. The principal component of this system is a four-inch water main running along 145th Street, traversing or adjoining both groundwater areas. This main serves four residences within, or immediately adjacent to, the groundwater areas. The line primarily supplies water to residences to the west of the expanded groundwater area. The only other water lines are spurs off of mains to the north and south that serve residences in the far north and far south ends of the expanded groundwater area. The Grant-Roberts Rural Water System reports that the water lines are usually located outside of the road ROW but at no set distance. The Co-owners would determine the exact locations of the Grant-Roberts Rural Water System pipes prior to installation of pipelines for groundwater production.

The only natural gas pipeline in the area serves the Poet Biorefining plant (formerly the Northern Lights Ethanol Plant). This pipeline connects to a mainline pipeline that is parallel to U.S. Highway 12, approximately 1.5 miles south of the proposed Big Stone II plant site. The interconnecting pipeline follows 484th Ave. from U.S. Highway 12 to the ethanol plant.

3.7.2.2 Public Health and Safety

The proposed plant site is geographically isolated (approximately 0.5 mile) from the nearest occupied structure. The nearest towns to the existing plant location are Big Stone City (approximately 2.5 miles), Ortonville (approximately 3.3 miles), and Milbank (approximately 13.7 miles). The groundwater areas are rurally located, northwest of U.S. Highway 12 between Big Stone City and Milbank.

From the existing plant location, one hospital is located in Milbank (St. Bernard's Providence Hospital), and three hospitals are located in the proposed Project area, including Ortonville Municipal Hospital in Ortonville (approximately five miles); Holy Trinity Hospital in Graceville, Minnesota (approximately 27 miles); and Deuel County Memorial Hospital and Clinic in Clear Lake, South Dakota (approximately 30 miles). Public facilities that serve the plant site are listed in Appendix H, Volume III. The closest burn center is at the McKennan Hospital in Sioux Falls, South Dakota.

Emergency services in Milbank consist of a county sheriff, a volunteer fire department, police department, and ambulance services. Police in Milbank are emergency medical technicians and train regularly with the Milbank Fire Department. Big Stone City and Ortonville also have volunteer fire departments, police departments, and ambulance services.

3.7.2.3 Hazardous Materials and Waste Management

Proposed Big Stone II Plant Site

Since the proposed plant site is adjacent to the existing plant, databases were reviewed concerning the existing facility's record with regard to releases of hazardous materials or hazardous substances. Review of USEPA databases indicated that the existing plant is a conditionally exempt small quantity hazardous waste generator (USEPA, 2005c). The conditionally exempt small quantity generator status means that the existing plant generates very small amounts of hazardous waste (less than 220 pounds or 100 kilograms per month). The databases also indicated that the existing plant does not have any compliance issues with regard to hazardous waste generation.

Review of the SDDENR databases indicated that the existing plant has had a number of hazardous material spills of hazardous materials over the years. Table 3.7-1 lists the incidents, materials spilled, quantities, and resolution of the incidents. All incidents are indicated as having been closed. It was not determined whether reported spills at the existing plant have affected the area where the proposed plant is to be built.

The existing plant generates an average of about 130,000 tons of combustion by-products per year, much of which is disposed of at the existing on-site landfill. The by-products include bottom ash and fly ash.

Groundwater Areas

In agricultural areas, unregulated solid waste disposal occasionally occurs. Piles of discarded materials (typically household-type wastes) could contain lubricants, pesticides, paints, batteries, and other potentially hazardous materials. Small aboveground storage tanks containing petroleum products such as gasoline, diesel, and heating oil are common to farms. Significant releases of hazardous materials from solid waste disposal sites and farm tanks are not typical, and therefore, the presence of significantly contaminated sites within the groundwater areas is expected to be unlikely.

Databases from the SDDENR and USEPA were reviewed to determine the presence of contaminated sites within the groundwater areas (SDDENR, 2006a; and USEPA, 2005d). The SDDENR's Incident Sites Database summarizes environmental incidents including releases, leaking tanks, and spills. No active sites (undergoing investigation and remediation) were found within the groundwater areas. No USEPA Comprehensive Environmental Response, Compensation Information System (CERCLIS) listed sites were identified in the groundwater areas.

Table 3.7-1. Historic Spills at the Existing Plant Site

SDDENR Number	Material	Volume Spilled (gallons)	Date Reported	Closure Date
88.263	Diesel	Not Available	12/16/1988	06/23/1989
92.185	Fuel Oil	Not Available	05/27/1992	10/28/1993
93.066	Sulfuric Acid	500	03/29/1993	06/09/1993
95.103	Sodium Hypochlorite	650	11/02/1995	01/01/1996
96.013	Sodium Hypochlorite	800	01/23/1996	02/18/1997
96.162	Mineral Oil	50	06/10/1996	06/18/1996
99.029	#2 Fuel Oil	40	01/28/1999	07/21/1999
2000.06	5 percent Hydrochloric Acid Solution	720	04/08/2000	09/19/2000
2002.046	Brine Concentrate Supernatant	300,000	04/19/2002	07/16/2003
2002.149	Holding Pond Water	Not Available	08/02/2002	11/27/2002
2008.039	Mercury	< 4 lbs	03/10/2008	04/24/2008

Source: SDDENR, 2005 and OTP, 2008a.

3.7.3 Transmission Corridors, Substations, and Other System Improvements

3.7.3.1 Infrastructure

Figure 3.7-2 illustrates roads, airports, railroads, and transmission lines in the proposed Project area of the corridors and substations.

Federal, State and County Roadways

The capacity of any roadway depends on many factors, as documented in the Highway Capacity Manual (Transportation Research Board, 2000). Roadways within the proposed Project area where the transmission corridors are located are rural two-way, two-lane highways. The functional capacity of a rural two-way, two-lane highway is between 4,000 and 6,000 vehicles per day based on typical peak hour percentages, trucks, terrain, and access spacing. Traffic data were obtained from existing mapping resources prepared by counties with the aid of the MnDOT and South Dakota Department of Transportation (SDDOT). Historical crash data were obtained from the MnDOT and SDDOT, which use a joint database with the Department of Public Safety.

In general, all of the corridors are located in rural areas served by highways with relatively low traffic volume. A summary of the average daily traffic on an annualized basis is documented for each corridor in Table 3.7-2. Congestion is not a factor on any of the roadways within any of the proposed corridors.

Railroad Traffic

Railroad data were obtained via information provided for government use by each rail carrier and by HDR. Table 3.7-3 list railroads in the vicinity of the proposed corridors.

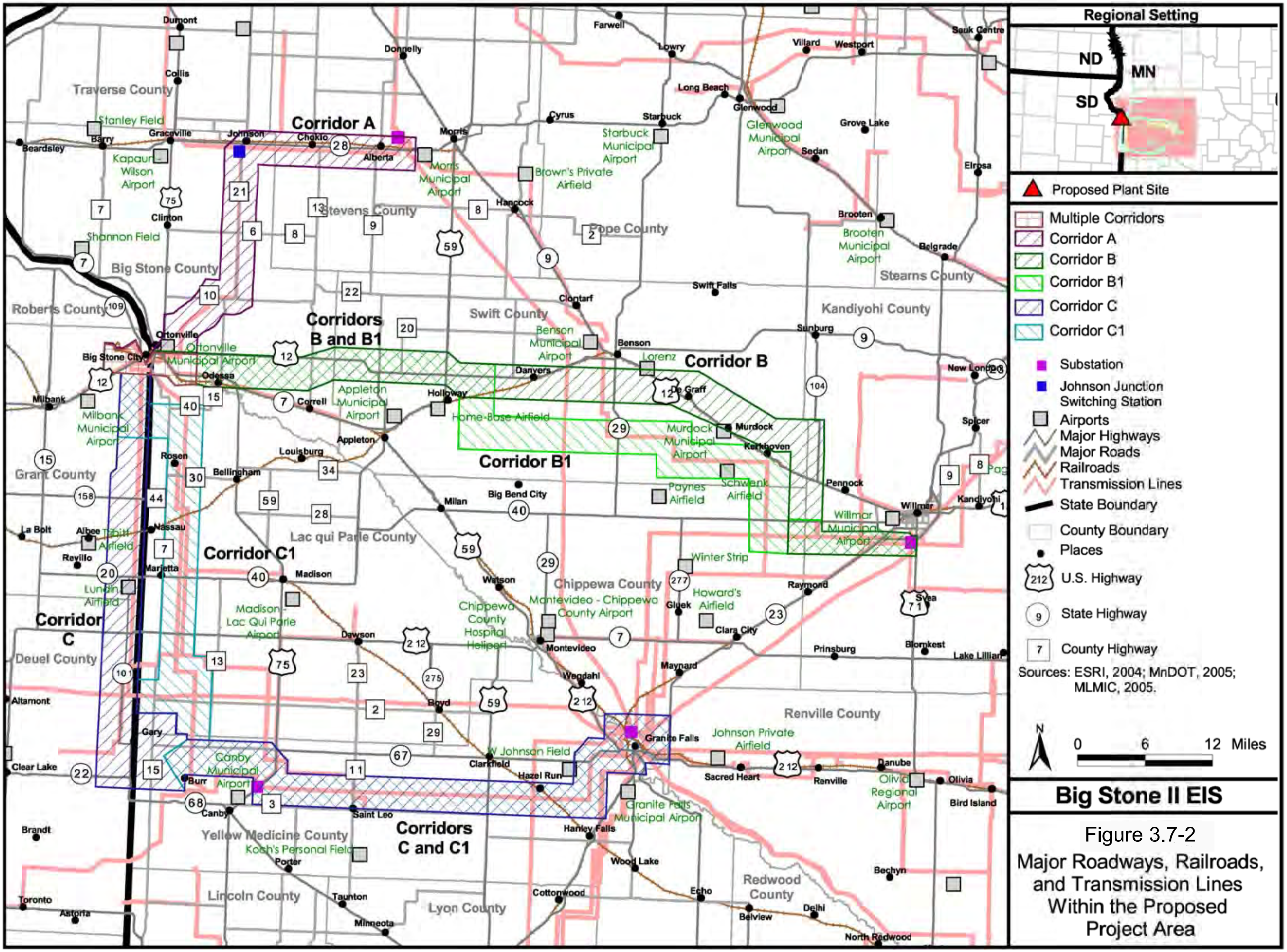


Figure 3.7-2
Major Roadways, Railroads, and Transmission Lines Within the Proposed Project Area

Table 3.7-2. Existing Average Annual Daily Traffic

Highway Route	Jurisdiction	Average Annual Daily Traffic				
		Corridor A	Corridor B	Corridor B1	Corridor C	Corridor C1
U.S. Highway 75	MnDOT	2,800	2,800	2,800	1,200	1,200
U.S. Highway 12	MnDOT					
• Rural		1,150	700	700	--[a]	--[a]
• Ortonville		3,900	3,900	3,900	--[a]	--[a]
• West of Willmar		--[a]	4,150	4,150	--[a]	--[a]
County Road 12	Big Stone County	370	--[a]	--[a]	--[a]	--[a]
County Road 21		255	240	240	--[a]	--[a]
County Road 6		95	--[a]	--[a]	--[a]	--[a]
County Road 10		225	--[a]	--[a]	--[a]	--[a]
State Highway 28	MnDOT	1,000	--[a]	--[a]	--[a]	--[a]
County Road 13	Stevens County	405	--[a]	--[a]	--[a]	--[a]
County Road 9		430	--[a]	--[a]	--[a]	--[a]
County Road 63		120	--[a]	--[a]	--[a]	--[a]
County Road 25	Big Stone County	--[a]	210	210	--[a]	--[a]
County Road 5	Swift County	--[a]	120	120	--[a]	--[a]
State Highway 119	MnDOT	--[a]	490	490	--[a]	--[a]
U.S. Highway 59		--[a]	790	790	1,450	1,450
State Highway 29		--[a]	1,950	1,950	--[a]	--[a]
State Highway 40		--[a]	720	1,400	260	560
State Highway 104		--[a]	570	--[a]	--[a]	--[a]
State Highway 23		--[a]	5,100	5,100	3,150	3,150
County Road 13	Swift County	--[a]	145	--[a]	--[a]	--[a]
County Road 20		--[a]	110	110	--[a]	--[a]
County Road 5	Kandiyohi County	--[a]	1,800	1,550	--[a]	--[a]
State Highway 158	SDDOT	--[a]	--[a]	--[a]	135	--[a]
State Highway 20		--[a]	--[a]	--[a]	260	--[a]
U.S. Highway 212		--[a]	--[a]	--[a]	1,650	--[a]
State Highway 101		--[a]	--[a]	--[a]	405	--[a]
State Highway 22		--[a]	--[a]	--[a]	630	--[a]
County Road 15	Yellow Medicine County	--[a]	--[a]	--[a]	275	--[a]
County Road 4		--[a]	--[a]	--[a]	405	405
County Road 3		--[a]	--[a]	--[a]	395	395
County Road 11		--[a]	--[a]	--[a]	500	500
County Road E2		--[a]	--[a]	--[a]	850	950
State Highway 67	MnDOT	--[a]	--[a]	--[a]	1,050	1,050
County Road 7	Lac qui Parle County	--[a]	--[a]	--[a]	--[a]	415
County Road 12		--[a]	--[a]	--[a]	--[a]	30
County Road 30		--[a]	--[a]	--[a]	--[a]	NA[b]
County Road 40		--[a]	--[a]	--[a]	--[a]	NA[b]
U.S. Highway 212	MnDOT	--[a]	--[a]	--[a]	2,900	2,900

[a]-- indicates not in corridor.
[b]NA indicates data not available.

Source: MnDOT, 2005; SDDOT, 2005.

Table 3.7-3. Active Rail Lines

Corridor	Operator	Segment	Classification
Corridor A	BNSF Railway Company	Benson-Aberdeen	Main Line
	BNSF Railway Company	Morris-Beardsley	Branch Line
Corridor B	BNSF Railway Company	Benson –Aberdeen	Main Line
	BNSF Railway Company	Willmar – Breckenridge	Main Line
	BNSF Railway Company	Willmar – Minneapolis Jct.	Main Line
Corridor B1	BNSF Railway Company	Benson –Aberdeen	Main Line
	BNSF Railway Company	Willmar – Breckenridge	Main Line
	BNSF Railway Company	Willmar – Minneapolis Jct.	Main Line
Corridor C	BNSF Railway Company	Benson – Aberdeen	Main Line
	BNSF Railway Company	Appleton – Yale	Branch Line
	BNSF Railway Company	Hanley Falls – Madison	Branch Line
	BNSF Railway Company	Sioux City – Willmar	Main Line
	Twin Cities & Western Railroad	Appleton – (Twin Cities)	Main Line
Corridor C1	BNSF Railway Company	Benson – Aberdeen	Main Line
	BNSF Railway Company	Appleton – Yale	Branch Line
	BNSF Railway Company	Hanley Falls – Madison	Branch Line
	BNSF Railway Company	Sioux City – Willmar	Main Line
	Twin Cities & Western Railroad	Appleton – (Twin Cities)	Main Line

Sources: HDR, 2005c.

Airports

Several airports are located within or in the vicinity of the proposed corridors (Table 3.7-4). Figure 3.7-2 includes the locations of these airports.

Table 3.7-4. Summary of Airport Locations in or Near the Proposed Corridors

Corridor	Airport	Location
Corridor A	Morris Municipal	Located southwest of Morris approximately 0.5 mile east of the eastern end of proposed corridor.
	Ortonville Municipal	Located east of Ortonville in the western side of the proposed corridor.
Corridor B	Appleton Municipal	Located north of Appleton, Minnesota, approximately 2.5 miles south of proposed corridor.
	Ortonville Municipal	Located east of Ortonville and north of the proposed corridor.
	Benson Municipal	Located west of Benson, Minnesota, approximately 2 miles north of proposed corridor.
	Willmar Municipal	Located west of Willmar approximately 1.3 miles north of the proposed corridor.
Corridor B1	Ortonville Municipal	Located east of Ortonville and north of the proposed corridor.
	Willmar Municipal	Located west of Willmar approximately 1.3 miles north of the proposed corridor.
	Schwenk Airport	Located south of Murdock, Minnesota in Corridor B1.
	Paynes Airport	Located southwest of Murdock and approximately 2 miles south of the proposed corridor.
Corridor C	Lundin Airstrip	Located west of Marietta, Minnesota, in the proposed corridor.
	Canby Municipal	Located in Canby, Minnesota, approximately 2 miles south of proposed corridor.
	Granite Falls Municipal	Located in Granite Falls approximately 2 miles south of proposed corridor.
Corridor C1	Canby Municipal	Located in Canby, Minnesota, approximately 2 miles south of proposed corridor.
	Granite Falls Municipal	Located in Granite Falls approximately 2 miles south of proposed corridor.

Source: HDR, 2005b, MnDOT, 2005; SDDOT, 2005.

3.7.3.2 Public Health and Safety

Electricity transmission projects may affect the public health environment temporarily during construction and long-term during operation. Potential health and safety concerns associated with power transmission include electrical shock, electric and magnetic fields (EMF), corona, collision hazards, fire risk and public access to transmission structures and substation equipment. Transmission safety and emergency services in the proposed Project area are listed for each proposed corridor in Appendix H, Volume III.

Electric and Magnetic Fields

EMF result from electrically charged particles which may cause effects some distance away from a transmission line. Voltage measured in volts (or kV) is the source of the electric field. Current, measured in amperes, is the source of a magnetic field. Fields drop rapidly as the distance increases from the source. The possibility of adverse health effects from EMF exposure has increased public concern in recent years about living near high-voltage transmission lines. The available evidence has not established such fields pose a significant health hazard to exposed humans. The lack of definitive correlation has resulted in an absence of thresholds that can be used regarding EMF parameters that are considered to be acceptable. The International Committee on Non-Ionizing Radiation Protection has set a voluntary protection level for electrical fields for the general public of 4.2 kilovolts per meter (International Commission on Non-Ionizing Radiation Protection, 1998).

3.7.3.3 Hazardous Materials and Waste Management

The presence of contaminated sites that may contain uncontrolled releases of hazardous substances within the proposed corridors is expected to be limited due to the rural nature of the area. Several small cities occur within the proposed corridors. The potential for uncontrolled releases of hazardous substances or materials is higher in cities. Potential sites of concern include mechanic garages, gasoline stations, and other commercial or industrial businesses.

In agricultural areas, unregulated solid waste disposal occasionally occurs. Piles of discarded materials (typically household-type wastes) could contain lubricants, pesticides, paints, batteries, and other potentially hazardous materials. Small aboveground storage tanks containing petroleum products such as gasoline, diesel, and heating oil are common to farms. Significant releases of hazardous materials from solid waste disposal sites and farm tanks are not typical, and therefore, the presence of significantly contaminated sites within the transmission corridors is expected to be unlikely.

Databases from the MPCA, SDDENR, and USEPA were reviewed to determine the presence of contaminated sites within the proposed corridors (MPCA, 2005a; SDDENR, 2006a; and USEPA, 2005d). The MPCA contaminated sites database contains listings of a variety of sites that are dealt with under different regulatory programs (Federal and State), and MPCA Voluntary Investigation and Cleanup Sites. Only Voluntary Investigation and Cleanup Sites and unpermitted dump sites were found within the corridors. Sites on the MPCA Leaking Underground Storage Tank (UST) Sites database that are enumerated on Table 3.7-5 are only those sites that are currently being investigated or under remediation. Most of the sites listed on the Leaking UST database are designated as closed and therefore would not present a potential contamination issue. The SDDENR Incident Sites database summarizes environmental incidents including releases, leaking tanks, and spills. No active sites (undergoing investigation and remediation) were found within the proposed corridors. No USEPA CERCLIS listed sites were found in the proposed corridors in either Minnesota or South Dakota. The numbers of sites listed on Table 3.7-5 indicate the largely rural character of the proposed corridors. Most of the sites are located in towns and cities. Additional sites may be present in the proposed corridors, but have not been reported or discovered by the regulatory agencies.

Table 3.7-5. Contaminated and Incident Sites Proposed Transmission Corridors

Corridor	MPCA Contaminated Sites[a]	MPCA Leaking UST Sites[b]	SDDENR Incident Sites[c]	USEPA CERCLIS
Corridor A	6	3	0	0
Corridor B	9	1	0	0
Corridor B1	6	1	0	0
Corridor C	5	1	0	0
Corridor C1	5	1	0	0

[a]Includes Voluntary Investigation Cleanup Sites and Unpermitted Dump Sites.
[b]Sites currently being investigated or remediated.
[c]Incident sites in South Dakota have been designated as closed.

Source: MPCA, 2004c, 2005a; SDDENR, 2006a; USEPA,2005d.

Substations

Infrastructure

Existing roads and railroads that occur in the immediate vicinity of the existing substations and the relocated Canby Substation include:

- Big Stone Substation (All corridors) – U.S. Highway 12; BNSF Railroad.
- Morris Substation (Corridor A) – Minnesota State Highway 28; BNSF Railroad.
- Willmar Substation (Corridors B and B1) – U.S. Highway 71; BNSF Railroad.
- Granite Falls Substation (Corridors C and C1) – U.S. Highway 212; TC&W Railroad.
- Canby Substation (Corridors C and C1) – U.S. Highway 75.
- Johnson Junction (Corridor A) – Minnesota State Highway 28; Big Stone County Road 21.

Public Health and Safety

Appendix H provides a list of emergency services in the vicinity of the existing substations and the relocated Canby Substation. The following list describes the location of this information in Appendix H:

- Big Stone Substation (All corridors) - (see Appendix H, Big Stone, SD facilities, Volume III).
- Morris Substation (Corridor A) – (see Appendix H, Morris, Minnesota, facilities, Volume III).
- Willmar Substation (Corridor B; Corridor B1) – (see Appendix H, Willmar, Minnesota, facilities, Volume III).
- Granite Falls Substation (Corridor C; Corridor C1) - (see Appendix H, Granite Falls, Minnesota, facilities, Volume III).
- Johnson Junction (Corridor A) – (see Appendix H, Morris, Minnesota facilities, Volume III).

- Canby Substation (Corridors C and C1) – (see Appendix H, Canby, Minnesota facilities, Volume III).

Hazardous Materials and Waste Management

Land immediately adjacent to the existing substations and the relocated Canby Substation currently consists of agricultural land. A review of MPCA (2004c, 2005a) and USEPA (2005d) databases indicated that there are no contaminated or environmental incident sites within or near the existing substations or the relocated Canby Substation.

3.8 Visual Resources

3.8.1 Introduction

The following discussion describes existing visual resources within the area of the proposed Project. A visual resource inventory was conducted using principles derived from a federally approved visual resource management system, the BLM Visual Resource Management (VRM) 8400 System.

The objective of conducting a visual resource inventory is to identify areas of visual resource sensitivity and to categorize these areas into classes (Class I area being characterized as highly valued; whereas, a Class IV area being considered a lower value). Components of the inventory include an evaluation of regional setting/landscape character, scenic quality ratings, viewer sensitivity, and distance zones. As part of the visual resource analysis, observation points were identified to evaluate the existing landscape conditions, which are used as the background for assessing impacts to visual resources resulting from the proposed Project. Factors considered in determining the observation points are number of viewers, view duration, special landscape features such as river crossings, and the proposed Project's features such as the proposed plant. Observation points included representative viewing points or locations where viewers reside, travel, or recreate. The inventory method, including adjustments, is described in Appendix I, Volume III.

The proposed Project is located within the Central Lowland Physiographic Province, Western Lake Section (Fenneman, 1938). Broad, flat to rolling topography, characterizes the landforms of the area, and water forms are characterized by riverway terraced topography, major waterbodies, rivers, creeks, and wetlands. The Chippewa, Lac qui Parle, Pomme de Terre, Yellow Bank, and Whetstone rivers are tributaries of the Minnesota River. Low terraces have formed along these rivers, while the Minnesota River is broadly entrenched through the center of the proposed Project area. Elevations range from approximately 900 feet amsl at the Minnesota River near Granite Falls, Minnesota, to 1,700 feet amsl in upland areas southwest of Gary, South Dakota.

Visual resources in the area are diverse and include partially intact landscapes of the Minnesota River Valley, the southwestern portion of Corridor C near Gary, South Dakota, the Big Stone NWR, and lakes, woodlands, wetlands, grasslands, large expanses of cropland, and interspersed homesteads with associated tree groves. Much of the landscape has been modified and cleared for agriculture. Shelterbelts line edges of agricultural fields. Farmsteads are evenly spaced throughout the area. Cultural modifications or man-made structures include communities, county and city parks, golf courses, highways with official scenic highway designation, communication towers, and the existing power plant. Networks of transmission and distribution lines crisscross the area of the proposed

Project. Population centers include Big Stone City, South Dakota, and Benson, Granite Falls, Morris, Ortonville, and Willmar, Minnesota. The area also includes numerous rural towns and communities.

Several scenic highways, byways, and other visually sensitive routes are located within the area of the proposed Project. Two scenic overlooks occur in the travel area. One is situated along U.S. Highway 212 above the Minnesota River Valley near Granite Falls and the other is located in the Big Stone NWR. There are several rest stops including one located on Highway 12 near the proposed plant site, one in Alberta, one near the crossing of the Pomme de Terre River on U.S. Highway 12, and another in Kerhoven.

3.8.2 Big Stone II Plant Site and Groundwater Areas

This section describes the landscape setting within the vicinity of the proposed plant site, which is located about two miles west of Big Stone Lake and about 150 feet higher in elevation than the lake.

Setting

Proposed Big Stone II Plant Site

Landscape settings in the proposed plant site area allow for expansive views. Landforms within the area are homogenous with relatively little topographic relief. The region consists of farm fields, wetlands, and tree groves or shelter belts associated with farmsteads and other residences. A network of transmission lines feed out of the power plant in various directions. Vegetation within the area primarily consists of croplands and windrows with interspersed groves of some hardwood tree species, shrubs, wetlands, and tallgrass prairie.

Big Stone Lake and the Minnesota River are east and southeast of the proposed plant site. Landscape character is composed of a broadly terraced valley with dense vegetation, water, wetlands, and human-made developments of Big Stone City and Ortonville town sites. Topographic relief is prominent, with sharp transitions from valley floor to the slope crest. Occasional boulders and rock formations protrude from the terrain.

Developed landscape character consists of farmsteads, residences, and communities interspersed throughout the open agricultural landscape. Parks, recreation, and public places are located near or within the municipal boundaries of Big Stone City, Ortonville, and around Big Stone Lake. The existing plant is a prominent visual feature, as shown on Figure 3.8-1, View of Existing Plant Site from Ortonville, Minnesota. The existing Big Stone plant stacks can be seen up to 15 miles away in several directions and transmission lines spoke out from the power plant in various directions. U.S. Highway 12 crosses through the region south of the proposed plant site. A rest stop is located southwest of the proposed plant site on U.S. Highway 12 (Figure 3.8-2).

Groundwater Areas

The expanded groundwater area is located within an area of rural agricultural landscapes, small lakes, and wetlands, and is traversed by the North Fork and South Fork tributaries to the Whetstone River.

The landscape within the expanded groundwater area is predominantly rural in character. Existing visual conditions are dominated by agriculturally-based landscape modifications. Portions of the area contain croplands and open pasture, occasional wetlands, and tree windbreaks associated with farmsteads. Vegetation within these areas primarily consists of agricultural lands with interspersed hardwood trees, shrubs, wetlands, and tallgrass prairie. Trees tend to be concentrated in irregularly narrow riparian areas along the North and South Forks and the main channel of the Whetstone River, and in linear windbreaks across fields and near farmsteads. The landscape character for portions of the expanded groundwater area within the North Fork and South Fork of the Whetstone River is generally described as a gently undulating plain with occasional ponds, wetlands, and native prairie amid the agricultural tracts. The landscape that is typical of the groundwater areas is represented by Figures 3.8-3 and 3.8-4. These photos were taken from the drillsite of Well PW1-2 (see Figure 3.2-3). The human-made developments that intermingle with the area's natural amenities include several gravel pits associated with river deposits. Modified landscape character consists of farmsteads and scattered residences interspersed throughout the open agricultural landscape. A few transmission lines and distribution lines cross the expanded groundwater area.

Visual Resource Classes

Proposed Big Stone II Plant Site

Three visual resource classifications were identified within the proposed plant site vicinity. Class II and III areas were designated along U.S. Highway 12 and the Minnesota River Valley; Class III-IV in areas of interspersed farmsteads, tree groves, and croplands in foreground and middleground viewing situations; and Class IV in areas of unvegetated residential, commercial, industrial development, open croplands, and background viewing situations. Appendix I, Volume III provides additional discussion regarding visual resource classifications and definitions of allowable landscape modifications. VRM classifications within the proposed Project area are illustrated on Figure 3.8-5**.**

Groundwater Areas

As a result of the visual resource inventory, three visual resource classifications were assigned within the expanded groundwater area. Class II areas were designated along portions of U.S. Highway 12 and along the Whetstone River tributaries. Areas of interspersed farmsteads, tree groves, and croplands were designated as Class III areas, and areas of unvegetated residential, commercial and industrial development, open croplands, and background viewing situations were designated as Class IV.

Observation Points

Proposed Big Stone II Plant Site

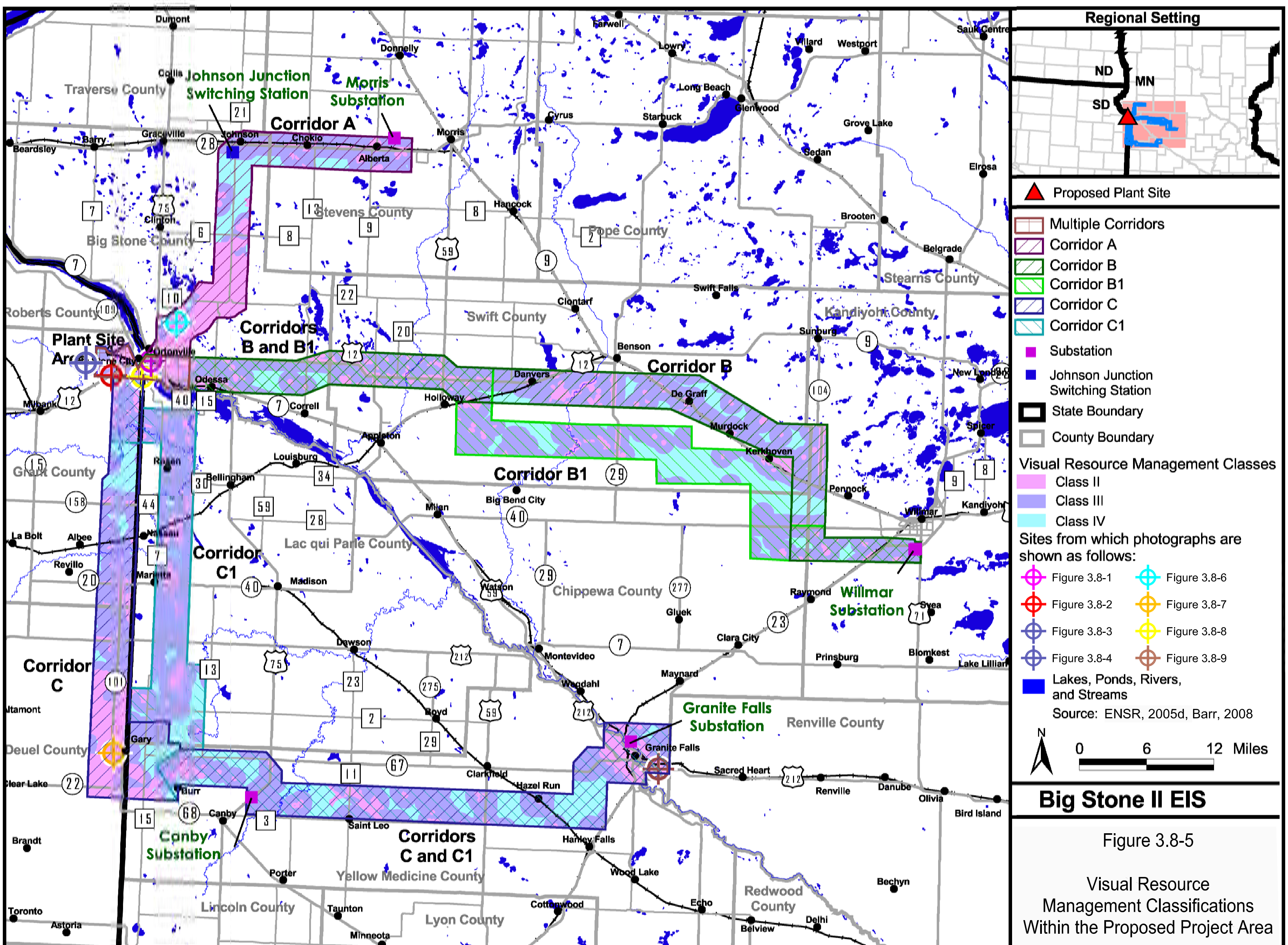
Observation points 6, 40, and 41 were identified in the vicinity of the proposed plant site. One viewpoint was located on State Route (SR) 7 in Ortonville looking west from a campground. Other viewpoints included a view of the proposed plant site to the north from the rest stop and a view from Ortonville to the northeast, both located on U.S. Highway 12. These observation points were selected as representative of residents, recreation users, and travelers in the area. Table 3.8-1, Proposed Project Area Observation Points, displays information for each observation point. This information includes landscape character, view direction and distance, viewer type, existing visual condition, and VRM class.

Figure 3.8-1 View of Existing Plant Site from Ortonville, Minnesota

Figure 3.8-2 View of the Existing Plant Site from U.S. Highway 12 Rest Stop

Figure 3.8-3 View of the Groundwater Area with Existing Big Stone Plant in Background

Figure 3.8-4 View of the Groundwater Area



Big Stone II EIS

Figure 3.8-5

Visual Resource Management Classifications Within the Proposed Project Area

Table 3.8-1. Proposed Project Area Observation Points

View Point No.	Location	Corridor[a]	View Direction[b]	View Distance (ML)	EVC[c]	Viewer[d] Res	Viewer[d] Trv	Viewer[d] Rec	VRM Class[e]	Impact[f]	Landscape Character
1	Crossing at SR 28 (near Morris Substation)	A M Sub[h]	N-S	0.25	Mod		●		III-IV	(A)L-M	Viewshed contains structural modifications at substation, TLs and DLs[g], shelterbelts and farmsteads
2	Alberta Wayside Rest Area	A	S	1.5	Mod	●	●	●	III-IV	(A)L-M	Some tree screening in foreground, agricultural (ag.) fields, strs./metal bldgs., TL
3	Chocko (Community)	A	S	1.5	Mod	●	●		III-IV	(A)L-M	Some shelterbelts, agricultural fields and metal bldgs., TL
4	Johnson @ SR 28	A	S	3.0	Mod	●	●		III-IV	(A)L-M	Some shelterbelts, and ag. fields, distribution line, small switchstation, TL
5	Otrey Town Hall	A	E	0.25	Part-Mod	●	●	●	II-III	(A)M	Scenic diversity (forest/lakes/wetlands) small scale str. Modifications
6	Ortonville – SR 7 (@ campground)	BSPP	W-SW	2.0-3.0	Part-Mod	●	●	●	II-III-IV	(A)L-M	Visual modifications draw some attention. Scale of viewshed (e.g., Minnesota River) competes for attention, BSPP stack focal point
7	CR 7 (Mn. River Scenic Byway)	C/CV	N-S	0.5	Part-Mod		●	●	II-III	(A)M	Much of the landscape is intact. 115 kV TL is a notable modification which draws some visual attention
8	Rosen @ CR 36	C	E	0.5	Mod	●	●		III-IV	(A)L-M	Shelterbelts, switchrack, network of TLs and DLs, cropland
9	Nassau @ CR 24	CV	W	1.5	Mod	●	●		IV	(A)/L	Shelterbelts, farmsteads, railroad, 115 kV TL, ag. fields
10	Marietta @ SR 40	C	E	1.5	Mod	●	●		IV	(A)L	Shelterbelts, farmsteads, ag. fields, TL
11	SR 20	CV	W	1.5	Mod		●		IV	(A)L	Open landscape with some shelterbelts, farmstead, TL
12	U.S. 212 @ MP 00	CV	W	1.5	Mod		●		IV	(A)L	Slightly rolling landscape commercial and ag. strs (metal bldgs.), TL
13	Mehurin @ U.S. 212	C	E	1.5	Mod	●	●		IV	(A)L	Small hills with shelterbelts, TL
14	Gary (Near Water Tank)	C/CV	W-E-SE	3.5	Mod	●			IIII-IV	(A)L-M	Townsite, wind turbine, small hills with shelterbelts, long distance views to the east
15	U.S. 212 @ SD 22	CV	E-SE	2.0	Mod		●		III-IV	(A)L-M	Hills and valley topographic enclosure shelterbelts, TL
16	Burr	C/CV	N-NE	3.0	Mod	●			III-IV	(A)L	Elevated viewing point, large viewshed and landscape scale, ag. bldgs., TL
17	U.S. Highway 79 (near MP 89)	C/CV	SW-NE	1.0	Mod	●			III-IV	(A)L-M	Elec. switchstation, shelterbelts, farmsteads, TL
18	Saint Leo (near cemetery)	C/CV	NW-N-NE	1.5	Mod	●	●		IV	(A)L	Townsite, open landscape (ag. fields), farmstead, TL
19	U.S. 59 (near MP 94)	C/CV	N-S	0.5	Mod		●		IV	(A)L	Shelterbelts, open landscape (ag. fields), farmstead, TL
20	Hazel Run (near cemetery)	C/CV	S	1.0	Mod	●	●		IV	(A)L	Townsite, shelterbelts, ag. fields, TL
21	SR 67 (@ Corridor Crossing)	C/CV	NE-E-SE	0.5	Mod	●			IV	(A)L	Ag. fields, shelterbelts, farmsteads, TL
22	Granite Falls (U.S. 212 and SR 67 Jct.)	C/CV	NE-E	0.25	Mod	●	●		III-IV	(A)L	Urban fringe of townsite, TL and DL network, stream crossing, riparian veg.
23	Granite Falls (Palmer Ck Rd. – Mn. River Scenic Byway)	C/CV GF Sub[8]	NW-W	0.25	Part-Mod		●	●	II-III-IV	(A)L-M	TL network, railroad corridor, Mn. River corridor, riparian forest with cleared ROWs, substation

Table 3.8-1. Proposed Project Area Observation Points

View Point No.	Location	Corridor[a]	View Direction[b]	View Distance (ML)	EVC[c]	Viewer[d] Res	Viewer[d] Trv	Viewer[d] Rec	VRM Class[e]	Impact[f]	Landscape Character
24	SR 40 and CR 1 Jct.	BV	N-NW	0.5-3.0	Mod		●		IV	(A)L	Ag. fields, shelterbelt, farmstead, other TLs
25	Murdock (@ U.S. 12)	B	N-NE-E	0.5-3.0	Mod	●	●		III-IV	L	Townsite, shelterbelts, ag. fields
26	SR 29 (near MP 25)	BV	N-S	0.5	Mod		●		III-IV	(A)L	Shelterbelts, farmstead, ag. fields
27	Holloway (@ U.S. 59)	B/BV	NW-N-NE	0.5-3.0	Mod	●	●		III-IV	L-M	Ag. field, scattered shelterbelts, communications tower, townsite
28	U.S. 12 (@ Pornme de Torre River Wayside)	B	N-S	1.0-2.0	Part-Mod		●	●	II-III	M	Hardwood forest, river feature, topographic variety, ag. field
29	U.S. 12 and SR 119 Jct.	B/BV	SW-S-SE	1.0	Mod		●		III-IV	L-M	Numerous shelterbelts
30	Ortonville (@ SR 7)	A/B/BV	W-SW-S	0.25-3.0	Mod	●	●		II-III-IV	L-M	Mixed viewshed from riparian forest to industrial/commercial disturbed landscapes
31	Ortonville (near Lakeside Park)	All Corridors	S-SW-W	0.25-3.0	Mod	●		●	II-III-IV	(A)L-M	Electrical substation, Townsite, forest, Mn. River, TLs and DLs
32	Ortonville (@ old Highway 12)	All Corridors	S-SE	1.0	Mod	●	●		III-IV	(A)L	Townsite, ag. strs., railroad, some open space and riparian forest but not dominant
33	U.S. 212 (near MP 2)	A/B/BV	E-W	0.25	Mod		●		III-IV	(A)L-M	Ag. fields, some shelterbelts, airfield
34	Danver (@ U.S. 212)	B	E-SE-S	1.0-3.0	Mod	●	●		III-IV	L	Townsite, ag. fields, shelterbelts
35	De Graff (@ U.S. 212)	B	NE-E	1.0-3.0	Mod	●	●		IV	L	Townsite, ag. field, shelterbelts
36	Kerkhoven (near U.S. 212 wayside)	B/BV	N-E-S	1.0-3.0	Mod	●	●	●	III-IV	L	Townsite, ag. field, shelterbelts
37	Willmar (SR 23 @ 15th St.)	B/BV W Sub[8]	SW-S-SE	1.0-3.0	Mod	●	●		III-IV	(A)L	Townsite, shelterbelts, substation, network of TLs
38	Auto Byway @ Big Stone NWR	B/BV	S-SW-W	0.25-2.0	Part-Mod		●	●	II-III	(A)M	Open landscape with ag. fields, river terrace in background with TL
39	Mn. River Overlook near Granite Falls	C/CV	NE-N	0.25-3.0	Natural Part-Mod		●	●	II-III	(A)M	Visually diverse landscape, some visual modifications but do not draw visual attention
40	U.S. 12 Rest Stop (near Big Stone City)	BSPP/All Corridors	N-NE	0.25-2.0	Mod		●	●	II-III-IV	(A)L-M	Modified landscape, open viewing power plant draws visual attention – focal point
41	Ortonville on U.S. Highway 12 near MP 1.0	BSPP	NE	3.5	Mod		●	●	III-IV	(A)L	Urban landscape, power plant draws visual attention – focal point

[a]Corridors A, B, BV (B Variation), C, CV (C Variation), BSPP (Big Stone Power Plant)

[b]View direction: N – North, NE – Northeast, E – East, SE – Southeast, S – South, SW – Southwest, W – West, NW – Northwest

[c] EVC – existing visual condition, Mod – modified landscape, Part-Mod – partially modified landscape

[d] Viewer: Res – resident/community, Trv – Traveler, Rec – Recreator

[e] VRM Class: II = Class II, III = Class III, IV – Class IV

[f] Impact: (A) – additive, L – Low, M - Moderate, L-M – Low to Moderate

[g] TLs – Transmission Lines, DLs – Distribution Lines

[h] Sub – M Sub - Morris Substation, GF Sub – Granite Falls Substation, W Sub – Willmar Substation

Groundwater Areas

The landscape in which the groundwater areas lie is flat to gently rolling and is dominated by croplands, with occasional isolated trees and windbreaks of trees. Photographs from the groundwater well locations are represented by Figures 3.8-3 and 3.8-4. These photographs were taken at the northeast portion of the groundwater area (at the drillsite of Well PW1-2); however, they typify the landscape of the groundwater areas. No specific observation points were defined within the groundwater areas.

Lighting

During nighttime hours, the proposed plant site area is visible from U.S. Highway 12 from lighting associated with the existing power plant and ethanol plant. These facilities' outdoor lighting consists of unshielded high-pressure sodium lamps or mercury lamps. The existing plant stack has white flashing strobe lights rated at medium intensity for Federal Aviation Administration compliance.

3.8.3 Transmission Corridors, Substations, and Other System Improvements

Setting

The proposed corridors traverse rural agricultural landscapes, a wide valley throughout the central region, and rolling hills in the southwestern portion (Gary, South Dakota area) of the proposed Project area. The landscape settings of the proposed corridors allow for expansive views of agricultural lands and enclosed views in the riverways, hills, and valleys.

The landscape is predominantly rural in character. Existing visual conditions contain numerous agriculturally-based landscape modifications. Grain silos are evenly spaced throughout the proposed Project area. Portions of the proposed corridors are located in a region described as cropland characterized by open landscape of farmland, wetlands, and tree groves associated with farmsteads. Vegetation within these areas primarily consists of agricultural lands with interspersed groves of hardwood trees, shrubs, wetlands, and tallgrass prairie. Landforms are homogenous with relatively little topographic relief. Modified landscape character consists of farmsteads, residences, and communities interspersed throughout the open agricultural landscape. Networks of transmission lines and distribution lines cross at various locations of the corridors.

The landscape character for portions of the proposed corridors along the Minnesota River downstream from the Ortonville area and in the vicinity of Granite Falls is generally described as a broadly-terraced valley with dense vegetation, water, wetlands, and human-made developments near the populated areas. Big Stone NWR, located along the Minnesota River valley, is a mix of a natural and modified landscape character. The landscape character includes lush understory vegetation mixed with tall tree cover, ponds, wetlands, and open tallgrass meadows. Topographic relief is a flat valley shape with steep slopes from valley edge to the top of the valley terrace. Occasional boulders and rock formations protrude from the terrain. Agricultural fields, shelterbelts, farmsteads, and transmission lines are some of the landscape modifications.

Scenic highways include segments of U.S. Highway 12 and the Minnesota River Scenic Byway. Other high sensitivity travel routes include the Big Stone NWR Byway, U.S. Highway 212, U.S. Highway 59, Minnesota State Highways 7, 9, 23, 29, 40, 71, and 75, and South Dakota State Highways 20 and 158. Adjacent scenery along these corridors includes modified landscapes, which has affected the visual sensitivity. Parks, recreation, communities, and public gathering places areas are located within the proposed corridors.

Corridor A

A portion of Corridor A northeast of Ortonville is characterized as the lake region, as shown on Figure 3.8-6, Lake Region Northeast of Ortonville. This portion of Corridor A is predominantly influenced by large and small waterbodies, tree cover, and wetlands. It is relatively flat and interspersed with farmsteads. There are sparsely- to thickly-vegetated low areas with varied native, farmstead, and cropland vegetation. The remainder of the corridor consists of a modified landscape character, which includes farmsteads, residences, and communities interspersed among tree groves and openings in the hardwood forest cover. Observation points include communities, travel routes, and recreation areas. A total of 10 observation points were identified for Corridor A (Table 3.8-1).

Corridor B and B1

With the exception of less surface water, landscapes within Corridor B and Corridor B1 are similar to much of the landscape described for Corridor A, consisting of open landscapes of agricultural fields, wetlands, and tree groves or shelter belts associated with farmsteads and other residents. U.S. Highway 12 traverses through much of Corridor B from the Minnesota River east to De Graff, south and southeast through Kerhoven, and east to the southern portion of Willmar. A total of 14 and 12 observation points each were identified for Corridor B and Corridor B1, respectively.

Corridor C and C1

Landscapes in the southwestern portion of Corridor C near Gary, South Dakota, are characterized as highlands with open agricultural fields and developed agricultural and residential areas with pockets of forested natural landscape. Vegetation within the area consists of groves of hardwood trees, shrubs, wetlands, and tallgrass prairie. The extreme southwestern portion of Corridor C is relatively prominent in topographic relief, as shown on Figure 3.8-7, View of Gary, South Dakota, to the east, which consists of rounded hills and enclosed valleys of pastoral landscapes.

The landscape characters within Corridor C1 are similar to those described in Corridor C with open landscapes of agricultural fields, wetlands, tree groves, or shelter belts associated with farmsteads and other residences. Landforms within portions of Corridor C are varied with rounded hills separated by valleys and ravines.

Two scenic overlooks are located within Corridor C; one is located in the Big Stone NWR (Figure 3.8-8, View from the Big Stone NWR Auto Byway) and the other is located along U.S. Highway 212 above the Minnesota River Valley near Granite Falls, Minnesota (Figure 3.8-9**,** Overlook Above the Minnesota River Near Granite Falls). Seventeen observation points were identified for Corridor C and 18 for Corridor C1.

Figure 3.8-6 Lake Region Northeast of Ortonville

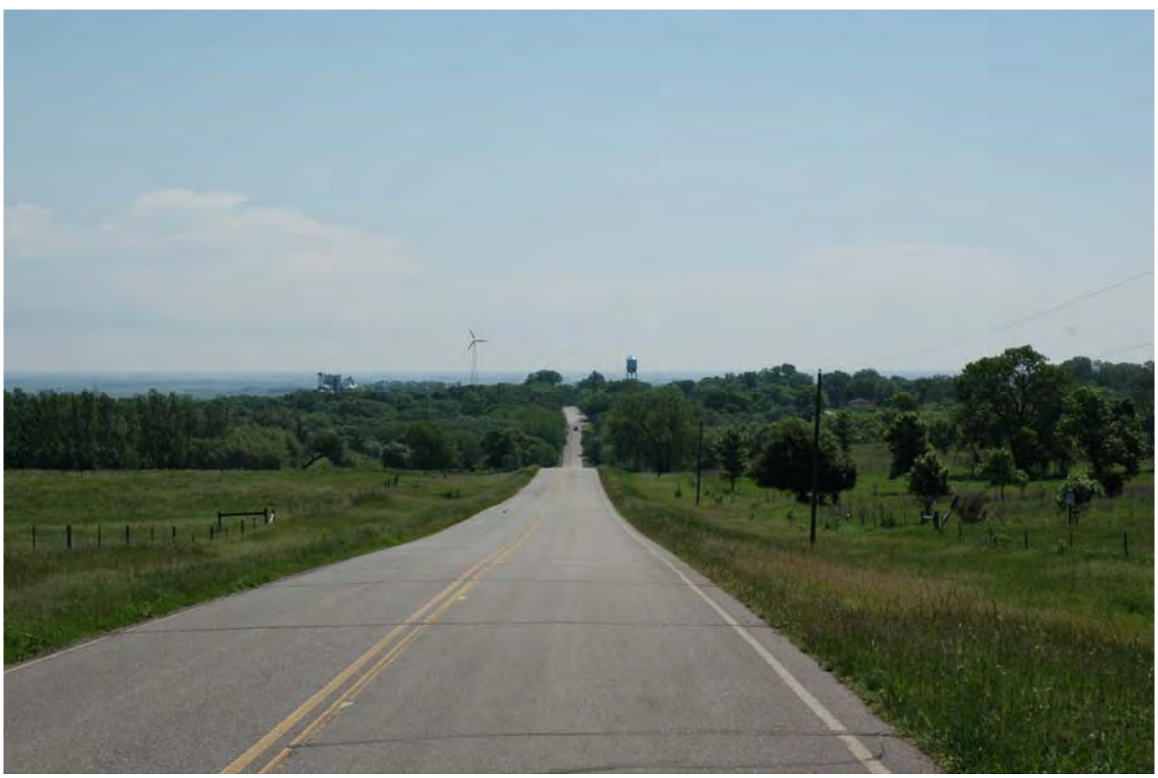


Figure 3.8-7 View East of Gary, South Dakota

Figure 3.8-8 View from the Big Stone NWR Auto Byway

Figure 3.8-9 Overlook Above the Minnesota River Valley Near Granite Falls

Substations

The substations that are proposed for modification and relocation are located within the corridors. The landscape character at the substations is similar with typical electrical structures and steel lattice works with a fenced yard.

Visual Resource Classes

As a result of the visual resource inventory, three visual resource classifications were assigned within the proposed corridors. Class II areas were designated along portions of U.S. Highway 12, Big Stone NWR along U.S. Highway 212, and pristine areas of the Minnesota River Valley. Areas of interspersed farmsteads, tree groves, and croplands in foreground and middleground viewing situations were designated as Class III areas; and areas of unvegetated residential, commercial, and industrial development, open croplands, and background viewing situations were designated as Class IV. As previously mentioned, Appendix I, Volume III provides a more detailed description of visual resource classifications and definitions of allowable landscape modifications. VRM classifications within the proposed Project area are illustrated on Figure 3.8-5.

Observation Points

A total of 41 observation points for the proposed corridors were identified representative of viewer conditions for residents, travelers, and recreation users in the proposed Project area. These observation points are displayed as Table 3.8-1. There were no observations points defined for the existing Hankinson line.

3.9 Noise

3.9.1 Introduction

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

Noise could be perceived as an annoyance to residents and the level of perception would relate to the magnitude and amplitude of sound that is generated, duration of the sound, and the sensitivity of receptors that are impacted by the sound. Noise is perceived differently by individuals. In general, it depends upon the loudness, measured in decibels (dB), and pitch, measured in Hertz (Hz). Other factors include the presence or absence of background noise loudness and pitch, its repetition rate, the time of day when it occurs, and numerous social and physiological factors. A consistent single pitch noise is typically more annoying than multiple pitch noise of the same loudness.

Noise levels are measured in pitch and loudness. Pitch is the frequency of noise and is typically measured in cycles per second, or Hz. Loudness is expressed in dB, which is based on sound pressure of micropascals (μPa). The lowest sound pressure that can be detected by an average human ear is 20 μPa, which equates to 0 dB. A sound pressure of 200 μPa equates to 140 dB, which is above the threshold of pain. The perceived loudness of a sound is not directly related to the sound pressure, since the sensitivity of the ear varies with the pitch of the sound. The human ear is most sensitive to frequencies around 4,000 Hz (4 kilohertz) and is insensitive to frequencies below about 20 Hz or above 20 kilohertz. Therefore, a “weighted” scale of frequencies has been developed to emphasize frequencies around 4,000 Hz and de-emphasize those of lower and higher frequencies. The "weighted" noise levels, which corresponds to that perceived by the human ear, is expressed as decibels in the "A" scale (dBA).

A noise level change of 3 dBA is barely perceptible to average human hearing. A 5 dBA change in noise level, however, is clearly noticeable. A 10 dBA increase in noise levels is perceived as a doubling of noise loudness, while a 20 dBA change is considered a dramatic change in loudness. Table 3.9-1 shows noise levels associated with common, everyday sources and places the magnitude of noise levels discussed here in context.

Table 3.9-1. Common Noise Sources and Levels

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

Source: Rau and Wooten, 1980.

The Noise Control Act declares that it is a national policy to promote an environment that is free from noise that jeopardizes the health and welfare of Americans. The Noise Control Act describes the role of Federal agencies and the President with respect to establishing noise emissions control standards. Each agency is responsible for compliance with local, interstate, State, and Federal noise pollution requirements.

The Noise Control Act directs the Administrator of the USEPA to develop and publish criteria with respect to levels of noise and other conditions that are necessary to protect the public health and welfare with an adequate margin of safety. Section 4913 of Noise Control Act authorizes the Quiet Communities Program, which offers State, regional, and local grants to study noise abatement and collect data, buy monitoring equipment, and provide technical assistance for noise control.

On the basis of its interpretation of available scientific information, USEPA identified a range of yearly Day-Night Sound Levels (L_{dn}) sufficient to protect public health and welfare from the effects of environmental noise. It is very important that these noise levels not be misconstrued. Since the protective levels were derived without concern for technical or economic feasibility, and contain a margin of safety to assure their protective value, they must not be viewed as standards, criteria, regulations, or goals. Rather, they should be viewed as levels below which there is no reason to suspect that the general population would be at risk from any of the identified effects of noise.

The USEPA has identified an outdoor L_{dn} noise level of 55 dBA as desirable for protecting public health and welfare in residential areas. Outdoor yearly levels on the L_{dn} scale are sufficient to protect public health and welfare if they do not exceed 55 dBA in sensitive areas (residences, schools, and hospitals). Inside buildings, yearly levels on the L_{dn} scale are sufficient to protect public health and welfare if they do not exceed 45 dBA. Maintaining 55 dBA L_{dn} outdoors should ensure adequate protection for indoor living. To protect against hearing damage, one's 24-hour noise exposure at the ear should not exceed 70 dBA.

No noise standards have been promulgated in South Dakota. The MPCA has established standards for environmental noise in Minnesota. While the Minnesota standards do not apply in South Dakota where the existing plant is located, the Minnesota standards do provide a reasonable benchmark for evaluation of measured noise levels near the residences.

Land use activities associated with residential, commercial, and industrial land have been grouped together into Noise Area Classifications (NAC) (Minn. R. 7030.0050). Each NAC is then assigned both daytime (7 a.m. to 10 p.m.) and nighttime (10 p.m. to 7 a.m.) limits (Minn. R. 7030.0040). Table 3.9-2 lists the MPCA daytime and nighttime limits in dBA for each NAC. The limits are expressed as a range of permissible dBA within a one-hour period; L_{50} is the dBA that may be exceeded 50 percent of the time within one hour, while L_{10} is the dBA that may be exceeded 10 percent of the time within one hour. Residences, which are typically considered sensitive to noise, are classified as NAC-1.

Table 3.9-2. MPCA Noise Limits by Noise Area Classification

Noise Area Classification	Daytime (dBA)		Nighttime (dBA)	
	L_{50}[a]	L_{10}[a]	L_{50}[a]	L_{10}[a]
1 (primarily residential)	60	65	50	55
2 (primarily commercial)	65	70	65	70
3 (primarily manufacturing)	75	80	75	80
4 (primarily undeveloped)	NA[a]	NA[a]	NA[a]	NA[a]

[a]Not applicable.

Source: MPCA, 2005c.

NAC-1 applies to most residential uses: homes (including farm houses), lodging, designated campgrounds, designated picnic areas, resorts, religious activities, correctional institutions, and more. Any location where people sleep generally falls under this noise classification. NAC-2 applies to what is generally thought of as commercial areas: retail locations, transportation terminals (air, rail, road, and sea), business offices, government services, parks, recreational areas not designated camping, or picnic areas and similar uses. NAC-3 applies to industrial type properties: manufacturing, metals processing, railroads, roads, highway and street ROW, utilities, agricultural and related activities, and all activities not otherwise listed in Minnesota Rule 7030.0050. NAC-4 applies to undeveloped land, water areas, areas under construction, and other undeveloped land use. These areas have no noise standard, as they are generally unoccupied.

Sensitive noise receptors are defined as locations where increased noise resulting from construction or operation of a project may be objectionable. Generally, most sensitive receptors are residences but also may include schools, hospitals, parks, and similar public facilities.

3.9.2 Big Stone II Plant Site and Groundwater Areas

Proposed Big Stone II Plant Site

The existing and proposed plant site area is classified NAC-3 due to the proximity of manufacturing and agricultural activities. Review of aerial photography indicates there are four residences within one mile of the main power block area for the existing plant. One of these residences is located south of the existing plant and the other three to the west. The Co-owners have purchased the three residences that are west of the existing plant. The primary residential areas associated with Big Stone City, South Dakota, are located more than two miles east of the proposed plant site.

Barr monitored sound levels at four locations shown in Figure 3.9-1, at and around the perimeter of the existing plant during operation. These monitoring locations are between the plant site and the sensitive receptors (residences). The monitoring locations included:

- Location A: Northwest of the existing plant at the intersection of 143rd Street and 484th Avenue.
- Location B: At the intersection of 144th Street and 484th Avenue, southwest of the Poet Biorefining plant (formerly the Northern Lights Ethanol Plant).
- Location C: West of 484th Avenue at the south edge of the existing plant property, immediately northeast of the Rabe homestead.
- Location D: Northwest corner of County Route 109 and 144th Street, at the southeastern corner of the existing plant property.

Noise levels were measured across all frequency spectra on a dBA scale. Monitoring data, collected over a 24-hour period, were compiled to provide the following values:

- L_{eq} – The equivalent or average noise level measured over the sampling period.
- L_{50} – The noise level exceeded for 50 percent of the sampling period. This is the median sound level during the monitoring period.
- L_{10} – The noise level exceeded for 10 percent of the sampling period.

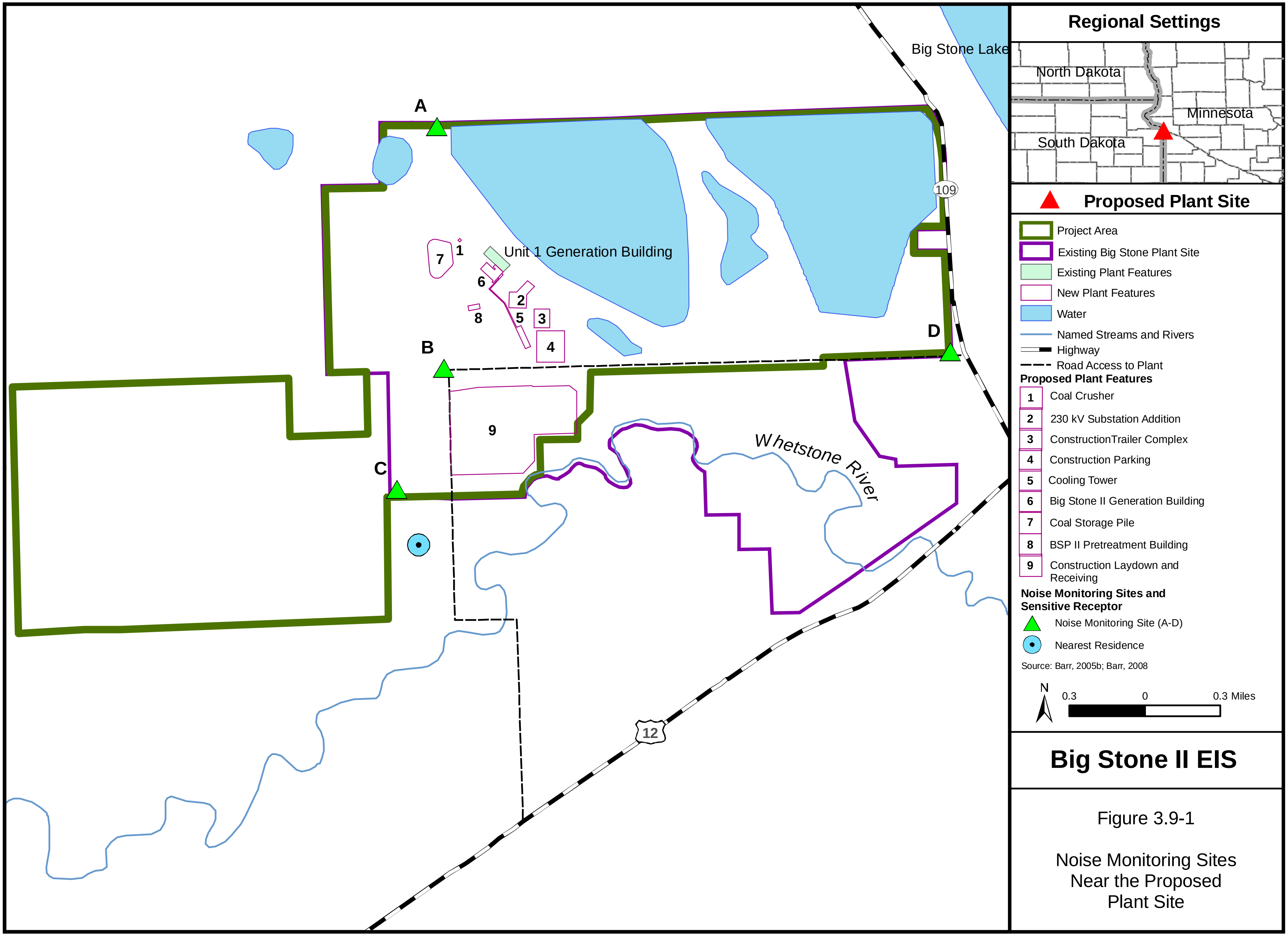
Monitored levels are summarized in Table 3.9-3.

Table 3.9-3. Baseline Noise Monitoring Results (dBA, weighted average)

Monitoring Location	L_{eq}	L_{50}	L_{10}
A	64	55	65
B	70	66	70
C	64	47	63
D	74	56	76

Source: Barr, 2005a.

Monitoring locations A, B, and C would be closest to the proposed plant expansion. Location A is located along a county road that runs on the north side of the existing Big Stone plant near the northwestern edge of the existing cooling pond. By Minnesota standards, this location would be NAC-3 (agricultural). There is limited traffic on this road; therefore, it was assumed that elevated daytime L_{10} noise levels were attributed to existing Big Stone operations, rather than traffic noise.



Big Stone II EIS

Figure 3.9-1

Noise Monitoring Sites Near the Proposed Plant Site

Location B is the closest monitoring location to the plant site and is along the main entrance road to the existing Big Stone plant and the Poet Biorefining plant, and is adjacent to the ethanol plant. This location would be classified as NAC-3 (primarily manufacturing). Elevated daytime L_{10} noise levels were attributed mainly to the Poet Biorefining plant operations, with additional noise from the existing Big Stone operations and traffic noise.

Monitoring Location C is closest to the nearest residential receptor, the former Rabe homestead, which, by Minnesota standards, would be classified as NAC-1 (residential) or NAC-3 (agricultural). Location C is located along a county road that receives limited traffic and is approximately 1,000 feet northwest of the nearest residential receptor. Elevated daytime L_{10} noise levels were attributed to existing Big Stone plant operations, rather than traffic noise.

Location D is at the northeast corner of State Route 109 and 144th Street. It is likely that daytime traffic influenced noise monitoring at the location. Information provided by OTP indicates that area residents have not filed complaints about noise.

Groundwater Areas

The primary land use within the expanded groundwater area is rural agricultural land. Ambient noise in rural areas commonly consists of rustling vegetation, farm equipment, and infrequent vehicle pass-bys. During the growing season, an additional noise source is a grass airstrip for crop dusting within the far west portion of the expanded groundwater area. Other noise in these areas is associated with the existing Big Stone Power Plant and the Poet Biorefining plant, located between approximately two and six miles to the east and northeast of the expanded groundwater area.

There are approximately 30 sensitive receptors in the expanded groundwater area including residences and farmsteads, where typical noise levels are 30 to 40 dBA. Higher ambient noise levels, typically 50 to 60 dBA, could be expected near roadways and associated with occasional noise impacts from the existing Big Stone Power Plant and the Poet Biorefining plant. In rural areas, the expanded groundwater area would be classified as NAC-3; they would be classified as NAC-1 in residential areas.

3.9.3 Transmission Corridors, Substations, and Other System Improvements

The primary land use in all of the proposed corridors, near substations, and the Hankinson line is rural agricultural land. Ambient noise in rural areas commonly consists of rustling vegetation and infrequent vehicle pass-bys. Typical noise sensitive receptors in each proposed corridor would include residences, churches, schools, and parks. Typical noise levels are 30 to 40 dBA. Higher ambient noise levels, typically 50 to 60 dBA, would be expected near roadways and more densely populated areas. Existing noise levels at substations that may be modified have been estimated to range from 51 to 59 dBA at 100 feet and from 45 to 53 dBA at 200 feet. In rural areas, the proposed corridors and substations would be classified as NAC-3; they would be classified as NAC-1 in residential areas. Table 3.9-4 shows the number of sensitive receptors (residences) located in each proposed corridor.

Table 3.9-4. Number of Residences in the Proposed Corridors

Corridor	Number of Residences
Corridor A	1,033
Corridor B and B1	1,427
Corridor C and C1	1,878

Source: Barr, 2005b.

Within Corridor A, the highest density of residences is located in the Ortonville, Minnesota, area. The highest density of residences located within Corridors B and B1 occurs near the eastern end near Willmar, Minnesota. The greatest concentration of residents within Corridors C and C1 are in the vicinity of Granite Falls, Minnesota. There are no State or local noise limits that apply to the portion of Corridor C or C1 located in South Dakota.

3.10 Social and Economic Values and Environmental Justice

3.10.1 Introduction

This section describes socioeconomic and demographic conditions in the proposed Project area, as well as the conditions regarding potential environmental justice communities.

The proposed plant site, proposed groundwater areas, and proposed transmission corridors are located in a region consisting of a predominantly Caucasian population engaged in predominantly agricultural activities. EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, states that “each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.” The analysis based on this executive order follows guidelines from the CEQ, Environmental Justice Guidance under the NEPA (CEQ, 1997).

According to the U.S. Census Bureau, minority persons are those identifying themselves as belonging to any of the following racial groups – Hispanic, Black, or African American (not of Hispanic origin), American Indian or Alaska Native, or Asian, Native Hawaiian, or other Pacific Islander. As shown in Table 3.10-1, the percentage of minorities in the counties encompassing the proposed Project ranges from 1.4 percent in Grant County, South Dakota, to 9.3 percent in Swift County, Minnesota. The percentage of minority populations near the proposed plant site, proposed groundwater areas, and within the proposed corridors is also below that for the State of Minnesota at 10.6 percent, and South Dakota at 11.3 percent in 2000. While the counties and the affected area are predominantly white, the Upper Sioux Community Reservation is located in Yellow Medicine County near Granite Falls, Minnesota, but outside the proposed corridors. Additionally, a minority population cluster occurs in western Grant and Roberts counties, South Dakota associated with the Lake Traverse Indian Reservation of the Sisseton-Wahpeton Oyate (approximately 23 miles west of the proposed Big Stone II plant).

Table 3.10-1. 2000 Census Data

Location	Population	Race Percentages Caucasian	Race Percentages Minority	Per Capita Income	Percentage of Population Below Poverty Level
State of Minnesota	4,919,479	89.4	10.6	$23,198	7.9
Big Stone County	5,820	98.4	1.6	$15,708	12.0
Chippewa County	13,088	96.8	3.2	$18,039	8.6
Kandiyohi County	41,203	93.6	6.4	$19,627	9.2
Lac qui Parle County	8,067	98.8	1.2	$17,379	8.5
Stevens County	10,053	96.1	3.9	$17,569	13.6
Swift County	11,956	90.7	9.3	$16,360	8.4
Traverse County	4,134	96.4	3.6	$24,509	12.0
Yellow Medicine County	11,080	96.1	3.9	$17,120	10.4
State of South Dakota	754,844	88.7	11.3	$17,562	13.2
Codington		96.7	3.3	$18,761	9.0
Deuel County	4,498	98.5	1.5	$15,977	10.3
Grant County	7,847	98.6	1.4	$16,543	9.9
Roberts County	10,016	69.3	31.7	$19,412	22.1
Plant Site Area[a]	1,512	98.8	1.2	$17,036	10.4
Corridor A[a]	4,757	98.2	1.8	$16,672	10.6
Corridor B[a]	17,210	92.8	7.2	$18,309	9.1
Corridor B1[a]	14,435	91.0	9.0	$18,616	9.3
Corridor C[a]	13,437	96.2	3.8	$16,805	8.4
Corridor C1[a]	11,909	96.0	4.0	$16,806	7.7

[a]For plant site, and corridor locations, smaller geographic subdivision data (i.e. "census block groups") were used and aggregated to develop the values shown. The proposed plant site and the groundwater area are located in Grant County.

Source: U.S. Census Bureau, 2000.

In compliance with the CEQ guidelines, the minority and low-income populations within the Minnesota and South Dakota sections of the proposed corridors were assessed. Data from the U.S. Census Bureau, 2000 Census, were obtained for smaller geographic subdivisions within each county called Census block groups (U.S. Census Bureau, 2000). Census blocks vary in size; but in the proposed Project area, they tend to be similar in size to the local townships. Data for each block group were aggregated to show the overall minority and low income population characteristics within each proposed corridor.

An analysis of socioeconomic census data of a 12–county area (Coddington, Deuel, Grant, and Roberts counties, South Dakota, and Big Stone, Traverse, Stevens, Lac qui Parle, Yellow Medicine, Chippewa, Kandiyohi, and Swift counties, Minnesota), chosen for proximity to the proposed plant site, groundwater areas, and corridors, shows the following characteristics and trends:

- In 2002, the population of this area was 166,990.
- From 1972 to 2002, the population declined by 50 (less than one percent).
- The most rapidly growing age group (45 to 49 years) of age has risen by 2.3 percent since 1990.
- The most rapidly declining age group (30 to 34 years) of age has decreased by 2.1 percent since 1990.

- The median age has risen from 35.5 in 1990 to 39.1 in 2000.
- The housing affordability index has risen from 194 to 213 between 1990 and 2000. (Higher numbers mean greater affordability, and a housing affordability index greater than 100 indicates that the median family can afford the median house.)
- From 1970 to 2002, the number of jobs increased from 70,403 to 108,552. This increase has an annualized rate of one percent, which is less than the national annualized median rate of 1.8 percent.
- The annualized growth in personal income from 1970 to 2002 was 1.8 percent, which is less than the national annualized median rate of 2.3 percent.
- From 1970 to 2002, non-labor income grew at 3.2 percent, while labor income increased at a 1.1 percent rate.
- Average earnings per job, adjusted for inflation, have fallen from $27,750 in 1970 to $24,690 in 2002. The 2002 average earnings per job for the 12-county area is lower than State and national averages ($38,135 and $40,758, respectively).
- The farm industry has shown the greatest decrease in employment (from 20.8 percent in 1970 to 4.7 percent in 2000). From 1970 to 2002, total net income from farming and ranching decreased from $479,976 to $148,200 (in 2002 dollars).
- In 2003, the unemployment rate was 4.9 percent for the 12-county area. This is comparable to the State rate of 4.9 percent and lower than the national rate of 6.0 percent, respectively.

3.10.2 Big Stone II Plant Site and Groundwater Areas

3.10.2.1 Social and Economic Values

The areas of interest with relation to the proposed plant and the groundwater areas are (1) a five-county area chosen for their social and economic relationship to the proposed plant site (Codington, Roberts, and Grant counties in South Dakota, and Big Stone and Lac qui Parle counties in Minnesota) and (2) the State of South Dakota, the State where the proposed plant would be sited. Codington County was included due to the economic influence of the city of Watertown in the region. The proposed plant site would be located immediately adjacent to the existing Big Stone plant in Grant County. Milbank is the largest community in Grant County, with a recorded population of 3,640. The total population for Grant County was 7,847, 10,016 for Roberts County, and 25,237 for Codington County. Watertown, located in Codington County, is the largest community in the vicinity of the proposed Project, with a population of 20,237. The total population of Big Stone and Lac qui Parle counties in Minnesota was 5,820 and 8,067, respectively. The largest community in Big Stone County within the proposed Project area is Ortonville, with a population of 2,158. The largest community in Lac qui Parle County included in the proposed Project area is Bellingham with a population of 205. A summary of the population by county and community within the proposed Project area is presented in Table 3.10-2. A summary of the population characteristics of the census tract in which the proposed site is located is presented in Table 3.10-1.

Table 3.10-2. Regional Population Summary

County/City	Estimated Population
Roberts County, South Dakota	10,016
Corona	112
CodingtonCounty, South Dakota	25,897
Watertown	20,237
Grant County, South Dakota	7,847
Big Stone City	605
LaBolt	86
Marvin	66
Milbank	3,640
Revillo	147
Stockholm	105
Strandburg	69
Twin Brooks	55
Big Stone County, Minnesota	5,820
Barry	25
Beardsley	262
Clinton	453
Correll	47
Graceville[a]	605
Odessa[b]	113
Ortonville[c]	2,158
Lac qui Parle County, Minnesota	8,067
Bellingham	205
Louisburg	26
Nassau	83

[a]Graceville City only. Graceville Township has a population of 205.
[b]Odessa City only. Odessa Township has a population of 147.
[c]Ortonville City only. Ortonville Township has a population of 2,287.

Source: U.S. Census Bureau, 2000.

The existing plant staff consists of 74 employees. Based on economic modeling, this plant contributes approximately $6.55 million/year of economic activity as the wages these employees earn go toward the purchase of goods and services in the area. The additional income generated in households outside those currently directly employed at the existing plant is approximately $2.34 million/year.

The nearest occupied residence is approximately 0.5 mile from the proposed plant site. Several residences and farmsteads exist within the expanded groundwater area.

Table 3.10-3 provides a list of accommodations available within a 60-mile radius of the proposed plant site and groundwater areas, based on a housing survey conducted in March 2005. A new 93-room hotel, associated with Native American gaming located six miles north of Watertown, South Dakota, opened in September 2005, after the housing survey was completed (Local Review Committee, 2005).

Table 3.10-3. Housing Accommodations[a]

Accommodations Type	Number
Motel Beds	2,242
Houses for sale	140
Houses for rent	23
Apartments for rent	140
Mobile homes for sale	10
Mobile homes for rent	18
Mobile home pads for rent	119
RV pads for rent	83

[a]Housing accommodations located within a 60-mile radius of the proposed plant site and groundwater areas.

Source: Greeter and Venerts, 2005.

3.10.2.2 Environmental Justice

Minorities comprise 1.2 percent of the population within the block groups near the proposed plant site. Low-income populations comprise 10.4 percent of the population (Table 3.10-1). These percentages are comparable to or lower than those found in the affected counties. A minority population cluster occurs in western Grant and Roberts counties, South Dakota associated with the Lake Traverse Indian Reservation of the Sisseton-Wahpeton Oyate (approximately 23 miles west of the proposed Big Stone II plant). As shown by Table 3.10-1, the minority populations of Grant and Roberts counties are 1.4 percent and 31.7 percent, respectively. The percentage of persons living below the poverty level in Grant and Roberts counties (which contain the Lake Traverse Indian Reservation of the Sisseton-Wahpeton Oyate) are 9.9 percent and 22.1 percent, respectively (see Table 3.10-1).

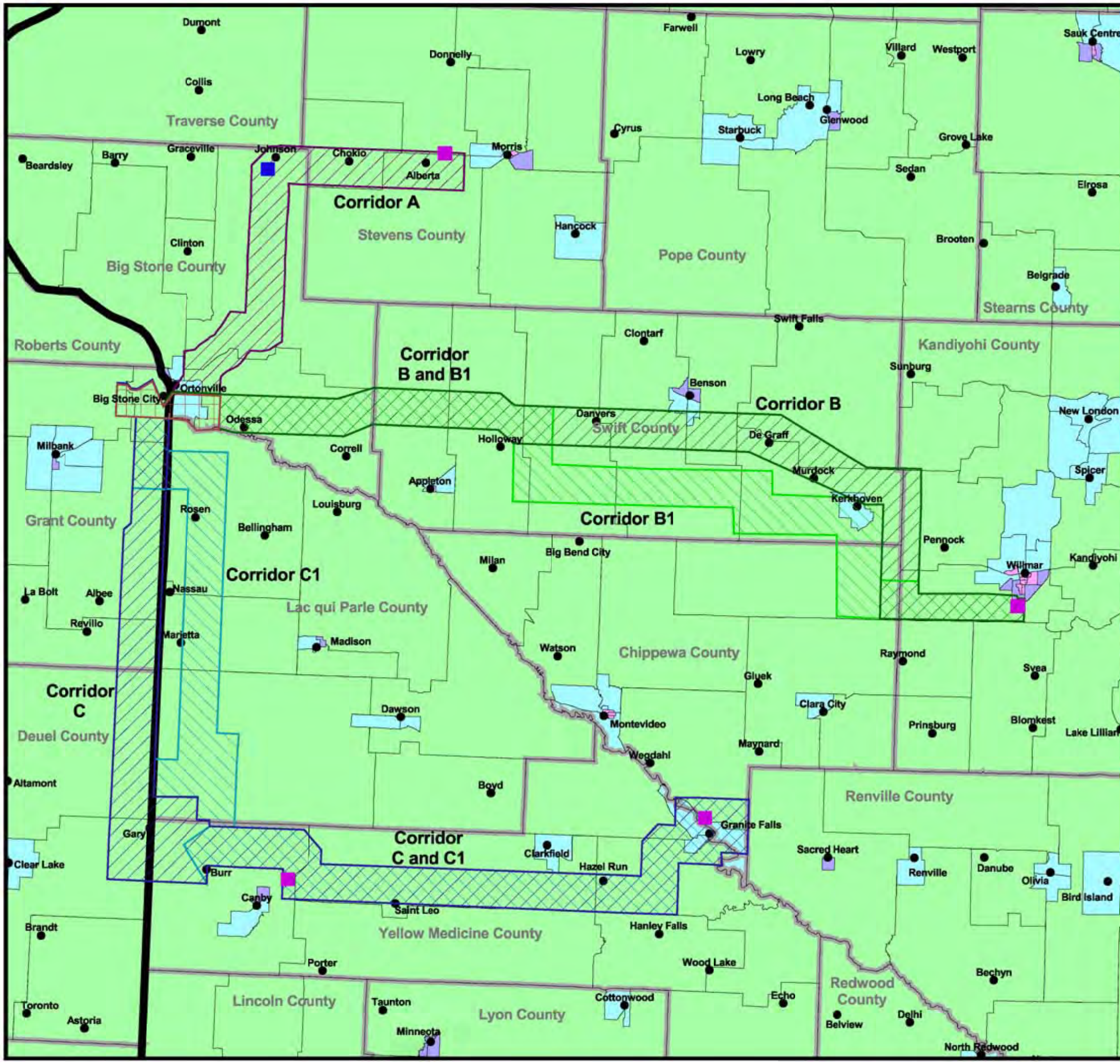
3.10.3 Transmission Corridors, Substations, and Other System Improvements

This section describes the socioeconomic values and the environmental justice conditions for the corridors. Socioeconomic and environmental justice conditions for the substations would be the same as described for the corridors.

3.10.3.1 Social and Economic Values

In general, the counties crossed by the proposed corridors have a lower percentage of racial minorities (ranging from 1.2 percent to 9.3 percent) than the States of South Dakota and Minnesota overall (11.3 percent and 10.6 percent, respectively). According to 2000 U.S. Census data, the per capita income within the counties ranges from $15,977 in Deuel County to $19,627 in Kandiyohi County, comparable to or lower than the South Dakota and Minnesota State averages ($17,562 and $23,198, respectively). Within these counties, the percentage of people living below poverty levels is higher than the Minnesota State average of 7.9 percent and generally lower than the South Dakota State average of 13.2 percent, ranging from 8.4 percent in Swift County to 13.6 percent in Stevens County. The proposed corridors occur in areas that generally have lower percentages of minority and low-income populations than the counties and States as a whole. Population density and median incomes by block group are illustrated in Figures 3.10-1 and 3.10-2, respectively.

More than 90 percent of the land in the counties crossed by the proposed corridors is used for agriculture.



Big Stone II EIS

Figure 3.10-1

Population per Square Mile (by Block Group) Within the Project Area

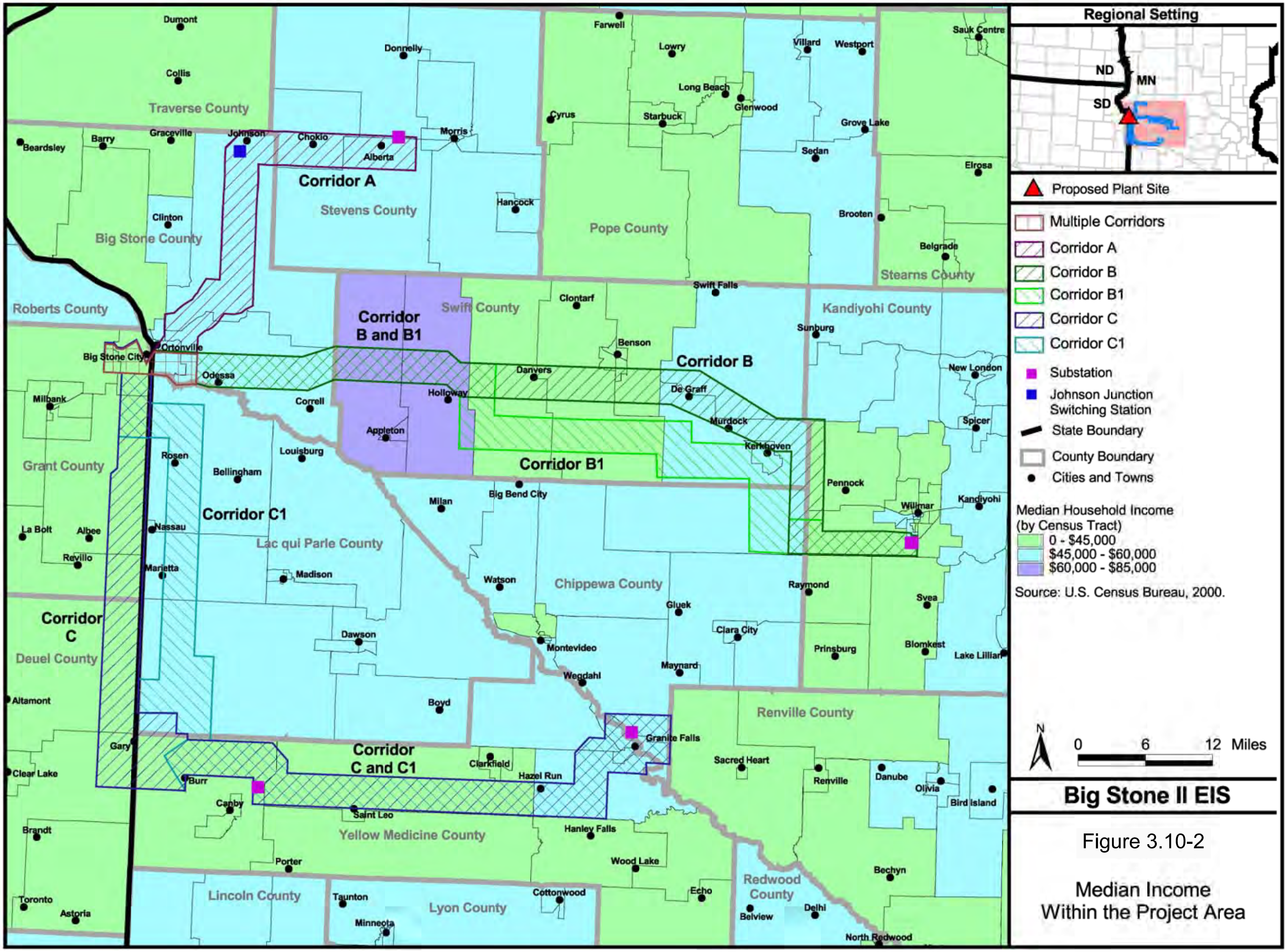


Figure 3.10-2

Median Income Within the Project Area

The Minnesota and South Dakota 2003 and 2004 Agricultural Statistics data show that acres of harvested crops and raised livestock remained relatively steady within the counties crossed by the proposed corridors between 2002 and 2003. The market value of all agricultural products sold in 2002 is shown in Table 3.10-4. Other industries, such as manufacturing, retail, construction and public and private services, contribute to the local economy of the cities within affected counties.

Table 3.10-4. Market Value of Agricultural Products in 2002

County	Value (dollars)
Minnesota	
Big Stone	57,670,000
Chippewa	102,881,000
Kandiyohi	83,050,000
Lac qui Parle	113,152,000
Stevens	120,209,000
Swift	157,718,000
Yellow Medicine	138,859,000
South Dakota	
Deuel	65,734,000
Grant	82,176,000

Source: USDA, 2002.

Table 3.10-1 presents a detailed description of the existing socioeconomic characteristics of the communities within the proposed corridors. Minority and low-income data were assembled at the block group level, the most detailed level for which economic data are available. Data for each proposed corridor were collected and analyzed for each block group that is crossed; in most cases, the block group encompasses a much larger area than the proposed corridor boundaries. Therefore, the population listed for a particular proposed corridor is the population of all of the block groups that overlap the proposed corridor; the actual population within the proposed corridor would be smaller. However, the socioeconomic trends shown by the block group data are expected to be representative of those found within the boundaries of the proposed corridors.

Table 3.10-5 presents a summary of housing units within each of the proposed corridors. The existing substations and the proposed Canby relocation are located within the corridors. There are no housing units located in close proximity to the substation sites, except for the Johnson Junction Substation site, which has two housing units within about 500 feet of the site.

Table 3.10-5. Housing Units and Vacancy Rates per Corridor

Corridor	Housing Units	Approximate Vacancy Rate %
Corridor A	805	15.4
Corridor B	992	9.4
Corridor B1	1,021	9.9
Corridor C	2,299	11.6
Corridor C1	2,221	10.3

Source: U.S. Census Bureau, 2000.

Corridor A

Within Corridor A, racial minorities comprise 1.8 percent of the population, which is slightly lower than the percentage of minorities in the affected counties of Corridor A (1.6 percent in Big Stone County and 3.9 percent in Stevens County) (Table 3.10-1). The per capita income in Corridor A is $16,672, which is higher than Big Stone County, and Grant County ($15,708 and $16,543, respectively), and lower than Stevens County ($17,569). The percentage of people living below poverty level in Corridor A is 10.6 percent, which is lower than the percentage in Big Stone County, and Stevens County (12 percent and 13.6 percent, respectively), and slightly higher than Grant County (9.9 percent).

The primary form of employment within Corridor A is agriculture. Major non-agricultural employers in the Ortonville area include the public school districts, city and county governments, Hasslen Construction Company, Pepsi-Cola, and various restaurants, retail stores, and banks. Within the small towns in Corridor A, such as Chokio and Alberta, Minnesota, other types of employment would include the small businesses found in rural towns such as convenience stores, restaurants, and farm equipment repair and sales.

According to the 2000 U.S. Census, Grant County had 3,482 housing units, Big Stone County had 3,168 housing units, and Stevens County had 4,108 units. Compared to 1992 data, numbers of housing units remained steady, or declined slightly in these counties. Vacancy rates in the vicinity of Corridor A are approximately 15.4 percent.

Corridor B

Within Corridor B, racial minorities comprise 7.2 percent of the population. This is comparable to the percentage of minorities in Kandiyohi and Swift counties (6.4 percent and 9.3 percent, respectively), and higher than the percentage in Big Stone County and Grant County (1.6 percent and 1.4 percent, respectively) (Table 3.10-1). A block group located in Appleton, which is in Swift County, has a high minority concentration; however, Corridor B is approximately five miles from this area. Several block groups within the outer portions of Willmar, which are crossed by Corridor B, also have relatively high minority populations. The per capita income in Corridor B is $18,309, higher than the rates in Grant, Big Stone, Chippewa, and Swift counties ($16,543, $15,708, $18,039, and $16,360, respectively), and lower than Kandiyohi County ($19,627). The percentage of people living below poverty level is 9.1 percent in Corridor B, which is comparable to the percentage in Big Stone, Kandiyohi, Swift, and Grant counties (12 percent, 9.2 percent, 8.4 percent, and 9.9 percent, respectively).

The primary form of employment within Corridor B is agriculture. Major non-agricultural employers in the Ortonville area are the same as previously described for Corridor A. Small towns in Corridor B, such as Odessa, Danvers, De Graff, and Murdock, Minnesota, have other types of employment including small businesses such as convenience stores, restaurants, and farm equipment repair and sales. In the Kandiyohi County lake area, employment also includes recreational services, such as boat dealers and sports supply retail.

According to the 2000 U.S. Census, the number of housing units was 3,482 in Grant County, 3,168 in Big Stone County, 3,673 in Chippewa County, 18,777 in Kandiyohi County, and 4,838 in Swift County. Compared to 1992 data, numbers of housing units declined slightly in Grant, Big Stone, and Swift counties, and housing in Kandiyohi and Chippewa counties increased by 2,108 units and 151 units, respectively. Vacancy rates in the vicinity of Corridor B are approximately 9.4 percent.

Corridor B1

Within Corridor B1, racial minorities comprise 15.4 percent of the population, which is higher than the percentage of minorities in Big Stone, Chippewa, Kandiyohi, Swift, and Grant counties (1.6 percent, 3.2 percent, 6.4 percent, 9.3 percent, and 1.4 percent, respectively), and higher than Minnesota overall (10.6 percent) (Table 3.10-1). A block group located in Appleton has a high minority concentration; however, Corridor B1 is approximately five miles from this area. Several block groups within the outer portions of Willmar, which are crossed by Corridor B1, also have relatively high minority populations. The per capita income in Corridor B1 is $18, 616, higher than the rates in Grant, Big Stone, Chippewa, and Swift counties ($16,543, $15,708, $18,039, and $16,360, respectively), and lower than Kandiyohi County ($19,627). The percentage of people living below poverty level is 9.3 percent in Corridor B1, which is comparable to the percentages in Grant, Big Stone, Chippewa, Kandiyohi, and Swift counties (9.9 percent, 12 percent, 8.6 percent, 9.2 percent, and 8.4 percent, respectively).

The primary form of employment within Corridor B1 is agriculture. Major non-agricultural employers in the Ortonville area are the same as previously described for Corridor A; and for the cities of Odessa, Danvers, and De Graff, and Murdock and Kandiyohi counties are as previously described for Corridor B. Employers in the Willmar area include the Jennie-O Turkey Plant, the public school districts, Rice Memorial Hospital, city and county governments, Ridgewater College, Bethesda Nursing Care Facility, MnDOT, Willmar Poultry Company, BNSF Railroad, and various restaurants, retail stores, and banks.

According to the 2000 U.S. Census, the number of housing units was 3,482 in Grant County, 3,168 in Big Stone County, 3,673 in Chippewa County, 18,777 Kandiyohi County, and 4,838 in Swift County. Compared to 1992 data, numbers of housing units declined slightly in Grant, Big Stone, and Swift counties, and housing in Kandiyohi and Chippewa counties increased by 2,108 units and 151 units, respectively. Vacancy rates in the vicinity of Corridor B1 are approximately 9.9 percent.

Corridor C

Within Corridor C, racial minorities comprise 3.8 percent of the population (Table 3.10-1), which is slightly higher than or comparable to the percentage of minorities in the counties in which Corridor C lies (1.5 percent in Deuel County, 1.4 percent in Grant County, 1.2 percent in Lac qui Parle County, 3.2 percent in Chippewa County, and 3.9 percent in Yellow Medicine County), but lower than that of Minnesota and South Dakota overall (10.6 percent and 11.3 percent, respectively). The greatest population of racial minorities occurs in Minnesota Falls Township in Yellow Medicine County. In the 2000 Census, 29.9 percent of the population in Minnesota Falls Township identified themselves as racial minorities; of these, 96.3 percent identified themselves as American Indian/Alaska Native. Part of the Upper Sioux Community is in the Minnesota Falls Township but outside of Corridor C. Much of the minority population shown in Table 3.10-1 for Corridor C is located within this community, but would not be affected by the proposed Project.

The per capita income in Corridor C is $16,805, higher than the rates in Deuel and Grant counties ($15,977, and $16,543, respectively), and lower than Chippewa and Yellow Medicine counties ($18,039 and $17,129, respectively). The percentage of people living below poverty level in Corridor C is 8.4 percent, which is lower than the percentage in Deuel, Grant, Lac qui Parle, Yellow Medicine, and Chippewa counties (10.3 percent, 9.9 percent, 8.5 percent, 10.4 percent, and 8.6 percent, respectively).

The primary form of employment within Corridor C is agriculture. Within the cities of Big Stone City and Granite Falls, other types of employment include public education, healthcare services, government services, construction, and retail services. Major employers in the Ortonville and Big Stone City area include the public school districts, city and county governments, Hasslen Construction Company, Pepsi-Cola, and various restaurants, retail stores, and banks. Major employers in Granite Falls include the Granite Falls Hospital, the public school district, Prairie's Edge Casino Resort, Fagen, Inc. (a construction company), city and county governments, Minnesota West Community and Technical College, United Parcel Service, and various restaurants, retail stores, and banks.

According to the 2000 U.S. Census, the number of housing units was 5,906 in Chippewa County, 2,200 in Deuel County, 3,482 in Grant County, and 4,889 in Yellow Medicine County. Compared to 1992 data, numbers of housing units declined slightly in all counties except for Chippewa County, where housing increased by 151 units. Vacancy rates in the vicinity of Corridor C are approximately 11.6 percent.

Corridor C1

Within Corridor C1, racial minorities comprise 4 percent of the population (Table 3.10-1). This is slightly higher than the percentage of minorities in the counties in which Corridor C1 lies (1.2 percent in Lac qui Parle County, 1.4 percent in Grant County, 3.2 percent in Chippewa County, and 3.9 percent in Yellow Medicine County), but lower than that of Minnesota and South Dakota overall (10.6 percent and 11.3 percent, respectively). The greatest population of racial minorities occurs in Minnesota Falls Township in Yellow Medicine County. In the 2000 Census, 29.9 percent of the population in Minnesota Falls Township identified themselves as racial minorities; of these, 96.3 percent identified themselves as American Indian/Alaska Native. Part of the Upper Sioux Community is in the Minnesota Falls Township but outside of Corridor C1.

The per capita income in Corridor C1 is $16,806, which is higher than the rates in Grant County ($16,543) and lower than Yellow Medicine, Lac qui Parle, and Chippewa counties ($17,120, $17,379, and $18,039, respectively). The percentage of people living below poverty level in Corridor C1 is 7.7 percent, which is lower than the percentage in Grant County and Yellow Medicine, Chippewa, and Lac qui Parle counties (9.9 percent, 10.4 percent, 8.6 percent, and 8.5 percent, respectively).

The primary form of employment within Corridor C1 is agriculture. Other types of employment within the cities in proximity to Corridor C1 are the same as previously described for Corridor C.

According to the 2000 U.S. Census, the number of housing units was 5,906 in Chippewa County, 3,763 in Lac qui Parle County, 3,482 in Grant County, and 4,889 in Yellow Medicine County. Compared to 1992 data, numbers of housing units declined slightly in all counties except for Chippewa County, where housing increased by 151 units. Vacancy rates in the vicinity of Corridor C1 are approximately 10.3 percent.

3.10.3.2 Environmental Justice

Table 3.10-1 presents the minority and poverty characteristics within the proposed corridors. The CEQ guidelines state that minority populations should be identified where "… (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis." (CEQ, 1997) According to the 2000 U.S. Census block group data, minority populations in the affected area are no more than 6.3 percent of the population within each proposed corridor. Minority populations within these counties proposed for transmission line construction ranges from 1.4 percent in Deuel County to 9.3 percent in Swift County. In addition, no clusters of minority populations have been identified in the proposed Project area associated with proposed plant construction or proposed transmission line construction. A minority population cluster occurs in western Grant and Roberts counties, South Dakota associated with the Lake Traverse Indian Reservation of the Sisseton-Wahpeton Oyate (approximately 23 miles west of the proposed Big Stone II plant). As shown by Table 3.10-1, the minority populations of Grant and Roberts counties are 1.4 percent and 31.7 percent, respectively.

The U.S. Census Bureau provides a measure of persons living below the poverty level, which is used to determine the presence of low-income populations in the affected area. The number of residents living below the poverty level in 1999 for each block group also was obtained from the 2000 Census and aggregated for the overall affected area to determine the percentage of persons below poverty level. Based on this information, low-income persons within the proposed corridors range from 5.6 percent in Corridor B to 10.8 percent in Corridor A. These percentages are consistent with the overall percentage in each county shown in Table 3.10-1, as they are either below or within a few percentage points of the county averages. The percentage of persons living below the poverty level in Grant and Roberts counties (which contain the Lake Traverse Indian Reservation of the Sisseton-Wahpeton Oyate) are 9.9 percent and 22.1 percent, respectively (see Table 3.10-1). Minority populations and populations in poverty, by block group, are illustrated in Figures 3.10-3 and 3.10-4, respectively.

Corridor A

Minorities comprise 1.8 percent of the population within the block groups included in Corridor A. Low-income populations comprise 10.6 percent of the population. These percentages are comparable to or lower than those found in the counties within Corridor A.

Corridors B and B1

Minorities comprise 7.2 percent of the population within the block groups included in Corridor B and nine percent in Corridor B1. A block group located in Appleton has a high minority concentration, however, Corridors B and B1 are approximately five miles away from this area. Low-income populations comprise 9.1 percent of the population for Corridor B and 9.3 percent for Corridor B1. For Corridors B and B1, these percentages are comparable to or lower than those found in the counties crossed by these corridors. The edges of Corridor B1 cross several block groups within Willmar that also have relatively high minority populations.

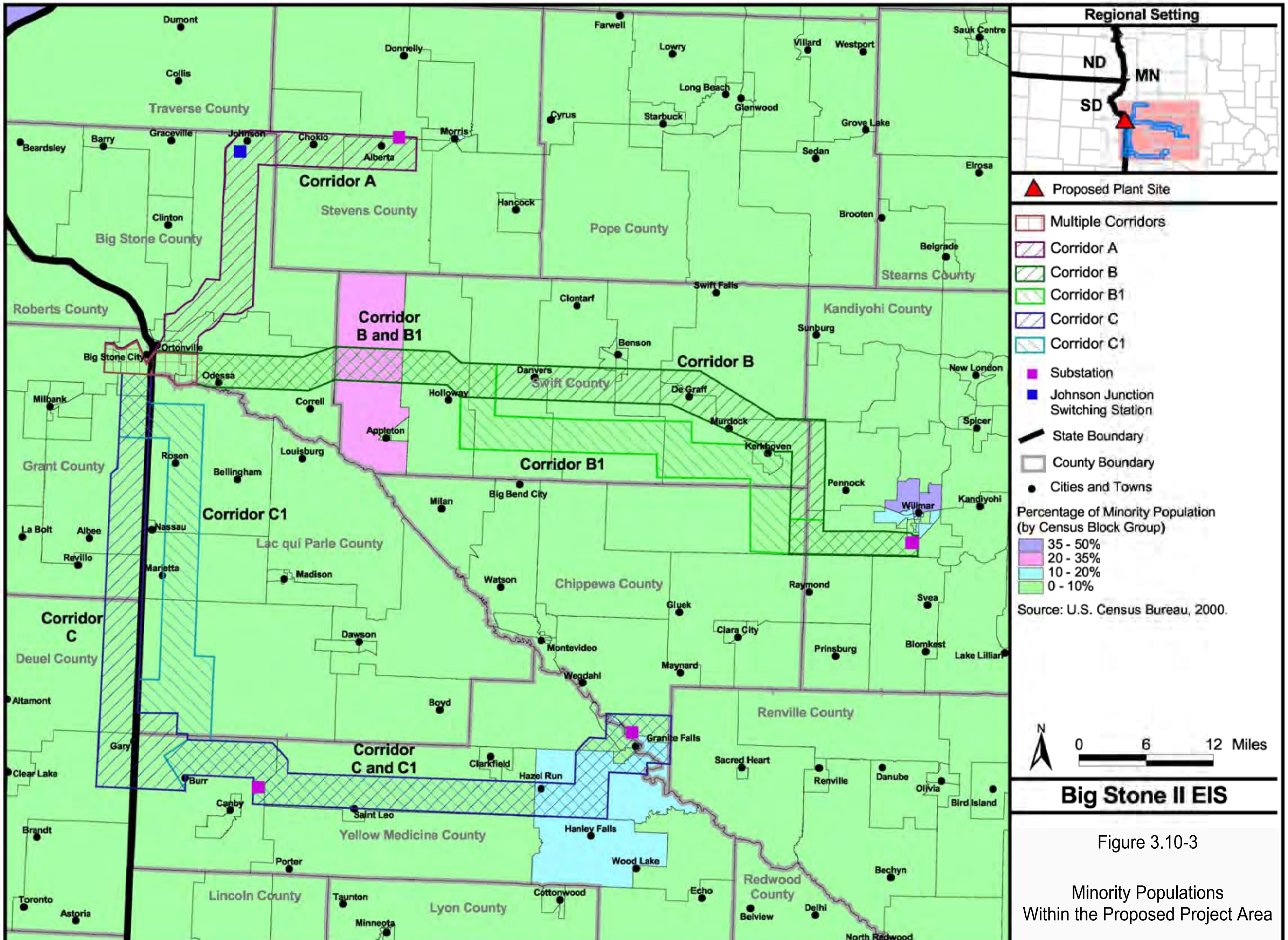
Corridors C and C1

Minorities comprise 3.4 percent of the population within the block groups included in Corridor C and four percent in Corridor C1. Low income populations make up 8.6 percent of the population in

Corridor C and 7.7 percent in Corridor C1. For Corridors C and C1, these percentages are comparable to, or lower than, those found in the counties crossed by these corridors.

Substations and Other System Improvements

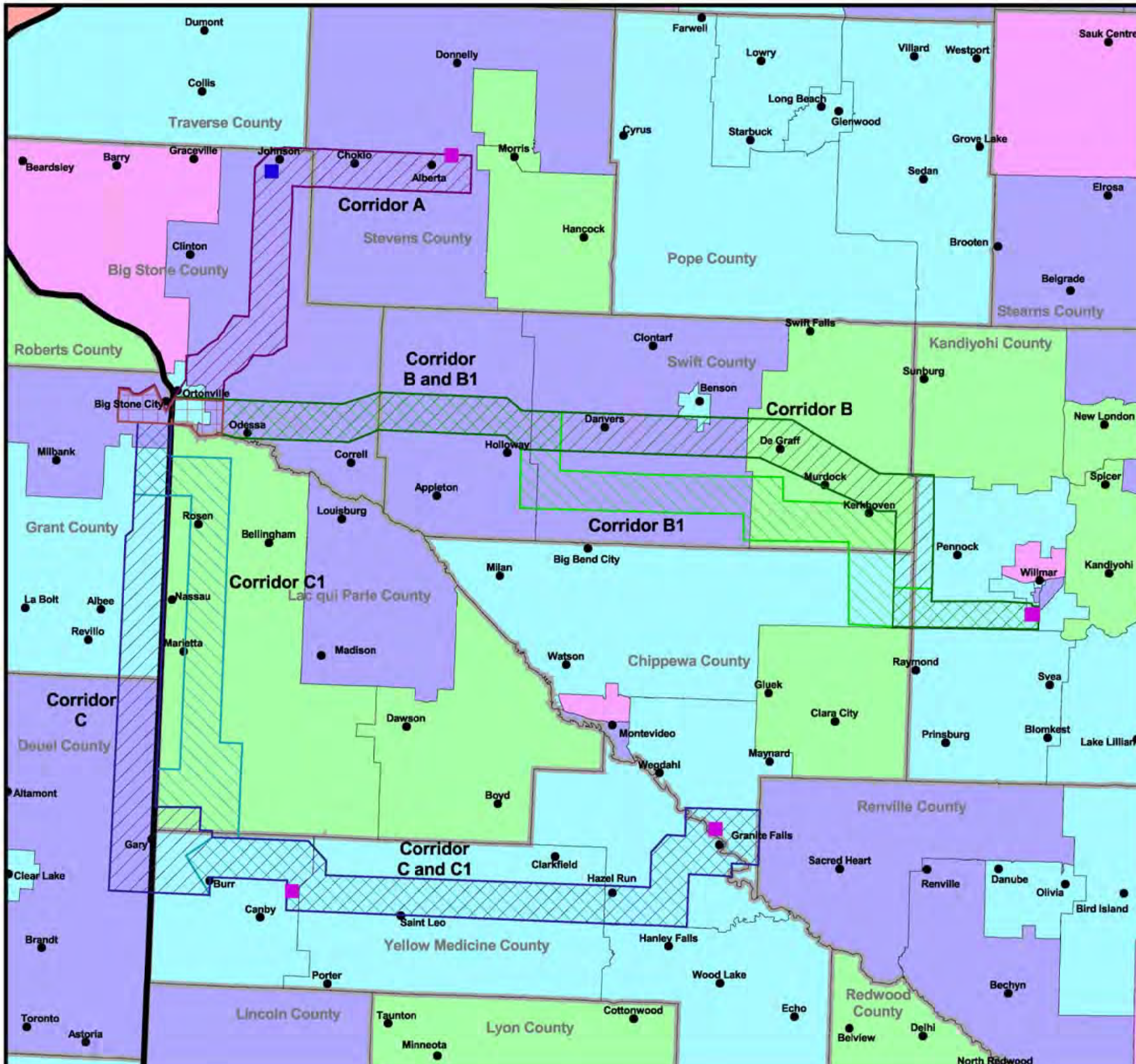
The substations that would require modification and the relocation of the Canby Substation for the proposed Project are within the proposed corridors and in general, have the same socioeconomic setting as the corridors. An approximately 23-mile long segment of the existing 68-mile long Hankinson transmission line crosses the Lake Traverse Indian Reservation of the Sisseton-Wahpeton Oyate.



Big Stone II EIS

Figure 3.10-3

Minority Populations Within the Proposed Project Area



Big Stone II EIS

Figure 3.10-4

Populations Below Poverty Level Within the Proposed Project Area

DOE/EIS-0377

Final Environmental Impact Statement

Volume I

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Big Stone II Power Plant and Transmission Project

Prepared for:

Lead Agency:
Western Area Power Administration

Cooperating Agency:
U.S. Army Corps of Engineers

ENVIRONMENTAL CONSEQUENCES

CHAPTER 4

Chapter 4 Changes

The changes to Chapter 4 included updates and new descriptions of the impacts to resource areas due to changes to the proposed Project and in response to public comments. Changes include:

- Restructured outline of Chapter 4 to better accommodate the description of impacts due to groundwater use.
- Updated information on the impacts to the various resource areas (such as air, water, biological, land, infrastructure, and socioeconomic and environmental justice areas), primarily in response to public comments received on the Draft EIS and the Supplemental Draft EIS.
- Added new information on the impacts to the various resource areas due to construction and operation of the groundwater system and use of groundwater as a back-up source of water for the proposed Project. The description of impacts and planned mitigation primarily focused on the impacts of groundwater pumping on groundwater and surface water resources, as well as biological resources and wetlands.
- Provided updated emission rate estimates due to additional analysis of boiler design and updates to USEPA's hazardous pollutant list and associated emission factors, updated information regarding mercury emissions and mercury removal due to new commitments made by the Co-owners, and updated the analysis of the mercury analysis to reflect the requirements of 40 CFR 1502.22, Incomplete or Unavailable Information.
- Added a substantial addition to the discussion and analysis on greenhouse gas emissions and updated the analysis per the requirements of 40 CFR 1502.22, Incomplete or Unavailable Information.
- Provided a discussion of the cooling technology alternative selected for detailed analysis in the EIS.
- Added a new evaluation that considers reasonably foreseeable accidents and intentional destructive acts, in accordance with recent court decisions for such information to be included in EIS analysis.
- Updated the analysis under Other Transmission System Modifications to include a qualitative analysis of the proposed Big Stone-Hankinson transmission line upgrade.
- Updated various tables and figures, and provided new figures that demonstrate how water is used by cooling system alternatives and that illustrate impacts to groundwater and wetland resources.
- Revised the discussion of the consequences of the No Action Alternative.
- Updated the cumulative impacts portion of the EIS.

CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

4.0 Environmental Consequences

Direct impacts are caused by an action and occur at the same time and place as the action. Indirect impacts are reasonably foreseeable impacts caused by an action that occur later in time or farther in distance. Long-term impacts would persist throughout the life of the proposed Project; short-term impacts would be limited to construction and restoration. Physical resources addressed include air, water, geology, soils, infrastructure, waste management, land use, and noise. Biological resources include vegetation, wildlife, fisheries, special status species, and wetland/riparian areas. Social, economic, visual, and cultural resources are also addressed. Information provided focuses on issues identified during the scoping process, comments received on the Draft Environmental Impact Statement (EIS) and the Supplemental Draft EIS, and those that pertain to regulatory compliance.

Chapter 4 presents the analysis of impacts related to constructing and operating the proposed Big Stone II power plant, alternative transmission line corridors that could be used to provide interconnection to the utility grid, transmission upgrades, and substations that may require modifications. Analyses that pertain to constructing and operating Big Stone II were specifically performed for the proposed plant site. The analyses consider the substantial changes to the proposed plant site since issuance of the May 2006 Draft EIS, such as the use of groundwater for back-up water for the proposed plant, elimination of the 450-acre make-up water storage pond, elimination of the 25-acre cooling tower blowdown pond, elimination of the new brine concentrator, relocation of the cooling tower, and construction of a new water pretreatment building. Therefore, this chapter also includes analyses of proposed groundwater activities associated with the proposed Project for each resource area.

Those analyses that pertain to Transmission Alternative A and Alternative B are based on analyses of the two-to-four mile-wide corridors to interconnect from Big Stone to Morris and Granite Falls substations (Alternative A) or from Big Stone to Willmar and Granite Falls substations (Alternative B). For ease of understanding the impacts and correlating Chapters 3 and 4, impacts are presented by transmission corridor rather than by transmission alternative. A summary of the impacts by transmission alternative is provided in Table 2.6-1, Chapter 2.

The proposed Project would require certain modifications to substations and related facilities. Additionally, as described in Section 2.2.3, the Co-owners would relocate the Canby Substation from its existing site (within a floodplain) to a new site about one mile to the northeast. However, the extent of such modifications cannot be determined until further detailed engineering analyses are performed. Therefore, impacts related to substation modifications have been addressed generically. Western Area Power Administration (Western) would address the environmental impacts of the modifications needed to support the proposed interconnection identified, subsequent to this Final EIS in accordance with regulatory requirements.

The analysis conducted for the Big Stone-Hankinson 230-kilovolt (kV) transmission line was based on reconnaissance-level information since the specific structures needing modification would not be identified until an engineering survey is completed. The analysis for the Hankinson line in this chapter takes into account typical transmission-related impacts that would be encountered following implementation of the standard mitigation measures (SMMs) related to transmission line construction, not site-specific environmental baseline information. Once the specific structures needing modification are identified, site specific environmental surveys would be conducted in accordance with the transmission-related SMMs (see Table 2.2-8, Standard Mitigation Measures for the Proposed Big Stone II Project), the Programmatic Agreement for compliance with the National Historic Preservation Act (NHPA), and any measures resulting from Western's informal consultation with the U.S. Fish and Wildlife Service (USFWS) under the Endangered Species Act (ESA). The results of the site-specific environmental surveys would be used by the Co-owners in consultations with regulatory agencies, if required, and to develop action plans to minimize impacts to any encountered sensitive environmental resources.

After the recent decisions made by the U.S. Court of Appeals, U.S. Department of Energy (DOE) National Environmental Policy Act (NEPA) documents are now required to include an evaluation that explicitly considers "intentional destructive acts," (i.e., acts of sabotage or terrorism) and the potential environmental consequences of such acts (DOE, 2006b). This additional discussion is included in Section 4.7.2, as well as an identification of "reasonably foreseeable accidents" associated with the proposed Project.

Issues identified during scoping and those that pertain to Federal, State, and local regulations are listed as part of the introduction to each resource. The methodology used to assess impacts from the proposed Project is described for each resource. In addition, Significance Criteria were developed and presented for each resource to provide a basis from which the significance of impacts was judged. SMMs proposed by the Co-owners, and Western SMMs, reflect best management practices for constructing, operating, and maintaining generating facilities and transmission systems. They are identified to avoid impacts or reduce the severity of impacts that cannot be fully avoided (see Section 2.2.4 for a full list). Additional mitigation measures, if adopted, are provided (see Table 2.6-2) when warranted to reduce impacts beyond the level obtained by the SMM. These additional mitigation measures, if adopted, will be reviewed by Western, and a decision will be made as to which ones should be implemented as part of the Mitigation Action Plan for the proposed Project and incorporated into Western's Record of Decision, if Western grants the interconnections. Residual impacts after the SMMs and additional mitigation measures (if adopted) are applied, are then compared to Significance Criteria to identify those considered significant and those considered less than significant.

Additionally, impacts that would result from implementing the No Action Alternative are described in this chapter for each resource. Finally, cumulative impacts of the proposed Project are also addressed in this chapter. Council on Environmental Quality (CEQ) regulations define cumulative impacts as those that result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions, regardless of the agency or person that undertakes these actions.

4.1 Air Quality

4.1.1 Introduction

The analysis of air quality impacts resulting from the proposed Project must consider the regulatory framework imposed by the Clean Air Act and Amendments (CAA). Applicable regulatory developments in subsequent years include National Ambient Air Quality Standards (NAAQS), Prevention of Significant Deterioration (PSD), New Source Performance Standards (NSPS), Maximum Achievable Control Technology (MACT), and Best Available Control Technology (BACT). These regulations and a summary of the impact analyses are described in more detail in the following sections. In addition to the discussion of impacts for which there are regulatory requirements, this section discusses climate change and greenhouse gas (GHG) emissions. The impacts of well drilling and installation and pipeline construction activities are also considered. Finally, the regulation of mercury emissions from the proposed Big Stone II plant under the Clean Air Mercury Rule (CAMR) was considered in the Draft EIS. However, as discussed further below, the U.S. Court of Appeals for the District of Columbia Circuit issued a mandate vacating the CAMR on March 14, 2008. Therefore, CAMR is no longer applicable to the proposed plant, in its current form.

The CAA requires the U.S. Environmental Protection Agency (USEPA) to establish NAAQS for pollutants considered harmful to the public and the environment. The USEPA set two types of standards. Primary standards set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including protection against decreased visibility, damage to animals, vegetation, and buildings. There are NAAQS for six principal pollutants that are commonly called criteria pollutants: nitrogen oxides (NO_X), sulfur dioxide (SO_2), carbon monoxide (CO), ozone (O_3), particulate matter (PM) with an aerodynamic diameter less than 10 micrometers (PM_{10}), PM with an aerodynamic diameter less than 2.5 micrometers ($PM_{2.5}$), and lead (Pb).

The CAA also requires USEPA to establish NSPS that set emissions requirements for new and modified sources of air emissions such as steam electric generating facilities, coal preparation plants, and large internal combustion engines.

In the CAA, Congress specified the PSD review process to protect from further air quality degradation those areas of the country that meet NAAQS. PSD regulations include the designation of Class I land areas, where maintenance of existing good air quality is deemed to be of national importance. These mandatory Class I areas include all international parks, national wilderness areas and memorial parks larger than 5,000 acres, and national parks larger than 6,000 acres that were in existence when the CAA were passed. All other land areas were classified as Class II. Class I areas are the most stringently protected from further reduction in air quality.

New sources located in areas that meet the NAAQS and have emissions above major source thresholds require a PSD permit review. Part of the review includes an assessment of whether the permitted facility would potentially violate NAAQS. The review also includes an analysis of the PSD increment consumption for PM_{10}, SO_2, and nitrogen dioxide (NO_2), if the new source exceeds significance levels for any of those three pollutants. Significance levels, as defined in the PSD rules of 40 Code of Federal Regulation (CFR) 52.21(b)(23)(i), are to be differentiated from significance criteria defined in this section (Section 4.1.1) and do not necessarily indicate significant impact. The increment analysis must consider all sources at the facility that contribute to the PSD increment, which includes all new sources, as well as any sources that consume PSD increments within the area of significant concentration gradient.

Through air dispersion modeling analyses, the predicted concentration of each applicable baseline pollutant is compared to the increment for the type of PSD area involved in the analysis (i.e., Class I or Class II), or to the amount of increment remaining if some of the increment has been consumed. The NAAQS and PSD increments that must be met are shown in Table 4.1-1.

Table 4.1-1. NAAQS and PSD Increments

(micrograms per cubic meter of air (μg/m^3))

Pollutant	Averaging Period	NAAQS Primary	NAAQS Secondary	PSD Increment Class I	PSD Increment Class II
SO_2	3-hour	365	1,300	25	512
	24-hour	80		5	91
	Annual	--		2	20
PM_{10}	24-hour	150	150	8	30
	Annual			4	17
$PM_{2.5}$	24-hour	35	35	None	None
	Annual	15	15		
NO_2	Annual	100	100	2.5	2.5
CO	1-hour	40,000	40,000	None	None
	8-hour	10,000	10,000		
Pb	3-month	1.5	1.5	None	None
Ozone	8-hour	157	157	None	None

Source: USEPA, 2008c.

The PSD review requires BACT analyses for those pollutants subject to PSD review. The BACT analysis ranks all available control technologies in descending order of control effectiveness. The top-ranked technology is established as BACT unless the permit applicant demonstrates that the technology is not achievable due to energy, environmental, or economic constraints.

A Conformity Review is required under the NEPA process if certain conditions exist. Specifically, a Conformity Review is required for actions involving criteria pollutants that impact non-attainment or maintenance areas as designated under the CAA. No such impacts would result from the proposed Project. Therefore, a Conformity Review is not required.

The regulation of mercury emissions from the proposed Big Stone II plant under the CAMR and the State's air permit was discussed in the Draft EIS. Since the issuance of the Draft EIS, several developments have occurred with regard to CAMR. Petitions for review of two final rules promulgated by the USEPA were heard before a three judge panel of the U.S. Court of Appeals for the District of Columbia Circuit on December 6, 2007. The first rule removed coal- and oil-fired electric generating units (EGUs) from the list of sources whose emissions are regulated under Section 112 of the CAA. The second rule set performance standards pursuant to Section 111 of the CAA for new coal-fired EGUs and established total mercury emission limits for States and certain tribal areas, along with a cap-and-trade program for new and existing coal-fired EGUs. This second rule was known as the CAMR. On February 8, 2008, the Court recommended that these two rules be vacated. A mandate was issued by the Court on March 14, 2008, formally overturning the CAMR. Thus, the CAMR no longer exists and is not addressed in this Final EIS.[1] The regulation of mercury emissions from coal-fired EGUs now falls under the requirements of Section 112, MACT standards. The Big Stone site, which includes both the existing and proposed plant sites, is subject to regulation under MACT. However, since the proposed Big Stone II plant is not a major source of hazardous air pollutant

[1] Even though CAMR has been overturned, the proposed plant, as designed, would meet the NSPS limit of 66 x 10^{-6} pound (lb) per megawatt-hour gross energy output under former CAMR regulations as a condition of the Title V Air Quality Permit and Acid Rain Permit that would be issued by the South Dakota Board of Minerals and Environment (SDBME).

emissions as defined in Section 112, and there are no MACT standards for mercury currently in place, there are no regulatory requirements regarding mercury that need to be addressed. The absence of current standards for mercury does not negate Western's obligation to analyze potential impacts of mercury emissions associated with the proposed Project. As discussed in Section 4.1.2, mercury emissions would be addressed in the "Settlement Agreement, High Voltage Transmission Lines – Big Stone Unit II, Minnesota Public Utilities Commission Docket No. CN-05-619," (Settlement Agreement, Appendix K, Volume III of the Final EIS) effective August 30, 2007, between the Co-owners and the Energy Planning and Advocacy function of the Minnesota Department of Commerce (MnDOC). The terms of the Settlement Agreement were included as a condition to the Certificate of Need, issued March 17, 2009. Additionally, the proposed Project would be required to comply with any new applicable regulations promulgated for mercury.

Through the permit application process and issuance of the PSD permit, the South Dakota Department of Environment and Natural Resources (SDDENR) has determined what emissions will be regulated from the proposed plant and specific control technologies and other conditions for plant operations. The Co-owners would be required to comply with these permit limits and conditions, and SDDENR would monitor emissions for the proposed plant and take regulatory action if conditions are not met. The South Dakota Board of Minerals and Environment (SDBME) issued the PSD permit[2] to the proposed Big Stone II plant on November 20, 2008. The SDBME also issued the Big Stone site Title V permit on November 20, 2008, for the USEPA's 45-day review period. On January 22, 2009, the USEPA issued objections to the Big Stone Title V permit during their 45-day review period. The SDDENR revised the Title V permit to satisfy the objections raised by the USEPA, and the permit revisions underwent a 30-day public notice period which began on February 11, 2009, and ended on March 13, 2009. The SDBME held hearings on April 20 and 21, 2009, to consider the revised Title V permit and whether any revisions were needed for the PSD permit issued on November 20, 2008. On April 21, 2009, the SDBME issued a signed final approval document after the SDBME the day before unanimously approved the revised Title V permit that addressed the objections raised by the USEPA and reaffirmed the PSD permit that was issued on November 20, 2008. The SDBME approved the hearing Findings of Fact and Conclusions of Law during their April 21, 2009 meeting. On April 22, 2009, the revised Title V permit was submitted to the USEPA for a 45-day review. The decisions of the SDBME constitute the State's Final Permit Decision on the Title V Permit, but may be appealed to the State Circuit Court and the State Supreme Court, and with the USEPA, as provided by law.

Identification of Issues

Each of the following was identified as an important element of the air quality impact analysis:

- Emissions from the proposed Project must comply with the NAAQS.
- Emissions from the proposed Project must comply with the PSD increment standards.
- Mercury emissions and carbon dioxide (CO_2) emissions are recognized as specific concerns to the public.
- Proposed Project emissions must not adversely impact visibility in PSD air quality Class I and Class II areas.

[2] South Dakota Administrative rules allow the applicant, interested person, or affected state to petition the SDBME and obtain a contested case hearing to dispute the department's draft permit. In such instances, the final permit decision is made by the SDBME.

- Proposed Project emissions must not adversely impact areas that are not in compliance with the NAAQS.
- Potential short-term fugitive dust emissions that would be a nuisance to property owners near construction activities for the proposed Project.
- The differences in long-term emissions associated with cooling system alternatives. Steam electric generation efficiency would be affected by the selection of the cooling alternative, which in turn affects air emissions.
- Heat rate, which is related to a power plant's air emissions. The cooling system selected for any power plant affects the net heat rate[3] of the steam turbine and thus impacts the net efficiency of the power plant. Efficiency impacts are primarily due to two factors: (1) steam generator and steam turbine design and (2) auxiliary electrical loads.[4] Efficiency is directly proportional to the amount of fuel consumed per kilowatt-hour of electricity leaving the plant site, which in turn may affect air emissions such as CO_2 (a GHG) from the plant.

Impact Assessment Methods

Dispersion models are the primary means for assessing impacts from stationary (permanent) air pollutant sources. Sources that produce emissions at one location for several years are generally thought of as permanent sources and can be characterized as area, volume, and point sources. Construction impacts often result from temporary mobile sources and are generally described in terms of emissions during a given time period such as a day, week or month.

Air quality dispersion models are most commonly used for impact analyses in the permitting process to estimate the concentration of pollutants at specified ground-level receptors surrounding an emissions source. Examples of dispersion models include the AMS/EPA Regulatory Model (AERMOD) and the Visual Impact Screening Analysis (VISCREEN) model. AERMOD is a USEPA-approved, steady state, Gaussian air dispersion model that is designed to estimate downwind concentrations from single or multiple sources using meteorological data. AERMOD is the current USEPA model used for modeling most industrial sources and in PSD permit applications and is an appropriate model for this type of industrial facility. The VISCREEN model is a USEPA-approved visibility impact model used to screen emissions sources for estimated visual impacts at sensitive receptors and Class I areas. These models were used to perform the impact analysis for the proposed Project.

Air quality models use mathematical and numerical techniques to simulate the physical and chemical processes that affect air pollutants as they disperse and react in the atmosphere. Based on inputs of meteorological data and emissions source information, such as emission rates and stack height, these models are designed to characterize primary pollutants that are emitted directly into the atmosphere and, in some cases, secondary pollutants that are formed as a result of complex chemical reactions within the atmosphere. These models are widely used by regulatory agencies tasked with controlling air pollution to both identify source contributions to air quality problems and assist in the design of

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[3] Heat rate is a measurement to calculate how efficiently a generator produces electric energy, and is expressed as the number of British thermal units (Btu's) required to produce a kilowatt-hour of electrical energy.

[4] Auxiliary electrical loads (power uses), such as those required for fans for dry cooling, water treatment systems, and water pumps, are drains on net power output, and therefore impact the amount of net power delivered to the electric grid.

effective strategies to reduce harmful air pollutants. For example, air quality models can be used during the permitting process to verify that a new source would not exceed ambient air quality standards or, if necessary, determine appropriate additional control requirements. In addition, air quality models can also be used to predict future pollutant concentrations from multiple sources after the implementation of a new regulatory program in order to estimate the effectiveness of the program in reducing harmful exposures to humans and the environment (USEPA, 2005a).

Because there is incomplete information on and no regulatory standards for mercury and CO_2, Western analyzed the impacts associated with these emissions in accordance with the NEPA regulations at 40 CFR 1502.22, which states: “When an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an environmental impact statement and there is incomplete or unavailable information, the agency shall always make clear that such information is lacking.” With respect to mercury and CO_2 emissions, Western has identified the areas where information does not yet exist and relies on available information where it does exist. In accordance with this regulation, Western: (1) recognizes that information regarding impacts from mercury and CO_2 is incomplete or unavailable, (2) recognizes that with the absence of this relevant information, it is unable to use available information to determine whether there are significant adverse impacts on the human environment, (3) has provided the relevant information regarding mercury and CO_2 within the Final EIS, and (4) has discussed and evaluated the impacts of mercury and CO_2 based upon theoretical approaches and generally accepted methods.

When the Draft EIS was published in May 2006, it contained a significance criterion for mercury that was tied to CAMR. As discussed above, CAMR was vacated in early 2008, and CAMR no longer exists. Thus, the regulation of mercury emissions from coal-fired EGUs now falls back under the requirements of Section 112 MACT standards. The Big Stone site, which includes both the existing and proposed plant sites, is subject to regulation under MACT. There are, however, no MACT standards for mercury in place at the current time, and the timeframe for rule development is currently unknown.

As a result of the CAMR being vacated, significance criterion related to CAMR could not be used for mercury. Nevertheless, the proposed plant, as designed, would meet the NSPS limit of 66×10^{-6} pound (lb) per megawatt-hour gross energy output under former CAMR regulations as a condition of the Title V Air Quality Permit and Acid Rain Permit that would be issued by the SDBME. Further, because many factors influence the transport and behavior of mercury in the environment, it is not appropriate to assess the likely environmental impacts of mercury emissions from the proposed Big Stone II plant by simply extrapolating from the results of either national or regional-scale mercury impact studies, or from the results of dissimilar local-scale emission and transport studies. To estimate how emissions from a single source of atmospheric mercury might affect mercury levels in a local environment, it is necessary to consider a large amount of data regarding the emissions and the environmental conditions in the area surrounding the source. Among the vital data are the forms of mercury in the emissions; local meteorological, geographical, geological, and ecological data; and information on consumption of locally caught fish. Even if all of the necessary data are available, modeled estimates are uncertain because the processes and parameters influencing the many stages of mercury transport and transformation are either not fully understood or insufficiently characterized to make reliable predictions. Therefore, a quantifiable significance criterion for mercury impacts could not be established for the Final EIS.[5]

There are differing views on the procedure for addressing climate change under the NEPA. Draft guidance issued in 1997 by the CEQ provides some suggestions as to how Federal agencies should address climate change. In the guidance, CEQ recognizes that individual projects will likely have only marginal impacts on global climate change and that it is the programmatic NEPA documents where an analysis of global climate change would be most useful. However, CEQ concludes that climate change is "reasonably foreseeable" and that NEPA documents should consider two aspects of climate change: (1) the potential for Federal action to influence global climatic change and (2) the potential for global climatic change to affect Federal actions. The discussion of GHG emissions in NEPA documents has evolved over time due to several factors including heightened public awareness, advances in the science of global warming, litigation, advances in technologies, and potential legislation and regulation (DOE, 2007). The lack of certainty regarding the impacts of source-specific emissions has made it difficult to estimate the impact of specific proposed projects with definitive conclusions (i.e., "a coal plant emitting X tons of CO_2 per year would result in a Y degree increase in global temperatures."). However, current DOE NEPA documents do include the following elements:

- Discussion of global climate change – When GHG emissions are relatively small, the discussion is typically limited to reasons why no further analysis is necessary. In cases where potential emissions are significant, discussions usually include findings and potential consequences mentioned in various studies by governmental agencies (i.e., USEPA, the Intergovernmental Panel on Climate Change (IPCC), DOE, etc.)
- Quantification of GHGs – Emissions in the form of annual emission rates are typically provided.
- Consideration of cumulative impacts – The extent of cumulative impacts generally depends on the type of proposal and amount of potential GHG emissions. Some of the elements include the following: (1) total emissions over the project lifetime, (2) life cycle analyses, (3) incremental emissions to existing similar source base (i.e., proposed plant emissions addition to emissions from all fossil plants), and (4) potential to induce other actions.
- Exploration of reasonable alternatives – Primarily occurs at the project definition and scoping stage.
- Consideration of potential mitigation – includes exploring current and future GHG reduction options such as carbon capture and sequestration (CCS).

Impact assessment also included a review of the proposed methods and equipment required for construction of the groundwater wells and the interconnecting pipelines along with mitigation

[5] Western recognizes that Minnesota has one of the most stringent mercury regulations in the U.S. Minnesota has adopted a rule regulating mercury emissions from coal-fired power plants greater than 500 MW (Mercury Emission Reduction Act of 2006 Minnesota Statutes §§ 216B.68 to 216B.688). The rule requires a 90 percent removal of mercury from units with wet scrubbers by December 31, 2014. Even though the proposed Big Stone II Project does not fall under the jurisdiction of the Minnesota regulations, the Co-owners have entered into the Settlement Agreement with the MnDOC, where the Co-owners agree to meet Minnesota mercury emission requirements. The terms of the Settlement Agreement were included as a condition to the Certificate of Need, issued March 17, 2009. Thus, the Settlement Agreement is binding and requires the Co-owners to install emission controls likely to result in removal of at least 90 percent of the mercury emitted from the existing plant and the proposed Big Stone II plant.

measures to control fugitive emissions. The analysis also compares the operation impacts of the steam electric generation unit efficiencies and associated air emissions for the two alternative cooling systems carried forward for analysis.

Significance Criteria

A significant impact on air quality would result if any of the following were to occur in the vicinity or downwind of the proposed Project:

- Predicted concentrations of Criteria Air Pollutants would exceed State and/or Federal NAAQS (Table 4.1-1).
- Predicted concentrations would exceed the maximum allowable PSD increments (Table 4.1-1) for PM_{10}, NO_2, or SO_2.
- Predicted air pollutant emissions would cause a change in visibility that would exceed Class I standards.
- Predicted emissions would conflict with or obstruct implementation of an applicable air quality plan.
- Predicted emissions of sulfur- and nitrogen-containing air pollutant emissions would cause detriment to the acid neutralizing capacity of sensitive lakes in Class I areas.

4.1.2 Proposed Project and Alternative 3

4.1.2.1 Big Stone II Plant Site and Groundwater Areas

Plant Emissions and Air Quality Impacts Assessment

The existing plant has been operational since 1975. The area around the existing plant is designated as either “attainment” or “unclassifiable” for all criteria pollutants. From 1975 until the fall of 1995, the primary boiler fuel was North Dakota lignite coal. In 1995, Powder River Basin (PRB) sub-bituminous coal replaced lignite as the primary boiler fuel. That fuel switch had the effect of substantially reducing (by approximately 67 percent) the emissions of SO_2 from the existing boiler.

In 2001, a new developmental technology, the Advanced Hybrid™ system, was installed. The Advanced Hybrid™ technology uses both an electrostatic precipitator and a fabric filter (baghouse) for exhaust gas particulate removal. That emissions control system was designed to reduce the emissions of PM from the existing boiler by approximately 99 percent. However, the demonstration technology encountered operational problems during its testing phase, which resulted in decreased fabric filter life, decreased particulate removal efficiencies, and limited plant operations. Despite replacing all of the fabric filter bags with a number of alternative bag fabric designs and increasing the filter area by nearly 40 percent at a cost of between $4.0 and $4.5 million, the Advanced Hybrid™ technology was unable to maintain desired plant electrical output and sustain acceptable particulate emission levels. Consequently, the Advanced Hybrid™ system was deemed unacceptable for particulate emissions control and was removed from the existing plant in 2007. The Advanced Hybrid™ system for the existing plant was replaced with a conventional pulse-jet fabric filter. The Advanced Hybrid™ system is not currently used in any coal-fired power plant, and it is not considered a viable technology to use for emissions control at the proposed Big Stone II plant.

The proposed Big Stone II plant would include a pulverized-coal-fired, super-critical boiler using low-sulfur, PRB coal. Operation of the proposed plant would cause emissions of certain regulated pollutants, including criteria pollutants regulated under the PSD regulations and hazardous air pollutants (HAPs). The emission controls for the proposed plant would include a selective catalytic reduction (SCR) system for NO_X emission control, a fabric filter for particulate control, and a Wet Flue Gas Desulfurization (WFGD) system for SO_2 emission control. The WFGD system for the proposed Big Stone II plant would also be used to reduce emissions from the existing Big Stone plant.

Mercury would be controlled through concurrent controls of the fabric filter and WFGD system. Additionally, in the Settlement Agreement, the Co-owners have agreed (as discussed below) to install control equipment for the existing and proposed Big Stone plants that is likely to remove approximately 90 percent of the mercury emitted from the units. For example, use of a PRB coal containing 0.0715 parts per million by weight mercury (USEPA, 2005e), the approximate value expected for the coal utilized by the proposed Project, a 90 percent removal would result in annual emissions of approximately 81.5 lb of mercury from the Big Stone site, significantly less than the estimated 189.6 lb of mercury emissions reported from the existing plant in 2004. Also, as part of the Settlement Agreement, the Co-owners agreed to act in good faith to install control equipment as expeditiously as possible. However, given the construction schedule and commercial operation date of the proposed Big Stone II plant, and also considering that emission controls specifically for mercury are not sufficiently demonstrated to be commercially available at this time, the parties to the Settlement Agreement recognize that the Co-owners would have four years from the proposed Big Stone plant's commercial operation date to achieve compliance with the control requirements and emission limits.

The Co-owners' "Big Stone II Prevention of Significant Deterioration Construction Permit Application" dated July 20, 2005 (major update on June 20, 2006), and in numerous other updates as noted in the SDDENR "Revised Statement of Basis, Prevention of Significant Deterioration Permit, Otter Tail Power Company – Big Stone II"[6] were used to develop the discussion in this section.

PSD Pollutant Emissions from the Existing and Proposed Plants

Air quality permitting involves a comparison of potential emissions for a site with actual emissions from the past. Table 4.1-2 summarizes the historic actual and projected emissions of PSD pollutants from the boilers of the existing and proposed plants. In this case, actual emissions are those from the existing plant as shown in the table.

In accordance with the PSD application, the Co-owners have committed to not increase NO_X emissions resulting from the operation of the proposed plant as compared to the annual average of 2003 and 2004 NO_X emissions from the existing plant. Compliance with NO_X emission standards would be achieved by using low NO_X burners and an SCR to control NO_X emissions from the proposed plant. The over-fire air system on the existing plant's boiler would be operated more aggressively to reduce NO_X emissions from the existing unit. NO_X emissions from the existing and proposed plants combined are proposed to be limited to less than 16,448 tons per year in the PSD construction permit application for the proposed Project.

[6] The PSD Permit application, updates, and the Revised Statement of Basis, as well as other air permit-related documents are available on SDDENR's website: http://www.state.sd.us/denr/DES/AirQuality/aapubnotbs.htm

Table 4.1-2. Summary of PSD Pollutant Boiler Emission Information(tons per year)

Pollutant	Existing Plant Emissions		Existing and Proposed Plant Emissions	
	1994 Actual	2004 Actual	Potential Emissions	Projected Actual Emissions
NO_x	13,434	17,033	<16,448[a]	<16,448
SO_2	43,888	14,296	<13,278[b]	2,000
PM_{10}	251	1[e]	6,703	470
CO	719	558	5,883	570
Volatile Organic Compounds (VOC)	84	123	252	193
Pb	0.35	<0.01	0.91	0.70
H_2SO_4[d] Mist	DNP[c]	11	254	196
Fluorides	74	35	31	24

[a] NO_X emissions from the existing and proposed plant combined would be limited to less than 16,448 ton/year in the permit for the proposed Project.
[b] SO_2 emissions from the existing and proposed plant combined would be limited to less than 13,278 ton/year in the permit for the proposed Project.
[c] Data not provided by Co-owners.
[d] Sulfuric Acid (H_2SO_4).
[e] The one-ton number is based on a single emissions test of the Advanced Hybrid™ system that was being used at the time of the test. PM_{10} emissions in 2004 were controlled by the Advanced Hybrid™ demonstration technology, which was unable to sustain acceptable particulate emission levels, and as a result, limited plant operations. The Advanced Hybrid™ system was deemed unacceptable for particulate emissions control and was removed from the existing plant in 2007 and was replaced with a conventional pulse-jet fabric filter. The Advanced Hybrid™ system is no longer considered a viable technology to use for emissions control at the proposed Big Stone II plant.

Source: Burns and McDonnell, 2005 and OTP, 2008a.

Compliance with SO_2 emission standards would be achieved by ducting the exhaust gases from both the existing and proposed plants' boilers through the WFGD system that would be common to both units. Operation of the new WFGD system on both the existing plant and proposed plant would significantly reduce SO_2 emissions from both plants, which would result in a combined potential SO_2 emission that is no greater than the annual average of 2003 and 2004 SO_2 emissions from the existing plant. Potential SO_2 emissions from the existing and proposed plants combined are proposed to be limited to less than 13,278 tons per year in the PSD permit application for the proposed Project.

A conventional pulse-jet fabric filter followed by a WFGD system would control particulate and SO_2 emissions, respectively, from the proposed Project. Exhaust from the existing and proposed plants would be combined and ducted to a WFGD system common to both boilers.

As noted above, the SDDENR revised the Title V permit to satisfy the objections raised by the USEPA, and the 30-day public notice period for the permit revisions ended on March 13, 2009. The SDBME held hearings on April 20 and 21, 2009, to consider the revised Title V permit and whether any revisions were needed for the PSD permit issued on November 20, 2008. On April 21, 2009, the SDBME issued a signed final approval document after the SDBME the day before unanimously approved the revised Title V permit that addressed the objections raised by the USEPA and reaffirmed the PSD permit that was issued on November 20, 2008. The SDBME approved the hearing Findings of Fact and Conclusions of Law during their April 21, 2009 meeting. On April 22, 2009, the revised Title V permit was submitted to the USEPA for a 45-day review. The proposed emission limits for the Big Stone site, included in the Title V permit revisions proposed by SDDENR for NO_X and SO_2 are consistent with potential emission values in Table 4.1-2 and would maintain emissions of NO_X and SO_2 for both plants at approximately the same levels as the present emissions from the existing power plant. The revisions to the Title V permit issued by SDBME also contain specific annual emission limits for SO_2 and NO_X for the proposed Big Stone II unit and for the existing plant. Potential emissions presented in Table 4.1-2 represent the permitted emission levels for the pollutants at the maximum possible annual boiler operating levels for the existing plant and proposed Project. Projected actual emissions presented in Table 4.1-2 represent the existing plant and proposed Project emission levels which the Co-owners are likely to achieve in the future based on the performance of the emissions control equipment and actual annual boiler operating levels. The 2,000 ton/year SO_2 emissions is the level of annual actual emissions expected from the Big Stone site once the WFGD system is operational on both the existing and proposed Big Stone plants.

The projected increase in PM_{10} emissions is attributable to the emissions from the existing plant equipped with the conventional pulse-jet fabric filter and increased coal consumption by the additional unit at the proposed plant. Potential PM_{10} emissions are calculated based on the existing plant's permitted emission rate of 0.26 lb/mmBtu, the proposed plant's permitted emission rate of 0.012 lb/mmBtu, and the maximum possible annual boiler operating levels for both plants. Projected actual PM_{10} emissions represent the combined existing and proposed plant's PM_{10} emission levels that the Co-owners are likely to achieve in the future based on the performance of the emissions control equipment and actual annual boiler operating levels.

PSD and NAAQS Impacts Assessment for the Existing and Proposed Plants Emissions

For existing major emission sources, such as the existing plant, the USEPA and SDDENR PSD regulations require projects that would cause significant net increase in emissions demonstrate that this increase in emissions would not cause an exceedance of the NAAQS or the PSD increment at or beyond the fenceline of the property.

PSD increment modeling considers the impact of other regional PSD projects that have been permitted since the PSD program was enacted in 1978. Table 4.1-3 shows a comparison of the projected increase in emissions of PSD pollutants from the proposed Big Stone II boiler and ancillary processes and equipment (such as coal hauling, cooling towers, emergency generators, etc.) with the PSD significance levels. It is noted that the "Change in Emission" values shown in the table below are based on a potential-to-emit for the proposed sources.

For pollutants listed in Table 4.1-3 where a "Significant Increase" is indicated, a BACT analysis was performed in support of the air quality permit application process resulting in the requirement to use BACT for emission control. For PM_{10}, BACT would be a fabric filter; for CO and VOC, BACT would be good combustion practice; and for sulfuric acid mist and fluorides, BACT would be the WFGD system. Although NO_X and SO_2 were not subject to PSD review, the installation of an SCR for NO_X control and the WFGD for control of SO_2 emissions would also represent BACT for these pollutants. A fabric filter would represent BACT for control of lead emissions.

VOCs are photoreactive pollutants and are generally regional in terms of their contribution to O_3 formation. Because it is difficult to predict O_3 formation, modeling of VOC dispersion is not required nor conducted. Also, since the area around the existing plant is designated as either "attainment" or "unclassifiable" for all criteria pollutants and the changes in SO_2 and NO_X emissions would each be less than the applicable PSD significance levels, a modeling analysis for these pollutants was not required or conducted.

Table 4.1-3. Summary of PSD Deterioration Pollutant Emission Changes

Pollutant	Change in Emission (tons/year)	PSD Significance Level (tons/year)	Significant Increase
NO_x	0[a]	40	No
SO_2	0[a]	40	No
PM_{10}	901.24	15	Yes
CO	3,946.59[c]	100	Yes
VOC	98.36	40	Yes
Pb	0.47	0.6	No
H_2SO_4[b] Mist	131.40	7	Yes
Fluorides	15.77	3	Yes

[a]The change in emission rate for NO_x and SO_2 includes reductions in emissions from the existing plant.
[b]Sulfuric Acid (H_2SO_4).
[c]As an example, CO emission of 3942 tons/year for the Big Stone II boiler was calculated using a heat input of 6,000 million Btu per hour times 8,760 hours per year times a CO emission rate of 0.15 lb per million Btu divided by 2,000 lb per ton. Emissions from the fire pumps and the emergency diesel generator contributed the balance of the 3946.59 CO emissions total. (See Appendix C of the PSD permit application).
Source: Burns and McDonnell, 2007, OTP, 2008a.

Since significant increases, as defined in the PSD rules, are proposed for emissions of CO and PM_{10}, modeling was conducted in accordance with PSD program guidance. The results of the modeling indicate that the impacts of CO from the proposed Big Stone II plant would not exceed the air quality significance levels at any location per 40 CFR 51.165(b)(2). No further modeling is required for a PSD pollutant if the modeled impacts are below the significance levels. As noted earlier in this section, significance levels referred to in this section as related to emission increases and air quality modeling are based on the definition of "significant" in 40 CFR 52.21(b)(23)(i) and "air quality significance level" as defined in 40 CFR 51.165(b)(2). These significance levels differ from significance criteria defined in Section 4.1.1 and do not necessarily indicate significant impact under NEPA.

Air dispersion modeling for PM_{10} and $PM_{2.5}$ was performed using AERMOD, Version 07026. Table 4.1-4 shows the results of the ambient air quality modeling and the increment analysis required for the PSD permit, which includes the proposed Big Stone II boiler and ancillary processes and equipment. Under South Dakota policy, the entire increment[7] for PM_{10} and $PM_{2.5}$ in Grant County would be available for consumption as proposed Big Stone II is the SDDENR's first PSD permit application in Grant County. Based on the regulations, however, the entire increment may not be available because of a PSD permit application submitted on September 16, 1991, for a facility near Sioux Falls, South Dakota. The SDDENR is currently working with the USEPA to harmonize its policy with the Federal regulations. Regardless of the interpretation of the amount of increment available for consumption, dispersion modeling, including potential increment consuming sources, shows that there would be no exceedances of the PSD Increment for PM_{10} nor the NAAQS for PM_{10} and $PM_{2.5}$ for the proposed Big Stone II plant. Operation of the proposed plant would not cause or contribute to a significant degradation of ambient air quality.

[7] PSD increment consumption: the increment is the incremental amount of degradation in air quality above the baseline level allowed under the PSD rules. If the entire increment is available for consumption, it means that no source has "consumed" increment, or degraded the air above baseline levels.

Table 4.1-4. Results of NAAQS and PSD Increment Modeling ($\mu g/m^3$)

Pollutant	Averaging Period	NAAQS	NAAQS Modeling Results	PSD Class II Increment	Class II Increment Analysis Results
PM_{10}	Annual	NA	NA	17	4.54
	24-hour	150	70.45[a]	30	26.50[b]
$PM_{2.5}$	Annual	15	12.10[c]	NA	NA
	24-hour	35	29.85[d]	NA	NA

[a]Includes second highest high air quality modeling results and monitored background concentrations.
[b]Results assume that all units, including fugitive dust sources, are operating at maximum load. The proposed new crusher house contributes 11.38 $\mu g/m^3$ emissions of PM_{10}. The maximum impact occurs at the fenceline of the proposed plant. Modeled impacts decrease quickly at distances further away from the property line.
[c]Average of 8th highest high from worst three years.
[d]Average of worst three years.

Source: Burns and McDonnell, 2007; OTP, 2008a.

Air Quality Related Values

The Federal Land Managers' Air Quality Related Values Work Group (FLAG) was formed to develop a more consistent approach to evaluate air pollution effects on Federal lands. Of particular importance is the New Source Review program, especially in the review of PSD air quality permit applications. The goals of FLAG have been to provide consistent policies and processes, both for identifying air quality related values (AQRVs) and for evaluating the effects of air pollution on AQRVs, primarily those in Federal Class I air quality areas, but in some instances, in Class II areas. AQRVs typically evaluated in the PSD permitting process include visibility and acid deposition.

FLAG guidance recommends completion of visibility and regional haze analyses for any Class I areas within 186 miles (300 kilometers) of the proposed Project. There are no Class I areas within 186 miles of the proposed plant. Therefore, no Class I visibility analysis was required or conducted.

In response to consultation with the SDDENR in preparing the PSD air construction permit application for the proposed Project, visibility impacts were examined at the Pipestone National Monument (approximately 90 miles from the proposed plant). To determine the effect of the proposed Big Stone II plant on this Class II area, VISCREEN modeling was completed following the guidelines in USEPA-450/4-88-015, Workbook for Plume Visual Impact Screening and Analysis (USEPA, 1988). Within the document, the VISCREEN model is recommended for plume visibility analysis. The most conservative VISCREEN model is the Level 1 model. The results of the Level 1 VISCREEN model show that the proposed Project emissions pass the Class I screening criteria at Pipestone National Monument. Class I screening criteria were used because Class II visibility criteria have not been established.

As with visibility, acid deposition is considered during the PSD permitting process when sensitive areas might be affected. Sulfur and nitrogen from emission sources can combine with moisture in the atmosphere to form acids. When the acidified moisture condenses, the acidic precipitation is deposited. The U.S. Forest Service has developed thresholds for the deposition of nitrogen and sulfur acids below which water bodies would not experience adverse effects. The acid neutralizing capacity of lake water is often used as a screening criterion for evaluating the affects of acid deposition.

Since there would be no increase in emissions of NO_X or SO_2 from the Big Stone site, a PSD review was not required for these pollutants. Also, as noted above, there are no Class I areas within 186 miles of the proposed plant. For these reasons, no Class I acid deposition analysis was required or conducted.

As shown by Table 4.1-2, the annual projected actual emissions from the existing and proposed plants would be approximately 2,000 tons of SO_2 and 16,448 tons of NO_X. These emissions would contribute to acid deposition. However, to the extent that emissions of SO_2 would be less if the proposed plant were constructed and emissions of NO_X would not increase, impacts to the environment due to acid deposition would be less if the proposed plant were constructed.

<u>Hazardous Air Pollutant Emissions and Impacts from the Existing and Proposed Plants</u>

In 1994, total emissions of all HAPs from the existing plant's boiler were calculated to be 583,364 lb. Actual emissions of HAPs from the existing plant's boiler have been reduced substantially since 1994 due to the change from lignite to PRB coal and use of the fabric filter. In 2004, total emissions of all HAPs from the existing plant's boiler were calculated to be 125,308 lb. Table 4.1-5 summarizes the historic estimated and projected emissions of HAPs from the boilers of the existing and proposed plants.

As shown in Table 4.1-5, the operation of the proposed Big Stone II plant's boiler would increase the emission of certain HAPs and the existing and proposed plant would emit approximately 9,441 lb of a combination of 58 other HAPs, which would consist primarily of various organic and metallic compounds. These emissions, in significant quantities, could impact human health and the environment. Although there are no specific regulations or requirements to reduce HAP emissions, the control of HAP emissions is enhanced through the use of BACT for PSD pollutants. The installation of the WFGD system on the exhaust from the existing and proposed plants' boilers represents BACT for SO_2 and would also provide a high degree of control for hydrochloric acid, hydrogen fluoride, and other acid gases. Emissions of organic HAPs would be reduced through the application of BACT for VOC, which was determined to be good combustion practices. The fabric filter controls represent BACT for particulate matter and would provide reductions for the metallic compounds. The projected total emissions of all HAPs from the existing and proposed plants' boilers is projected to be 63,460 lb per year, a reduction of 61,848 lb per year from current emission levels for the existing Big Stone plant. This reduction of approximately 49 percent in total HAP emissions would proportionately decrease any impacts attributable to HAPs emissions as compared to existing conditions. Because HAPs emissions would be less if the proposed plant were constructed, impacts to the environment due to HAPs emissions would be less compared to emissions from the existing plant alone.

Table 4.1-5. Summary of Hazardous Air Pollutant Emission Information (pounds/year (lb/yr))

Pollutant	Existing Plant Emissions		Existing and Proposed Plant Emissions
	Actual 1994	Actual 2004	Projected Future
Hydrochloric acid (HCl)	429,519	50,264	25,370
Hydrogen fluoride (HF)	146,938	70,939	28,084
Methyl chloride	1,268	1,181	99
Selenium Compounds	1,611	37	466
Other HAPs	4,028	2,887	9,441
Total HAPs	583,364	125,308	63,460

Regarding the changes in emission rate information in Table 4.1-5: Recent Electric Power Research Institute (EPRI) data sources have updated emission rate estimates for some of the HAPs parameters. As a result, methyl chloride is no longer projected as a significant contributor to HAPs emissions. Also, EPA removed methyl ethyl ketone (MEK) from the HAPs list in or around 2006. Consequently, MEK has been removed from the analysis and its contribution has been subtracted from the 1994 Actual and 2004 Actual columns in the table. Projected Future emission estimates have been revised and updated for both units based on the most recent HAPs emission estimates. The drop in methyl chloride emissions is due to the change in the projected emission rate. HCl and HF emissions changed due to updated fuel quality information and updated WFGD emissions control effectiveness information.

Source: Burns and McDonnell, 2005 and OTP, 2008a.

Mercury Emissions from the Existing and Proposed Plants

Mercury exists in the environment as a result of natural and human (anthropogenic) activities. The amount of mercury mobilized and released into the biosphere has increased since the beginning of the industrial age (mid-19th century). Most of the mercury in the atmosphere is elemental mercury vapor, which circulates in the atmosphere for up to a year and can, hence, be widely dispersed and transported thousands of miles from likely emission sources. Most of the mercury in water, soil, sediments, or plants and animals is in the form of inorganic mercury salts and organic forms of mercury (e.g., methylmercury). The inorganic form of mercury, when either bound to airborne particles or in a gaseous form, is readily removed from the atmosphere by precipitation or dry deposition. Precipitation is the primary route for transporting mercury from the atmosphere to surface waters and land. Even after it deposits, mercury commonly is emitted back to the atmosphere either as a gas or associated with particles, to be re-deposited elsewhere. As it cycles between the atmosphere, land, and water, mercury undergoes a series of complex chemical and physical transformations, many of which are not completely understood.

Mercury is present in coal in trace amounts (approximately 0.1 parts per million on average). Research by the U.S. Geological Survey (USGS) indicates that much of the mercury in coal is associated with pyrite. Other forms of mercury that have been reported include organically bound, elemental, and in sulfide and selenide minerals. Approximately 75 tons of mercury are found in the coal delivered to U.S. power plants each year. About two-thirds of this mercury is emitted to the air, resulting in about 50 tons being emitted annually. This 25-ton reduction is achieved through existing pollution controls such as fabric filters (for PM), WFGD systems (for SO_2), and SCRs (for NO_X).

During coal combustion, mercury is released into the exhaust gas as elemental mercury vapor. Elemental mercury vapor is then converted to different forms by a series of complex reactions depending on the changing conditions of the flue gas from the boiler exit to the stack. The forms of mercury found in the flue gas are elemental mercury, oxidized mercury, and particle-bound mercury. The amount of elemental mercury oxidized is highly dependent on the amount of chlorine in the flue gas, which depends on the chlorine content of the coal being burned. In practice, the amount of oxidized mercury in the flue gas can vary from a few percent to more than 90 percent. Mercury adsorbed onto the fly ash becomes particle-bound mercury. The characteristics of the ash (especially unburned carbon) as well as chlorine content and other gases (especially sulfites and water) play an important role in mercury speciation and capture (USEPA, 2005e). WFGD systems and particulate control devices, such as fabric filters, are more effective in removing oxidized and particle-bound forms of mercury than elemental mercury. In general, bituminous coals tend to have higher chlorine contents and also tend to produce higher levels of unburned carbon in the fly ash. As a result, the flue gas from the burning of bituminous coals tends to contain higher amounts of oxidized compounds while that of sub-bituminous and lignite coals tends to contain more elemental mercury vapor (USEPA, 2005e). Mercury not captured by the pollution control devices is emitted into the atmosphere with the flue gas at the stack.

Western notes there is uncertainty and incomplete information associated with mercury deposition. To estimate how emissions from a single source of atmospheric mercury might affect mercury levels in a local environment, it is necessary to consider a large amount of data regarding the emissions and the environmental conditions in the area surrounding the source. Among the vital data are the forms of mercury in the emissions; local meteorological, geographical, geological, and ecological data; and information on consumption of locally caught fish. Since proposed plant is not operating, Western does not have access to mercury emission data that can be used to determine the forms of mercury in the emissions.

Western does have access to emission data from tests performed in 2002 on the existing plant that could be used to analyze deposition (Laudal, 2003), but planned emission controls at the existing plant and proposed new plant would change the amount of the various forms of mercury emitted. Specifically, the test results indicate that emissions from the existing plant are comprised of approximately 74 percent oxidized mercury and 26 percent elemental mercury. Emissions of particle-bound mercury were measured, but they were not detectable. All else equal, this data would be useful in analyzing deposition if the mercury controls would not change. However, as mentioned, the Co-owners have committed to additional controls at the existing and proposed Project. Due to the solubility of oxidized mercury in water, the addition of the WFGD system is expected to significantly change the mercury speciation of emissions of the existing plant. The mercury emissions speciation from the proposed Big Stone II plant would be somewhat different than that for the existing plant due to the oxidation of elemental mercury that would take place across the SCR emissions control system, which is used for control of NO_X emissions. The SCR would likely allow for a higher percentage of mercury to be in the oxidized form. Therefore, the forms of mercury in the emissions of the existing plant will change and the forms of mercury in emissions emitted from the proposed Project are not known and would not be known until the proposed plant is in operation. Despite this lack of data and the concerns with extrapolating from results of other studies, Western notes that a USEPA report issued to Congress (USEPA, 1997a) based on research of local impacts from mercury emissions may provide some guidance on mercury deposition and its impact on the surrounding area. The report makes two recommendations. First, facility-specific information about the forms of mercury in a facility's emissions should be utilized. The second recommendation in the USEPA report states that the assessment must account for the fact that each form of mercury behaves differently in the atmosphere. The report notes that the majority of mercury exiting a stack does not readily deposit, but is vertically diffused to the free atmosphere, by which it is transported outside the local area and into the global cycle. For purposes of air quality and environmental modeling, the local area is considered to extend 50 kilometers (approximately 30 miles) from the source. The report recommends using the following fractions to assess local impacts of mercury emissions:

- A vast majority of the vapor-phase elemental mercury (over 99 percent) does not readily deposit, but becomes part of the global cycle;
- Of the mercury emitted as oxidized mercury, about 68 percent is deposited locally and about 32 percent diffuses vertically to the global cycle; and
- 36 percent of the particle-bound mercury is deposited, and the rest diffuses vertically to the global cycle.

Based on the USEPA's conclusions, facilities that emit higher fractions of uncontrolled oxidized mercury, especially vapor-phase mercuric chloride, are more likely to produce elevated levels of local mercury deposition than facilities that emit higher fractions of elemental mercury. If the USEPA study could be used as a guide then of the remaining 10 percent (after accounting for the 90 percent of mercury emissions that would be removed) emitted into the atmosphere, approximately 36 percent of the particle-bound mercury and 68 percent of the oxidized mercury would be deposited locally, and the rest would diffuse vertically to the global cycle. Furthermore, even without this study and the mercury emissions data from the proposed and existing project, it is still possible to reasonably assess whether its mercury emission would increase or decrease in the surrounding area. With the implementation of the air pollution controls, satisfaction of the conditions of the Settlement Agreement, and compliance with the conditions of the air permit for the proposed plant, the rate of mercury deposition from the combined existing and proposed plants would decrease as a result of the proposed plant being constructed. Since mercury emissions from the existing and proposed plant combined would be lower than mercury emissions from the existing plant alone, it is reasonable to assume the mercury impacts in the surrounding area would also decrease. Much of the lower the rate of mercury deposition from the combined existing and proposed plants would be due to a much higher fraction of mercury emissions from the proposed plant being in oxidized form given the installation of an SCR. Since the addition of the WFGD would remove a large portion of mercury in this form due to its solubility in water, emissions of oxidized mercury from the combined plants would decrease. As a result, deposition in the vicinity of the Big Stone site would likely also decrease.

Estimated mercury emissions from the existing boiler in 1994 were 421 lbs (actual electric generation of 2,573,169 megawatt-hours (MWh) times 163.6×10^{-6} lb mercury/MWh). This was based on the average mercury content of the lignite coal and the assumption that 80 percent of the mercury was emitted from the facility. The remaining 20 percent of the mercury was assumed captured with the fly ash removed from the boiler flue gas by the existing plant's electrostatic precipitator. As previously discussed, the existing plant was converted from lignite to PRB coal in 1995 and an Advanced Hybrid™ filter system was installed in 2001.[8] These changes reduced the actual mercury emissions from the existing plant's boiler. Based on emissions testing, the 2004 mercury emissions from the existing plant were estimated to be 189.6 pounds per year (lbs/yr) (actual electric generation of 3,477,705 MWh times 54.5×10^{-6} lb mercury/MWh).

Mercury emissions would be controlled by ducting the exhaust from the existing plant to a new WFGD scrubber that would be installed to control emissions from both the existing unit and proposed

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[8] The Advanced Hybrid™ technology encountered operational problems during its testing phase, which resulted in decreased fabric filter life, decreased particulate removal efficiencies, and caused limiting factors to plant operations. Consequently, the Advanced Hybrid™ system was deemed unacceptable for particulate emissions control and was removed from the existing plant in 2007. The Advanced Hybrid™ system for the existing plant was replaced with a conventional pulse-jet fabric filter.

Big Stone II unit. As is the case with the existing Big Stone plant, the proposed Big Stone II plant would also include a fabric filter upstream from the WFGD. The combination of the fabric filter and the WFGD would exhibit greater mercury removal than other conventional emissions control configurations when firing sub-bituminous coal.[9]

Minnesota has one of the most stringent mercury regulations in the United States. Minnesota has adopted a rule regulating mercury emissions from coal-fired power plants greater than 500 megawatts (MW). The rule requires a 90 percent removal of mercury from units with wet scrubbers by December 31, 2014. Even though the proposed Big Stone II Project does not fall under the jurisdiction of the Minnesota regulations, the Co-owners have also committed to install control equipment that is most likely to result in removal of at least 90 percent of the mercury emitted from both the existing plant and the proposed Big Stone II plant. Also, the Co-owners agree to act in good faith to install such equipment as expeditiously as possible but have four years after the commercial operation date of the proposed Big Stone II plant to achieve compliance with this commitment.

Table 4.1-6 summarizes the historic estimated mercury emissions and the projected emissions for mercury from the existing and proposed plants' boilers based on the above commitment.

As shown by Table 4.1-6, actual reported mercury emissions from the existing plant in 2004 were 189.6 lb. With actual energy generation in 2004 of 3,477,705 MWh, the calculated emission rate was 54.5×10^{-6} lb mercury per MWh. Based on a typical PRB coal mercury content of 0.0715 parts per million by weight, it can be calculated that at a 90 percent removal efficiency, total annual mercury emissions from the Big Stone site would be approximately 81.5 lb per year. This equates to an emission rate of approximately 9.87×10^{-6} lb mercury per MWh. The fabric filter and WFGD proposed to be installed as part of the proposed Big Stone II plant, would provide a level of mercury removal which cannot be specifically defined at this time. Testing and evaluation during the four year evaluation period would provide conclusive data to indicate the actual level of mercury removal from the currently proposed emission control equipment and from additional control equipment, if any, installed in accordance with the Settlement Agreement.

Under the Settlement Agreement, the Co-owners of the proposed Big Stone II Project commit to install technologies that are most likely to result in removal of at least 90 percent of the mercury emitted from the existing plant and the proposed Big Stone II plant. This would result in mercury emissions of approximately 81.5 lb per year from the combined plants, which would contribute mercury to the environment. To estimate how emissions from a single source of atmospheric mercury might affect mercury levels in a local environment, it is necessary to consider a large amount of data regarding the emissions and the environmental conditions in the area surrounding the source. Among the vital data

[9] The Co-owners have jointly participated in a research and testing project on Texas Genco's W.A. Parish Station Unit 8. This electric generating unit is a similar size, burns similar coal, and is equipped with similar emissions control equipment and configuration to the proposed Big Stone II plant. The preliminary test results at the Parish Station Unit 8 plant indicate that mercury removal in excess of 90 percent is possible, while utilizing calcium chloride (CaCl) injection into the boiler and an additive in the wet scrubber in combination with the SCR, fabric filter, and WFGD. While a portion of the mercury was captured by the fabric filter, the results indicate that nearly all of the oxidized mercury was captured in the WFGD. Commercially available mercury control technologies are currently limited, but additional research and development activity is anticipated to produce additional options that will become available during the next few years. As such, there is presently no long-term operating record for any mercury control technology on a comparable size facility. Considering the unit specific emissions characteristics of mercury from coal-fired boilers and the significant chemical differences between the various species of mercury, it would be necessary to perform tests to evaluate control technologies available to the Big Stone units upon startup of proposed Big Stone II plant.

needed would be the forms of mercury in the emissions; local meteorological, geographical, geological, and ecological data; and information on consumption of locally caught fish. Even if all of the necessary data are available, modeled estimates would be uncertain because the processes and parameters influencing the many stages of mercury transport and transformation are either not fully understood or insufficiently characterized to make reliable predictions. Nevertheless, if one considers changes in the amounts and forms of mercury emitted from a given facility, it is possible to reasonably assess whether its mercury impacts would likely increase or decrease in the surrounding area. If the proposed Big Stone II plant is constructed (and after implementation of emissions controls), mercury emissions from both plants would be less than the emissions from the existing plant. Although the combined plants would continue to emit mercury, Western has concluded that the decrease in mercury emissions compared to the emissions of the existing plant would result in reduced impacts to the environment.

Table 4.1-6. Summary of Mercury Emission Information

Pollutant	Existing Plant Emissions		Existing and Proposed Plants Emissions
	1994 Actual	**2004 Actual**	**Goal[a]**
Mercury (lb/yr)	421	189.6[b]	70 to 90[c]
Emission Rate (lb mercury/MWh)	163.6×10^{-6}	54.5×10^{-6}	8.64 to 11.1×10^{-6}

[a]Goal is based on the commitment in the Settlement Agreement to install control equipment that is most likely to result in removal of at least 90 percent of the mercury emitted from both the existing plant and the proposed Big Stone II plant. However, since the proposed fabric filter and WFGD system have not been evaluated for mercury removal, it is unknown at this time whether additional control equipment would be required to comply with the Settlement Agreement.

[b]The existing plant's actual mercury emission was approximately 189.6 lb in 2004, based on the mercury content in the coal and the expected removal rate of the existing emissions control equipment. Based on the actual energy generation in 2004 of 3,477,705 MWh, the calculated emission rate was 54.5×10^{-6} lb mercury per MWh.

[c]The mercury emissions goal for the combined plants (after implementation of emissions controls) is expressed as an expected range, depending upon the final removal efficiency. Assuming a mercury content of 0.0715 parts per million by weight (typical PRB coal) and a combined consumption of approximately 5.7 million tons per year from the existing and proposed plants, approximately 0.40755 tons (approximately 815.1 lb) of mercury would be present in uncontrolled emissions. With a 90 percent removal efficiency, the combined plants would emit approximately 81.5 lb of mercury per year.

Source: Burns and McDonnell, 2005 and OTP, 2008a.

As mentioned previously, the State of Minnesota has one of the most stringent mercury regulations[10] in the U.S. Even though the proposed Big Stone II Project does not fall under the jurisdiction of the Minnesota regulations, as noted above, the Co-owners have entered into the Settlement Agreement[11] with the MnDOC, where the Co-owners agree to meet Minnesota mercury emission requirements.

Additional discussions of mercury emission impacts are found in the Mercury Response Paper (Response Paper A, Volume II), and in Section 4.2.2.1, which discusses airborne contaminant concerns in surface waters, and in Section 4.4.2.1, which discusses impacts from mercury to plant,

[10] Minnesota has adopted a statute regulating mercury emissions from coal-fired power plants greater than 500 MW (Mercury Emission Reduction Act of 2006 Minnesota Statutes §§ 216B.68 to 216B.688). The rule requires the use of technology for mercury removal that is most likely to result in the removal of at least 90 percent of the mercury emitted from units with wet scrubbers by December 31, 2014.

[11] The terms of the Settlement Agreement were included as a condition to the Certificate of Need, issued March 17, 2009. The terms of the Settlement Agreement are binding and require the Co-owners to install emission controls likely to result in removal of at least 90 percent of the mercury emitted from the existing plant and the proposed Big Stone II plant.

animal, bird, and fish species. The economic impact of mercury emissions is addressed in Section 4.10.2.1.

Greenhouse Gas Emissions from the Existing and Proposed Plants

There is a growing body of evidence indicating that GHGs are contributing to climate change. In November 2007, the IPCC published “Climate Change 2007 Synthesis Report” (IPCC, 2007), also known as the Fourth Assessment Report on Climate Change. The report concluded that climate change is occurring and human activity is likely the primary contributor. In this report and previous reports, the IPCC has predicted that global warming could lead to more heat waves, droughts, fires, and coastal flooding, as well as, decreased snowpack, more severe hurricanes, increased spread of infectious diseases, and more heart and respiratory aliments. In May 2008, a report by the Committee on Environment and Natural Resources (CENR) of the National Science and Technology Council (NSTC) published a report titled “Scientific Assessment of the Effects of Global Change on the United States” (NSTC, 2008), which integrated and evaluated the findings of the U.S. Climate Change Science Program (CCSP) and the findings from the IPCC assessments. The NSTC report concluded that there is a strong human influence on climate change and while the lines of evidence vary in their degree of certainty, they provide a compelling and scientifically sound explanation. The NSTC report further concluded that while GHGs are but one of many factors that affect climate, they are very likely the single largest cause of the recent warming. The IPCC report finds that, “most of the observed increase in global average temperatures since the mid-20th century is very likely (i.e., more than 90 percent likely) due to the observed increase in anthropogenic greenhouse gas concentrations.” (IPCC, 2007) Correspondingly, the IPCC report finds, “It is extremely unlikely (<5 percent) that the global pattern of warming during the past half century can be explained without external forcing, and very unlikely that it is due to known natural external causes alone. The warming occurred in both the ocean and the atmosphere and took place at a time when natural external forcing factors would likely have produced cooling.” While this scientific evidence has moved many governments around the world to take action to curb GHG emissions, the difficultly in measuring the source-specific, incremental impact of anthropogenic sources on climate change has made it impossible for these governments to establish a single regulatory threshold to apply to new electric power generation.

In the U.S., GHG emission regulation and standards vary significantly by State and Federal proposal. California, Washington, and Oregon are the only States to choose source-specific emission rates as the basis for their GHG emissions standards. Massachusetts and New Hampshire targeted older plants by capping their emissions to certain historical levels. Still, most other States and Federal legislators are taking a much different approach by employing market-based programs, creating incentives to increase efficiency, and by encouraging developers to bring low carbon emitting technologies online.

There are no specific Federal, State, or regional GHG regulations that apply to the proposed Big Stone II Project at this time, nor are there established standards to guide assessment of GHG emissions. Further, CO_2 is not a regulated pollutant under the CAA and, thus, ambient standards have not been developed. However, based on the comments received during the public comment period, Western has provided updates in this Final EIS that reflect a comparison of GHG emission standards and regulations to emissions from the proposed Big Stone II plant, a comparison of projected GHG emissions with other known GHG emissions, and actions proposed to reduce GHG emissions related to the proposed Big Stone II plant.

CO_2 is one of six GHGs that contributes to climate change. CO_2 emissions represent approximately 84 percent of all GHG emissions in the U.S. CO_2 is generated whenever a carbon-based fuel, such as coal, wood, natural gas, or fuel oil is burned. It is the primary GHG emitted from fossil-fired utility boilers, with approximately 41 percent of U.S. carbon emissions (primarily CO_2) coming from power plant sources (EIA, 2009). Other significant sources are automobile and truck exhaust, industrial combustion sources, and residential heating sources.

The operation of the proposed Big Stone II plant would release an estimated 4.7 million tons of CO_2 into the atmosphere each year. According to testimony before the South Dakota Public Utilities Commission (SDPUC) (SDPUC, 2006), and based on Energy Information Administration (EIA) information, this amount would represent about one one-hundredth of one percent (0.00014) of global anthropogenic emissions. As a further means of comparison, the projected annual emissions from the proposed Big Stone II plant are less than 1.5 percent of the estimated 322 million tons of CO_2 emitted from wildfires in the U.S. each year. Using USEPA's emissions equivalency calculator, the projected CO_2 emissions from the proposed Big Stone II plant would be roughly equivalent to the annual CO_2 emissions from 780,910 passenger cars, or about 0.3 percent of the total vehicles registered in the U.S. in 2006 (USDOT, 2008).

In accordance with Section 4.1 and 4.10 of the Settlement Agreement, the Co-owners have agreed (in absence of Minnesota and Federal rules applicable to the proposed Big Stone II plant) to offset 100 percent of the emissions of CO_2 from the proposed Big Stone II plant that are attributable to the generation of electricity for Minnesota consumers, for a period not to exceed four years after the commercial operation date of the proposed Big Stone II plant. The Settlement Agreement contains specific formulas, methodologies, and guidelines to be used for calculating the percentage of generation attributable to Minnesota customers, the timing and calculation of emissions to be offset, offset methods, and carbon trading. Several of the offset methods outlined in the Settlement Agreement would serve to further reduce the intensity of U.S. carbon emissions by investing in renewable energy, achieving energy savings, and investing in transmission that the MnPUC certifies would enhance renewable energy development. However, the Co-owners and MnDOC have agreed that the offset requirements required by the Section 4.1 of the Settlement Agreement would continue only until Minnesota or Federal GHG rules are developed that apply to the proposed Big Stone II plant; or if such rules have not been adopted, the offset requirement would cease four years after the proposed Big Stone II plant reaches it commercial operation date, as prescribed by Section 4.10 of the Settlement Agreement. Currently, the proposed plant is scheduled to begin commercial operation in July 2015. It is reasonably anticipated that State of South Dakota or Federal GHG emissions regulations will be promulgated before 2019 (i.e., four years after commercial operation). If Minnesota or Federal GHG rules have not been developed that apply to the proposed Big Stone II plant within the four-year timeframe following commercial operation, the offset requirement would cease. The terms of the Settlement Agreement were included as a condition to the Certificate of Need, issued March 17, 2009.

The projected emission rate can be estimated for the proposed Big Stone II plant using the following specific input parameters:

- Unit Net Heat Rate: 8,988 Btu/kWh
- Sub-bituminous fuel carbon content: 50 percent
- Sub-bituminous fuel heat content: 8,400 Btu/lb

Based on the above input parameters, the projected carbon emissions from the proposed Big Stone II plant would be 0.27 tons carbon/MWh, or 0.98 tons CO_2/MWh. In accordance with the Settlement Agreement with the MnDOC, when offsetting the 45 percent of emissions attributable to Minnesota consumers, the equivalent CO_2 emissions from the proposed Big Stone II plant would be on the order of 0.54 tons/MWh, which is lower than the 2005 U.S. average for power generation of approximately 0.68 tons/MWh (the average includes all fuels used for power generation). Note that this emission rate does not consider the impact of any future CCS retrofit requirements.[12] Although advances in CCS technology offer promising prospects to be part of the future solution regarding the control of GHGs, currently no commercial CCS technologies are available to the proposed Project (see further discussion in Section 2.5.1.11).

Table 4.1-7 provides a comparison of various fossil fuel-fired power generation technologies. As shown, the proposed Big Stone II plant compares favorably and, when considering the offsets required under the Settlement Agreement, has a CO_2 intensity approximately equivalent to a natural gas-fired combined cycle unit.

Table 4.1-7. Comparison of Typical CO_2 Emissions from Various Fossil Fuel-fired Power Generation Technologies

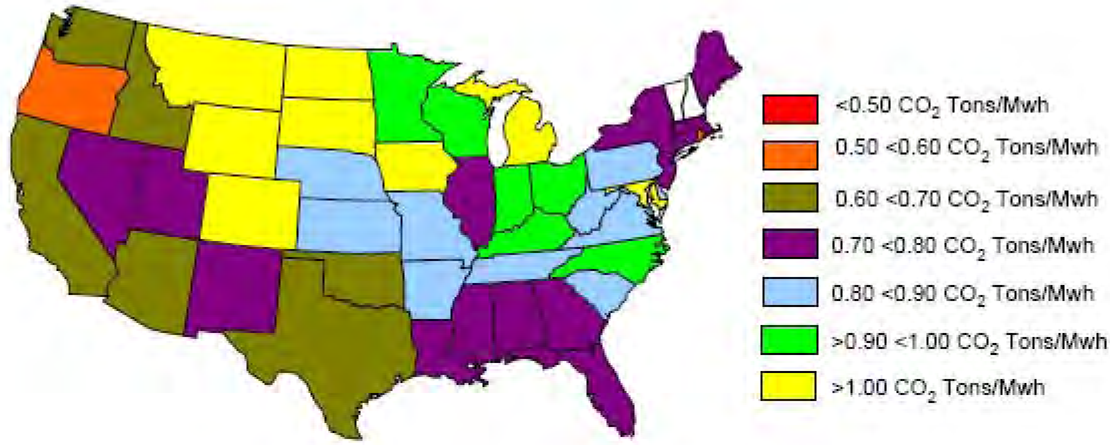
Technology	CO_2 Emissions (tons/MWh)
2005 Average U.S. Coal-fired generation	1.18
New Pulverized-Coal Sub-Critical	1.02
New Pulverized-Coal Super-Critical[a]	0.98
Integrated Gasification Combined Cycle	0.88
Natural Gas Simple Cycle	0.55
Proposed Big Stone II[b]	0.54
Natural Gas Combined Cycle	0.44

[a] Equivalent to the proposed Big Stone II plant, without the offsets considered under the Settlement Agreement.
[b]Considers the offsets required under the Settlement Agreement.

Source: EIA, 2008a; R.W. Beck, 2008a.

Further comparisons can be made at the State, regional and national levels using the USEPA Data and Maps database (USEPA, 2006a). Figure 4.1-1 shows the 2006 average CO_2 emission rate (tons/MWh) by State for units in the Acid Rain Program (ARP). The EPA's ARP is a market-based initiative which strives to reduce overall emissions of SO_2 and NO_X, which contribute to acid rain. The ARP achieves emission reductions through a cap-and-trade program for applicable sources, including coal-fired power plants. In addition to information related to these two pollutants, the ARP gathers a considerable amount of additional information for specific sources, including many similar to the type of plant proposed in this Project. As the figure shows, there are only two States (Oregon and Rhode Island) that have average emission rates at or below the rate projected from the proposed Big Stone II Project when considering the offsets required under the Settlement Agreement.

[12] The Co-owners have evaluated CCS technology by conducting a "Carbon Capture Retrofit Ready Analysis" (OTP, 2008b). The analysis concluded that should a CCS retrofit be required, there is adequate area within the Big Stone site to accommodate the process equipment. The analysis also indicates that the proposed configuration of ductwork and equipment would accommodate a retrofit of carbon capture. CCS technology is estimated to be capable of reducing CO_2 emissions by 90 percent.



Source: USEPA, 2006a.

Figure 4.1-1 Average CO_2 Emission Rate by State (2006, tons/MWh)

Using the same data, Table 4.1-8 shows the average 2006 CO_2 emission rates by North American Electric Reliability Council (NERC) region for all units in the ARP. The table shows that average CO_2 emission rates for all NERC regions and the national average are above the projected emission rate for the proposed Big Stone II plant when considering the offsets required under the Settlement Agreement (i.e., 0.54 tons CO_2/MWh). However, if Federal or State regulations are not promulgated and the conditions of the Settlement Agreement expire, the emissions of the proposed Big Stone II plant would be about 0.98 tons CO_2/MWh.

On a regional level, which includes the States of Minnesota, North Dakota, and South Dakota, CO_2 emissions in 2006 were reported to be approximately 79.24 million tons from approximately 67.20 MWh of fossil-fired generation sources (R. W. Beck, 2008b). Based on new generation currently permitted and proposed in the referenced region, as well as typical industry capacity factors, the 2015 projected regional CO_2 emissions[13] from fossil-fired power generation would be approximately 97.16 tons from a projected 91.36 million MWh of generation. Thus, the regional CO_2 emission rate from power generation sources in 2006 was 1.18 ton CO_2/MWh, considerably higher than the 0.54 ton CO_2/MWh rate that would be achieved by the proposed Big Stone II plant when considering offsets. The projected 4.7 million tons of CO_2 that would be emitted from the proposed plant, not including offsets, would make up 4.8 percent of projected regional CO_2 emissions from fossil-fired power generation in 2015. When considering the offsets pursuant to the Settlement Agreement, the projected 2015 CO_2 emissions from the proposed plant would amount to only about 2.7 percent of projected regional CO_2 emissions from fossil-fired power generation.

[13] The projected 2015 CO_2 emissions do not take into account future applicable regulations that might limit CO_2 emissions through initiatives such as CCS, cap and trade programs, or other emissions reductions.

Table 4.1-8. Average 2006 CO_2 Emission Rates by NERC Region for Units in the Acid Rain Program

NERC Region	CO_2 Emission Rate (tons/MWh)
East Central Area Reliability Coordination Agreement	1.03
Electric Reliability Council of Texas	0.75
Florida Reliability Coordinating Council	0.83
Mid-America Interconnected Network	0.99
Mid-Atlantic Area Council	0.87
Mid-Continent Area Power Pool	1.10
Northeast Power Coordinating Council	0.83
Southeastern Electric Reliability Council	0.89
Southwest Power Pool	0.79
Western Electricity Coordinating Council	0.91
Unidentified Region	0.71
Average	**0.81**

Source: USEPA, 2006a.

Several States, including California, Washington, and many others have begun developing or have already finalized GHG legislation and regulation under State or regional programs. The States of California and Washington promulgated 0.55 tons CO_2/MWh emission standards for baseload electric generation. Electric utilities entering into a long-term (five years or more) financial commitment for baseload generation must show that the baseload generation complies with the GHG emissions standard. When comparing the proposed Big Stone plant with typical pulverized-coal (PC) plant, we see an efficiency gain on the order of three to four percent through the use of super-critical technology. This would result in lower CO_2 emissions per MWh generated from the proposed Big Stone II unit when compared to typical PC units. As calculated above, the equivalent CO_2 emissions from the proposed Big Stone II plant would be on the order of 0.54 tons/MWh, which is less than the California and Washington standards when offsetting the 45 percent of emissions attributable to Minnesota consumers. However, if Federal or State regulations are not promulgated and the conditions of the Settlement Agreement expire, the emissions of the proposed Big Stone II plant would be about 0.98 tons CO_2/MWh.

It should be noted that GHG emission standards are rather difficult to develop when regulations and control technologies are still evolving. At a minimum, GHG emission standards may consider the following four factors:

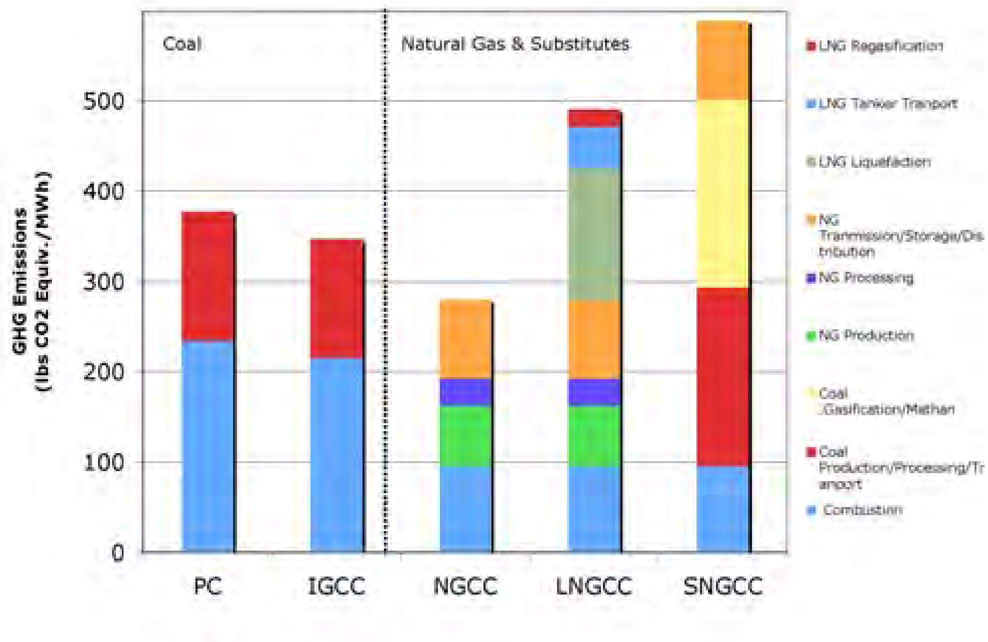
- Fuel life cycle emissions – GHG emission should be measured over the entire life cycle of the fuel instead of just emissions from the combustion process itself.
- Investment horizon – Power generation plants are long-lived assets and investment decisions need to be made today.
- Fuel supply make-up – The fuel supply make up in the U.S. will change over the foreseeable future. For example, the U.S. natural gas supply is expected to become increasingly more dependent on liquefied natural gas (LNG) and possibly synthetic natural gas (SNG) in the foreseeable future.
- Control technologies – Emission standards should reflect the GHG control technologies that are under development and will become commercially available in the foreseeable future.

Given that GHGs are viewed as an economy-wide problem, emissions from the entire fuel life cycle, including GHGs emitted in the process of exploring, producing, and transporting the fuels themselves, as well as emissions from the combustion process, may be considered when developing emission standards. Annual fuel life cycle GHG emissions for the proposed Big Stone II plant would be just over 4.9 million tons (R. W. Beck, 2009). More than 95 percent of the total GHG emissions would occur from electricity generation with the remainder occurring during coal mining and rail transportation. Further, since investments need to be made now to meet current load requirements and those investments have lives of forty years or more, emission standards may reflect more than just the lowest emitting technologies and fuel sources available today. Instead, they may reflect a longer term horizon that considers the lowest emitting technology and fuel source combination that is likely to be observed within the foreseeable future. In addition, GHG emission standards may consider the changing fuel supply make-up. The U.S. is becoming increasingly dependent on LNG, and by 2030 LNG is predicted to make up almost 13 percent of the entire natural gas supply in the U.S. (EIA, 2008a). In a July 2007 report prepared by Carnegie Mellon entitled "Comparative Life Cycle Air Emissions of Coal, Domestic Natural Gas, LNG, and SNG for Electric Generation" (Carnegie Mellon, 2007), the authors suggest that not considering the impact of LNG or SNG on the natural gas supply would inaccurately lead to the conclusion that natural gas-fired technologies would produce lower GHG emissions than advanced super-critical plants similar to the proposed Big Stone II plant with advanced pollution control technologies. Figure 4.1-2 (Carnegie Mellon, 2007) shows that after the commercialization of CCS, an advanced super-critical coal plant (with CCS installed, with a removal efficiency of 90 percent) could have a lower emission rate than a gas-fired plant burning LNG or SNG.

Finally, GHG emission standards may reflect developing control technologies that would become commercially available in the foreseeable future. The DOE, the electric utility industry, and the USEPA, among others, are currently focusing on developing commercial scale CCS demonstration projects to control CO_2 emissions from coal-fired power plants. Moreover, EPA, EIA, and others are projecting that CCS will play a large role in reducing GHGs in their studies of various national GHG proposals (including the proposed Lieberman-Warner's Climate Security Act of 2008 (S. 3036, formerly S. 2191), introduced May, 2008) starting around 2020. By contrast, the USEPA and EIA studies show a small role for natural gas-fired power plants outside of one or two sensitivity cases, primarily because this technology will be viewed as the highest GHG emitting technology at that time.

Other than California and Washington, there are no other States that have promulgated emission performance standards for GHG emissions from coal-fired power plants. Massachusetts and New Hampshire focused legislation on a few older power plants to restrict CO_2 emissions. Montana has adopted legislation requiring new coal-fired power plants to at least sequester 50 percent of CO_2 emissions, but many parts of the legislation are still in committee. Massachusetts caps CO_2 emissions from six older fossil fuel power plants at approximately 10 percent below 1997-1999 levels by 2006-2008, while New Hampshire caps CO_2 emissions from three existing fossil fuel power plants at 1990 levels by 2006. Table 4.1-9 below shows the net CO_2 emission rate from the proposed Big Stone II plant in comparison to the emission rate limit for the coal-fired power plants in Massachusetts that were capped under State legislation.[14]

[14] The regulation actually capped emissions on four coal plants and two gas/oil fired plants. Table 4.1-9 shows emissions information on three of the coal plants. Information on the fourth coal plant, Somerset, was unavailable, as USEPA data was insufficient for this plant.



Source: Carnegie Mellon, 2007.

Figure 4.1-2 GHG Emissions-Full Life Cycle of Power Generation Technologies

Note: This chart is not intended to promote the selection of any particular fuel supply or power generation technology. It simply shows estimated GHG emissions over the entire fuel life cycle for various power generation technologies (pulverized-coal, IGCC, and natural gas combined cycle) with carbon capture and sequestration technologies. Life cycle emissions for combined cycle technology are displayed for three separate fuel assumptions – domestic natural gas, LNG, and SNG.

Table 4.1-9. Comparison of Massachusetts CO_2 Limit on Coal Plants with Proposed Big Stone II

Massachusetts CO_2 Limit on Coal-Fired Plants (1997-1999 avg.)				
Station	**Generation (MWh)**	**CO_2 Emission (tons)**	**CO_2 Rate (tons/MWh)**	**10% Below by 2006 (tons/MWh)**
Brayton Point	9,057,539	8,585,152	0.95	0.85
Mt. Tom	1,035,509	1,117,569	1.08	0.97
Salem Harbor	4,009,787	4,009,787	1.00	0.90
Somerset[a]	-	-	-	-
Average			**1.01**	**0.91**
Proposed Big Stone II with CO_2 Offsets[b]			0.54	NA
Proposed Big Stone II without CO_2 Offsets[c]			0.98	NA

[a]Somerset information not included due to missing USEPA data.
[b]Includes offsets under Settlement Agreement with MnDOC.
[e]Equivalent to the proposed Big Stone II plant, without the offsets considered under the Settlement Agreement.

Source: USEPA, 1997b.

As the Table 4.1-9 shows, the equivalent CO_2 emission rate for the proposed Big Stone II plant with the offsets under the Settlement Agreement is approximately 40 percent lower than the CO_2 rate implied by the CO_2 cap set under Massachusetts legislation. When the same equivalent emission rate for the proposed Big Stone II plant is compared to the effective emission rate under the New Hampshire cap, the outcome is the same: the equivalent CO_2 emission rate at the proposed Big Stone II plant is lower than the effective emission rate implied by the legislated CO_2 cap in New Hampshire. However, if Federal or State regulations are not promulgated and the conditions of the Settlement Agreement expire, the emissions of the proposed Big Stone II plant would be about 0.98 tons CO_2/MWh, which would be higher than the caps set in Massachusetts and New Hampshire, but still lower than the national average for coal-fired plants of 1.18 tons CO_2/MWh (see Table 4.1-7).

Setting GHG emission limits on power generators at the unit level or plant level, such as the ones mentioned above, is not the norm for States or Federal legislators or regulators. In fact, the States mentioned above (California, Washington, New Hampshire and Massachusetts) are the only ones that developed unit level emission rates or caps, and those levels appear to produce a higher net emission rate than the estimated net rates at the proposed Big Stone II plant when taking into consideration the offsets under the Settlement Agreement.

The remaining States, Federal agencies, and legislators appear to be using incentive and cost-based options to reduce GHGs. Some of these options include the following.

- Establishing or increasing renewable portfolio standards (RPS) through regulation and financial incentives. California and many other States now have RPS requiring utilities to purchase a certain percentage of power from renewable generators, including wind, solar, biomass, etc.
- Employing State, regional, or national cap-and-trade programs, which establish emission costs for generators. The first GHG cap-and-trade program in the U.S. is the Regional Greenhouse Gas Initiative (RGGI) in the northeast where CO_2 is regulated for generators starting in 2009. Generators can buy and sell allowances, but must hold allowances equal to annual CO_2 emissions each year.
- Creating energy efficiency program incentives designed to reduce total demand. Incentives to employ high efficiency appliances, florescent lighting, and programmable thermostats are a few of the options that States are exploring. Tax deductions and partial funding from utilities are often the methods for advancing efficiency programs.
- Increasing the use of low carbon technologies and fuel switching through financial incentives and research support. The DOE and State agencies are moving forward with the development of technologies such as CCS by providing partial funding and research support.
- Encouraging distributed generation. States are developing financial incentives for homeowners to install and operate distributed generation, including solar technology. Incentives to homeowners are usually in the form of subsidization for the equipment and revenue for electricity sold back to the utilities.
- Allowing offsets to meet compliance in cap-and-trade programs. Several proposed and finalized cap-and-trade programs in the U.S. including the proposed program in California and the finalized RGGI program in the northeast allow generators to purchase offset certificates to apply against emissions.

None of these options exclude any generator from operating or participating in a market. Instead, they cause GHG emission reductions by adding costs to emissions sources, reducing demand, or encouraging more efficient and lower emitting technologies to enter the market.

There are no Federal standards in place for CO_2 or any other GHG in the U.S., but it is highly likely that a national greenhouse program limiting emissions from multiple sectors (including the power sector) will be passed in the U.S. within the next few years. Federal legislators continue to focus on the proposed Lieberman-Warner legislation as the basis for developing a national GHG program.[15] The proposed legislation is a market-based cap-and-trade program covering approximately 87 percent of all GHG emissions in the U.S., including the power sector, as well as, transportation, industrial, commercial, and residential sectors. It would allow participants to comply by: (1) using free allocated allowances, (2) purchasing allowances through auctions or secondary markets, (3) reducing emissions, or (4) purchasing offset certificates. The proposed Lieberman-Warner legislation does not set an emission limit at the unit or plant level. Instead, it sets an initial system-wide cap of four percent below 2005 levels for the entire program starting in 2012 and then 17 to 19 percent below 2005 levels by 2020. The cap continues to decline over time and ends up being 70 percent lower than 2005 emission levels by 2050. By setting a system-wide cap instead of a unit or plant specific limit, the program achieves GHG reductions through a market-based solution where participants that operate lower emitting technologies or have economic GHG reduction projects available would create positive net credit positions and then sell excess credits to those participants that cannot economically reduce GHG emissions. According to 2005 EIA projections, the average CO_2 emission rate from coal-fired generation was 1.18 CO_2 tons/MWh, which is 21 percent higher than the emission rate (0.98 tons/MWh) from the proposed Big Stone II plant without considering the offsets in the Settlement Agreement. Therefore, the efficiency difference between a super-critical coal plant (such as the proposed Big Stone II plant), and the average U.S. coal plant alone can make contributions to targeted reductions under the Lieberman-Warner proposal.

A market-based GHG program similar to the proposed Lieberman-Warner legislation promotes the employment of low carbon technologies, energy efficiency, and the development of new GHG emission control technologies, which together lead to GHG reductions over time. According to the EIA, the electric sector is expected to provide the vast majority of GHG emission reductions under the proposed Lieberman-Warner legislation. By 2020, the EIA projects that the electric sector CO_2 emissions will be approximately 15 percent lower than CO_2 emission estimates for 2012. By 2030, CO_2 emissions from the electric sector will be almost 85 percent lower than 2012 estimates. These reductions are largely expected to be achieved through the installation and operation of nuclear capacity, coal-fired capacity with CCS technology, and renewable capacity (EIA, 2008b).

Another proposal currently in the U.S. House of Representatives is the "Moratorium on Uncontrolled Power Plants Act of 2008," which differs from the cap-and-trade approach for reducing emissions. This bill was introduced on March 11, 2008, by Representatives Henry Waxman and Edward Markey. The bill, if ultimately passed, would place a moratorium on the USEPA or States issuing permits to

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[15] In June 2008, the U.S. Senate voted down the Manager's Amendment of the Lieberman-Warner Climate Security Act of 2008. The bill will be likely taken up again in 2009, but legislators will likely ask that any final bill fully address and consider the following: (1) contain cost and prevent harm to the U.S. economy, (2) invest aggressively in new technologies and deployment of existing technologies, (3) treat States equitably, (4) protect America's working families, (5) protect U.S. manufacturing jobs and strengthen international competitiveness, (6) fully recognize agriculture and forestry's role, (7) clarify Federal/State authority, and (8) provide accountability for consumer dollars. Upon review, legislators found that the Lieberman-Warner bill, as it was presented in May 2008, did not fully address or consider the impact of the proposed bill on these issues.

new coal-fired power plants without state-of-the-art control technology to capture and sequester CO_2 emissions. While the proposal is one of the more recent ones to be introduced to Federal legislators, there is no indication that it will prove to be more popular than any of the eleven proposals introduced in 2007 (see Table 3.1-3).

As discussed above, there are incomplete or undefined factors associated with CO_2 including issues such as: insufficient information, numerous models producing widely divergent results, undefined GHG regulations, unknown allowance prices, a lack of good data on technology developments and performances, and future revenue streams. The IPCC finds "Most of the global average warming over the past 50 years is *very likely* (probability of >90%) due to anthropogenic GHG increases and it is *likely* (probability >66%) that there is a discernible human-induced warming averaged over each continent (except Antarctica). Anthropogenic warming over the last three decades has *likely* (probability >66%) had a discernible influence at the global scale on observed changes in many physical and biological systems." (IPCC, 2007) Western also recognizes that the IPCC report finds that "Effects of temperature increases have been documented with *medium confidence* (5 out of 10) on some aspect of human health, such as excess heat-related mortality in Europe, changes in infectious disease vectors in parts of Europe, and earlier onset of and increases in seasonal production of allergenic pollen in Northern Hemisphere high and mid-latitudes."

Western concludes that the proposed plant would emit CO_2, which could have an undetermined effect on local, regional, or global climate change. Because numerous models produce widely divergent results, and there is insufficient information, Western is unable to identify the specific impacts of the proposed plant's CO_2 emissions on human health and the environment. This lack of sufficient information and the use of widely diverging models is evident in the IPCC report where it states in the Key Uncertainty section "Difficulties remain in reliably simulating and attributing observed temperature changes to natural or human causes at smaller than continental scales. At these smaller scales, factors such as land use change and pollution also complicate the detection of anthropogenic warming influence on physical and biological systems. The same section also states, "Models differ considerably in their estimates of the strength of different feedbacks in the climate system, particularly cloud feedbacks, oceanic heat uptake, and carbon cycle feedbacks, although progress has been made in these areas." The lack of information and differences in predictive models have made it difficult for scientists and other experts to link a direct cause and effect of anthropogenic impacts of climate change on a global scale, much less on a local scale. As a result, Western believes that any attempt to analyze and predict the local or regional impacts of the proposed plant's CO_2 emissions on human health and the environment cannot be done in any way that produces reliable results.

However, Western did provide comparisons of the projected CO_2 emission rate from the proposed Big Stone II plant to other technologies, existing State and regional levels, and regulatory levels. Western believes the discussion provided in this section provides the relevant information regarding CO_2 and climate change issues of pubic interest.

GHG Emissions from the Proposed Plant Ancillary Equipment and Processes

In addition to CO_2, sulfur hexafluoride (SF_6) is another GHG listed by the IPCC. The proposed Project would use SF_6 in electrical equipment such as circuit breakers. OTP participates in USEPA's SF_6 Emission Reduction Partnership for Electric Power Systems and also has plans in place for handling SF_6. Western's and OTP's SF_6 programs are described below in Section 4.1.2.2.

Radionuclide Emissions from the Existing and Proposed Plants

There are no specific radionuclide emissions data for the existing plant. However, a study sponsored by DOE on nine coal-fired power plants found that most measured activities were non-detects. Average emission factors for detected values on an activity basis were in the range of 1.4 x 10^8 pico curies (pCi)/10^{12} Btu for Ra-226 (radium) to 7.2 x 10^{10} pCi/10^{12} Btu for Pb-210 (lead). On a mass basis, emission factors ranged from 3.9 x 10^{-10} lb/10^{12} Btu for Po-210 (polonium) to 312 lbs/10^{12} Btu for Uranium-238. The radionuclide data set suggests that radionuclide emissions are very low for the tested (Phase I) coal-fired power plants (EERC, 1996).

With regard to coal ash, technologically enhanced naturally occurring radioactive material (TENORM) is produced when radionuclides that occur naturally in ores, soils, water, or other natural materials (such as coal) are concentrated or exposed to the environment by industrial activities. Coal-related radionuclides (such as uranium, thorium, and potassium, and their radioactive decay products) can be found in natural trace amounts in coal. When coal is burned, minerals including most of the radionuclides do not burn and as a result are concentrated in the ash. Therefore, TENORM may be found in coal ash residues, rather than air emissions. A very small amount of coal fly ash would be contained within the air emissions of the stack, in the form of particulates. An air emissions permit issued by the SDDENR would establish the permit limits for regulating the amount of particulates allowed in the stack emissions. TENORM radiation in coal bottom ash averages 3.5 to 4.6 picocuries per gram (pCi/g), and averages 5.8 pCi/g in coal flyash (USEPA, 2008a). For comparison purposes, the average level of radium in soil ranges from less than 1.0 to slightly more than 4.0 pCi/g (USEPA, 2008b). Bottom ash and flyash generated by combustion of coal at the proposed Big Stone II plant would be collected and disposed at the existing, on-site landfill. Alternatively, some ash may be used beneficially (e.g., for soil stabilization, structural fill, or for use in concrete). Therefore, the low levels of coal-related radionuclides in the coal ash are not considered an issue for the proposed Big Stone II Project.

<u>Emissions and Impacts Assessment from the Proposed Plant Ancillary Equipment and Processes</u>

The ancillary equipment and processes for the proposed Big Stone II plant, that is the equipment used to support the major site components, would result in an increase in emissions. These processes include:

- Coal handling, crushing, and storage.
- Limestone handling, crushing, and storage.
- Ash and slag handling and storage.
- Vehicle traffic on facility paved and unpaved roads.
- Cooling tower operation.
- Emergency fire pump operation.
- Emergency power generation.

The material handling processes, road traffic, and cooling tower operation would result in an increase in the emissions of PM and PM_{10}. Three emergency fire pumps and an electrical generator would utilize diesel-fired engines to operate. These systems would result in an increase in emissions of combustion byproducts including PM, PM_{10}, NO_X, SO_2, CO, and VOC.

Table 4.1-10 shows the projected emissions from the operation of the ancillary equipment and processes from the proposed systems. Since some of the ancillary equipment and processes would be common to the existing and proposed plants, the projected emissions shown in the table are for both plants.

Table 4.1-10. Summary of Emissions from Ancillary Processes and Equipment (tons/yr)

Source	Estimated Emissions				
	PM_{10}[a]	NO_x	SO_2	CO	VOC
Coal Handling	59.29	None	None	None	None
Fly Ash Handling	5.96	None	None	None	None
Limestone and Lime Handling	8.31	None	None	None	None
Gypsum Handling and Landfill	4.17	None	None	None	None
Haul Roads	87.79	None	None	None	None
Cooling Towers	20.55	None	None	None	None
Existing Auxiliary Boiler	9.20	156.37	49.28	32.85	1.31
Existing Heating Boiler	4.29	60.09	23.00	15.33	0.61
Existing Emergency Generator	4.11	140.97	1.99	32.31	4.14
Existing Emergency Fire Pump	0.25	3.57	0.04	0.77	0.29
Emergency Fire Pump	0.07	0.73	0.03	1.24	0.73
Emergency Generator	0.18	2.94	0.07	3.18	2.94

[a]For these sources, PM is assumed to equal PM_{10}.

Source: Burns and McDonnell, 2007 and OTP, 2008a.

The air quality impacts from these ancillary equipment and processes were analyzed as part of the Co-owners' PSD Construction Permit Application submitted to SDDENR. These emissions were included in the PSD and NAAQS increment modeling, and the results are presented in Table 4.1-4. The results demonstrate compliance with applicable air quality standards.

Cooling System Alternatives

Proposed Project

The efficiency of the steam-generating unit (boiler) and steam turbine affect the emissions of pollutants. Table 2.3-1 compares the efficiencies of the alternatives and shows that using a wet cooling system would provide the most efficient process for generating electricity along with the least amount of air emissions. The proposed Project has 0.15 percent lower impacts to air quality than the original Project that was proposed in the May 2006 Draft EIS (see Alternative 1 in Section 2.5.2.1 under Cooling Technology Alternatives Eliminated in this Final EIS) for SO_2, NO_X, CO, PM, mercury, and CO_2. Although the air emissions would be less under the proposed Project, the modeling completed for the PSD Permit would still be applicable. With 0.15 percent lower air emissions for the proposed Project, there would be no substantial change to the results of air modeling noted above.

Alternative 3

A description of Alternative 3 is in Section 2.3.1, and includes wet/dry cooling technology. The discussion of impacts from regulated pollutant emissions from the proposed Project is applicable to Alternative 3. However, using a wet/dry cooling system would result in a slightly higher heat rate (lower efficiency) because of auxiliary electrical loads and steam turbine generating unit design requirements associated with the dry cooling process. As shown in Table 2.3-1, Alternative 3 would have lower efficiency, and estimated CO_2 emissions would be approximately 8.7 tons per hour more than the proposed Project. On an annual basis, this would be about 76,000 more tons per year of CO_2 compared to the proposed Project. Emission of other pollutants would be proportionally higher on a pounds per kilowatt-hour produced.

Construction Impacts

Construction Impacts are the same for the proposed Project or Alternative 3.

Plant and Ancillary Facility Construction

Construction of the proposed plant has the potential for short-term impacts on air quality in the immediate area around the site. Diesel exhaust from construction vehicles and dust from site preparation and construction vehicle operation can affect local air quality during certain meteorological conditions. However, these instances would only occur during the period of construction. SMM Air-1 through Air-4 would minimize these short-term impacts by controlling dust, vehicle emissions, and avoiding nuisance to persons, crops, and dwellings. Applying water to on-site roads used by construction equipment during dry periods would minimize fugitive dust and, as a result, short-term impacts related to construction activities would be less than significant.

Well Construction

Based on the results of the exploratory drilling described in Section 3.2.2.1, the proposed Project would require the construction of 7 to 14 permanent wells within the proposed groundwater areas. Local or regional drillers would drill the additional proposed groundwater production wells. Minor fugitive dust emissions could occur along dirt access roads from the positioning and removing of drilling equipment from drill sites and during drilling activities. These activities are short-term in nature and would only occur in the immediate area around these activities. SMM Air-4 requires contractors to minimize dust nuisances during construction activities and would apply to well construction activities.

Drilling equipment would use gasoline or diesel engines to power the equipment needed to drill the wells, resulting in minor emissions from internal combustion engines. Well testing activities may also use gasoline or diesel engines to power pumping equipment during short-term pumping tests, typically lasting up to four days. Drilling and testing activities are short-term, lasting only a few days at each location. SMM Air-2 requires construction equipment to operate efficiently to not cause excessive emissions. Application of SMM Air-2 would apply to all construction equipment for the proposed Project.

Construction at the proposed well sites includes other permanent facilities including a pre-engineered building, fence, access road, and electrical service for the groundwater pumps. Construction of the small pre-engineered building (i.e., a pumphouse, approximately 10 feet by 15 feet) would occur on a concrete slab surrounding the well, with a 50-foot by 50-foot fence surrounding the pumphouse. The pumphouse building would be weathertight and heated, and ventilated if appropriate. Each proposed well site would also have an access road constructed from the nearest County road and a distribution line constructed to supply power to the well pumps. The distribution lines would be either overhead poles or underground (or a combination of both), according to the preference of the service provider. Minor fugitive dust emissions could occur during the construction of these proposed facilities; however, these activities are short-term in nature. SMM Air-2 through Air-4 would apply to construction of permanent facilities at well locations. Once construction is completed and disturbed areas reseeded to blend with the surrounding vegetation in accordance with SMM Bio-5, the disturbed ground would no longer be susceptible to wind erosion, and fugitive dust emissions would cease.

Pipeline Construction

Proposed pipeline construction activities would include trenching that could result in minor fugitive dust emissions. Minor fugitive dust emissions could also occur when covering the piping placed in the trenches. Trenching equipment would use gasoline or diesel engines to power the equipment needed to perform the trenching and covering activities. These activities are short-term in nature. SMMs Air-2 through Air-4 would also apply to proposed pipeline construction activities.

Well and Pipeline Operations

During operations, infrequent maintenance activities would occur that might cause fugitive dust from vehicles using County roads and access roads to the well sites. These emissions would be consistent with general farming operations within the proposed groundwater areas and would not cause any measurable changes to regional air quality ratings.

Summary of Impacts

Overall, no air quality impacts exceed significance criteria, as presented in Section 4.1.1, for air resources. The long-term impacts from the proposed Project for NAAQS and PSD increment would be less than significant. The Grant County, South Dakota area is designated either “attainment” or “unclassifiable” for all criteria pollutants. Emissions from the proposed Project would not conflict with or obstruct implementation of any applicable air quality plan. Since the increase in criteria pollutant emissions would either be less than the PSD significance levels or well within the NAAQS and PSD increments, the proposed Project’s long-term and short-term emissions impacts on distant air quality areas that are not in compliance with the NAAQS is unlikely. In addition, visibility impacts to Class I and Class II areas would be less than significant. SDDENR is responsible for issuing a PSD permit for the proposed plant, and the PSD permit was issued on November 20, 2008. Through the permit application process and issuance of the PSD permit, the SDDENR has determined what emissions will be regulated from the proposed plant and specific control technologies and other conditions for plant operations. The Co-owners would be required to comply with these permit limits and conditions, and SDDENR would monitor emissions for the proposed plant and take regulatory action if conditions are not met. There would be no increase in NO_X or SO_2 emissions. Acid deposition is not expected to increase. Therefore, sulfur- and nitrogen-containing air pollutant emissions would not be detrimental to the acid neutralizing capacity of sensitive lakes in Class I areas. As such, any short-term and long-term residual impacts would meet regulatory requirements and would be less than significant.

Mercury would be controlled through concurrent controls of the fabric filter and WFGD system. In the Settlement Agreement (Appendix K, Volume III of the Final EIS), the Co-owners of the proposed Project have committed to expeditiously install emission controls technologies that are most likely to result in removal of at least 90 percent of the mercury emitted from the existing plant and the proposed Big Stone II plant. This would result in mercury emissions of approximately 81.5 lb per year from the combined plants (where reported emissions from the existing plant in 2004 were 189.6 lb of mercury), which would contribute mercury to the environment.

Western notes there is uncertainty and incomplete information associated with mercury deposition. Based on USEPA studies, facilities that emit higher fractions of uncontrolled oxidized mercury, especially vapor-phase mercuric chloride, are more likely to produce elevated levels of local mercury deposition than facilities that emit higher fractions of elemental mercury. If the USEPA study could be used as a guide then of the remaining 10 percent (after accounting for the 90 percent of mercury emissions that would be removed by the controls for the proposed plant) emitted into the atmosphere, approximately 36 percent of the particle-bound mercury and 68 percent of the oxidized mercury would be deposited locally, and the rest would diffuse vertically to the global cycle. Furthermore, even without this study and the mercury emissions data from the proposed and existing project, it is still possible to reasonably assess whether its mercury emission would increase or decrease in the surrounding area. With the implementation of the air pollution controls, satisfaction of the conditions of the Settlement Agreement, and compliance with the conditions of the air permit for the proposed plant, the rate of mercury deposition from the combined existing and proposed plants would decrease as a result of the proposed plant being constructed. Since mercury emissions from the existing and proposed plant combined would be lower than mercury emissions from the existing plant alone, it is reasonable to assume the mercury impacts in the surrounding area would also decrease.

Western concludes that the proposed plant would emit CO_2, which could have an undetermined effect on local, regional, or global climate change. Because numerous models produce widely divergent results, and there is insufficient information, Western is unable to identify the specific impacts of the proposed plant's CO_2 emissions on human health and the environment and believes that any attempt to analyze and predict the local or regional impacts of the proposed plant's CO_2 emissions on human health and the environment cannot be done in any way that produces reliable results. However, by obtaining offsets through a variety of methods, the Co-owners have agreed to offset 100 percent of the emissions of CO_2 from the proposed Big Stone II plant that are attributable to the generation of electricity for Minnesota consumers. This would result in the proposed plant having CO_2 emissions approximately equivalent to a natural gas-fired simple cycle unit (after obtaining offsets in accordance with Section 4 of the Settlement Agreement). However, the Co-owners and MnDOC have agreed that the offset requirements required by the Section 4.1 of the Settlement Agreement would continue only until Minnesota or Federal GHG rules are developed that apply to the proposed Big Stone II plant; or if such rules have not been adopted, the offset requirement would cease four years after the proposed Big Stone plant reaches it commercial operation date, as prescribed by Section 4.10 of the Settlement Agreement. The terms of the Settlement Agreement were included as a condition to the Certificate of Need, issued March 17, 2009. Without any offsets, emissions from the proposed Big Stone II plant would be 0.98 tons CO_2/MWh, which, per 2005 EIA projections, is approximately 17 percent lower than the average CO_2 emission rate for all U.S. coal-fired generation.

Construction and operation activities for the proposed wells, pipelines, and electrical distribution lines for the proposed Project or Alternative 3 would not exceed significance criteria for air resources. The proposed activities would not result in long-term impacts to air resources. Short-term impacts from fugitive dust and vehicle emissions would not exceed any State, Federal, or local air quality regulations and would not interfere with any regional air quality plan. Therefore, impacts to air resources from these activities would not be significant.

4.1.2.2 Transmission Corridors, Substations, and Other System Improvements

Constructing transmission lines within the proposed corridors, modifying substations, relocating the Canby Substation, and upgrading the Hankinson line also have the potential for short-term adverse effects on air quality in the immediate area around the construction sites. Diesel exhaust from construction vehicles and dust from site preparation and construction vehicle operation can affect local air quality during certain meteorological conditions. However, these instances would be limited in time and area of affect to the period of construction. The proposed corridors and the Hankinson line are in attainment areas or are unclassifiable for all criteria pollutants. Operation of construction vehicles is not expected to significantly affect ambient air quality. Applying water to disturbed areas would minimize fugitive dust.

SMM Air-1 through Air-4 would be employed during transmission line construction, substation modifications, and Hankinson line upgrades. These measures are intended to minimize short-term impacts generated by construction activities by controlling dust, vehicle emissions and other nuisance activities. Once construction is completed and SMM Bio-5 is employed, the disturbed ground would no longer be susceptible to wind erosion, and fugitive dust emissions would cease.

Residual impacts to air quality would not occur after initial construction activities. Short- and long-term impacts to air quality from constructing the proposed transmission lines, substation modifications, and Hankinson line upgrades would be less than significant.

Sulfur Hexafluoride Issues

SF_6 is used in electrical equipment such as circuit breakers. The Co-owners would have circuit breakers containing SF_6 at the Big Stone, Johnson Junction, and Canby substations. As described above in the discussion of GHGs in Section 4.1.2, SF_6 is another GHG listed by the IPCC. New electrical equipment containing SF_6 purchased for the proposed substation modifications would be factory tested to ensure there were no leaks of SF_6 gas. In subsequent years of operation, the equipment would be included in an on-going SF_6 emissions reduction program and regularly tested to detect possible SF_6 leakage. Leaking equipment would be repaired to ensure it is properly operated in order to minimize SF_6 leaks into the environment.

<u>Western SF_6 Program</u>

Western's Morris and Granite Falls substations currently have SF_6 gas-filled circuit breakers, and Western would install additional SF_6 breakers to interconnect the proposed Project. During operation of the new substation additions, authorized Western personnel would conduct periodic inspections and service equipment as needed. Properly trained maintenance personnel would monitor and manage the use, storage, and replacement of SF_6 to minimize any releases to the environment. SF_6 gas used in substation circuit breakers is contained in sealed units that are factory-certified not to leak. During inspections, equipment would be monitored for detection of leaks, and repairs would be made as appropriate.

In 2000, USEPA invited Western, along with other electric utilities, to take part in a voluntary program to reduce SF_6 gas emissions. Western determined the best way to participate was to develop an alternative plan to proactively find and stop SF_6 leaks rather than just report SF_6 emissions as is outlined in the USEPA program. Annually, Western evaluates equipment to locate leaks, and either immediately repairs them, or schedules repairs or replacement. An annual SF_6 emissions reduction report is prepared and reported to the USEPA.

<u>OTP SF_6 Program</u>

OTP participates in USEPA's SF_6 Emission Reduction Partnership for Electric Power Systems and also has plans in place for handling SF_6, with a goal of maintaining annual losses at less than two percent of system capacity. As part of its plan, OTP maintains a written policy establishing safe working practices for handling SF_6. The policy specifies procedures for inventory control, monitoring and reporting of annual usage, and methods for handling of SF_6 gas while servicing substation equipment. The policy prohibits voluntary discharge of SF_6 to the atmosphere.

4.1.3 No Action Alternative

Under the No Action Alternative, Western would not grant the Co-owners' interconnection request, and the U.S. Army Corps of Engineers (USACE) would not issue any permits to the Co-owners related to the proposed Big Stone II. Under the No-Build Alternative, the proposed Big Stone II plant would not be constructed. None of the impacts associated with the proposed Project would be realized, except for the Ortonville-Johnson Junction-Morris 115-kV transmission line (Corridor A), which would occur at a later date when the line is rebuilt. Since the emission controls for the proposed plant would not be constructed (that would have also controlled the existing plant's emissions), the reduction of certain emissions (mercury, SO_2, and total HAPs) at the existing plant would not occur, and emission levels at the existing plant would continue at current levels. No CO_2 would be produced by Big Stone II.

Under Sub-alternative 2, where the Co-owners would continue with the construction of the proposed plant and would seek alternate transmission capacity, the air impacts associated with the construction, operation, and maintenance of the proposed plant would likely be identical to those presented above. Any impacts to the air resource associated with the transmission component of the proposed Project would likely be similar to those presented as part of the potential impacts associated with the proposed Project, though their location is unknown.

4.2 Water Resources

4.2.1 Introduction

This section discusses impacts to groundwater, floodplains, and surface water[16] that would result from constructing and operating the proposed Project and includes an overview of water resource issues, describes impact assessment methods, and presents criteria used to evaluate the significance of impacts that may occur. Water resource regulatory programs are summarized and SMMs are referenced. Implementing the SMMs and complying with regulations and permit programs would reduce the occurrence and severity of proposed Project effects on water resources. Additional mitigation measures (if adopted) are identified that could be implemented to further reduce impacts. An assessment of impacts and their significance concludes the discussion of each issue.

Identification of Issues

Impacts to water resources may occur from constructing and operating the proposed plant, from constructing and maintaining transmission lines and related access features, from activities undertaken to modify existing substations, and from using groundwater as the source for back-up water supply for the proposed Big Stone II plant. Related concerns are that the available quantities of groundwater or surface water could be reduced and the quality of groundwater or surface water resources could be degraded. These effects could then reduce the availability or suitability of water resources for other

[16] Many of the impacts related to floodplains and surface water discussed in the Draft EIS would not occur because the 450-acre make-up water storage pond would not be constructed under the proposed Project. The 450-acre make-up water storage pond described in the Draft EIS would have removed about 0.8 square mile of contributing watershed area from the Whetstone and Upper Minnesota River drainages, including 65 acres of wetlands. With elimination of the make-up water storage pond and relocation of the cooling tower, these impacts to wetlands and runoff within the watershed of the pond would not occur.

beneficial uses. In addition, any floodplain modifications may constrict flows and increase the extent of flooding and flood damages.

Groundwater

- The proposed Project has the potential to contaminate groundwater by spills or leaks from equipment or materials storage, seepage from ponds, the disposal of coal combustion byproducts, or inadequate sanitation practices. This issue primarily relates to constructing and operating the proposed plant and ancillary facilities, but also pertains to construction and maintenance activities along the transmission line corridors.
- The consumptive use of groundwater as a back-up water supply has the potential to affect the availability of groundwater supplies in the local area for other beneficial uses.

Floodplains

- Constriction or modification of flow conveyances could occur, and may result in increased flooding and flood damage from stream crossing approaches or structures such as culverts, towers, or pads.
- Accelerated bank and channel erosion or sedimentation could be caused by equipment traffic, excavation, temporary crossing methods, or the development of permanent access across streams and adjacent lands.

Surface Water

- Reduced runoff water quality could be generated from disturbed sites, proposed plant site features, and adjacent areas as a result of construction activities and operation of the proposed Project.
- The proposed Project could modify drainage networks and change surface flows (magnitudes and/or timing), create channel and bank erosion, and increase sedimentation along streams affected by the placement of proposed Project components.
- Contamination of existing surface water resources could occur from spills or leaks from equipment or storage of petroleum products, lubricants, or hazardous materials. Water quality could be degraded by turbidity or other pollutant increases resulting from the disposal of coal combustion byproducts, dewatering discharges, channel disturbance, or discharges of construction materials or debris into streams, ponds, or lakes.
- Airborne plant emissions could cause local and regional surface water quality impacts such as acidification or increases in mercury concentrations.
- Lower lake levels at Big Stone Lake may result from increased power plant withdrawals, resulting in reduced flows from Big Stone Lake downstream to the Minnesota River.
- Increased consumptive use of surface water could reduce the availability of this resource for other uses.
- Agricultural water management features such as irrigation systems, terraces, ditches, and tile drains could be damaged during transmission line construction.
- Groundwater pumping could cause reductions in groundwater flow contributions to the total runoff of surface water resources. The reduced contributions of groundwater to

stream runoff could cause an extension in the period of natural stream flow reductions due to seasonal variation.

Impact Assessment Methods

Impacts to water resources were analyzed by collecting, reviewing, and making comparisons among an inventory of existing conditions, public scoping comments, regulatory provisions, and the specifics of the proposed Project. Numerous sources provided data and information about the existing occurrence, extent, uses, and quality of surface water and groundwater. Such sources included Federal and State, and local agencies, the internet, university libraries, Geographic Information System data, and other maps and private organizations. Federal Emergency Management Agency (FEMA) sources were accessed for floodplain information. Regulatory information was collected from the States of South Dakota and Minnesota, the USACE, USEPA, and the Co-owners. Barr Engineering Company (Barr) provided results and discussion about water balance modeling scenarios for Big Stone Lake and prepared the groundwater modeling studies for the proposed pumping of groundwater. Data and information for the existing power plant and the proposed Project were provided by the Co-owners.

State and Federal regulatory programs in the proposed Project area have a substantial role in impact assessments. Numerous agency programs, regulations, and guidelines exist to protect and manage water resources in South Dakota and Minnesota. Interaction with agencies, compliance with applicable regulatory programs, and adequate responses to recommendations or permit stipulations on the part of the Co-owners would minimize or mitigate impacts to water resources from the proposed Project activities. In addition, implementing SMMs as proposed for constructing, operating, and maintaining the proposed Project facilities (including transmission lines) would prevent or minimize impacts to water resources (Section 2.2.4).

In South Dakota, the SDDENR regulates dam construction and safety, water rights appropriations for industrial uses, safe drinking water, groundwater discharges, storm water discharges, wastewater discharges, spill reporting and cleanup, and surface and groundwater quality programs. Water pollution controls for surface and groundwater resources are promulgated under the South Dakota statutes, Chapter 34A-2. The South Dakota Waste Management Program within SDDENR regulates solid waste disposal permits under Administrative Rules of South Dakota 74:27. Permit requirements for landfills address siting considerations, surface and groundwater resources, liners, monitoring, and other aspects of landfill construction, operation, and closure. Additional proposed Project features, designs, and facility siting issues are subject to permit approval from the SDPUC. Spill reporting and cleanup requirements and groundwater quality and protection are regulated by SDDENR under the Administrative Rules of South Dakota 74:34 and 74:54, respectively.

Similarly, the Minnesota Pollution Control Agency (MPCA) oversees water quality programs (including construction storm water permitting) and discharge regulations in that State. Minnesota Statute Chapters 115.061 and 115E (the “Spill Bill”) require all applicable handlers of oil and hazardous substances to prevent and prepare for spills of these substances and to be ready to rapidly and thoroughly recover discharges. Within the Minnesota Department of Natural Resources (MnDNR), the Division of Waters administers water supply appropriations, floodplain management, and the Public Waters Work Permit Program, and maps public waters and wetlands under the Minnesota Wetland Conservation Act (WCA). Local government units—cities, counties, watershed management organizations, soil, and water conservation districts, and townships—implement the WCA locally. The Minnesota Board of Water and Soil Resources administers the WCA Statewide and the MnDNR enforces it through regulatory jurisdiction.

State-approved National Pollutant Discharge Elimination System (NPDES) permits for construction activities would be required for the construction phase of the proposed Project (Spangler, 2005; Livingston, 2005). Permit authorizations would apply to the control of storm water discharges and would not authorize discharges of regulated substances resulting from spills or leaks, mixed non-storm water discharges, or discharges having reasonable potential to generate violations of water quality standards. Major features of an approved NPDES Stormwater Construction Permit include a Notice of Intent describing the project setting and ownership and a Storm Water Pollution Prevention Plan (SWPPP).

Per SMM Water-2, an approved SWPPP would necessarily provide a thorough site description and define appropriate pollution control measures, maintenance, and inspections. Best Management Practices (BMPs) would be defined and implemented to prevent or reduce the discharge of pollutants to waters of the State. These may include erosion control and stabilization practices, structural practices to control and route drainage, good housekeeping, and administrative protocols. All control measures, including BMPs, materials storage practices, and a spill prevention and response plan, must be properly selected, installed, and maintained in accordance with manufacturer's specifications, good engineering practice, and defined protocols for response, records-keeping, and reporting. The SWPPP would be developed prior to the start of construction and implemented for all construction activity. With definition and implementation of controls, and compliance with the provisions and stipulations of an approved NPDES Stormwater Construction permit, impacts to surface water during this phase of the proposed Project would be minimal. After construction, the proposed plant would need to comply with South Dakota General Stormwater Permit for Industrial Activity.

Federal agencies also are involved in water resources regulations in both States. The primary Federal agencies involved are the USEPA and the USACE. Both South Dakota and Minnesota administer the USEPA water quality programs at the State level (see Appendix D, Volume III). Both the USEPA and USACE have additional regulatory authority under the Clean Water Act (CWA). USEPA has the Federal oversight role for the NPDES program, the CWA Section 401 Water Quality Certification program, Sections 303(d) and 316(b) programs (for "impaired water bodies" and cooling water intakes, respectively), and the Section 404 ("dredge and fill") program.

Under CWA Section 404, the USACE regulates all waters of the United States (WUS), which include jurisdictional wetlands, ponds, streams, and lakes, including those on private land. The USACE regulatory nationwide permit program for South Dakota is administered by the Omaha District through the South Dakota Regulatory Office in Pierre. The Minnesota program is administered by the St. Paul District as a Statewide general permit program.

The USACE Section 404 permitting process requires a Section 401 Water Quality Certification from both South Dakota and Minnesota and the attendant compliance with anti-degradation or non-degradation regulations (see Appendix D) for any discharge into WUS including wetlands.

Under Section 10 of the Rivers and Harbors Act of 1899, a USACE permit is required for work in, over, or under a navigable waterway of the U.S. The Minnesota River, including Marsh Lake and Lac qui Parle Lake, are the only navigable waters subject to USACE regulation under Section 10 of the Rivers and Harbors Act that occur within or near the proposed Project area. The St. Paul District, USACE, administers a Section 10 permit program.

In addition, the DOE mandates that floodplain management goals and wetland protection considerations be incorporated into its planning, regulatory, and decision-making processes (10 CFR, Parts 1021 and 1022). Floodplain management and other water resource programs are also administered within the local jurisdictions of county governments, watershed management districts, and soil and water conservation districts.

As described in Section 3.2, the Co-owners conducted hydrogeological investigation activities in the areas proposed for groundwater use that included the installation of 34 continuous-core borings using Rotosonic drilling methods. Two 2-inch diameter observation wells and two 12-inch diameter production wells were also installed. The Co-owners conducted aquifer tests (pumping tests) at two groundwater production wells to collect data on the aquifer's response to pumping. The core borings, well installations, and aquifer tests supported the development of a numerical groundwater flow model of the regional aquifer system, which was calibrated to observed groundwater level conditions and subsequently used to predict the effects of pumping of proposed plant water-supply wells.

The surface-water model developed was based on historical climatological data and proposed plant water demand for a 70-year period with climatic conditions similar to the period between 1930 to 2000 (Barr, 2007b). The period between 1930 to 2000 included multiple drought and wet periods, including the extreme drought period experienced in the 1930s.[17] The historical 70-year period was the basis for predicting water levels in Big Stone Lake, with both the existing and proposed Big Stone plants operating at 88 percent of full output for a similar 70-year period. The climatological input parameters of the surface-water modeling resulted in predictions of the lake levels of Big Stone Lake on a weekly basis. Big Stone Lake was used as the source for plant water demands when Big Stone Lake water levels permitted withdrawals. During periods when lake levels did not permit surface-water withdrawal, a combination of water stored in ponds at the plant site and groundwater from the Veblen Aquifer was used to satisfy the water demands for the existing and proposed Big Stone plants. The surface-water model provided quantitative estimates of weekly groundwater demand for the 70-year period. These estimates of groundwater demand were used in the groundwater flow model.

The groundwater flow model of the Veblen Aquifer is a numerical simulation of groundwater flow conditions over approximately 1,000 square miles using the computer code MODFLOW.[18] Well logs from SDDENR were used to determine variations in aquifer thickness over the modeled area, as well as the core borings conducted as part of the Co-owners' hydrogeologic investigation. A conservative assumed recharge rate of one-inch per year was used in the groundwater modeling and applied over the entire 70-year modeling period, which conservatively addresses the range of actual recharge expected to occur in the wet and dry periods.

Detailed surface-water features were included in the model, such as Big Stone Lake, the Minnesota River, and the Whetstone River. The model was calibrated to groundwater elevations (as measured in borings and wells installed during the Co-owners' investigation and water levels reported in regional

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[17] While historical data was used in assessing the needs for the proposed Project, it included data that spans across some of the most severe drought conditions, including the worst conditions recorded in the 1930s. The period 1930 through 2000 was chosen because reliable climatological and hydrologic data were available and because this period is representative of drought, normal, and wet climatological conditions. The years 2001 through 2007 have been a period of somewhat wetter than normal conditions in the area of the proposed Project. While wetter than normal conditions may persist into the future, it was deemed more appropriate to assume that longer periods of drought, similar to those experienced in the historical record, would likely occur.

[18] MODFLOW (developed by the USGS) is widely used, extensively benchmarked, and widely accepted by scientific and regulatory entities. Additional description of MODFLOW may be found in Appendix M, Volume III.

well logs from the SDDENR), with greater emphasis placed on observations near the proposed Big Stone II well field. The model's ability to predict the groundwater inflow portion of baseflow into the Whetstone River was verified by comparing the model's results of baseflow to measured stream flows. Groundwater makes up the majority of baseflow during the months of January and February, and stream flow measurements taken in the Whetstone River during this period likely represent the range of natural groundwater inflows into the river. The range of stream flow values in the Whetstone River at Big Stone City during January and February for the period 1932 to 1988 ranged from zero cubic feet per second (cfs) to six cfs for 87 percent of the time. The model predicted approximately two cfs inflow into the Whetstone River under non-pumping conditions, which is within the range of measured values. Thus, the flow model was deemed to be a good predictor of the groundwater contribution to the baseflow of the Whetstone River.

The calibrated groundwater flow model was then used to predict the effects of pumping on groundwater levels, base flow contributions to the Whetstone River, and groundwater inflows to Big Stone Lake for a 55-year period between 1945 and 2000. The pumping rates used in this predictive simulation were obtained from the surface-water model. The total groundwater pumping was distributed among 14 wells. The groundwater modeling results were used to estimate the regional effects of future pumping and the approximate yields from proposed wells. The groundwater modeling results also aided in identifying adverse effects, if any, from the pumping of wells as a back-up supply of water for the proposed Big Stone II plant (Barr, 2007a; 2007c).

Significance Criteria

Groundwater

A significant impact on groundwater would result if any of the following were to occur from constructing or operating the proposed Project:

- Groundwater quality degradation that causes groundwater quality to violate State or Federal standards.
- Groundwater depletion or interference with groundwater recharge that adversely affects existing or proposed uses of the groundwater aquifer.

Floodplains

A significant impact on floodplains would result if any of the following were to occur from constructing or operating the proposed Project:

- Modification of a floodplain that would impede or redirect flood flows that would result in property damage on- or off-site.
- Construction within on-site waters or adjacent rivers that would adversely affect the capacity of the floodplain, or the pattern or magnitude of the flood flow.
- Increased scouring during a flood event that would result in structural or property damage.

Surface Water

A significant impact on surface water would result if any of the following were to occur from constructing or operating the proposed Project:

- Contamination of surface water from erosion or storm water runoff that would result in a violation of Federal and/or State water quality standards.
- Surface water quality degradation that would result from plant operations including air emissions.
- Reduced flows that would result in a long-term loss of human use.
- Alteration of the existing drainage pattern of the site or area that would result in off-site erosion or siltation.
- Surface water impacts that would violate Section 404 of the CWA or other applicable surface water regulations, including State-established standards for designated uses.
- Groundwater pumping that causes a substantial extension in the period of naturally occurring seasonal reduction of flow in surface water that results in insufficient quantities of water for downstream users, or endangered and special status species.

4.2.2 Proposed Project and Alternative 3

4.2.2.1 Big Stone II Plant Site and Groundwater Areas

The existing plant operates as a zero wastewater discharge facility. Site runoff discharges are permitted under existing Statewide General NPDES permit number SDR00A145 issued by SDDENR. In keeping with this approach, the proposed plant has been designed as a zero wastewater discharge facility, wherein no releases of industrial process wastewater would occur to WUS. Excess process wastewater would discharge to storage ponds. Water from the ponds would be re-circulated and re-used to the extent possible, and excess water would evaporate. Per SMM Water-2, storm water runoff would be detained on-site and released to existing drainages following application of BMPs, in compliance with the South Dakota NPDES programs corresponding to construction and industrial activities.
Figure 2.2-7 is a schematic of the preliminary water and wastewater mass balance developed for the proposed Project by the Co-owners, assuming a groundwater back-up water supply (Black & Veatch, 2006). Components of the wastewater and water supply systems for the proposed Project include the BSP II Pretreatment facility, a cooling tower, WFGD, and groundwater wells. In addition, as discussed in Chapter 2, approximately half of the existing evaporation pond would be modified to create a WFGD system blowdown pond. Elsewhere, new valves and piping would be installed to manage water.

The following sections discuss impacts to water resources from these new or modified features for the proposed plant (as shown on Figure 2.2-3). The analysis has been conducted with respect to existing conditions, the regulatory setting, and proposed practices that would avoid or minimize impacts.

Groundwater

Introduction

The information in this introduction is applicable to both the proposed Project and Alternative 3.

The existing plant does not use any groundwater. Under the proposed Project and Alternative 3, the industrial water supply for the proposed plant would consist of additional withdrawals from Big Stone Lake, supplemented by groundwater from the Veblen Aquifer. Groundwater would be used when sufficient quantities of water could not be pumped from Big Stone Lake. Groundwater would be treated in the BSP II Pretreatment facility and combined with surface water prior to entering the circulating water stream for the proposed Big Stone II steam cycle. The existing Big Stone cooling pond would store surface water supplies, as well as groundwater treated in the BSP II Pretreatment facility.

As described in Section 3.2, the Veblen Aquifer lies beneath the proposed plant site and the groundwater areas. The proposed plant site components would have an elevation of approximately 1,130 feet. Based on this general elevation and general aquifer water level data, the depth to groundwater (assuming unconfined conditions) is roughly 90 to 100 feet below ground surface (bgs) in most of the proposed plant site and as shallow as 20 feet below grade in the expanded groundwater area. Overlying geologic materials in the groundwater areas are primarily end moraine and ground-moraine tills having compact, silty, clay-enriched matrices with sand- to boulder-sized clasts (Barr, 2004b). These materials would limit seepage and chemical migration between the proposed plant site and underlying aquifer zones. Additional information on the Veblen Aquifer may be found in Section 3.2.2.1.

The brine sludge pond for the existing plant was expanded from approximately 2.0 acres to 9.1 acres in 2007 to accommodate the needs of the existing Big Stone plant. The expansion included installation of an engineered liner to protect groundwater resources. Following construction of proposed Big Stone II, the existing brine sludge pond would serve as the WFGD system blowdown settling pond. With the planned use of a zero wastewater discharge operation, no short-term or long-term water resources impacts from the use of the WFGD system blowdown settling pond are anticipated.

Bottom ash would be essentially dry when hauled to the existing ash disposal landfill. Additionally, fly ash would be handled as described in Chapter 2, and would also be disposed of in the existing ash disposal landfill. Runoff that currently collects near the existing landfill area would continue to be pumped out to the pond system or evaporated. Almost all of that surface runoff originates from off-site fields and woodlands in the landfill vicinity. Tritium analyses of deep H-series monitoring wells around the existing ash disposal site indicate that surface water and groundwater has not interacted since at least 1952 (OTP, 2005f). The existing landfill has approximately 10 years of additional capacity, and any new landfill facility would be required to comply with the design, construction, and operational requirements of South Dakota's waste management program. Features of the regulatory program include hydrogeologic considerations for siting investigations. Siting studies and the State permit approval process for any new landfill would minimize impacts to water resources. No impacts to groundwater resources are anticipated from additional ash disposal activities.

Proposed Water Uses

OTP, on behalf of the Co-owners, filed an application for a Water Appropriation Permit with SDDENR on March 28, 2007 (OTP, 2007c). Water Permit No. 6846-3 was approved by the South Dakota Water Management Board (SDWMB) on August 23, 2007 (SDWMB, 2007). The permit would allow the Co-owners to withdraw the groundwater needed for the proposed Big Stone II plant.

During typical operations, surface water from Big Stone Lake is proposed as the primary source of make-up water for both the existing Big Stone plant and proposed Big Stone II plant.

During periods when withdrawals from Big Stone Lake are restricted by permit (such as during a drought) or other operational constraints (such as maintenance at the lake intake structure), make-up water would be withdrawn from the existing cooling pond (see Figure 2.2-2). When Big Stone Lake and the cooling pond supply sources could not meet the plant needs, the cooling pond would be "topped off" with groundwater using the proposed groundwater supply system (wells and pipeline).

Modeling results showed at least one period of extended drought occurred during the historical modeling period, which would have resulted in water from Big Stone Lake not being available for use. Under these circumstances, the groundwater appropriation would become the sole source of water supply for both the existing and proposed Big Stone II plants. With the working storage volume in the existing cooling pond of approximately 3,500 acre-feet (af) and a maximum annual groundwater appropriation of 10,000 af, both the existing and proposed Big Stone II plants could operate at full output for about one year without withdrawals from Big Stone Lake. In addition to the maximum annual groundwater withdrawal of 10,000 acre-feet per year (afy), the Water Appropriation Permit authorizes a total beneficial use not to exceed 4,700 afy, averaged on a rolling 20-year period. Modeling showed that the groundwater appropriation alone would not be enough to operate the existing and proposed plants at full output levels after one year and power output would have to be curtailed, or the Co-owners could request a waiver of the appropriation limits from SDDENR, if an extended drought period were to occur.

The proposed Big Stone II plant would operate as a zero wastewater discharge facility where no releases of industrial process wastewater would occur to WUS.

Groundwater Treatment

Using groundwater to supply back-up water would create additional water treatment requirements due to chemical differences between surface water and groundwater. Water treatment is described in Section 2.2.1.4.

Groundwater Resource Evaluation and Testing Activities

A groundwater flow model of the Veblen Aquifer covering an approximately 1,000 square-mile area was prepared by Barr using the computer software MODFLOW and results of the hydrogeological investigation activities, and pumping test (Barr, 2007a and 2007c, see Appendix M, Volume III). The borders of the model include Big Stone Lake and the Minnesota River to the east, the Prairie Coteau to the west, and 10 miles to the north and 20 miles to the south of the proposed Big Stone II plant. The groundwater model was used to estimate the regional effects of future pumping, to estimate the approximate yields from proposed wells, and to aid in identifying adverse effects, if any, from the pumping of wells as a back-up supply of water for the existing and proposed Big Stone II plants. The model incorporates the thickness and depth information of other known Veblen Aquifer data from existing wells within the modeled area. The results of the groundwater modeling indicate that the Veblen Aquifer is a confined aquifer where a thick sequence of surficial clay overlies the aquifer. This occurs over large portions of the modeled area. In areas where a thin clay layer overlies the aquifer, or where a clay layer is absent, the Veblen Aquifer would be unconfined.

The groundwater model was able to show a sustained yield of 6,200 gallons per minute for a simulated period of one year from 7 to 14 proposed well locations that would be installed within the groundwater areas. The model demonstrates that the 10,000 afy groundwater appropriation for the existing and proposed plants could be met from these 7 to 14 proposed wells.

The model also considered recharge to the Veblen Aquifer. Recharge from infiltrating rainfall and snowmelt are the primary mechanisms for adding water to the Veblen Aquifer. In Minnesota, recharge rates of four to eight inches per year for groundwater modeling are commonly used (Barr, 2007a). In western Minnesota, recharge rates are estimated to be approximately two inches per year where surficial soils are clayey (Delin, 2007). Since there are no site-specific data available for recharge rates in the modeled area, the model used a conservative estimate of one inch per year, which would be well below the likely average recharge rate. Using a conservative recharge rate would generate a model with a larger predicted maximum drawdown area. The SDDENR prepared a report on the Co-owners' Water Appropriation Permit Application (SDDENR, 2007b). In their report, the SDDENR calculated the amount of recharge rate necessary to equal the average annual withdrawals of the appropriation applied for by the Co-owners (approximately 3,720 afy) plus withdrawals by the existing Grant County users (approximately 1,000 afy). According to the report, an average annual recharge rate of 0.34 inches per year would balance withdrawals for the proposed plants, assuming average annual withdrawals of 4,700 afy (SDDENR, 2007b).

Proposed Project

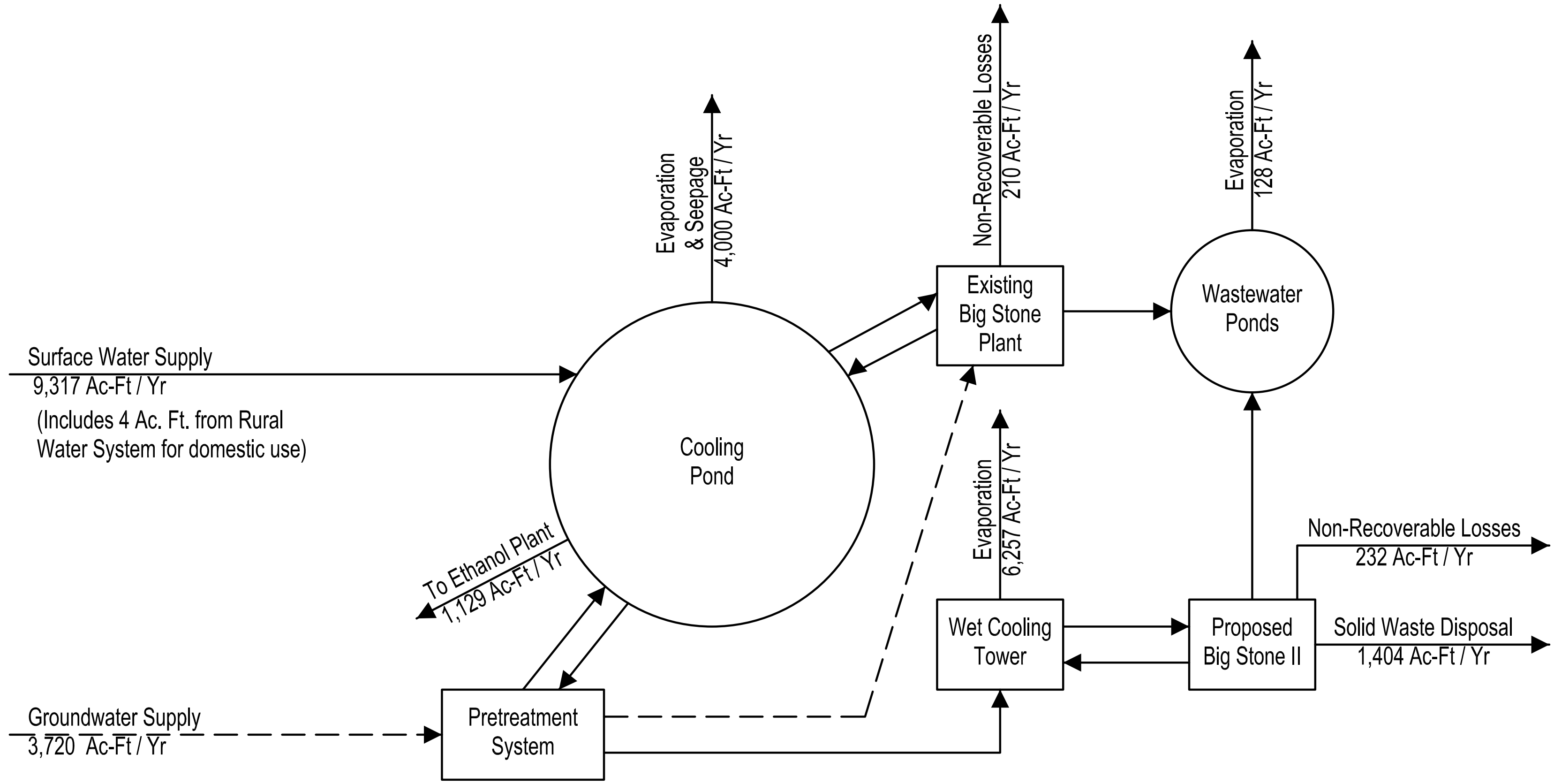
Groundwater Use

Detailed modeling of the annual water withdrawals from Big Stone Lake over a 70-year period was performed for the proposed Project, based on historical climatic conditions between the years 1930 and 2000 (Barr, 2007b). This modeling assumed the following input parameters:

- Existing plant and proposed Big Stone II plant combined annual consumptive water use of about 13,000 af, which includes an annual average groundwater appropriation of about 3,720 af.
- Available storage in the existing cooling pond of approximately 3,500 af.
- The order of appropriations from water supply sources would be (1) from Big Stone Lake, (2) from storage in the on-site ponds, and (3) from groundwater.
- Withdrawals to replenish the on-site ponds would first be from Big Stone Lake, followed by supply from groundwater.

The model predicts that the amount of groundwater required to annually operate the existing plant and the proposed Big Stone II plant ranged from zero af (4 out of 70 years) to 10,000 af (3 out of 70 years) and averaged 3,720 af. The modeling indicates that groundwater would need to be withdrawn from the Veblen Aquifer in 66 of the 70 years. For some years, the total water requirements exceed 13,000 afy and accounts for refilling the depleted cooling pond after drought years. This may occur when either surface water or groundwater is available, and there is storage available in the cooling pond.

Figure 4.2-1 illustrates the annual average water use modeled for both the existing and the proposed plants under the proposed Project using a wet cooling system for the proposed Big Stone II plant. The total combined water consumption would be approximately 13,000 afy for both plants, an increase of approximately 1,300 afy from the 11,700 afy stated in the Draft EIS. This increase is the result of a more detailed design for the proposed Big Stone II plant and the revised water management and water treatment plans for the proposed Project.



Notes:

1. Water supply inputs for groundwater and surface water are anticipated annual averages. Total water supply requirements for existing Big Stone plant and the proposed Big Stone II plant is 13,037 Ac-Ft / Yr. During times when supply from Big Stone Lake is prohibited, groundwater would be the sole water supply source with a total pumping requirement of approximately 6,200 gallons per minute.
2. Ac-Ft. / Yr = Acre - feet per year.
3. Water use volumes are approximate.
4. Groundwater supply is an intermittent back up source, as designated by dashed lines, for existing and proposed plants. Pretreated water will be further treated by proposed filtration, reverse osmosis and demineralization prior to entering the steam cycle (not shown).
5. Basis for the simplified diagram is Figure 2.2-6.

Big Stone II EIS

Figure 4.2-1
Proposed Project
Simplified Annual Average
Water Use Diagram
Wet Cooling System Alternative
with Back-up Groundwater Supply

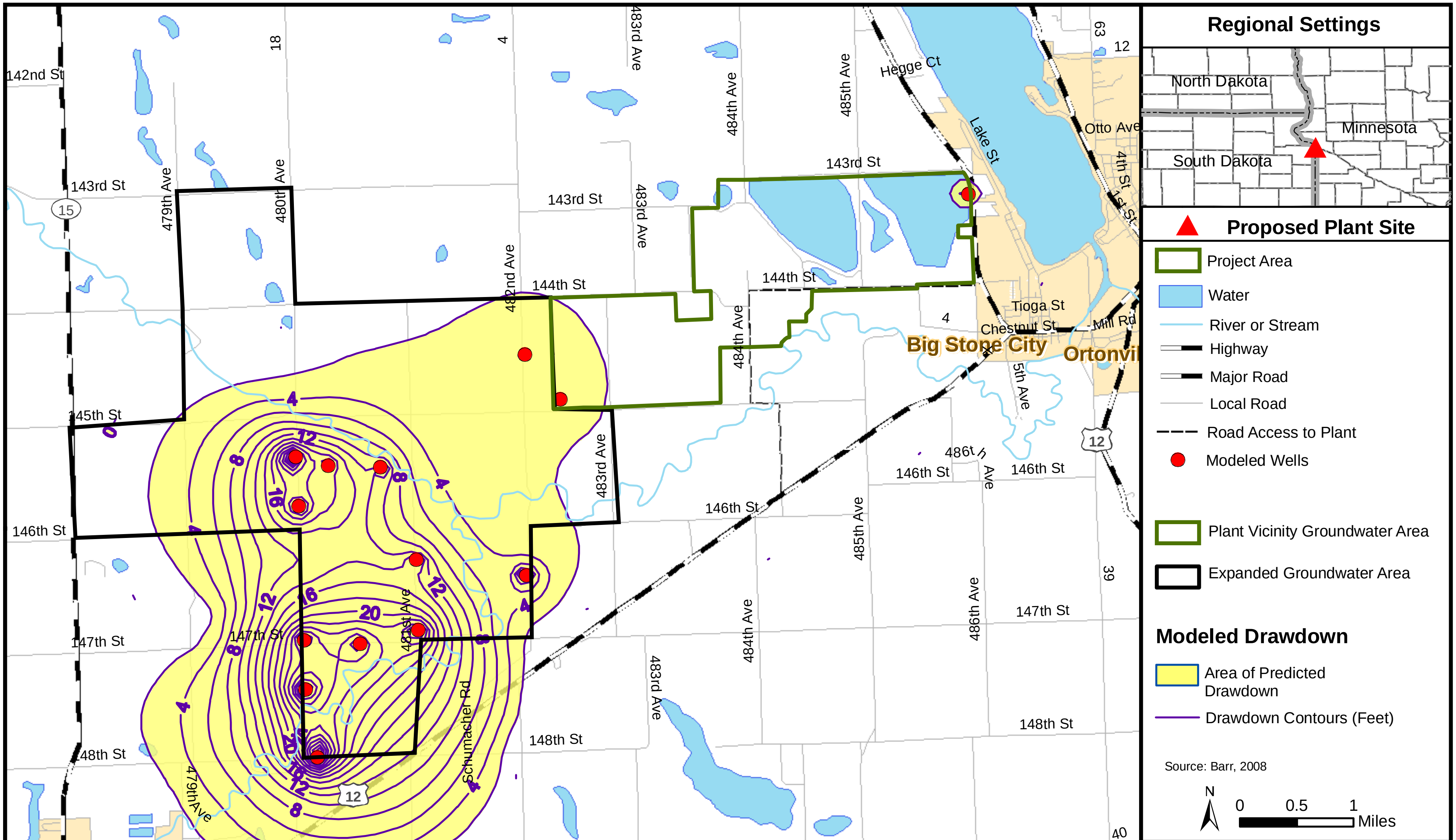
During proposed normal operations, the annual average surface water use from Big Stone Lake would be about 9,300 af and about 3,700 af from groundwater. During periods when water withdrawals are not permitted from Big Stone Lake, the proposed groundwater supply system would need to provide the majority of the existing plant and proposed Big Stone II plant needs. This could involve up to 10,000 af of groundwater over a one year period, assuming use of the on-site cooling pond for the remaining 3,000 af. During extended drought periods, groundwater appropriation limits would limit the full output operation of the proposed plant.

Groundwater Pumping and Production Impacts

As discussed in Section 3.2, the Veblen Aquifer is confined in some areas and unconfined in other areas. Hydrogeological investigation activities showed that some areas of the expanded groundwater area encounter shallow water table conditions in the unconfined portions of the Veblen Aquifer. In these areas, drawdown from proposed groundwater pumping would form a cone of depression at the surface of the water table in the vicinity of the wells. The amount of drawdown at a well is related to an aquifer's saturated thickness and the aquifer's hydraulic conductivity (i.e., a measure of an aquifer's ability to transmit water). Wetlands or streams with little or no clay beneath them may be in greater hydraulic contact with the water table. However, the results of the 82-hour pump test conducted on Well PW1-2 (see Figure 3.2-3) did not show any evidence of leakage effects or hydraulic connection with surface water bodies near Well PW1-2. The pumping test indicates that the Veblen Aquifer, overlain by 97 feet of clay at Well PW1-2, is a confined aquifer in this area, and is not in good hydraulic connection with the nearby Whetstone River (Barr, 2007a).

Figure 4.2-2 shows the predicted area of maximum drawdown of the Veblen Aquifer due to groundwater pumping for the proposed Project for the entire period of model simulation (55 years). The figure shows the greatest drawdown on the south side of the expanded groundwater area, where predicted drawdown of the Veblen Aquifer is approximately 37 feet. Since relative distribution of pumping for all wells was held constant in the model, the predicted drawdown in the figure reflects anticipated aquifer characteristics of lower hydraulic conductivity and/or thinner aquifers within the areas of greatest drawdown. Groundwater modeling indicates that predicted drawdowns of the Veblen Aquifer would not cause reductions in yield for wells near Milbank and areas to the south. Additionally, groundwater pumping for the proposed Big Stone II plant would not impact the aquifers within the Lake Traverse Indian Reservation of the Sisseton-Wahpeton Oyate (approximately 23 miles west of the proposed Big Stone II plant).

All types of groundwater models have some level of uncertainty associated with prediction. The sources of uncertainty derive primarily from the inherent unpredictability of geologic conditions. Installation and logging of continuous-core borings, inclusion of well-log data, performance of pumping tests, and automated calibration of the groundwater model serve to reduce this uncertainty. The groundwater model's predictions of maximum drawdown are most sensitive to the estimates of hydraulic conductivity (permeability) of the Veblen Aquifer in the vicinity of the proposed pumping wells. If values of hydraulic conductivity are two-times less than calibrated values, the maximum predicted drawdown would increase from 37 feet to 52 feet, but the areal extent of the drawdown would not change. The model is also sensitive to recharge rates. If recharge rates are decreased in the model from 1.0 inches per year to 0.5 inches per year, the maximum predicted drawdown would increase from 37 feet to 40 feet.



Big Stone II EIS

Figure 4.2-2

Predicted Area of Maximum Drawdown, Proposed Project

The Water Appropriation Permit would allow the Co-owners to withdraw the groundwater needed for the existing and proposed Big Stone plants and the existing ethanol plant. The SDDENR independently evaluated the availability of groundwater from the Veblen Aquifer during their review of the Co-owners' Water Appropriation Permit Application. They prepared a report to the SDWMB recommending approval of the Co-owners' application (SDDENR, 2007b). In their report, the SDDENR concluded:

- There is a reasonable probability that unappropriated water is available from the Veblen Aquifer for this appropriation.
- The Veblen Aquifer in Grant County is a viable aquifer.
- The appropriation proposed by the Co-owners' application will not adversely impact existing rights.

The SDDENR calculated the amount of recharge rate necessary to equal the average annual withdrawals of the appropriation applied for by the Co-owners (approximately 3,720 afy) plus withdrawals by the existing Grant County users (approximately 1,000 afy). According to the report, an average annual recharge rate of 0.34 inches per year would balance annual average withdrawals of 4,700 afy.

Most homes in the drawdown area use municipal or rural water distribution systems for their primary domestic water supply. The SDDENR lists 22 private wells in its well database within the area of drawdown predicted by the groundwater model. These wells may be used for residential supply, crop irrigation, or livestock watering and range in depth from 25 to 202 feet according to the database. The Co-owners committed, as part of the South Dakota groundwater appropriations permitting process, to ensure that current uses are maintained by modifying wells as necessary or connecting users to the Grant-Roberts Rural Water System at the Co-owners' expense. Additionally, the Co-owners have committed to ensure that current agricultural well uses are maintained by modifying wells as necessary, in the event of impacts to agricultural wells.

The SDDENR concluded that the appropriation proposed by the Co-owners would not adversely impact existing rights. Water Permit No. 6846-3 was approved by the SDWMB on August 23, 2007 (SDWMB, 2007).

Construction Impacts

The Grant-Roberts Rural Water System currently supplies domestic water needed by plant personnel and is expected to be able to accommodate the increased domestic needs of personnel during construction and operation of the proposed plant. Alternatively, domestic needs of personnel for construction and operation of the proposed plant may be provided by Big Stone City municipal water system. Depending on location and need, a new well or wells may be necessary for short-term uses of groundwater during construction (e.g., at the concrete batch plant). These limited construction demands would only affect groundwater resources within the immediate vicinity of pumping. Minimal effects would occur only when the relatively small volumes of water needed are withdrawn and during the short time subsequently needed for aquifer water levels to recover within the small area affected by pumping.

The existing plant uses an on-site sanitary sewage treatment facility that would not be adequate for construction crews. The construction work force domestic waste (sewage) would be handled by one or more of the following methods: (1) holding tanks, (2) portable treatment facility, (3) waste collection tank/drain field, and/or (4) the Big Stone City municipal sewage treatment system. Design, construction, operation, and closure of such temporary facilities would occur following State regulatory requirements. No impacts to groundwater quality are anticipated from constructing or operating these facilities.

Impacts to groundwater from construction activities could occur from accidental discharges of chemicals or other materials. Construction activities that produce wastewater, including concrete batching and equipment washing, and the storage and handling of chemicals, trash, and other contaminants would be conducted in a manner to prevent wastewater and pollutants from entering streams, watercourses, lakes, or underground water sources in accordance with SMMs Water-3, -5, and -6. Additionally, SMM Water-2 requires construction activities to obtain a NPDES permit for construction of the proposed power plant. The NPDES permit process contains BMPs for spill prevention, control, and response. With these measures, no water quality degradation would occur, avoiding significant water quality impacts.

Section 2.2.1.5 describes construction activities for the proposed well sites and pipelines used to convey groundwater to the proposed plant. Impacts to groundwater from proposed well and pipeline construction activities could occur from accidental discharges of chemicals. To avoid spills during well drilling and pipeline construction, additional mitigation measure W-1, if adopted, would require the contractors to prepare plans to address the use of regulated substances, spill response, and compliance with State, Federal, and local regulations. The adoption of additional mitigation measure W-1 would minimize the adverse impacts from spills.

- **W-1.** The construction contractor would prepare a Pipeline Construction Work Plan consistent with industry standards and State, Federal, and local regulations. The plan would include protocols to address spill prevention, response equipment, guidelines for handling spills, and spill cleanup. The work plan would also require the construction contractor to check for underground utilities prior to construction and to provide flagmen to control traffic flow along county roads when needed.

With implementation of additional mitigation measure W-1 (if adopted), adverse impacts to groundwater quality from proposed well and pipeline construction activities would not be significant.

<u>Alternative 3</u>

Groundwater Use

The wet/dry cooling system alternative would also use a combination of surface water supply and groundwater supply. Generally, although the location and the total number of wells required for a wet/dry cooling alternative and the wet cooling alternative would be the same, the duration of pumping and the average pumping rate would generally be less for the wet/dry alternative.

The same modeling of the annual water withdrawals from Big Stone Lake was conducted for Alternative 3 as for the proposed Project (Barr, 2007d). This modeling assumed the following input parameters for Alternative 3:

- Existing plant and proposed Big Stone II plant combined annual consumptive water use of about 7,300 af, which includes an annual average groundwater appropriation of about 2,036 af.
- Available storage in the existing cooling pond of approximately 3,500 af.
- The order of appropriations from water supply sources would be (1) from Big Stone Lake, (2) from storage in the on-site ponds, and (3) from groundwater.
- Withdrawals to replenish the on-site ponds would be first from Big Stone Lake, followed by supply from groundwater.

The model predicts that the amount of groundwater required to operate the existing plant and the proposed Big Stone II plant using wet/dry cooling technology ranged from zero afy (6 out of 70 years) to approximately 6,984 afy maximum, which occurred in only one year out of 70. For some years, the total water requirements exceed 7,300 afy and accounts for refilling the depleted cooling pond after drought years. This may occur when either surface water or groundwater is available, and there is storage available in the cooling pond.

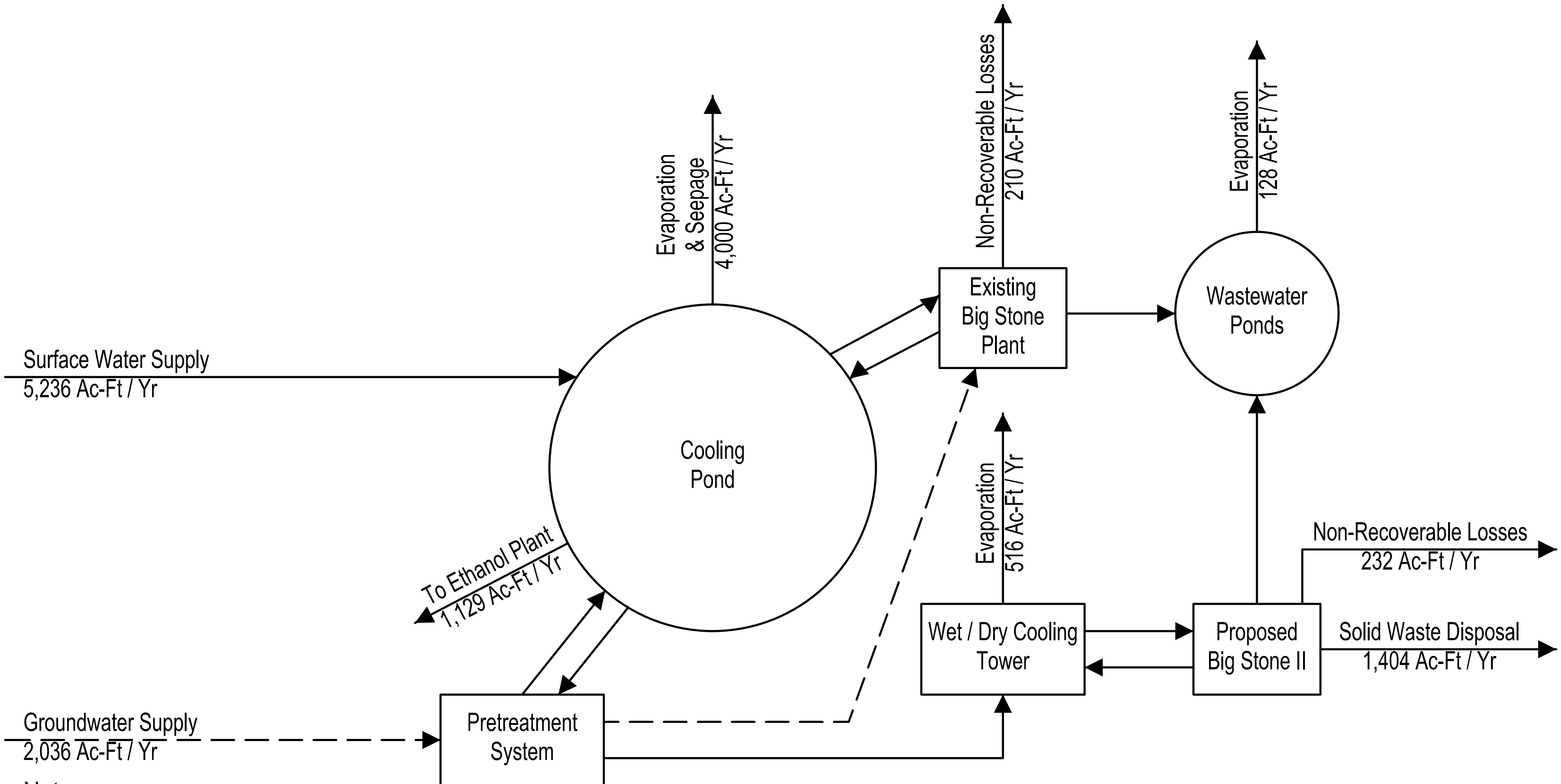
Figure 4.2-3 illustrates the annual average water use for both the existing and the proposed plants under Alternative 3 using a wet/dry cooling system for the proposed Big Stone II plant. The total combined water consumption would be approximately 7,300 afy for both plants, approximately 5,700 afy less than the proposed Project. The annual average surface water appropriation from Big Stone Lake would be approximately 5,236 af, and the groundwater appropriation would be about 2,036 af. During periods when water withdrawals are not permitted from Big Stone Lake, the groundwater supply system would need to provide the majority of the existing plant and proposed Big Stone II plant needs, which could involve approximately 3,800 af of groundwater over a one year period, assuming use of the on-site cooling pond for the remaining 3,500 af.

The frequency of groundwater supply system use to support the total plant water supply during periods of curtailed withdrawals from Big Stone Lake is reduced because of the lower consumptive use. According to modeling performed by the Co-owners, if the proposed Project uses a wet/dry cooling tower system, the groundwater appropriation limits would not limit the full output operation of the proposed plant during extended drought periods, and plant output would not need to be curtailed.

Groundwater Pumping and Production Impacts

The discussion of groundwater pumping and production impacts for the proposed Project is the same for Alternative 3, except modeling shows that the predicted maximum drawdown area for groundwater use by the wet/dry cooling alternative is about 55 percent of the area of maximum drawdown for the wet cooling alternative (Barr, 2007d). The predicted maximum drawdown of the Veblen Aquifer, also on the south side of the expanded groundwater area, would be approximately 24 feet.

As discussed for the proposed Project, all types of groundwater models have some level of uncertainty associated with prediction. Predictions of maximum drawdown are most sensitive to the estimates of hydraulic conductivity (permeability) of the Veblen Aquifer in the vicinity of the proposed pumping wells. The model is also sensitive to recharge rates. If values of hydraulic conductivity are two-times less than calibrated values, the maximum predicted drawdown would increase from 24 to 33 feet, but the areal extent of the drawdown would be unchanged. If recharge rates are decreased in the model from 1.0 inches per year to 0.5 inches per year, the maximum predicted drawdown would increase from 24 to 26 feet.



Notes:

1. Water supply inputs for groundwater and surface water are anticipated annual averages based on historical modeling. Total water supply requirements for existing Big Stone plant and the proposed Big Stone II plant is 7,295 Ac-Ft / Yr, which is 23 Ac-Ft / Yr more than the historical modeling results. During times when supply from Big Stone Lake is prohibited, groundwater would be the sole water supply source with a total pumping requirement of approximately 6,200 gallons per minute.
2. Ac-Ft. / Yr = Acre - feet per year.
3. Water use volumes are approximate.
4. Groundwater supply is an intermittent back up source, as designated by dashed lines, for existing and proposed plants. Pretreated water will be further treated by proposed filtration, reverse osmosis and demineralization prior to entering the steam cycle (not shown).
5. Basis for the simplified diagram is Figure 2.2-6.

Big Stone II EIS

Figure 4.2-3
Alternative 3
Simplified Annual Average
Water Use Diagram
Wet /Dry Cooling System Alternative
with Back-up Groundwater Supply

Construction Impacts

The discussion of power plant construction, well, and pipeline construction impacts for the proposed Project is the same for Alternative 3.

<u>Summary of Impacts to Groundwater</u>

With implementation of SMMs Water-2, -3, -5, and -6, and additional mitigation measure W-1 (if adopted), adverse impacts to groundwater quality from construction of the proposed power plant and well and pipeline construction activities would not be significant. Operating the proposed plant and groundwater well system would not degrade water quality within the affected area or violate State or Federal standards. The consumptive use of groundwater for proposed plant uses would not deplete groundwater supplies or interfere with groundwater recharge in the affected area in a way that would adversely affect existing or proposed uses of groundwater resources. The SDDENR concluded that the appropriation proposed by the Co-owners' application would not adversely impact existing rights and has imposed conditions to the approved Water Appropriation Permit that avoid adverse impacts to future groundwater resources (SDDENR, 2007b). The Water Appropriation Permit was approved by the SDWMB on August 23, 2007 (SDWMB, 2007). Short- and long-term impacts to groundwater resources from constructing and operating the proposed plant would not cause significant impacts to groundwater resources. During extended drought periods, plant output may be limited by the groundwater appropriation limit for the proposed Project, while it would not limit plant output for Alternative 3.

Floodplains

FEMA maps indicate that isolated flood hazard zones have been delineated (as determined by approximate methods) within the general area of the proposed plant site (Barr, 2004c). Based on topographic maps, these appear to be small, isolated depressions where excess local runoff would occasionally pond, rather than floodplains and alluvial features where open channel flow would occur. Some of these isolated flood hazard zones would be regraded due to construction of new facilities. No impacts to off-site floodplains are anticipated from construction activities or operations at the proposed plant. Since constructing and operating the proposed plant facilities would not constrict or modify flow conveyances or measurably add to flood flows, no significant or residual impacts would occur.

The proposed groundwater production wells would not be drilled or installed within any of the flood hazard zones mapped by the FEMA as outlined in Section 3.2.2.2. The proposed groundwater pipeline gathering system is still in design; therefore, the exact routes of pipelines connecting the proposed groundwater production wells to pipeline corridors have not been determined. However, short-term construction activities for water pipeline corridors within the expanded groundwater area would cross flood hazard zones associated with the Whetstone River, but these would be short-term construction activities. The proposed pipeline construction activities would not modify the floodplains or adversely affect the capacity of the floodplains, constrict or modify flow conveyances, or measurably add to flood flows. Therefore, these activities would not cause a modification of a floodplain or adversely affect the capacity or flow of a floodplain in the groundwater areas or increase scour during a flood event that would result in structural or property damage, and the proposed Project would not cause significant impacts to floodplains.

Surface Water

Surface water impacts from constructing and operating the proposed plant involve effects on water quantity and related water bodies, effects of groundwater pumping on surface waters, and effects on water quality. Surface water quantity impacts would occur at and beyond the proposed plant site.

Runoff and Surface Drainage and Construction Impacts

Runoff, surface drainage, and construction impacts are the same for the proposed Project and Alternative 3.

Proposed Plant Site

Impacts to surface water quantity and existing water features would occur at the proposed plant site primarily as a result of topographic modifications during construction. These impacts would include changes in watershed areas that contribute runoff to streams and ponds, corresponding modifications to streamflows, existing natural pond volumes and wetland hydrology, accelerated channel and bank erosion, and attendant downstream sedimentation.

The proposed plant expansion and associated construction laydown yard would be located near the Whetstone River. During construction, short-term runoff and erosion impacts would occur from excavation, equipment staging, vehicular access at the individual plant site components, and parking and laydown areas. Short-term impacts to water quality could result from spills, leaks, or improper disposal of construction materials or sediment and other contaminants carried in downstream runoff. As a result of BMPs implemented following the NPDES permit for construction activity (SMM Water-2), construction impacts to the river and on-site streams and ponds would be reduced to less than significant levels.

Groundwater Areas

The proposed groundwater activities (i.e., well drilling and installation, pipeline construction, and construction of electrical distribution lines) that involve equipment traffic or other disturbances within water bodies or on banks or shorelines, could create surface water impacts from erosion, turbidity, and sedimentation. Spills, leaks, or improper disposal of construction materials could degrade surface water quality. The potential for spills or leaks to contaminate surface water resources would be reduced by implementing SMM Water-6 and additional mitigation measure W-1, if adopted. If the 100-foot distance noted in SMM Water-6 is not practical, then the greatest feasible distance from such features would be used. Additional BMPs (such as "good housekeeping," approved storage practices, runoff controls, and sediment barriers) as identified in construction plans and any related issued permits would be employed to further protect surface water resources.

Construction of the groundwater pipelines and electrical distribution lines would require stream, wetland, and river crossings. The crossings could cause erosion to stream banks or contribute to stream turbidity. Depending upon the point of stream crossing, stream flow may be low enough for excavations to occur within the stream, followed by installation of the pipeline, and burial. These types of stream crossings would only be undertaken where it could occur with minimal impacts. Alternatively, using directional boring technology (i.e., under the stream) could also be considered when crossing a large stream. At those locations where it is necessary to cross wetlands, streams, or tributaries, crossing would be in compliance with the applicable USACE and SDDENR permit and mitigation requirements following procedures typical of utility water line installation. Any disturbances would be temporary, and any area disturbed would be restored shortly after construction in accordance with permit requirements.

Mitigation Activities During Construction

Short-term surface water impacts would be avoided or minimized by storm water pollution prevention planning and the implementation of proposed Project measures to control runoff, erosion, and sedimentation during construction activities. With diligent planning and implementation of control practices, compliance with any permit stipulations, and application of the Co-owners' proposed mitigation measures SMM Water-2 through -11, short-term impacts to surface waters from groundwater construction activities would be minimized.

Damage to ditches, tile drains, terraces, roads, and other features would be corrected as identified in proposed SMM Land-10, which stipulates that such features would be restored as nearly as practicable to their original condition.

After construction, runoff from surrounding watershed areas that previously would have drained across the proposed plant site would be routed around the proposed Project features. The coal delivery facility is the proposed plant component of primary concern for re-routing and control of upslope runoff. The coal delivery facility is a covered facility that would be designed to collect the coal dust as the coal is unloaded from the rail cars. The coal storage facility would be designed to control runoff and contain it on-site under the zero wastewater discharge program. Long-term operational impacts to surface water quality from storm water discharges would be avoided or minimized at the proposed plant site by complying with the NPDES General Permit for storm water discharges associated with industrial activity (SMM Water-12). Implementing SMM Water-2 and SMM Water-12 would reduce potential storm water quality impacts to less than significant levels.

<u>Proposed Project</u>

Plant Water Use

Increased consumptive use of water supplies is expected as a result of the proposed plant operations. These withdrawals would be required to operate the proposed steam turbines and other plant systems and make-up for losses due to evaporation from the plant cooling towers, WFGD system, and cooling ponds. Some evaporation would also occur at the WFGD system blowdown pond. The volumes evaporated would not be constant; they would vary with weather conditions and plant operations. Evaporative consumption for the existing plant averaged about 3,550 afy for the 11-year period from 1991 through 2001, and about 4,220 afy for the 1999 through 2001 interval (Barr, 2002). These rates can be reasonably expected to increase substantially as a result of the volume of water required for the proposed Big Stone II plant.

As described in Section 2.2.1.4, in a typical year the proposed plant would require an additional 8,800 acre-feet of fresh water, in addition to existing typical withdrawals of 4,200 afy for the existing plant (i.e., totaling approximately 13,000 afy for the combined plants under the proposed Project).

Based on detailed modeling, surface water alone would not meet proposed water supply requirements in 66 out of 70 years. During typical operations, surface water from Big Stone Lake is proposed as the primary source of make-up water for both the existing Big Stone plant and proposed Big Stone II plant. In accordance with permits, the existing plant operation can appropriate up to 110 cfs from the lake whenever water levels are greater than 967 feet. When the lake level is below this elevation, no appropriations are allowed from May through September, and up to 35 cfs are allowed between October and April (OTP, 2005b). If lower lake levels occur between October and April, allowable withdrawals are reduced to 10 cfs at elevation 966 feet, and are further reduced to zero at 965 feet. During periods when withdrawals from Big Stone Lake are restricted by permit (such as during a drought) or other operational constraints (such as maintenance at the lake intake structure), make-up water would be withdrawn from the existing cooling pond. When Big Stone Lake and the cooling pond supply sources could not meet the plant needs, the cooling pond would be "topped off" with groundwater using the proposed groundwater supply system (wells and pipeline). On average (as shown by Figure 4.2-1), this proposed water requirement would be composed of 9,317 afy from the Big Stone Lake surface water supply and about 3,720 afy from the groundwater supply.

As part of permitting the proposed Big Stone II plant, an application for a new Permit to Appropriate Water was made to the State of South Dakota on March 16, 2006, to increase the approved withdrawal amount by 10,000 afy from Big Stone Lake to a total of 18,000 afy.[19] This volume is necessary to satisfy existing and proposed plant needs through the most extreme of drought periods. The SDWMB issued Water Permit No. 6678-3 on November 1, 2006, which authorizes an additional 10,000 af of water annually from Big Stone Lake. The new permit includes the same withdrawal restrictions based on Big Stone Lake water levels and time of year as in the previous permit. Therefore, water withdrawals from Big Stone Lake would operate within the withdrawal restrictions of the permit for the existing plant, in accordance with SMM Water-1. Because the proposed Big Stone II Project would operate under the withdrawal restrictions, the increase in water withdrawals from the proposed Project would not impact the water quality improvement achieved by the Big Stone Lake Restoration Project and would not impact their long-term goal of an increased lifespan for Big Stone Lake.

Additionally, Water Appropriation Permit No. 6846-3 was approved by the SDWMB on August 23, 2007 (SDWMB, 2007). The permit would allow the Co-owners to withdraw a maximum of 10,000 afy of groundwater needed for the proposed Big Stone II plant, but not to exceed 4,700 afy, averaged on a rolling 20-year period.

<u>Summary of Water Use and Supply for the Proposed Project</u>

Three water appropriation permits have been issued to Big Stone. Two of the permits authorize a combined withdrawal of up to 18,000 afy from Big Stone Lake and one of the permits authorizes up to 10,000 afy of groundwater withdrawal from the Veblen Aquifer. However, this combined water appropriation of 28,000 afy under the three permits does not mean that 28,000 afy would be used. Under the proposed Project, the existing plant (including the existing ethanol plant) and the proposed Big Stone II plant combined annual consumptive water use would still average about 13,000 af, which includes an annual average surface water appropriation of about 9,300 af from Big Stone Lake and an average annual groundwater appropriation of about 3,700 af. Because occasional drought conditions could occur that could deplete the water stored in the cooling pond, the cooling pond may need to be refilled after those drought years, when either surface water or groundwater is available. Therefore, in some years, in order to keep the ponds full, there would be an occasional need to appropriate more than the average 13,000 afy consumptive use of the combined plants. The theoretical maximum combined appropriation of surface water and groundwater equals the sum of the existing and proposed plants' annual consumptive use (i.e., 13,000 af) plus the working volume of the water storage pond (i.e., 3,500 af). This theoretical result, 16,500 af, would require that the entire working storage volume of the storage pond was completely depleted at the beginning of the year (but would be filled to its working volume of 3,500 af by the end of the year). As shown by Figure 2.2-6, the modeled maximum annual combined surface water and groundwater appropriation would be approximately 16,200 af. Combined annual appropriations would exceed 16,000 af in three years of the 70-year

[19] The original surface water withdrawal permit issued for the existing Big Stone plant authorizes a withdrawal of 8,000 afy for the existing plant and the ethanol plant.

modeling period. The maximum annual surface water appropriation over the 70-year modeling period would be about 13,600 af and the maximum groundwater appropriation would be 10,000 af (three occurrences).

Effects on Big Stone Lake Levels and Minnesota River Flows

Extensive simulation and calibration of modeled lake levels over time, using historical agency measurements as modeling inputs and references, was used in a lake level and outflow evaluation by Barr (Barr, 2002). Slightly lower lake levels at Big Stone Lake are expected on rare occasions as a result of increased power plant withdrawals (Barr, 2007b). Study results indicate that if plant water withdrawals were increased to 13,000 afy with the existing cooling pond system storage volume of about 3,500 af, the worst effect would be that the lake would be 0.83 foot lower in two non-consecutive weeks out of a 70-year model period (as compared to a one-foot reduction under the Project that was proposed in the May 2006 Draft EIS). On average, over 70 years, the lake elevation would only decrease by 0.15 feet (Barr, 2007b). The study predicted very slight increases in the relative frequency of lake levels less than 964 feet (project datum), and very slight decreases in the relative frequency of lake levels between 964 feet and 967 feet. Essentially no change in the relative frequency of attaining the target recreational season pool elevation (968 feet project datum) would be expected.

Minimum lake outflows to the Minnesota River downstream are 20 cfs whenever the lake level is greater than 967 feet, which is the physical elevation of the silt dam. Due to the nature of the outlet controls and an associated silt dam, no water is available for release from Big Stone Lake to the Minnesota River when the elevation of Big Stone Lake is below 967 feet (project datum) (Rademacher, 2005). On average, the flow in the Minnesota River as measured at the gauging station downstream of the Whetstone River confluence, is approximately 98,000 afy (Barr, 2002). The proposed increase in water use (on the order of 8,800 afy) represents about nine percent of the average annual outflow from the lake. Reductions in flow releases from Big Stone Lake downstream to the Minnesota River would be expected as a result of increased plant withdrawals (Barr, 2007b). These reductions in flow releases are expected to be infrequent.

The occurrence of a noticeable flow reduction would depend on the interactions of a number of variables, including the timing and volume of existing and proposed plant withdrawals, seasonal and shorter-term runoff conditions, and other influences on lake levels. Modeling indicates that additional lake withdrawals would have little or no effect on an average annual basis or over most flow intervals. Using 2004 as an example, withdrawals for the existing plant were made in May, June, July, and November, with most withdrawals made in May (OTP, 2005f). All of these months, except November, are relatively high flow months on the upper Minnesota River and withdrawals are expected to have minimal effect. However, due to varying river and lake conditions and the possibility of storage withdrawals at other times, occasional reductions in outflows from Big Stone Lake would be expected. These may be particularly noticeable during periods of lower lake outflows and would be infrequent short-term impacts.

The key issue with respect to water withdrawals from Big Stone Lake is the impact on low flows (less than 80 cfs in the Minnesota River below Big Stone Lake). Except for the different sources of the back-up water supply, the water supply plan described in the Draft EIS and the proposed water supply plan under the proposed Project are nearly identical, and the impacts on the Minnesota River low flows are limited to less than two percent of the 2,800 low flow weeks modeled in the 70-year study period. This is because the surface water appropriations permit limits most lake appropriations to periods when the Minnesota River flows are relatively high (e.g., during spring runoff periods). These flow changes would occur for short durations and would not significantly impact fisheries and water quality in the Minnesota River. Further discussion of this issue for fisheries and other resources is presented in Section 4.4. The existing and proposed Big Stone II plants' combined surface water use for the proposed Project would reduce flows out of Big Stone Lake into the Minnesota River, but these reductions would be less than significant.

The combination of existing downstream water management features and hydrologic factors described in Section 3.2.2.3 would somewhat reduce the surface water effects from lake outflow changes. The USACE operates the Lac qui Parle flood control project downstream of Big Stone Lake. Over much of the river reach between the Big Stone Lake outlet and the Highway 75 Dam, normal flows are confined to an artificial channel. Immediately downstream of Big Stone Lake, the Big Stone Wetland Management District operates several smaller impoundments to manage wetlands and water contributed to them by agricultural drainage (USFWS, no date; USFWS, 2003). Uncontrolled seepage from Big Stone Lake as well as varying groundwater contributions also supply water to the Minnesota River reach downstream of the lake (Hansen, 1990). Farther downstream, incoming tributaries such as the Yellow Bank and Pomme de Terre rivers also add to the flow. Overall, the short-term impacts of infrequent reduction or cessation of lake outflows on downstream water resources are anticipated to be less than significant due to these downstream hydrologic factors and the water management infrastructure.

Groundwater flow modeling predicts that pumping of proposed wells would not cause a reduction in groundwater flows to Big Stone Lake or the Minnesota River (Barr, 2007c). As shown by Figure 4.2-2, the maximum drawdown of the modeled pumping wells does not extend to Big Stone Lake or the Minnesota River. The model also indicates that groundwater inflows into Big Stone Lake were not reduced during the 55-year simulation period.

Reductions in flow releases from Big Stone Lake downstream to the Minnesota River would be expected as a result of increased plant withdrawals (Barr, 2007b). The predicted reduction is not of sufficient magnitude to affect human uses of the Minnesota River. Therefore, the reduced flows would not cause a long-term loss of human use.

Effects on the Whetstone River

Rainfall runoff and snowmelt dominate the flows in the Whetstone River. Over the past 70 years, the months of April through July have typically had the highest flows in the Whetstone River, averaging 110 cfs. Only a very small portion of flow in the Whetstone River (about 1.8 percent of average flow) originates as groundwater inflows. The Veblen Aquifer is separated from most of the stream reaches of the Whetstone River either by low-permeability clay on top of the aquifer or an unsaturated zone where the elevation of the water table is below the Whetstone River. January and February are low-flow periods when surface-water runoff contributions are small and groundwater inflows dominate. The Whetstone River's flow at Big Stone City during January and February for the period 1932 to 1988 ranged between zero cfs and six cfs for 87 percent of the measurements. Several times over the past 70 years, extended dry conditions with low precipitation caused the water table to drop below the elevation of the Whetstone River, and there was no flow in the river.

The groundwater model (Barr, 2007c) was used to predict changes in base flows (i.e., groundwater contribution to streamflow) into areas of the Whetstone River within the groundwater area. Groundwater pumping, over time, is predicted to reduce the average groundwater flow into the Whetstone River by approximately 0.64 cfs (from a modeled 2.0 cfs to a modeled 1.36 cfs, or approximately 32 percent of total groundwater inflow). Because groundwater is a very small portion of total flow in the Whetstone River, this predicted reduction is approximately 1.3 percent of average annual stream flow and 0.5 percent of average stream flow during the months of April through July. The predicted reduction is not of sufficient magnitude to affect human uses of the Whetstone River. Therefore, the reduced flows would not cause a long-term loss of human use.

Historically, during dry periods or periods below-freezing when surface runoff from precipitation or snowmelt is absent, stream flows in the Whetstone River have fallen to very low levels (below 0.5 cfs). Over a 55-year period from 1932 through 1986, average monthly stream flows have fallen below 0.5 cfs 23 times (3.4 percent), typically occurring in the months of January, February, and September. Modeling indicates that decreases in the contribution of groundwater to base flow from pumping would cause the frequency of stream flows below 0.5 cfs to rise from 3.4 percent to 7.4 percent of the time, assuming that future climatic conditions are similar to past conditions. This would result in average monthly stream flows falling below 0.5 cfs approximately 48 times over the next 55 years. These low flow levels are within the historically-observed range of flow levels. The modeling indicates an increase in the frequency of very low flows, but it does not indicate flows lower than the low end of the observed range.

Airborne Contaminant Concerns

An additional water resource issue involves concerns about regional surface water quality impacts (including acidification and mercury concerns) from airborne plant emissions. Air emissions are described in Section 4.1.

There is no evidence that any of Minnesota's lakes, including 11 sensitive lakes that have been monitored since the mid-1980s, have been acidified by acid rain under existing conditions, which include the existing Big Stone plant (MPCA, 2002a). Review of soil survey information for the surrounding counties indicates that the majority of soils have relatively high base saturation, and are buffered against higher acidity levels as a result of clay content, organic matter content, and/or calcium carbonate accumulations. These conditions mitigate the potential for runoff to contribute to acidifying surface waters. SDDENR information shows the agency is not aware of any lakes in South Dakota currently being impacted by acid deposition. This is attributed to a lack of industrialization and a natural buffering capacity of the soils (SDDENR, 2004). Surface water quality impacts from acid rain or acid runoff caused by additional plant emissions would not occur.

As described in Section 4.1, the proposed emission limits for NO_X and SO_2 would maintain future emissions of NO_X and SO_2 from both the existing power plant and the proposed plant at levels no greater than the average emissions in 2003 and 2004 from the existing power plant.[20] The vast majority of nitrogen and other nutrient contributions to the lake result from municipal wastewater treatment and nonpoint runoff sources. The Big Stone Lake Restoration Project has done much to improve water quality, and long-term impacts to the lake from airborne emissions would be minimal. Therefore, the proposed Project would not conflict with the goals of the Big Stone Restoration Project.

Actual emissions of mercury from the existing plant in 2004 were 189.6 lb. The Co-owners commit to install technologies that are most likely to result in removal of at least 90 percent of the mercury

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[20] As shown in Table 4.1-2, projected actual NO_X emissions for the proposed plant are about the same as (or slightly less than) the 2004 actual NO_X emissions from the existing plant. However, with installation of new emissions controls if the proposed plant is constructed, projected actual emissions of SO_2 from the combined plants would drop to 2,000 tons per year from the 2004 actual SO_2 emission of 14,296 tons from the existing plant alone.

emitted from the existing plant and the proposed Big Stone II plant. This would result in mercury emissions of approximately 81.5 lb per year from the combined plants, which would contribute mercury to the environment. If the proposed Big Stone II plant is constructed (and after implementation of emissions controls), mercury emissions from both plants would be less than the emissions from the existing plant. As mentioned above, much of the lower the rate of mercury deposition from the combined existing and proposed plants would be due to a much higher fraction of mercury emissions from the proposed plant being in oxidized form given the installation of an SCR, and since the addition of the WFGD would remove a large portion of mercury in this form due to its solubility in water, emissions of oxidized mercury from the combined plants would decrease and, as a result, the rate of deposition in the vicinity of the Big Stone site would likely also decrease. Even though the Co-owners propose to install mercury controls, there are no current mercury regulations establishing criteria for protection of human health and the environment.[21]

However, the SDDENR does test for mercury in fish in South Dakota lakes and rivers in cooperation with the South Dakota Game, Fish & Parks Department (SDGFP). As a result of this testing, fish consumption advisories were put in effect (SDDENR, 2008a) for six lakes for healthy adults, children over seven, children under seven, and high risk groups (women who plan to become pregnant, are pregnant, or are breast-feeding). South Dakota does not list Big Stone Lake or the Whetstone River. The closest listed lake to the existing plant is Bitter Lake, approximately 39 miles west of the proposed plant. For the state of Minnesota, the MnDNR, the MPCA, and the Minnesota Department of Health (MnDOH) collaborate in producing the fish consumption advisory for Minnesota lakes and rivers. Fish from over 1,000 Minnesota lakes and streams have been tested for contaminants (MnDOH, 2008). Since nearly all of the mercury polluting lakes and rivers in Minnesota comes from uniform statewide atmospheric deposition, the MPCA prepared one total maximum daily load (TMDL) instead of many TMDLs for specific water bodies or watersheds. In preparing Minnesota's Statewide Mercury TMDL, MPCA established targets for reducing mercury pollution in Minnesota. The TMDL sets an annual air emission target of 789 lb and an annual water discharge limit of 24 lb for Minnesota sources by 2025. The air emission goal represents a 76 percent reduction from today's levels. The water limit is above current discharge levels by about 9 lb, allowing for some growth. Minnesota's TMDL report indicates that power plants are the main source of mercury emissions, but efforts to reduce emissions through the installation of control technologies and conversions of some plants has resulted in lower mercury concentration levels. Some coal plants have also switched to low mercury content coals to help reduce emissions. The report states, "Declines in mercury emission and deposition should result in reduced mercury concentrations in fish." It also states, "Because of long-range transport of mercury in the atmosphere, reductions in mercury air emissions outside of Minnesota will eventually lead to reduced mercury deposition in Minnesota and reduced contamination of Minnesota fish." Some mercury would still be emitted from both plants, and these mercury emissions would still bioaccumulate in fish and could affect those who eat fish and others who are exposed to mercury emissions from the proposed Project. However, the proposed Project would not cause an increase in the rate of accumulation of methylmercury concentrations in fish, although bioaccumulation of methylmercury would continue at a reduced rate. Further, according to information from the MPCA, declines in mercury emission and deposition should result in reduced mercury concentrations in fish (MPCA, 2007). The reduced rate of bioaccumulation, when considering the MPCA information,

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[21] The CAMR (intended to cap and reduce mercury emissions from coal-fired power plants) was vacated by Federal court in March 2008. See additional discussion in Section 3.1.2.

suggests that the lower mercury emissions from the existing and proposed plant could contribute to lower mercury concentrations in fish over time.[22]

Even with the implementation of air pollution controls for SO_2, NO_X, and particulates, satisfaction of the conditions of the Settlement Agreement, compliance with the conditions of the air permit for the proposed plant, and compliance with NAAQS, the existing and proposed plants would still have emissions that could impact water, but not at levels expected to exceed thresholds established by the State and USEPA for protection of human health and the environment.

Alternative 3

Plant Water Use

If Alternative 3, the wet/dry cooling alternative, was implemented, the total annual water requirements for the existing Big Stone and proposed Big Stone II plants would be reduced to approximately 7,300 afy. Because surface water from Big Stone Lake would not always be available when needed, the proposed water requirement would be composed of about 5,236 afy from the Big Stone Lake surface water supply and about 2,036 afy from the groundwater supply.

Effects on Big Stone Lake Levels and the Minnesota River Flows

With the total proposed water requirements of approximately 7,300 afy under Alternative 3 and average proposed surface water supply requirements decreasing to about 5,236 afy, the predicted impacts on Big Stone Lake, over a 70 year study period, are summarized as follows:

- On average, the Big Stone Lake elevation would decrease by 0.14 feet (compared to 0.15 feet under the proposed Project).
- The worst effect would be a lake elevation reduction of 0.58 feet in two non-consecutive weeks (compared to 0.83 feet under the proposed Project).

Similar to the proposed Project, impacts on the Minnesota River low flows for Alternative 3 are limited to less than one percent of the low flow weeks modeled in the 70-year study period due to water permit limits during high flows.

These short-term impacts of infrequent reduction or cessation of lake overflows on downstream resources would be less than significant.

Effects on Whetstone River

If the wet/dry cooling alternative was implemented, the impacts discussed under the proposed Project would be reduced but at a higher cost (see Table 2.3-1). The discussion under the proposed Project would be the same except for the following changes.

The groundwater model also predicted changes in base flows into areas of the Whetstone River within the groundwater areas for Alternative 3 (Barr, 2007d). Under Alternative 3, proposed groundwater pumping over time would reduce the average groundwater flow into the Whetstone River by

[22] Notwithstanding the reductions in annual mercury emissions that would occur, the proposed Big Stone II plant would likely achieve greater reductions in emission rates of certain specific types of mercury, or chemical species of mercury that would be more likely to enter surface waters. As a result, construction of the proposed Big Stone II plant can reasonably be expected to reduce the incremental rate of historical local mercury deposition. Refer to Response Paper A on mercury (Volume II).

approximately 0.30 cfs (from approximately 2.0 cfs to 1.70 cfs), or approximately 15 percent of total groundwater inflow. Predicted reduction in the Whetstone River flows is approximately 0.6 percent of average annual stream flow and 0.23 percent of average stream flow during the months of April through July for Alternative 3.

Modeling of Alternative 3 indicates that decreases in the contribution of groundwater to base flow in the Whetstone River from groundwater pumping would cause the frequency of stream flows that are below 0.5 cfs to rise from 3.4 percent to 5.3 percent of the time, assuming that future climatic conditions are similar to past conditions.

Airborne Contaminant Concerns

Impacts to surface water associated with airborne contaminants described under Alternative 3 would be the same as the proposed Project.

Summary of Surface Water Impacts

Impacts to surface water resources from constructing and operating the proposed plant would be reduced by implementing SMMs, by complying with regulatory programs and permit approval processes, and by implementing additional mitigation measure W-1 (if adopted). The existing and proposed Big Stone II plants' combined surface water use for the proposed Project would reduce flows out of Big Stone Lake into the Minnesota River, but these reductions would be less than significant. Although minor and infrequent residual effects on lake levels and outflows at Big Stone Lake would occur, these residual impacts would be less than significant. No impact on lake levels and outflows from Big Stone Lake are expected as a result of proposed groundwater pumping for the proposed Project or Alternative 3.

Minor episodic decreases in base flow to the Whetstone River would occur due to proposed groundwater pumping. However, the pumping would not cause a significant extension in the period of naturally occurring seasonal reduction of flow in surface water that results in insufficient quantities of water for downstream users. These impacts would be less than significant. The predicted reduction is not of sufficient magnitude to affect human uses of the Whetstone River and the Minnesota River. Therefore, the reduced flows would not cause a long-term loss of human use.

By implementing the SMMs, construction associated with groundwater activities would not result in a violation of Federal and/or State water quality standards, alter drainage patterns, or violate Section 404 of the CWA or other applicable surface water regulation due to erosion. Impacts to surface water during construction activities would be less than significant.

Even with the implementation of air pollution controls for SO_2, NO_X, and particulates, satisfaction of the conditions of the Settlement Agreement, compliance with the conditions of the air permit for the proposed plant, and compliance with NAAQS, the existing and proposed plants would still have emissions that could impact water, but not at levels expected to exceed thresholds established by the State and USEPA for protection of human health and the environment. Further, certain emissions (e.g., SO_2 and mercury) would be less if the power plant is constructed, since additional or improved emissions controls would also be installed for the existing plant.

4.2.2.2 Transmission Corridors, Substations, and Other System Improvements

Due to the surface nature of the proposed transmission line construction, substation modifications, relocation of the Canby Substation, and the Hankinson transmission line upgrades, impacts to surface water resources (as opposed to groundwater impacts), such as contamination from erosion, sedimentation, and runoff, would generally have the greatest potential to occur. However, groundwater quality impacts also may result from fluid spills or other pollutant discharges.

Water impacts in the transmission corridors, substations, and along the Hankinson line would be avoided or minimized by complying with the NPDES storm water permit for construction activities or the spill reporting and cleanup programs administered by North Dakota, South Dakota, and Minnesota (SMM Water-2 and -3). The NPDES storm water permit application and approval would include planning, implementing, and maintaining controls to avoid or minimize storm water pollutant discharges to waters of the State of South Dakota or to Public Waters of Minnesota. Co-owners' controls include prevention of stockpiling or depositing unprotected excavated materials near water resources (SMM Water-4), prevention of concrete batching wastewater from entering water resources (SMM Water-5), locating construction sites, transmission poles, and other features at least 100 feet from water resources (SMM Water-6), and limiting heavy equipment use near water resources (SMM Water-10). Controls required by the NPDES permit may be similar to, or more stringent than, the SMMs proposed by the Co-owners. In addition, regulatory requirements for spill reporting and cleanup are in place in both States. Compliance with Minnesota's "Spill Bill" would be required for spill reporting and notification for construction and operational activities in the State of Minnesota. The USACE CWA Section 404 permitting process and the CWA Section 401 Water Quality Certification from North Dakota, South Dakota, and Minnesota (as discussed in this section under "Impact Assessment Methods") apply to activities within the transmission corridors and, if applicable, the Hankinson transmission line right-of-way (ROW).

The proposed Project would require areas to be cleared for placement of transmission structures, laydown areas, pull sites, relocation of the Canby Substation, and potentially for substation expansion. The Hankinson line upgrades would involve limited site disturbances for structure modifications or replacements. These construction areas would discharge storm water runoff into the surrounding environment. In Minnesota, construction sites that discharge near special waters (waters with qualities that warrant additional protection) must employ additional BMPs and enhanced controls. Also, sites that discharge near an impaired water for which there is a TMDL load allocation for sediment and parameters associated with sediment transport (per the CWA Section 303(d) listing) must meet special conditions. Impaired waters in the proposed Project vicinity are described in Section 3.2.

SMMs are proposed by the Co-owners to reduce impacts to water resources. In addition to the controls for construction activities that would be part of the NPDES construction permit, measures are proposed to protect streams and other water resources. These include SMM Water-6 and -7 which address location of construction areas a distance of 100 feet from water resources, and SMM Water-8, which requires permits for perennial stream crossings, placement of properly sized culverts for new access ways, minimal disturbance of stream beds, and regrading and revegetation of disturbed areas. SMM Water-9 requires placement of culverts for crossings of streams with high and steep banks. Any narrow flood prone areas would be spanned (SMM Water-11).

By complying with permitting requirements from the agency programs described above, and by implementing the proposed SMMs, short- and long-term impacts to both surface water and groundwater resources from constructing or operating the proposed transmission lines, substations, and other system improvements would be avoided or minimized. Other impact considerations specific to a particular transmission corridor are discussed below.

Groundwater

The Co-owners have not identified any need for groundwater use during transmission line construction, substation construction, modification of existing substations, or other system improvements. Construction activities having a potential to impact groundwater would be limited to spills of fuel and oil.

The sensitivity of groundwater resources to potential pollution from surface sources has been studied on a regional basis by MnDNR, Division of Waters (Bradt, 2000). No comparable information has been found for the proposed Project region in South Dakota; however, available information indicates that similar geologic processes, materials, and aquifer characteristics occur in the proposed Project region on both sides of the Minnesota River valley (see Chapter 3). In the MnDNR assessment framework, broad categories of sensitivity were assigned to near-surface water table aquifers. These sensitivity ratings (Very High, High, Moderate, Low, and Very Low) were assigned on the basis of estimated ranges of vertical travel times from the surface to an aquifer target zone. This basis is supported by pumping tests, other hydraulic conductivity studies, and radiometric dating of isotopes from groundwater samples (Bradt, 2000). In the "Very High" category, estimated vertical travel times range from hours to months. These aquifers generally consist of coarse-textured stream sediments exposed at the surface. In contrast, vertical travel times in the "Moderate" category are on the order of years to decades. These generally include areas of less permeable glacial till and lake deposits. "Low" and "Very Low" categories consist of buried aquifer zones overlain by a sufficient thickness of low-permeability geologic materials. The integrity of wells constructed in these zones can affect their sensitivity by providing or preventing a contaminant migration pathway. Groundwater samples with carbon-14 age dates between 1,500 to 8,000 years before present support a Very Low sensitivity rating for aquifers more than 100 feet bgs (Bradt, 2000).

While the MnDNR study is regional in nature and does not support site-specific assessments, it is useful for generally characterizing and comparing the sensitivity of near-surface groundwater resources between proposed Project corridors. Additional factors in the assessment of potential groundwater impacts include State and local permit approval processes.

Corridor A

Within the proposed corridor, the Minnesota groundwater pollution sensitivity rating is "Very High" within the Minnesota River Valley (Bradt, 2000). Elsewhere within the proposed corridor, glacial till, and lake deposits overlie near-surface groundwater, and the sensitivity rating is "Moderate."

Corridors B and B1

Within the proposed corridors, the Minnesota groundwater pollution sensitivity rating is "Very High" within the Minnesota River Valley, and also in alluvial deposits along the Pomme de Terre and Chippewa rivers (Bradt, 2000). Large areas of surficial sand and gravel, as well as shallow Quaternary buried aquifers, occur in the vicinities of Danvers and Benson. The pollution sensitivity rating is "Very High" for these areas. Very highly sensitive zones also may occur eastward toward Willmar. Elsewhere within the proposed corridor, glacial till and lake deposits overlie near-surface groundwater, and the sensitivity rating is "Moderate."

Corridors C and C1

Within the proposed corridor, the groundwater pollution sensitivity rating is "Very High" within western Lac qui Parle County (Bradt, 2000), and similar sensitive groundwater resources are likely to occur in eastern South Dakota. Very highly sensitive areas occur in west central Yellow Medicine County, associated with the Lac qui Parle River headwaters. Alluvial aquifer zones along Spring Creek through central Yellow Medicine County are rated very highly sensitive to groundwater pollution as well. Similar very highly sensitive groundwater resources are located in the Minnesota River Valley and associated tributary drainages at Granite Falls. Elsewhere within the proposed corridor, glacial till and lake deposits overlie near-surface groundwater, and the sensitivity rating is "Moderate" (Bradt, 2000).

Within all proposed corridors, both South Dakota and Minnesota regulate waters of the State, including groundwater. Regulatory programs and statutes (e.g., Minnesota Statute 115E.02) are oriented to preventing the pollution of waters of the State, and include reporting requirements and cleanup of spills. Each State's NPDES program for construction activities requires a permit with associated plans and on-site activities for projects involving more than one acre, whether individually, or as part of an overall project. The States reserve the right to require a permit for projects affecting smaller acreages.

Implementation of SMM Water-3 and compliance with the reporting and cleanup requirements of South Dakota and Minnesota spill regulations would avoid or minimize impacts of construction and maintenance activities on groundwater resources within all of the proposed corridors, therefore, impacts would be less than significant.

Substations and other System Improvements

As described in Chapter 2, potential activities at substations may include transformer replacement, additions of new bays, rearrangement of existing equipment, upgrading other electrical and communication equipment, site expansions, or other activities as needed to accommodate transmission system modifications. Additionally, the Canby Substation would need to be relocated to a site approximately one mile northeast of the existing Canby Substation (located on Highway 75) because the existing Canby Substation is within the 100-year floodplain of Canby Creek. Structure modifications or replacements would be required along portions of the Hankinson line. These activities may include on-site use or storage of fuel or oil. Spills of these substances could contaminate groundwater at the substation locations and along the Hankinson transmission line.

By complying with State and Federal regulatory requirements and implementing the SMMs for activities at substations and along the Hankinson transmission line, no groundwater impacts are anticipated from substation modifications, the Canby Substation relocation, or Hankinson line upgrades; therefore, impacts would be less than significant.

Summary of Impacts to Groundwater

Construction and operation of the transmission lines, substations, substation modifications, and other system improvements would not degrade groundwater quality or violate State and Federal standards.

Floodplains

Potential impacts to floodplains from proposed transmission line construction and maintenance and the Hankinson line upgrades would be similar on all corridors. However, the location and extent of floodplains differ between corridors as described in this section and in Section 3.2. SMMs would be applied in floodplain areas on all corridors and along the Hankinson line, as would conditions resulting from Federal, State, and local regulatory permit processes. The assessments of potential short-term, long-term, and residual impacts to floodplains apply similarly to all the corridors, as does the suggested additional mitigation identified in this section.

<u>All Corridors</u>

Given the width of the floodplains, it is likely that construction activities and permanent installations would occur on them. However, the relatively small structural dimensions for transmission line towers would not provide sufficient cross section to obstruct overbank flows on river floodplains. Other constructed features (e.g., access road culverts) within smaller drainages may create flow obstructions and modify flood water surface elevations and velocities. If adopted, additional mitigation measure W-2 would reduce significant floodplain impacts to less than significant for all proposed transmission line construction and maintenance:

- **W-2**. If permanent culverts or other crossing structures and their approaches are placed in channels or on floodplains, the type of structure, its size, location, erosion protection, and timing of construction would be reviewed beforehand with landowners, USACE, applicable State agencies, and county floodplain management officials. Typical drawings may be used to depict the type of structure and related erosion control. This measure would apply to all such placements, whether on perennial, intermittent, or ephemeral streams. Shallow crossings that could be accomplished by fording would be located, designed, and stabilized in coordination with these same entities. Periodic inspections would be conducted at all permanent instream crossings, and maintenance and reporting would be conducted as needed. In addition, no buildings (e.g., substations, storage warehouses, or maintenance facilities) or enclosures would be located on delineated or approximated floodplains, low stream terraces, or shorelines.

The proposed construction activities would not modify the floodplains or adversely affect the capacity of the floodplains, constrict or modify flow conveyances, or measurably add to flood flows. Therefore, these activities would not cause a modification of a floodplain or adversely affect the capacity or flow of a floodplain in the groundwater areas or increase scour during a flood event that would result in structural or property damage, and the proposed Project would not cause significant impacts to floodplains. With the use of additional mitigation measure W-2, , if adopted, residual impacts to floodplains would be less than significant.

<u>Substations and other System Improvements</u>

With the exception of the existing Canby Substation, the substations do not occur within base-flood (100-year) special flood hazard areas as defined and mapped by FEMA. The Canby Substation would need to be relocated to a site approximately one mile northeast of the existing Canby Substation (located on Highway 75) because the existing Canby Substation is within the 100-year floodplain of Canby Creek. Any other modifications to substations would not occur within floodplains or in designated special flood hazard areas. There would be no change in flood flows, channel geometry, or floodplain conveyance as a result of modifications to substations. No impacts to such floodplains would occur from proposed substation modifications or the relocation of the Canby Substation. Upon completion of the engineering survey to determine which structures require modification or replacement along the Hankinson line, site specific environmental surveys would be conducted in accordance with the transmission-related SMMs. If the results of the site-specific environmental surveys determine that floodplains would be affected, SMMs would be applied. If adopted, additional mitigation measure W-2 also would be applied. With the use of additional mitigation measure W-2, residual impacts to floodplains would be less than significant along the Hankinson upgrade.

Surface Water

For surface water resources, the types of potential impacts from proposed construction and maintenance would be similar for all corridors, substations, and the Hankinson line upgrades. However, the occurrence and characteristics of surface water resources differ between corridors as described in this section, in Section 3.2, and as indicated in Appendix E. SMMs would be applied within all corridors, as would Federal, State, and local regulatory permit processes and any resulting stipulations. The assessments of potential short-term and long-term impacts to surface water resources apply similarly to all the corridors, as does the suggested additional mitigation measure W-2, if adopted.

<u>All Corridors</u>

Surface water resources in the proposed corridors are described in Section 3.2.3.3, and summarized in Tables 3.2-3 and 3.2-4. Table 3.2-3 shows that Corridor A has fewer stream miles within it than the other corridors, but contains a substantially larger area of lakes and Minnesota Public Waters. Corridor B has a larger concentration of perennial streams than Corridor B1, but a smaller concentration of intermittent streams. The number and acreage of lakes and Minnesota Public Waters within Corridors B and B1 are similar. Corridor C has fewer perennial and intermittent streams than Corridor C1. Also, because of its South Dakota portion, Corridor C has fewer Minnesota Public Waters. The overall acreage of lakes is approximately the same between Corridors C and C1. All proposed corridors would cross the Minnesota River and would be subject to USACE regulations under Section 10 of the Rivers and Harbors Act.

Locating transmission lines across rivers, streams, and lakes within these corridors would not directly create water resource impacts. All jurisdictional stream and wetland crossings would be constructed according to CWA Section 404 permit requirements and the Section 401 Water Quality Certification requirements, which would include mitigation requirements to prevent erosion, sedimentation, and disturbances of stream banks and other impacts. With careful route selection during the Minnesota permitting process, the larger lakes and most of the smaller lakes could be avoided or spanned. If route selection occurs within these water features, these crossings would also require permits which would stipulate mitigation requirements for any specific impacts.

Construction activities that involve equipment traffic or other disturbance within water bodies or on banks or shorelines, would create surface water impacts from erosion, turbidity, and sedimentation. Spills, leaks, or improper disposal of construction materials could degrade surface or groundwater quality. The potential for spills or leaks to contaminate surface water resources would be reduced by implementing SMM Water-6. If the 100-foot distance is not practical due to the spatial density of surface water features, existing topography, or the nature of the equipment, then the greatest feasible parking, washing, or storage distance from such features would be used. Additional BMPs (such as “good housekeeping,” approved storage practices, runoff controls, and sediment barriers) as identified in construction plans and any related issued permits would be employed at parking and storage locations to further protect surface water resources.

Short-term surface water impacts would be avoided or minimized by storm water pollution prevention planning and the implementation of proposed Project measures to control runoff, erosion, and sedimentation during construction activities. With diligent planning and implementation of control practices, compliance with any permit stipulations, and application of the Co-owners' proposed mitigation measures SMM Water-2 through -11, short-term impacts to major lakes and stream crossings within the proposed corridors would be minimized.

Damage to ditches, tile drains, terraces, roads, and other features would be corrected as identified in proposed SMM Land-10, which stipulates that such features would be restored as nearly as practicable to their original condition. Additional mitigation measures identified for consideration for soils (Section 4.3) and land use (Section 4.6) would, if adopted, minimize impacts to water-related agricultural features.

By implementing the SMMs, construction activities would not result in a violation of Federal and/or State water quality standards or violate Section 404 of the CWA or other applicable surface water regulation. Impacts to surface water during construction activities would be less than significant.

<u>Substations and other System Improvements</u>

Surface water impacts from substation modifications, the relocation of the Canby Substation, and Hankinson line upgrades would primarily be from water runoff and spills during construction as described for transmission line construction. Compliance with the SMMs, permit requirements, and reporting and cleanup requirements of North Dakota, South Dakota, and Minnesota spill regulations would avoid or minimize short-term impacts of construction activities on surface water resources at these sites. Implementing these procedures would reduce or eliminate any long-term impacts to water resources for these facilities. Impacts would be less than significant.

4.2.3 No Action Alternative

Under the No Action Alternative, Western would not grant the Co-owners' interconnection request, and the USACE would not issue any permits to the Co-owners related to the proposed Big Stone II. Under the No-Build Alternative, the proposed Big Stone II plant would not be constructed. None of the impacts associated with the proposed Project would occur to water resources, except along the Ortonville-Johnson Junction-Morris 115-kV transmission line (within Corridor A), which would occur at a later date when the line is rebuilt. The existing plant would continue to operate under current or renewed environmental permits as a zero wastewater discharge facility. Impacts to water resources would continue to occur such as water withdrawals from Big Stone Lake for the existing plant and the ethanol plant. Additional surface water withdrawals and groundwater pumping associated with the proposed plant would not occur.

Under Sub-alternative 2, where the Co-owners would continue with the construction of the proposed plant and would seek alternate transmission capacity, the water resource impacts associated with the construction, operation, and maintenance of the proposed plant would likely be identical to those presented above. Any impacts to water resources associated with the transmission component of the proposed Project would likely be similar to those presented as part of the potential impacts associated with the proposed Project, though their location is unknown.

4.3 Geology and Minerals, Paleontological Resources, and Soils

4.3.1 Introduction

This assessment focuses on impacts to geologic resources, including mineral deposits and paleontological resources, and to soils at the proposed plant site, the transmission corridors, substation sites, along the Hankinson line, and the groundwater areas. In addition, the potential effects of geologic hazards on the proposed Project are summarized. The discussion includes an overview of issues that may affect these resources, methods used to analyze impacts, the related significance criteria, and descriptions of proposed and additional mitigation measures (if adopted) that would reduce the occurrence and significance of impacts. A review of State and local programs that promote soil conservation and erosion control in South Dakota and Minnesota is also presented.

Due to the geologic setting and the nature of the proposed Project, most of this discussion centers on impacts to soil resources from proposed Project construction and maintenance activities. Impacts to wetlands and prime farmlands are described in Sections 4.4 and 4.6, respectively.

Identification of Issues

Geology, Minerals, and Paleontological Resources

No issues were identified for geological, mineralogical, or paleontological resources. Rock outcroppings protected by the State of Minnesota because of sensitive species habitat issues are described in Section 4.4.

Soils

Soil resources issues are primarily related to construction activities, but impacts may also occur during maintenance efforts, particularly along transmission line corridors.

- Soil disturbance from construction activities may result in accelerated erosion, compaction, and/or reduced agricultural productivity.
- Soil contamination may occur from spills of petroleum products, solvents, lubricants, or other chemical substances.
- Soil resources would be removed or covered within the footprints of proposed Project components.
- There may be disturbance of existing conservation practices, or interference with soil resource management programs developed under agricultural assistance contracts, particularly within the transmission line corridors and associated access routes.

Impact Assessment Methods

Geology, Minerals, and Paleontological Resources

Impact assessment was based on information from literature reviews and field surveys (HDR, 2005d). The information was reviewed to determine if potential impacts rose to the level of significance.

Soils

Impacts to soil resources were investigated by examining soil types, their extent, and physical and chemical characteristics in relation to the proposed Project. This was accomplished by reviewing the proposed Project description, published county soil surveys, and National Resources Conservation Service (NRCS) databases previously described in Section 3.3.

Runoff and erosion control practices would be required as part of the NPDES storm water permit approval process administered by SDDENR and the MPCA. A SWPPP would be required for construction activities under the NPDES program. A NPDES general storm water permit for industrial activities would be required for the proposed plant operation. Measures to control erosion and sedimentation and protect water quality are permit requirements under Sections 404 and 401 of the CWA, as administered by USACE, South Dakota, Minnesota, and the USEPA. SMMs are proposed by the Co-owners and Western as part of the proposed Project to control runoff and potential erosion and sedimentation (see Tables 2.2-8 and 2.2-9). Both South Dakota and Minnesota have spill reporting and cleanup regulations in place that would avoid or minimize soil contamination when implemented in combination with SMM Gen-1 and Gen-2 (see Table 2.2-8). Further discussion of related regulatory programs and proposed SMMs is presented in Chapter 2 and in the impact assessment for Water Resources (Section 4.2).

Soil conservation efforts in South Dakota and Minnesota are largely administered by local districts in cooperation with the NRCS, the South Dakota Association of Conservation Districts, the Minnesota Board of Water and Soil Resources (MBWSR), and related Federal programs. Examples of Federal programs that typically involve conservation planning, implementation, and contractual obligations between landowners and agencies include the following:

- Conservation Reserve Program (CRP) (Farm Service Agency (FSA))
- Wetlands Reserve Program (NRCS)
- Environmental Quality Incentives Program (NRCS)
- Sodbuster Program (NRCS)
- Conservation Compliance Program (NRCS)

A number of State programs with similar orientations also are in place. In South Dakota, Conservation District Law Section 38-8A provides enabling legislation for local guidance of erosion and sedimentation control. Under its Statewide planning framework for water and related land resources, Minnesota includes preventive or remedial measures to control or alleviate soil erosion and siltation of affected watercourses or bodies of water. County ordinances also are in place to administer soil and water conservation programs. In Minnesota, counties frequently administer the State Wetland Conservation Act through county ordinances, in cooperation with State agencies (notably MBWSR).

Within the proposed Project area, conservation districts that administer local programs in cooperation with State and Federal agencies include:

South Dakota:

- Grant County Conservation District (Milbank)
- Deuel County Conservation District (Clear Lake)

Minnesota:

- Big Stone Soil and Water Conservation District (Ortonville)
- Chippewa Soil and Water Conservation District (Montevideo)
- Kandiyohi Soil and Water Conservation District (Willmar)
- Lac qui Parle Soil and Water Conservation District (Madison)
- Stevens Soil and Water Conservation District (Morris)
- Swift Soil and Water Conservation District (Benson)
- Yellow Medicine Soil and Water Conservation District (Clarkfield)

Significance Criteria

A significant impact to geology, minerals, paleontological resources, or soils would result if any of the following were to occur from construction and operation of the proposed Project:

- Areas of geological importance are lost or made inaccessible for future use.
- Known mineral resources of economic value to the region or residents of the State are lost or made inaccessible for future use.
- Increases in the probability or magnitude of mass geological movement (e.g., slope failures, slumps, rockfalls).
- State-identified rock outcroppings of significance are adversely affected.
- Loss of or inaccessibility to scientifically important paleontological resources.
- Soil loss or accelerated erosion due to disturbance that results in the formation of rills and/or gullies, or that results in sediment deposition in downgradient lands or water bodies to the extent that existing uses cannot be maintained.

4.3.2 Proposed Project and Alternative 3

4.3.2.1 Big Stone II Plant Site and Groundwater Areas

Geology and Minerals

The impacts to geology and minerals are the same for the proposed plant site and groundwater areas. The geology and minerals in the vicinity of the proposed plant site and groundwater areas are described in Section 3.3. Glacial deposits cover bedrock throughout most of the proposed Project vicinity. No unique geologic features or State-designated outcrops occur within the proposed plant site. The proposed plant site and groundwater areas are located in an area not considered to be seismically active. While a few historic earthquake epicenters are located near the proposed Project area, the potential for strong ground motion from an earthquake is unlikely. Landslides rarely occur in the region because of the general low relief. As such, landslide-prone areas were not identified in the proposed Project vicinity. Karst formations are not present in the proposed plant site; therefore, the potential for sinkhole development, associated with karst, is unlikely. In summary, geological hazards are unlikely to impact the proposed Project area.

Crushed stone, sand, and gravel are important mineral commodities in the proposed Project area. Dimension stone is quarried from outcrops of the Milbank Granite; however, the nearest quarry is south of the proposed plant site. Mineral resources would not be precluded from development as a result of the proposed plant site construction.

There would be no significant impacts to unique geological features, mineral resources, or impacts resulting from geological hazards from the construction or operation of the proposed plant. No additional mitigation measures are needed.

Paleontological Resources

The impacts to paleontological resources are the same for the proposed plant site and the groundwater areas. As discussed in Section 3.3, there is low potential for the presence of scientifically important fossils at the proposed plant site; therefore, it is unlikely that paleontological resources would be adversely affected by construction of the proposed plant. Implementing SMM Geo-3 would prevent the inadvertent destruction of paleontological resources. With this measure, no impacts are likely to occur to paleontological resources. There would be no significant impacts to paleontological resources from constructing or operating the proposed plant.

Soils

Proposed Big Stone II Plant Site

The proposed plant would require excavating soils to construct facility components. Total area of soils disturbed for construction activities and proposed plant components is about 107.6 acres and comprises about four percent of the proposed plant site. Of this, about 80.1 acres would consist of short-term impacts from construction laydown areas and related parking. Proposed Project components would permanently remove approximately 27.5 acres of existing soils, none of which have related agricultural productivity value. Some or all of the acreage used during construction may be restored to agricultural uses, depending on the ultimate space requirements at the proposed plant. Additional relatively small acreage areas may eventually be required for other ancillary facilities or to configure property boundaries.

By implementing SMM Geo-2, topsoil would be salvaged from the facilities' footprints and construction sites and stockpiled for future use. Implementing SMM Geo-5 would require recontouring and revegetation of excavations to create stable slopes. SMM Bio-4 would be used to prevent unnecessary scarring of natural surroundings and vegetation at the construction site. Under SMM Water-2, storm water runoff and erosion controls would be developed on the proposed plant site under NPDES/SWPPP permit requirements for construction and industrial activities. Under SMM Water-3, soil contamination would be minimized by spill prevention, reporting, and cleanup practices required under SDDENR regulations. Using SMMs Geo-2 and Bio-5, stockpiled soil materials not used as engineered fill or landscaping would be replaced on disturbed areas when construction has been completed and disturbed areas would be repaired and reseeded.

The permanent removal of approximately 27.5 acres of soil would be a long-term impact. This would not be a significant impact, due to the stockpiling of topsoil and the extensive similar resources present in the vicinity of the proposed plant. Erosion control and recontouring practices, as described in the SMMs for soils and water and implemented in accordance with approved permits, would reduce impacts to less than significant. No additional mitigation measures are needed.

Groundwater Areas

Surficial soil disturbances that could result in the formation of rills or gullies or that could result in sediment deposition in downgradient lands or water bodies would occur during construction of the proposed wells and electrical distribution lines. Trenching activities would also be required to install the pipelines to carry the groundwater from the proposed well sites to the proposed plant. The impacts would be the same for the proposed Project or Alternative 3.

Well Drilling and Installation Construction

The total area of soils temporarily disturbed during proposed well drilling and installation activities would be about 0.25 acre per well site. Long-term impacts to proposed groundwater well site areas are based on a 10 feet by 15 feet structure to house the wellhead and equipment and a 50-foot by 50-foot fenced area around that structure, for a total of 2,500 square feet (approximately 0.06 acre). Each proposed well site would also have an access road approximately 50 feet long by 12 feet wide. Twelve of the fourteen proposed well sites would be near roads and would require only short access roads. Two of the proposed well sites are further out in agricultural fields, and would require access roads approximately 1,300 to 1,700 feet long.

Each proposed well site would incorporate storm water runoff and erosion controls to prevent soil loss or accelerated erosion in accordance with SMM Water-2. SMM Water-3 and additional mitigation measure W-1 (if adopted) would require minimization of soil contamination by implementing spill prevention, reporting, and cleanup practices required under SDDENR regulations. Under SMM Bio-5, disturbed areas would be repaired and reseeded to prevent erosion and contamination after construction activities. SMM Land-11 requires that all well drilling and installation be completed in agricultural areas or uncultivated pastureland at the edge of farm fields, avoiding impacts to center-pivot irrigation structures, and preventing erosion during discharges of groundwater during pump tests. No additional mitigation measures are needed.

Pipeline Installation

To the extent possible, pipeline routing would occur along the ROW of county roads and roads along section lines, and along well access roads in accordance with SMM Land-12. In atypical cases, limited segments of proposed piping could be placed outside of these ROW areas or buried in agricultural fields. Negotiations with landowners for easements across their properties would be required. Approximately 36.7 acres of soils would be temporarily disturbed during trenching and pipeline installation activities assuming 80,000 linear feet of piping and a 20-foot wide construction zone. With the implementation of SMM Water-2, storm water runoff and erosion controls would be implemented as appropriate along the corridors to prevent soil loss or accelerated erosion. In accordance with SMM Water-3 and W-1, the implementation of spill prevention, reporting, and cleanup practices required under SDDENR regulations would minimize soil contamination. Soil disturbance impacts would be temporary, and disturbed areas would be repaired and reseeded in accordance with SMM Bio-5. No additional mitigation measures would be needed.

Electrical Distribution to Wells

The local distribution company would perform construction and maintenance of the electrical distribution to power the proposed well pumps in accordance with their standard operating procedures. Generally, distribution lines would be constructed along the ROWs of county roads and along section lines. Most of the proposed wells would be located near an existing three-phase electric distribution network. In some cases, longer extensions of the distribution network may be required and may be outside of existing electrical distribution ROW, therefore, landowner easements would be required. Approximately 29.8 acres of soils would be temporarily disturbed during the erection of utility poles and stringing of overhead distribution line, assuming approximately 43,300 linear feet of new distribution line and a 30-foot wide construction zone. Some segments of the proposed distribution lines could be buried. Similar to well installation, impacts to soil would be temporary, and implementation of SMM Water-2 would prevent soil loss or accelerated erosion. SMM Water-3 and additional mitigation measure W-1 (if adopted) would minimize soil contamination, and disturbed areas would be repaired and reseeded in accordance with SMM Bio-5; no additional mitigation measures would be needed.

<u>Summary of Impacts to Soils</u>

Surficial soil disturbances would occur during construction of the proposed plant site. Proposed plant and groundwater system components would disturb a total of 189.4 acres of soils, of which 2.4 acres would be permanently removed from potential agricultural use. Implementation of SMM Water-3 would minimize impacts to soils due to spills. With the implementation of SMMs Bio-4, Bio-5, Geo-2, and Geo-5, the amount of soil loss or erosion that would result in the formation of rills or gullies, or that would result in sediment deposition in downgradient lands or water bodies would be reduced to less than significant. Under SMM Water-2, storm water runoff and erosion controls would be developed on the proposed plant site under NPDES/SWPPP permit requirements for construction and industrial activities.

Surficial soil disturbances would also occur during proposed well drilling and installation activities, during trenching activities associated with construction of proposed pipelines that would carry the groundwater from the well sites to the proposed plant, and during pole erection and line stringing activities associated with the construction of proposed electricity distribution lines to power the well pumps. Implementation of SMM Water-3 and additional mitigation measure W-1, if adopted, would minimize impacts to soils due to spills. With the implementation of SMMs Water-2, SMM Bio-5, SMM Land-11, and SMM Land-12, the amount of soil loss or erosion that would result in the formation of rills or gullies, or that would result in sediment deposition in downgradient lands or water bodies would be reduced to less than significant.

4.3.2.2 Transmission Corridors, Substations, and Other System Improvements

Geology and Minerals

<u>All Transmission Corridors</u>

No unique geologic features are located within any of the corridors. Potential geologic hazards such as seismicity, landslides, and sinkhole development associated with karst formation, are not present within nor are they identified in, the vicinity of any of the corridors. Therefore, there would be no impacts to unique geological features or impacts associated with geologic hazards as a result of constructing or operating a transmission line within any of the proposed corridors.

Corridor A lies within a glacial moraine and till that primarily consists of gravel, clay, silt, and sands. An inactive gravel pit is located adjacent to or slightly within Corridor A in Big Stone County, Minnesota.

The geologic materials in Corridors B and B1 are primarily glacial drift composed of till with a few areas of buried sand and gravel, increasing in thickness east of the Minnesota River. Several active and inactive gravel and aggregate pits, as well as a rock quarry are located within Corridor B. Several active and inactive gravel pits and a rock quarry are located within Corridor B1.

Corridors C and C1 primarily consist of glacial till with many surficial and buried sand and gravel lenses. Aggregate sites are primarily located in the vicinity of Granite Falls, Minnesota and the Cold Springs Granite rock quarry in South Dakota.

If adopted, implementing additional mitigation measure GM-1 would avoid mineral extraction activities to ensure future access, if needed. Transmission lines would also be routed to avoid State-designated rock outcrops protected by the Blue Devil Valley Scientific and Natural Area (SNA) within Corridors C and C1.

- **GM-1**. Transmission lines would be routed to avoid conflict with mineral extraction activities (e.g., active gravel pits and rock quarries), including access to these facilities that currently exist within the proposed transmission corridors. Also, lines would be routed to avoid State-designated rock outcrops.

By implementing additional mitigation measure GM-1 (if adopted), no residual impacts to geological resources are likely from constructing or operating a transmission line within any of the proposed corridors. There would be no significant impacts to geology and mineral resources from constructing or operating a transmission line within any of the proposed corridors.

Substations and Other System Improvements

Glacial deposits comprise the surficial deposits at the existing substations, the proposed area for the relocation of the Canby Substation, and along the existing Hankinson line. There are no unique geological features or State-designated rock outcrops at the substation sites. Potential geologic hazards such as seismicity, landslides, and sinkhole development associated with karst formation, were not identified in the vicinity of the substation sites; therefore, there would be no impacts to geological resources or impacts due to geological hazards. There would be no impacts with regard to geology and mineral resources as a result of the proposed Project-related activities at the substations, including the proposed Canby Substation. Upon completion of the engineering survey to determine which structures require modification or replacement along the Hankinson line, site specific environmental surveys would be conducted in accordance with the transmission-related SMMs. If the results of the site-specific environmental surveys determine any State-designated rock outcrops occur near any structure requiring modification or replacement, SMM Land-5 would be implemented to minimize disturbance the any outcrops.

Paleontological Resources

All Proposed Corridors, Substations, and Other System Improvements

There is low potential for the presence of scientifically important fossils within the proposed corridors, substations, the proposed area for the relocation of the Canby Substation, and along the Hankinson line; therefore, it is unlikely that paleontological resources would be adversely affected by constructing transmission lines and substation modifications. However, implementing SMM Geo-3 would prevent the inadvertent destruction of paleontological resources during transmission line construction, modifications at the substations, or during Hankinson line upgrades. Western's standard construction standard includes provisions for inadvertent discovery of paleontological resources. Therefore, significant impacts to scientifically-significant paleontological resources would not be expected to result from modifications to Western's facilities to accommodate the transmission line interconnections.

Soils

<u>All Transmission Corridors</u>

General soil inventories identified potential highly erodible soils and soils with severe natural drainage restrictions within each corridor. The actual amount of potentially highly erodible soils that would be encountered within the narrow ROW would be a fraction of that shown in Table 4.3-1. The actual amount is not known because the exact transmission line routes and associated ROW have not been determined. A smaller (but unknown) extent of soils with severe natural drainage restrictions probably occurs within each corridor as well, due to artificial drainage practices.

Table 4.3-1. Corridor Acreage for Soils Prone to Erosion, Rutting, and Compaction

Soil Type	Corridor				
	A	**B**	**B1**	**C**	**C1**
Potential highly erodible soils	2,310	2,650	2,650	7,000 – 8,000	7,000 – 8,000[a]
Soils particularly prone to rutting and compaction	35,300	99,000	104,600	94,800	88,250

[a]Information not available. Based on regional similarities and Minnesota soil inventories within Corridor C, it is reasonable to expect that 7,000 to 8,000 acres are potentially highly erodible in Corridor C1.

Source: USDA, 2006.

Transmission line construction within any of the proposed corridors would result in a temporary impact as well as permanent removal of soils. Table 4.3.2 quantifies temporary and permanent impacts for each corridor.

Table 4.3-2. Impacts to Soils for Each Proposed Corridor

	Corridor				
Impact (acres)	**A**	**B**	**B1**	**C**	**C1**
Temporary impact	254.5	495.6	503.3	538.2	563.8
Permanent impact	21.8	31	29.7	49	36.6

Source: USDA, 2006.

By implementing SMM Geo-2, topsoil would be salvaged from the transmission structure construction sites for future reuse. Runoff and erosion controls would be implemented under SMM Water-2 and NPDES/SWPPP permit requirements (including BMPs) for construction. Particular attention would be given to erosion and sedimentation controls at or near streambanks and along steeper slopes. Per SMM Water-3, soil contamination would be minimized by spill prevention, reporting, and cleanup practices required under SDDENR and MPCA regulations. Replacement of topsoil and damage to ditches, tile drains, terraces, and other agricultural features or conservation practices would be repaired and reseeded as part of SMM Geo-2, Geo-5, and Bio-5.

Soil rutting from construction activities would compact soil layers and restrict drainage and aeration necessary for plant growth. Deep ruts may interfere with cropping and drainage systems. Depending on weather and soil moisture conditions during construction, deep soil rutting may occur. Control and repair of soil rutting would be implemented under SMM Land-10.

Natural soil drainage classes particularly prone to rutting and compaction during much of the year include very poorly drained, poorly drained, and somewhat poorly drained soils. These soils are wet at or near the surface for significant portions of the growing season. Unless artificially drained or avoided, these soils would be particularly prone to soil rutting and compaction impacts. A substantial potential for soil rutting and compaction is anticipated in these areas. Implementing the SMMs would reduce the potential impacts from soil rutting and compaction to an extent that would be less than significant.

Since soil inventories used in the impact assessment are of a general nature and most of the proposed corridors are under intensive agricultural management, specific local expertise would be required to further identify the locations and extent of particular soil characteristics and related agricultural or site restoration practices, particularly with regard to erosion-prone sites and drainage considerations. Without further coordination with local soil conservation agencies, significant impacts to soils may occur as a result of unforeseen soil characteristics or related circumstances, leading to permanent removal of soils and related soil productivity. Because of this, additional mitigation measure S-1, if adopted, has been proposed.

- **S-1**. In addition to implementing the SMMs and other practices required by NPDES/SWPPP permits and spill control regulations, during transmission line design, the Co-owners would coordinate with the appropriate soil conservation district within each county or local area as necessary to incorporate specific local knowledge of existing soil conditions and drainage management practices within a locale, and to further develop site-specific mitigation measures as needed (such as means of traversing or avoiding steep slopes) and site restoration programs (including goals, practices, and materials) for a particular area.

If adopted, implementing additional mitigation measure S-1 would reduce the potential for soil impacts to less than significant.

<u>Substations and Other System Improvements</u>

Small areas of soils may be permanently removed during proposed modifications at substations, at the relocated Canby Substation (about 8.3 acres), and during Hankinson line upgrades. Minor impact would occur if expansion of substations would be required. Protections regarding storm water runoff and erosion controls, spill prevention, replacement of topsoil, and repair of damage and reseeding would be implemented within the substation areas and at affected Hankinson line structures. Soil disturbance or removal within these sites would create less than significant impacts to local and regional soil resources.

4.3.3 No Action Alternative

Under the No Action Alternative, Western would not grant the Co-owners' interconnection request, and the USACE would not issue any permits to the Co-owners related to the proposed Big Stone II. Under the No-Build Alternative, the proposed Big Stone II plant would not be constructed. None of the impacts to geological, mineral, paleontological, and soils resources would occur, except for the Ortonville-Johnson Junction-Morris 115-kV transmission line (Corridor A), which would occur at a later date when the line is rebuilt. Except for rebuilding the Ortonville-Johnson Junction-Morris 115-kV transmission line, soil resources that are highly erodible or that have substantial natural drainage limitations would not be affected. Existing resources would continue to be lost as a result of other activities in the region where land uses would change from agricultural to urban/industrial.

Under Sub-alternative 2, where the Co-owners would continue with the construction of the proposed plant and would seek alternate transmission capacity, the impacts associated with the construction, operation, and maintenance of the proposed plant would likely be identical to those presented above. Any impacts to the geological, mineral, paleontological, and soil resources associated with the transmission component of the proposed Project would likely be similar to those presented as part of the potential impacts associated with the proposed Project, though their location is unknown.

4.4 Biological Resources

Impacts to biological resources from constructing and operating the proposed Project are addressed in this section. Biological resources include vegetation, wildlife, fisheries, special status species, and wetland/riparian areas. This section identifies the issues associated with construction and operation of the proposed Project relative to the existing environment, the methods used to assess impacts on biological resources, and the impacts expected to occur. Figure 2.2-4 shows the areas studied for impacts to biological resources for the proposed plant site and associated with the use of groundwater for the proposed Project.

4.4.1 Introduction

Identification of Issues

A number of issues were considered in assessing the environmental consequences of the proposed Project. Those issues were raised by resource agencies or the public during scoping or were included by the technical experts preparing this section. The issues are summarized in the following paragraphs.

<u>Vegetation</u>

Issues related to vegetation impacts for all areas of construction and operation include:

- Habitat alteration, soil compaction, and surface disturbance resulting in the loss or decline in native plant species or their associated habitat.
- Introduction and spread of noxious and invasive weed species and the subsequent displacement of native habitat as a result of implementation of the proposed Project.
- Loss or decline in native plant species or their associated habitat from disturbance of native plant communities (i.e., mesic prairies, dry hill prairies, wet prairies, rock outcrops, etc.)

Issues related to vegetation due to constructing and operating the proposed Big Stone II power plant include:

- Air emission effects from the operation of the proposed plant resulting in the loss or decline of any plant community, including agricultural crops.

Issues related to vegetation from constructing and operating the proposed transmission lines include:

- Habitat alteration and surface disturbance to native prairie species and their habitat, including the area south of Granite Falls, Minnesota.

Wildlife

Issues related to wildlife impacts for all areas of construction and operation include:

- Declining populations or local extinctions of wildlife populations from loss of wetlands, flooding/flood control, and declining water quality.
- Declining populations or local extinctions of migratory and resident bird species from the loss of wetland and upland habitats.
- Habitat fragmentation causing displacement of wildlife.
- Vehicle and equipment operation causing loss of eggs, nests, or young.
- Loss of economic or recreational opportunities caused by impacts to wetland habitat and associated wildlife.
- A decline of wildlife and its associated habitat within special wildlife management areas (i.e., State Wildlife Management Areas (SWMAs), Minnesota County Biological Survey (MCBS) Sites of Biodiversity Significance, National Wildlife Refuges (NWRs), Waterfowl Production Areas (WPAs), SNAs, and other high-priority areas).

Issues related to wildlife due to constructing and operating the proposed Big Stone II power plant include the following:

- Air emission effects from the operation of the proposed Big Stone II plant resulting in the decline in wildlife populations.

Issues related to wildlife from constructing and operating the proposed transmission lines include the following:

- Electrocution or collision of birds with transmission lines.

Fisheries

Issues related to fisheries due to constructing and operating the proposed Big Stone II power plant include the following:

- Effects on fish and their habitat due to surface disturbance and possible water quality changes.
- Effects on fish and their habitat as a result of water withdrawal, impingement, and entrainment.
- Effects of air emissions in contributing to acid rain and mercury contamination on fish.

Issues related to fisheries from constructing and operating the proposed transmission lines include the following:

- Effects on fish and their habitat as a result of surface disturbance and habitat alteration.

Special Status Species

Issues related to special status species impacts for all areas of construction and operation include the following:

- The loss or decline of special status species (i.e., federally-listed, proposed, or candidate species for listing under the ESA); and species protected by State law (Minnesota and South Dakota) and their associated habitats.

Issues related to special status species due to constructing and operating the proposed Big Stone II power plant include the following:

- Air emission effects resulting in the loss or decline of any special status species and their associated habitat.

Issues related to special status species from constructing and operating the proposed transmission lines include the following:

- Electrocution or collision of bird species with transmission lines.

Wetland/Riparian Areas

Issues related to wetland/riparian areas impacts for all areas of construction and operation include the following:

- Loss or reduction of jurisdictional and isolated wetland/riparian areas (i.e., plant communities, wildlife, soil resources, and aquatic habitats).
- Decline in wetland/riparian community functionality (e.g., wildlife habitat, sediment filtering, flood control, etc.) resulting from the degradation of water quality within these areas.

Issues related to wetland/riparian areas due to constructing and operating the proposed Big Stone II power plant include the following:

- Air emissions, including CO_2 and mercury and other heavy metals, on wetlands, lakes, and other water bodies within the Prairie Pothole Ecoregion.

Impact Assessment Methods

Impacts to biological resources from the proposed Project are based on the locations of the resources in relation to the proposed surface disturbance areas. SMMs and additional mitigation measures (if adopted) are also taken into account in addressing the severity of the impact. The acres of disturbed areas were estimated based on the extent of disturbance for construction and operation activities. The exact centerlines for the transmission lines are unknown; however, acreages were calculated based on the percentage of each vegetation type within each corridor. The area disturbed was based on using H-frame structures with a nominal span between structures of 700 feet for 230-kV lines and 800 feet for 345-kV lines. Calculations of acreages disturbed for Corridors A, B, and Corridor B1, were based on a 230-kV transmission line; for Corridor C and Corridor C1, calculations were based on a 345-kV transmission line extending south from Big Stone to Hazel Run, and a 230-kV transmission line from Hazel Run to its terminus at Granite Falls. Areas disturbed at the proposed plant site are the actual acreages needed to construct the proposed plant facilities.

Vegetation, Including Special Status Plant Species

Impact analysis focused on plant community habitats that may be affected by constructing and operating the proposed Project. This process considers Federal laws and Minnesota and South Dakota State statutes relating to the protection of plant species, sensitive habitat, and control and eradication of noxious species.

Impact assessments identified the occurrence of plant communities and their associated habitat and the occurrence of noxious weed species within the proposed Project area. Methods included reviewing published literature, natural heritage database information, internet Web sites, agency correspondence, and field surveys. Biologists with the SDGFP, MnDNR, USFWS, and the Minnesota Natural Heritage Program were contacted for information about the occurrence of plant species, special community features, and habitats. Information on likely effects from construction and operation activities on these plant communities was also requested (USFWS, 2005a; USFWS 2005b; USFWS 2005c; MnDNR, 2005a; MnDNR, 2005b; SDGFP, 2005a; SDGFP, 2004a; SDGFP, 2004b). Reconnaissance of the proposed Project area was conducted on several occasions between spring 2005 through summer 2007 to document and evaluate possible disturbance to vegetation resources.

Vegetation impacts associated with the proposed Project are classified as either short- or long-term. Short-term impacts to vegetation are impacts that exist for the duration of construction plus up to two reproductive cycles. Short-term impacts include the loss of individual plants. Long-term impacts are those whose duration occurs for the life of the action and whose impacts would include plant community loss or alteration. Short- and long-term impacts were assessed for the development of the proposed Project, including the proposed Big Stone II plant and its associated ancillary facilities and transmission lines including structure and pad, access roads, turnarounds, pulling and tensioning sites, splicing sites and staging areas, and substation modifications. The severity of these disturbances depends on the timing and duration of the disturbance activities and the sensitivity of the affected plant communities. Short-term disturbances may or may not result in long-term impacts while long-term disturbances will always result in long-term impacts.

Wildlife Including Special Status Animal Species

Impact analysis focused on wildlife species and habitats that may be affected by construction and operation of the proposed Project. This process considered Federal laws and State statutes. The ESA is administered by the USFWS and provides broad national protection for fish, wildlife, and plants that are listed as endangered, threatened, or proposed for listing. The ESA outlines procedures for Federal agencies to follow when a listed species or designated habitat may be affected by an action they authorize, fund, or permit. Species considered for listing or as possible candidates also receive some protection. The Migratory Bird Treaty Act (MBTA) is also administered by the USFWS. The MBTA is a Federal law enabling the U.S. to fulfill its international, bilateral conventions for conserving migratory bird populations and their habitats. The MBTA makes it unlawful to take, kill, or possess migratory birds, nests, eggs, or parts of birds without a permit.

In addition to Federal laws, States also regulate the protection of State-sensitive and protected fish, wildlife, and plant species. Under State statutes (South Dakota Law 34A-8-8; Minnesota Statute 84.0895), no one is allowed to take, import, transport, or sell any portion of an endangered species (wild animal or plant), or sell or possess with intent to sell an article made with any part of the skin, hide, or parts of an endangered species except under certain conditions.

Methods for establishing a baseline of status, occurrence, and associated habitat of wildlife that may occur within the proposed Project area include reviewing published literature, natural heritage database information, internet Web sites, agency correspondence, and field surveys. Biologists with the SDGFP, MnDNR, USFWS, and the Minnesota Natural Heritage Program were contacted for information about the status of wildlife species, habitat, special wildlife features, and habitats in the proposed Project area (USFWS, 2005a; USFWS 2005b; USFWS 2005c; MnDNR, 2005a; MnDNR, 2005b; SDGFP, 2005a; SDGFP, 2004a; SDGFP, 2004b). Field studies were conducted throughout 2005 to document and evaluate wildlife and habitat that may occur within the proposed Project area.

Short-term impacts to wildlife species are impacts that occur during construction plus up to two reproductive cycles. Short-term impacts include the loss of individuals and disruption of movement in to, out of, and through the proposed Project area. Long-term impacts are those whose duration occurs for the life of the proposed Project. Long-term impacts would include habitat loss or alteration from the development of the proposed Project. Severity of impacts would depend on the timing and duration of the disturbance associated with the proposed Project, the sensitivity of impacted species, and wildlife seasonal use patterns. Short-term disturbances may or may not result in long-term impacts while long-term disturbances would result in long-term impacts.

Fisheries, Including Special Status Fish Species

The impact assessment for fisheries focused on the disturbance to water bodies that support fish species on a consistent basis. The water bodies affected by proposed construction activities were those located within the physical footprint of the facilities or downgradient of the disturbed areas. In general, the downgradient distance was approximately 0.25 to 0.5 mile from the proposed facility locations when considering runoff-related impacts. Impact evaluations associated with possible water quantity changes were based on predicted water levels in Big Stone Lake and flows in the Minnesota River, as a result of water withdrawals for power plant operation.

Wetland/Riparian Areas

A short-term impact to wetlands would not extend more than two reproductive cycles after construction. Short-term impacts could occur from driving across dry or frozen wetlands, mowing wetlands, soil sampling as part of a wetland determination, and removal of poles from existing wetlands. Long-term impacts would extend for the life of the proposed Project. The impact analysis focused on existing wetland/riparian areas that may be affected from constructing and operating the proposed Project. The impact analysis adheres to Federal laws (i.e., CWA) and State statutes (i.e., WCA) as they apply to Federal jurisdictional and State-protected WUS.

Pertinent aspects of the CWA administered by the USACE provide broad protection for existing WUS, including jurisdictional wetlands. The CWA specifically directs Federal agencies to provide leadership by taking actions to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agencies' responsibilities for a variety of actions, including federally undertaken, assisted, or financed construction (USDOT FHA, 2005). Jurisdictional wetlands located within South Dakota and Minnesota are subject to USACE regulations.

Under Minnesota State Statute Section 1036.222-.2373, the WCA, as defined by the MBWSR, explicitly prohibits draining, filling, and in some cases, excavating in wetlands unless the drain, fill, or excavation activity is exempt or wetlands are replaced by restoring or creating wetland areas of at least equal public value (MBWSR, 2004a). These regulations are administered locally through local government units (i.e., cities, counties, watershed management organizations, soil and water conservation districts, and townships); the MBWSR administers the WCA Statewide; MnDNR wetland enforcement officers and other peace officers enforce it (MBWSR, 2004b).

Preliminary wetland delineations were conducted at the proposed plant site in September 2004. Delineation methods followed guidelines presented in the *U.S. Army Corps of Engineers Wetland Delineation Manual* (USACE, 1987). Wetlands were classified following the *Wetlands of the United States* ("Circular 39") guidance (Shaw and Fredine, 1971), USFWS NWI mapping system (USFWS, 1990), and the *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al., 1979). Wetland boundaries were delineated and wetland acreages were calculated for wetlands observed at the proposed plant site. The delineation and jurisdictional determination for wetlands present within the proposed plant site was completed in June 2005 during a field inspection with a USACE representative.

Wetland and riparian resources in the vicinity of the proposed corridors and the existing Hankinson line were identified by reviewing USFWS NWI maps and land cover data.

Wetlands in the vicinity of the proposed groundwater wells were identified and impacts were assessed using the following sources:

- USFWS National Wetland Inventory (NWI) mapping
- 2004 and 2005 Farm Service Agency (FSA) color aerial photography
- Field delineations of wetlands near the proposed plant
- FSA annual crop photos dating back to 1980
- Field surveys of area vegetation

The NWI mapping, color aerials, delineations, and field surveys were used to determine the number and locations of wetlands in the groundwater area. The FSA crop photos were used to assess the responses of area wetlands to drought and excessive wet periods over time. Riparian areas in the area were identified by using the color aerials and field surveys.

Wetland impacts resulting from proposed groundwater pumping were assessed using the groundwater modeling discussed in Section 4.2. Modeling results for Alternative 2 and Alternative 3 were compared and correlated with the locations of wetlands using a modeling input of two feet or more of drawdown (two feet is equivalent to 0.6 meters, as used by the groundwater model). In addition, the presence or absence of thick surficial clay deposits (i.e., greater than 10 feet of clay) under each wetland within the drawdown boundary was determined. The thickness of the clay layer beneath a given wetland governs the influence of groundwater on the wetland's water regime, and wetlands with little or no clay beneath them are potentially in greater hydraulic contact with the water table. Changes in the water table level are more likely to manifest themselves in such wetlands. Based on this information, the number of wetlands that would be affected by proposed groundwater pumping was determined.

Significance Criteria

The following thresholds were established to determine impact significance to biological resources (i.e., plant communities, noxious weeds, terrestrial and aquatic wildlife, and wetland/riparian areas) that may be affected by construction disturbance and operational activities for the proposed Project.

Vegetation

A significant impact on vegetation would result if any of the following were to occur from constructing and operating the proposed Project:

- Loss of rare plants, native plant communities and other sensitive features identified by a State or Federal resource agency.
- Loss to any population of plants that would result in a species being listed or proposed for listing as threatened or endangered.
- Introduction or spread of noxious weeds.

Wildlife

Impacts to wildlife would occur when habitats or individuals are disturbed or lost during the proposed Project's construction or operation. Significance of the impact depends, in part, on the sensitivity of the population. A significant impact on wildlife would result if any of the following were to occur from constructing and operating the proposed Project:

- Loss of individuals of a population of wildlife that would result in the species being listed or proposed for listing as threatened or endangered.
- Violation of any statutes and regulations pertaining to wildlife.
- Introduction of constituents in any water body (such as evaporation or sludge ponds) in concentrations that cause adverse effects on wildlife.

Fisheries

Impacts to fisheries would occur when habitats or individuals are disturbed or lost during the proposed Project's construction or operation. Significance of the impact depends, in part, on the sensitivity of the population. A significant impact on fisheries would result if any of the following were to occur from constructing and operating the proposed Project:

- Loss of individuals of a population of aquatic species that would result in the species being listed or proposed for listing as threatened or endangered.
- Violation of any statues and regulations pertaining to fisheries.

- Water withdrawal in excess of State-permitted levels.
- Water intake resulting in additional impingement/entrainment impacts on fish that would adversely affect the stability of fish populations.

Special Status Species

A significant impact on endangered or threatened species or their critical habitats would result if any of the following were to occur from constructing and operating the proposed Project:

- Jeopardy to the continued existence of a federally-listed species.
- Loss of individuals of a population of species that would result in a change in species status.
- Adverse modification of Critical Habitat to the degree it would no longer support the species for which it was designated.
- Violation of any Federal or other applicable statutes and regulations pertaining to special status species.
- Adverse impacts to habitat used by special status species for spawning or rearing and mussel species for attachment to bottom substrates.

Wetland/Riparian Areas

A significant impact on wetland and riparian areas would result if any of the following were to occur from constructing and operating the proposed Project:

- Degradation or loss of any Federal- or State-protected wetland(s), as defined by Section 404 of the CWA or other applicable regulations.
- Indirect loss of wetland or riparian areas, caused by degradation of water quality, diversion of water sources, or erosion and sedimentation resulting from altered drainage patterns.

4.4.2 Proposed Project and Alternative 3

4.4.2.1 Big Stone II Plant Site and Groundwater Areas

Vegetation

The impacts and mitigation measures associated with vegetation would be the same for the proposed Project or Alternative 3. Construction and operation activities of the proposed plant site and groundwater areas would affect vegetation communities in several different ways, including herbaceous trampling, partial removal of aboveground plant cover, and long-term removal. Clearing, grubbing, and vegetation trampling may occur within the proposed plant site and groundwater areas. Vegetation impacts associated with the proposed plant site and groundwater areas would be both short-term and long-term, as defined in the impact assessment methods.

Disturbances associated with construction activities including the proposed Big Stone II plant, cooling tower, and groundwater well facilities would be long-term, extending for the life of the proposed Project. Vegetation disturbances associated with construction areas that would occur within the upland forested communities would be long-term due to their recovery timeframe. All other vegetation types would return to pre-disturbance conditions following successful reclamation within two years depending on the sensitivity of the plant communities, the timing and extent of the disturbance, and the geographic and topographic location. Table 4.4-1 summarizes the short-term and long-term impacts for each vegetation type.

Table 4.4-1. Summary of Acreages of Affected Vegetation Types for Construction and Operation of the Proposed Big Stone II Plant and Groundwater System

Facilities[a]	**Agriculture**		**Wetland/ Riparian[b]**		**Forest[b]**		**Prairie**		**Subtotal of Vegetation Affected**		**Developed**		**Total Affected Land Area**	
	Short-term	**Long-term**	**Short-term**	**Long-term**	**Short-term**	**Long-term**	**Short-term**	**Long-term**	**Short-term**	**Long-term**	**Short-term**	**Long-term**	**Short-term**	**Long-term**
Proposed Power Plant	0	0	0	0	0	0	0	0	0	0	0	20.8[c]	**0**	**20.8**
Cooling Tower	0	0	0	0	0	0	0	0	0	0	0	2.0[c]	**0**	**2.0**
Constructio n Laydown	49.6	0	0	0	0	0.4	18.3	0	67.9	0.4	0	0[c]	**67.9**	**0.4**
Constructio n Parking	12.2	0	0	0	0	0	0	2.6	12.2	2.6	0	1.7[c]	**12.2**	**4.3**
Groundwate r Well Sites	3.5	1.6[e]	0	0	0	0	0	0.2[e]	3.5	1.8[e]	0	0.1	**3.5**	**1.9**
Groundwate r Pipelines[f]	3.8	0	--[d]	0	0	0	0.9	0	4.7	0	32.0	0	**36.7**	**0.0**
Electrical Distribution Lines to Wells[g]	2.4	0.8	--[d]	0	0	0	3.7	1.2	6.1	2.0	23.7	7.9	**29.8**	**9.9**
Total	71.5	2.4	--[d]	0	0	0.4	22.9	4.0	94.4	6.8	55.7	32.5	**150.1**	**39.3**

[a]Proposed plant facilities do not impact open water or shrubland.
[b]Any impact to forest and wetland vegetation cover types is considered a long-term impact based on length of recovery time after construction and reclamation.
[c]Located on areas disturbed for construction of the existing Big Stone plant.
[d]There are no short-term wetland impacts associated with the power plant, cooling tower, laydown, or parking areas. Groundwater well sites would also be located to avoid wetlands. Short-term impacts, if they occur, would result from the groundwater pipelines and electrical distribution lines. The area of short-term impacts resulting from these activities cannot be estimated at this time. This is because routes for proposed electric distribution lines and water pipelines have not been finalized. Routes for proposed electric distribution lines would be designed to span wetlands, thus eliminating long-term wetland impacts. Groundwater pipeline routes will also be selected to avoid or minimize wetland impacts. Short-term impacts could still occur from trenching for pipelines during the winter, driving across dry or frozen wetlands, mowing wetlands, soil sampling as part of a wetland determination, and removal of poles from existing wetlands. Short-term impact to wetlands would not extend more than two reproductive cycles after construction.
[e]Long-term agricultural impacts from assumed groundwater well sites are based on an assumed 10-foot by 15-foot structure to house the wellhead and equipment and a 50-foot by 50-foot fenced area around that structure. Total long-term impact per well site is 2,500 square feet (about 0.06 acre). Also included at each well site is an access road approximately 50 feet long by 12 feet wide. There are ten proposed well sites located in agricultural land, three in grassy areas, and one in a developed area on the east portion of the existing plant water storage pond. Twelve of the fourteen proposed well sites are located near existing roads and would require short access roads. Two of the proposed well sites are further out in agricultural fields and would require access roads from 1,300 feet to 1,700 feet long. The 0.2-acre area under the prairie designation is actually grassy (uncultivated pastureland) areas adjacent to farm fields, rather than native prairie.
[f]The final groundwater pipeline alignments have not yet been determined. Impacts from proposed groundwater pipeline construction are based on the most direct route from the wells to the plant site, forming a network that primarily parallels existing roads. The proposed groundwater pipeline would be installed adjacent to a range of vegetative cover types. However, the proposed pipeline itself would be constructed immediately adjacent to the existing roadside drainage ditches. These are considered developed cover types. There is one segment of the proposed groundwater pipeline network that crosses open land.
[g]Vegetation impacts related to the addition of electric distribution lines to power proposed wells are based on a conceptual network of lines connected to the existing three-phase electric distribution lines in the area. Additional lines parallel roads to the extent practicable. Acreages shown are based on a 30-foot construction corridor (short-term impact) and a 10-foot permanent easement in which the proposed distribution lines would be located (long-term impact).

Source: Barr, 2008.

Construction of the proposed power plant would permanently remove 3.0 acres of vegetation, as most of the proposed plant (24.5 acres) would be constructed on already-developed industrial land. Installation of the proposed groundwater production wells, access roads, pipelines, and electrical distribution lines would affect an additional 3.8 acres of vegetation. Short-term impacts would occur on 150.1 acres from herbaceous trampling and partial removal of aboveground plant cover associated with construction of the proposed plant and facilities and the installation of the proposed groundwater production wells and associated proposed pipeline and electrical distribution lines.

Post-construction impacts to plant communities are expected to include alteration of plant species composition due to discrepancies between the plant species currently present, the plant species available for revegetation, and the expansion of distributions of weedy species within the proposed plant site. Impacts to vegetation due to construction are anticipated to be short-term and would diminish over time as the revegetated plant communities become established and mature. Within the short-term use areas (i.e., construction laydown, parking, and water pipeline easement areas), this EIS assumes that revegetation would be successful and that the only long-term impact on vegetation would be associated with the 0.4 acres of upland forested communities impacted by construction laydown. Any aboveground facilities associated with the proposed plant site and groundwater areas would permanently remove vegetation at the site.

No long-term impacts would occur to wetland vegetation. Use of groundwater is not anticipated to induce changes in wetland vegetation communities. This is because there is no groundwater contribution to perched wetlands in the area. The contribution of groundwater to non-perched wetlands is insufficient to exert an influence over wetlands vegetation.

Impacts to vegetation would not result in fragmentation of vegetation communities on the proposed plant site. This is because the construction and operation of the components of the proposed Project would occur in areas that are either currently disturbed (i.e., part of the existing plant or in low-quality vegetation communities) or are consolidated in a manner that would not divide high or medium quality vegetation communities. The highest quality vegetation communities on the Big Stone property, including high quality prairie and the forested bluffs along the Whetstone River, would not be affected by the construction and operation of the proposed plant. Since the impacts to vegetation would occur primarily in disturbed areas, shifts in vegetation community composition are expected to be minor. This is because disturbed areas are already dominated by plant species that tend to be adapted to and tolerant of human-induced changes. Vegetation impacts occurring in higher-quality plant communities would be mitigated through revegetation practices designed to restore and enhance the pre-construction conditions.

Long-term fragmentation of vegetation would not occur in the groundwater areas. However, short-term fragmentation of vegetation communities would occur along segments of the groundwater pipelines and the electrical distribution lines. Fragmentation of vegetation communities would occur only during the construction of the pipelines and electrical distribution lines, and would not extend more than two reproductive cycles. Moreover, since the majority of the pipeline and electrical distribution line routes would follow roadway alignments and/or would cross agricultural land, there would be little or no fragmentation impact on vegetation communities in these areas. This is because roadways represent edges of existing fragmented areas, and agricultural lands are generally not affected by fragmentation.

The Co-owners' SMMs Gen-1, Gen-2, and Water-3 are intended to ensure that all construction and operational activities be performed following Federal, State, and local environmental laws, orders, permits, and regulations. Other SMMs are intended to prevent significant impacts to vegetation.

SMM Bio-5 assures that all disturbed areas would be regraded such that all surfaces drain naturally and blend with the natural terrain. Disturbed areas would be reseeded with seeds native to the region in a seed mixture certified as free of noxious or invasive weeds or left in a condition that would facilitate natural revegetation. All destruction, scarring, damage, or defacing of the landscape resulting from the construction would be repaired. By implementing this measure, forage and habitat for wildlife would likely regenerate within three to five years following successful reclamation.

To minimize disturbances to vegetation, proposed pipelines and electrical distribution lines would be constructed to the extent possible along the ROW of county roads and roads along section lines in accordance with SMM Land-12. Disturbed vegetation would return to pre-disturbance conditions following successful reclamation within two years depending on the sensitivity of the plant communities, the timing and extent of the disturbance, and the topographic setting following SMM Bio-5.

Revegetation of short-term impacts to vegetation communities would use native seed mixtures. Most of the revegetation efforts would occur in areas that are previously disturbed, non-native dominated vegetation communities. Revegetation with native grasses would improve the ecological quality of these areas.

<u>Air Emissions Impacts to Vegetation</u>

The effects of air emissions from the proposed Big Stone II plant on plant communities, including agricultural crops, were considered. Actual emissions of mercury from the existing plant in 2004 were 189.6 lb. The design of the proposed Big Stone II plant includes air emission controls that would reduce the combined mercury emissions from the existing and proposed plants to levels lower than the current emissions from the existing plant (see discussion of mercury emissions controls in Section 4.1.2.1). The Co-owners commit to install technologies that are most likely to result in removal of at least 90 percent of the mercury emitted from the existing plant and the proposed Big Stone II plant. This would result in mercury emissions of approximately 81.5 lb per year from the combined plants, which could cause impacts to vegetation communities in the area. This includes potential impacts to plant species collected or known for their cultural and/or medicinal ethnobotanical properties. If the proposed Big Stone II plant is constructed (and after implementation of emissions controls), mercury emissions from both plants would be less than the emissions from the existing plant. Although the combined plants would continue to emit mercury, the decrease in mercury emissions would result in reduced impacts to vegetation communities in the area. Additional detailed discussion on mercury may be found in the Mercury Response Paper (Response Paper A, Volume II).

Current regulations limiting ambient air quality impacts consider potential impacts to vegetation. Complying with these regulations should minimize direct impacts to plant communities. All impacts are predicted to be well below applicable ambient air quality standards. Consequently, no significant impacts to plant communities from air emissions would be anticipated from the operation of the proposed Big Stone II plant (USFWS, 1987; ATSDR, 1999a; ATSDR, 1999b).

The proposed Big Stone II plant would also be a source of CO_2 (a GHG), which could have an undetermined effect on local, regional, and global climate change. Western is unable to identify the specific impacts of the proposed plant's CO_2 emissions on global warming and climate change, because there is insufficient information and numerous models that produce widely divergent results. Therefore, it is difficult to state with any certainty what vegetation impacts may result from climate change, or to what extent the proposed Project would contribute to those impacts. As a result, Western believes that any attempt to analyze and predict the local or regional impacts of the proposed plant's CO_2 emissions on vegetation cannot be done in any way that produces reliable results. On May 14, 2008, the Director of the USFWS noted, "The best scientific data available today do not allow us to draw a casual connection between GHG emissions from a given facility and effects posed to listed species or their habitats, nor are there sufficient data to establish that such impacts are reasonably certain to occur." (USFWS, 2008)

Noxious Weeds

Noxious weeds and other undesirable plant species could be introduced within disturbed areas of the proposed plant site and groundwater areas during construction from off-road driving, unwashed vehicles, and improper maintenance of temporary construction laydown and parking areas. Noxious weeds could also be introduced into previously uninfested areas by transferring topsoil, construction materials, and/or soil stabilizing materials. Noxious species are generally fast-growing and could displace native species and inhibit the establishment of native grass, forb, and shrub species in areas beyond the plant site. To prevent the introduction and spread of noxious weeds and other undesirable plant species, additional mitigation measure V-1, if adopted, is proposed for implementation during construction activities at the proposed plant site and groundwater areas. By implementing this measure, no short- or long-term impacts associated with the introduction or spread of noxious weeds would occur.

- **V-1.** Prior to construction, the Co-owners would prepare and implement an Integrated Weed Management Plan to prevent, control, and manage noxious and invasive weeds during construction and maintenance activities for the proposed Project. The Plan would identify actions to be taken by construction crews (including contractors) and operations personnel. Such actions would include surveys of construction areas for invasive and noxious weeds, prevention of the spread of invasive and noxious weeds and their seeds, appropriate monitoring, and other appropriate measures.

Summary of Impacts on Vegetation

Implementation of either the proposed Project or Alternative 3 would impact 101.2 acres of vegetation. Impacts to vegetation would occur due to long- or short-term removal of vegetation or from the introduction of noxious weeds. Following the implementation of the standard and additional mitigation measures (if adopted), no significant impacts to rare plants, native plant communities, or other sensitive features identified by a State or Federal resource agency, or spread of noxious weeds would occur from construction and operation activities of the proposed plant or within the proposed groundwater areas. Residual impacts would include long-term net loss of approximately 4.4 acres of forest and prairie vegetation.

If the proposed Big Stone II plant is constructed (and after implementation of emissions controls), mercury emissions from both plants would be less than the emissions from the existing plant. Although the combined plants would continue to emit mercury, the decrease in mercury emissions would result in reduced impacts to vegetation communities in the area.

The proposed Big Stone II plant would be a source of CO_2, which is a GHG. GHGs have been linked to climate change. It is difficult to state with any certainty what vegetation impacts may result from climate change, or to what extent the proposed Project would contribute to those impacts. This is because the best available science on climate change has yet to definitively predict the magnitude of climate change, or to quantify the relative contributions of various GHGs and their sources as potential causes of climate change.

Wildlife

The impacts and mitigation measures associated with wildlife would be the same for the proposed Project and Alternative 3. Impacts to wildlife species would include the long-term loss of approximately 6.8 acres of vegetation and the short-term loss of 94.4 acres of vegetation to industrial use from constructing the proposed Big Stone II plant and groundwater system. Construction of the groundwater wells and electrical distribution lines to the well sites would result in the long-term removal of approximately 2.4 acres of agricultural land used for row crops that would be of moderate use as wildlife habitat. Short-term disturbance would result in the loss or alteration of an additional 71.5 acres of agricultural and 22.9 acres of prairie vegetation for temporary construction uses (i.e., construction laydown and parking areas) and groundwater system construction.

Features which characterize the predominant existing wildlife habitats would not be changed by construction of the proposed plant. The area surrounding the existing plant and groundwater areas is characterized by a flat to gently rolling landscape dominated by row crops, hayfields, and pastures. The majority of the proposed construction and operation impacts would occur in these types of habitats, as well as within the existing plant area. Disturbed areas are utilized by deer, small mammals, pheasants, and other species typically capable of co-existing with intensive human land uses. This type of habitat dominates the proposed plant and groundwater areas. As a result, construction and operation of the proposed Big Stone II plant would not substantially reduce opportunities for wildlife to utilize disturbed habitats.

Wildlife impacts also include reduced use of habitats at or near the proposed groundwater well sites, pipeline routes, and the electric distribution lines during construction activities. Wildlife would likely avoid these areas during construction, but would be able to use similar habitats at distances that vary with a given species' tolerance of human activity. However, these impacts would be short-term; wildlife would return to the area once construction activities cease.

No short- or long-term impacts would occur in high-quality vegetation communities, which frequently provide habitat for a diversity of wildlife species. Species dependent on less-disturbed, native vegetation communities, or on extensive forested or riparian cover would not experience habitat losses, because the proposed Project has no long-term impacts on habitats in medium- or high-quality vegetation communities, or on forested or riparian areas. There are no short-term impacts proposed in high-quality vegetation communities, or in forested or riparian habitats.

Considerable research has been conducted on the effects to wildlife populations of habitat fragmentation caused by a variety of human activities (Rost and Bailey, 1979; Irwin and Peek, 1983; Lyon, 1983; Vaillancourt, 1995; Baker and Dillon, 2000; Gelhard and Belnap, 2003). However, there are no habitat fragmentation effects anticipated. Wildlife habitat fragmentation would not occur near the plant, because construction and operation of the proposed Big Stone II plant would occur in areas that are either currently disturbed (i.e., part of the existing plant or in low-quality vegetation communities), and/or are consolidated in a manner that would not divide high or medium quality vegetation communities. Fragmentation of wildlife habitat in the groundwater well areas and associated infrastructure would be short-term. Moreover, wildlife habitats in the groundwater areas and associated infrastructure occur primarily along edges of roadways and in agricultural areas. Roadways are edges of existing habitat fragments, and agricultural areas typically have low habitat value and are not seriously degraded by short-term fragmentation.

During construction, elevated noise, increased human presence, dispersal of noxious and invasive weed species, and dust deposition would extend beyond the boundaries of the construction area, resulting in a larger overall area of disturbance. The severity of reductions in local wildlife populations and changes in species composition depend on factors such as the sensitivity of the species, seasonal use, type and timing of construction activities and physical parameters (e.g., topography, cover, forage, and climate), and quality of the habitat. After construction, activity would return to approximately the same levels as existing activities at the plant site. Since species compatible with the existing use would likely be compatible with the proposed use, there would not be a significant long-term impact to wildlife due to habitat alteration.

Terrestrial invertebrates that prefer areas that are disturbed would experience a reduction in habitat area. This is because all of the proposed Project's long-term impacts would occur in low-quality habitats. Low-quality habitats are areas that have been previously disturbed by agriculture, grazing, infrastructure development, or other events initiated by human activities. Terrestrial invertebrates that prefer low-quality habitats would therefore experience a reduction in habitat area. However, low-quality habitat dominates the Big Stone property and surrounding area. Reductions resulting from the proposed Project in low-quality habitat area would be small relative to the large amount of habitat available. Terrestrial invertebrates that utilize high- and medium-quality habitats would not experience long-term losses of habitat, since the proposed Project does not include long-term impacts to these habitats. Impacts to medium-quality grassland habitats are relatively small, would be short-term, and would be mitigated through revegetation of the disturbed area with native grasses.

Due to the effects of groundwater pumping, a reduction in the flow of water within the Whetstone River could cause minor changes in the ways that wildlife use the river. Potential changes include shifts in forage, cover, and reproductive behaviors to adjacent stream reaches with flow more suitable to a given wildlife behavior. However, groundwater contributions to the Whetstone River during the April-July period are less than two percent of the base flow. Water in the Whetstone River during the growing season and peak wildlife activity is almost entirely from surface runoff. Moreover, there would be no surface water withdrawn from the Whetstone River, and no surface water discharged to the river. As a result, the aquatic and riparian habitats along the Whetstone River would not be significantly changed from their existing conditions. Impacts to aquatic invertebrates or their habitats would be less than significant.

The potential reduction in stream flow from proposed groundwater pumping is not anticipated to induce long-distance migration of wildlife species to other rivers or streams associated with the Whetstone River. Changes in wildlife use of the Whetstone River caused by reductions in flow would not cause a significant loss of wildlife population or violate any statutes or regulations pertaining to wildlife. Therefore, this impact would be less than significant.

Impacts to wildlife utilization of wetland habitats would also be minimal. The majority of wetlands receive water primarily from surface runoff, and are perched above groundwater on thick surficial clay layers. Therefore, pumping groundwater would not have an effect on the hydrology of these wetlands, and, hence, no impact on wildlife utilization of these wetlands. Wetlands that are not perched above groundwater, i.e., wetlands with thin or no clay layers beneath them, still receive the majority of their water from surface runoff. The contribution from groundwater is low and it would not influence water regimes in non-perched wetlands. Regionally, there would be no reduction in wildlife utilization of wetland habitats, since most wetlands in the region would not be affected by pumping of groundwater.

<u>Game Species</u>

Direct impacts to big game species within the proposed plant site and groundwater areas would include the long-term disturbance of approximately 6.8 acres and short-term disturbance of approximately 94.4 acres of forage and cover. Of these 101.2 acres, approximately 73.9 acres are agricultural land. Vegetation losses would represent a small percentage (less than one percent) of the available habitat within the vicinity of the proposed plant site and groundwater areas.

Indirect impacts to white-tailed deer would include additional disturbance caused by increased human activity, noise levels, dispersal of noxious and invasive weeds, and dust effects from unpaved road traffic. Noise impacts would be minimized by SMM Noise-1 and -3, to provide an adequate buffer around the proposed plant site and mufflers for internal combustion engines, respectively. Upon completion of construction of the proposed Big Stone II plant, disturbed areas would be mitigated by grading and planting native seed mixes (SMM Bio-5) to restore wildlife habitat. However, indirect impacts to wildlife would be most evident during the construction phase of the proposed plant as a result of increased human activity (e.g., heavy equipment and traffic) and noise levels. Overall, white-tailed deer would likely be displaced from the proposed plant site during surface disturbance activities, but would return to the area following construction activities, probably on a daily basis. Because the proposed plant would be constructed immediately adjacent to the existing plant, it is assumed that white-tailed deer and other game species are currently acclimated to existing disturbance (e.g., noise and human activity). Since no adverse impacts to white-tailed deer have been identified as a result of the existing plant, adverse impacts from constructing and operating the proposed plant are not anticipated (SDGFP, 2005c).

Direct impacts to small game species (e.g., rabbits, squirrels, mourning dove, pheasant, wild turkey, and waterfowl) would include the long-term loss of suitable breeding, nesting, and foraging habitat primarily in upland areas. Incremental losses of vegetation would represent a small percentage (less than one percent) of the available habitat within the vicinity of the proposed plant site and groundwater areas. Indirect impacts to small game species would be the same as discussed for big game and would result from increased human activity, augmented noise levels, dispersal of noxious and invasive weeds, and dust effects from traffic on unpaved roads. Other direct impacts to small game species, including migratory birds, would include loss of eggs or young caused from nest abandonment or as a result of crushing from vehicles and equipment. This would constitute a significant impact. Migratory birds are protected under the MBTA, which makes it unlawful to take (kill, harm, or harass) or possess migratory birds or their parts (nests, eggs, etc.), without a permit issued by the USFWS. If adopted, additional mitigation measure WL-1 would prevent a violation of the MBTA for take of migratory bird species, and residual impacts to migratory birds would be less than significant.

- **WL-1.** Prior to construction at the plant site, biological surveys would be conducted within the plant site construction boundary. The surveys would be directed toward identifying sensitive species or their habitat that would be affected by construction activities. Depending on timing of construction, breeding bird surveys may be necessary to identify and locate nests. This information would be used to acquire the needed permits for take of migratory bird nests.

Nongame Species

Direct impacts to nongame species from constructing the proposed plant site would result in the long-term disturbance of approximately 6.8 acres of habitat. Other direct impacts would include mortality of less mobile or burrowing non-game species (e.g., small mammals, birds, reptiles, amphibians, and invertebrates) and nest abandonment, resulting in loss of eggs or young.

Impacts to nongame species would also occur from the short-term loss of 150.1 acres of forage and cover during construction of the proposed plant, groundwater well sites, pipeline routes, and the electric distribution lines. Wildlife would likely avoid these areas during construction, but would be able to use similar habitats at distances that vary with a given species' tolerance of human activity. Wildlife would return to the area once construction activities cease. Significant impacts to nongame species are not expected to occur during construction of the proposed groundwater wells, pipelines, or electrical distribution lines.

Additional direct long-term impacts to nongame species would include disturbance caused by increased human activity, increased noise levels, dispersal of noxious and invasive weeds, and dust effects from traffic on unpaved roads. Noise impacts would be minimized by SMM Noise-1 and -3, which provide an adequate buffer around the plant site and mufflers for internal combustion engines, respectively. Upon completing construction of the proposed plant, noxious weeds and disturbed areas would be mitigated by grading and planting native seed mixes (SMM Bio-5) to restore wildlife habitat. Construction activities could possibly displace wildlife to adjacent habitat that may be at or approaching carrying capacity. As a result, displacement of wildlife species could cause an unquantifiable change in wildlife populations within the proposed plant site. However, the extent of these impacts would depend upon factors such as the sensitivity of the species, seasonal use patterns, and type and timing of the construction activities.

As discussed in Section 3.4.2.2, raptor species may occur within the proposed Project area. Direct impacts to raptors would result from the disturbance of breeding and foraging habitat. If breeding raptors are present in or adjacent to the proposed plant site, they may abandon breeding territories, nest sites, or lose eggs or young as a result of development and production activities of the proposed plant. As previously discussed, the loss of active nests, eggs, or young, would violate the MBTA and cause a significant impact. Additional mitigation measure WL-1, if adopted, would prevent a violation of the MBTA. The bald eagle was formerly a federally-threatened species, but was removed from the Federal list of endangered and threatened species on August 8, 2007. However, bald eagles remain a federally-protected species under the Bald and Golden Eagle Protection Act and the MBTA. Bald eagles are discussed further in Sections 4.4.2.1 and 4.4.2.2.

The proposed Project activities would include increased human disturbance for raptors resulting in habitat loss and a reduction in prey base. Impacts to small mammal populations due to habitat loss could result in a reduced prey base for raptors, resulting in lower raptor densities. However, the degree of these impacts would depend on a number of variables including the location and proximity of the nest site in relation to construction activities, the species' relative sensitivity, breeding phenology, and possible topographic shielding. The only raptor nests identified during biological surveys in 2005 are located north of the proposed plant site and would not be affected by the proposed plant.

Air Emission Impacts to Wildlife

Actual emissions of mercury from the existing plant in 2004 were 189.6 lb. The Co-owners commit to install technologies that are most likely to result in removal of at least 90 percent of the mercury emitted from the existing plant and the proposed Big Stone II plant. This would result in mercury emissions of approximately 81.5 lb per year from the combined plants, which could cause impacts to wildlife, including species recognized as having cultural value. If the proposed Big Stone II plant is constructed (and after implementation of emissions controls), mercury emissions from both plants would be less than the emissions from the existing plant (see discussion of mercury emissions controls in Section 4.1.2.1). Although the combined plants would continue to emit mercury, the decrease in mercury emissions (and a corresponding decrease in methylmercury) would result in reduced impacts to the wildlife of the area. This includes a reduction in potential impacts to wildlife species recognized as having cultural value. Mercury emissions and associated potential impacts have been addressed in further detail in the Mercury Response Paper (Response Paper A, Volume II).

The proposed Big Stone II plant would also be a source of CO_2, which could have an undetermined effect on local, regional, and global climate change. Western is unable to identify the specific impacts of the proposed plant's CO_2 emissions on global warming and climate change, because there is insufficient information and numerous models that produce widely divergent results. Therefore, it is difficult to state with any certainty what wildlife impacts may result from climate change, or to what extent the proposed Project would contribute to those impacts. As a result, Western believes that any attempt to analyze and predict the local or regional impacts of the proposed plant's CO_2 emissions on wildlife cannot be done in any way that produces reliable results. On May 14, 2008, the Director of the USFWS noted, "The best scientific data available today do not allow us to draw a casual connection between GHG emissions from a given facility and effects posed to listed species or their habitats, nor are there sufficient data to establish that such impacts are reasonably certain to occur." (USFWS, 2008)

Summary of Impacts to Wildlife

Direct impacts to wildlife would include limited direct mortality from construction activities, habitat loss, alteration of habitat, animal displacement and disturbance of breeding, nesting, and foraging habitat for small game and birds. These impacts would not be in sufficient quantities to cause a species to become listed or proposed for listing as threatened or endangered. Since species compatible with the existing use would likely be compatible with the proposed use, there would not be a significant long-term impact to wildlife due to habitat alteration.

Additional mitigation measure WL-1, if adopted, would reduce impacts to breeding birds. Implementation of the SMMs and WL-1 would reduce impacts to wildlife at the proposed plant site and the groundwater areas to less than significant. None of the identified impacts would represent an unpermitted violation of statutes or regulations. Residual impacts would include the long-term net loss of approximately 6.8 acres of wildlife habitat.

Introduction of constituents such as spills, garbage, wastes, and other pollutants into water bodies during construction activities would be controlled through SMM Water-3. Since accidental spills and introduction of other wastes and pollutants would be prevented, there would be no impact to wildlife.

If the proposed Big Stone II plant is constructed (and after implementation of emissions controls), mercury emissions from both plants would be less than the emissions from the existing plant. Although the combined plants would continue to emit mercury, the decrease in mercury emissions (and a corresponding decrease in methylmercury) would result in reduced impacts to the wildlife of the area, including wildlife species recognized as having cultural value.

The proposed Big Stone II plant would be a source of CO_2, which is a GHG. GHGs have been linked to climate change. It is difficult to state with any certainty what wildlife impacts may result from climate change, or to what extent the proposed Project would contribute to those impacts. This is because the best available science on climate change has yet to definitively predict the magnitude of climate change, or to quantify the relative contributions of various GHGs and their sources as potential causes of climate change.

Fisheries

The impacts and mitigation measures associated with fisheries for the proposed Project or Alternative 3 would be the same; however, impacts associated with the Whetstone River would be slightly less for Alternative 3 than those described for the proposed Project due to the decrease in the amount of groundwater use.

<u>Water Quality Impacts to Fisheries</u>

The proposed plant site is located approximately 0.2 mile from Big Stone Lake and 0.8 mile from the Whetstone River. During construction, drainage from the proposed plant site and groundwater area flows south to the Whetstone River, and there would be no pathway to Big Stone Lake. Due to the distance from these water bodies, riparian vegetation or species located in these water bodies would not be altered. Plant and groundwater system construction would result in surface disturbance to soils in the drainage area for the Whetstone River that could result in a short-term increase in soil erosion in the vicinity of the proposed plant site and groundwater area. By implementing the SMMs involving erosion control (SMMs Bio-5, Water-2 and -5), sediment input to the Whetstone River would be minimized, and it is not expected to adversely affect suspended solids levels, and therefore, impacts to fisheries from surface disturbances would be less than significant.

The use of petroleum fuel products and other regulated materials during construction and operation of the proposed plant or groundwater system would pose a risk of spills or leaks that could enter the Whetstone River. Effects of a spill or leak would depend upon the quantity entering the water body, weather conditions, and characteristics of the receiving water (i.e., volume, flow, depth, etc.). SMMs Water-3 and -5 would be implemented to minimize risks if a spill or leak occurred at the proposed plant site, and cleanup and containment measures would be used to prevent spilled material from entering or dispersing in a water body. To avoid spills during proposed well construction, the well drilling contractor would implement BMPs for spill prevention and the pipeline construction contractor would prepare a Pipeline Construction Work Plan to address use of regulated substances in accordance with additional mitigation measure W-1 (if adopted). The electricity distribution line provider would use standard operating procedures to control spills. By implementing these measures, impacts to fisheries from petroleum and chemical use would be less than significant.

The proposed plant would be a zero wastewater discharge facility, so wastewater resulting from plant operations would not affect water quality conditions or alter habitat for aquatic species in the Whetstone River.

<u>Water Use Impacts to Fisheries</u>

Water for the proposed plant would require approximately 8,800 afy in addition to the current withdrawal of 4,200 afy (at the existing plant) from Big Stone Lake. The effects of this increased withdrawal on Big Stone Lake and the Minnesota River are discussed in Section 4.2.2.1. Based on hydrological modeling, on average over a 70-year period, the lake elevation would decrease by about 0.15 foot (Barr, 2007b). Modeling results indicated a maximum lake level reduction of 0.83 foot in two non-consecutive weeks over the 70-year model period. Impacts to lake levels would be minimized by management of waters within the existing storage ponds and by use of groundwater.

Big Stone Lake and its fisheries are an important recreation attraction in both Minnesota and South Dakota. The Big Stone Lake Restoration Project has improved the fisheries of the lake (USEPA, 2002b). The proposed Big Stone II power plant would operate within the same withdrawal restrictions as the existing plant. Therefore, the increase in water withdrawals associated with the proposed plant would not impact the improved fisheries achieved by the Big Stone Lake Restoration Project and would not impact their long-term goal of increased recreation.

Reductions in fish habitat within Big Stone Lake would be minor and infrequent. In most years, lake depths would not be visibly lower than under current conditions. The expected fluctuations in Big Stone Lake levels are of an insufficient magnitude to substantially degrade fisheries and aquatic habitats. Lake levels would not be drawn down during ice cover months to a point where the probability of winterkills would significantly increase. At the lowest allowed lake levels, there would still be sufficient depth to avoid winterkill conditions in most years.

A summary of the flow changes to the Minnesota River is provided in Section 4.2.2.1. As a result of these water level or flow changes, there could be a slight reduction in available habitat for aquatic species. The reach that could be affected would be the approximate 10-mile section from the Big Stone Dam downstream to Highway 75 Dam. The corresponding effect on available aquatic habitat would be a concern if the change in base flows exceeded 25 percent during low flow conditions (flows less than or equal to 80 cfs) for several weeks or longer. The modeling results indicated that the 25 percent or less flow reductions from withdrawals occurred less than 1.5 percent of the weeks in the 70-year study period. Based on these projections, flow changes would occur for short durations but would not cause any loss of individuals or violate any statutes or regulations related to fisheries, and, therefore, would not significantly impact fisheries in the Minnesota River.

Intake velocities and the intake system design would remain unchanged from existing conditions. Withdrawals would be restricted to appropriation permit requirements (Section 4.2). Additional pumping would not result in new impingement or entrainment impacts that would adversely affect the stability of fish populations in the lake.

Fish populations in the Whetstone River exist within an annual cycle of winter low flow and spring-summer high flow. Surface water runoff from precipitation and early spring snowmelt sustain high flow periods in the Whetstone River, generally from April through July. Groundwater flows contribute a greater portion of the river's flow only during January and February, however, flow during this period is less than two cfs. As a result, the annual variation in flow of the Whetstone River during groundwater pumping activities would not be significantly different from the flow regime that currently supports Whetstone River fish populations.

Any changes in flow resulting from reduction in groundwater input to the Whetstone River during groundwater pumping activities would be minor. These changes could include shifts in the ways in which fish use the various components of the stream environment. These components include areas of higher and lower current, which in turn influence fish spawning habitat, cover for young fish, and forage for all age classes of fish. The reductions in flow are not sufficient to notably alter fish behaviors. However, any changes caused by reductions in flow would be reflected in minor shifts in fish use of the river. These shifts, if they were to occur, would be local. Reductions in stream flow due to proposed groundwater pumping would not induce long-distance migration of fish species from the Whetstone River. Changes in fish use of the Whetstone River caused by reductions in flow would not cause a loss of fish populations or violate any statutes or regulations pertaining to fisheries. Therefore, this impact would be less than significant.

Air Emission Impacts to Fisheries

The effects of air emissions on acid rain and mercury contamination in surface waters are discussed in Sections 4.1.2.1 and 4.2.2.1. Based on predicted air emissions data, operation of the proposed plant would not contribute particulates with pH or mercury levels that would measurably change background concentrations in the proposed Project area. Mercury concerns have been identified in fish from the Minnesota River, where a fish consumption advisory has been issued. SO_2 and mercury emissions, as a result of the operation of the proposed Big Stone II plant, would be less than historical levels. NO_X emissions would be equal to or less than historical levels.

Mercury in most aquatic ecosystems comes from atmospheric deposition, primarily associated with rain. The fate of mercury in an aquatic ecosystem is affected by pH (acidity) and dissolved organic carbon concentration. Many scientists think that mercury becomes more mobile and thus more likely to enter the food chain when acidity and dissolved organic carbon levels are higher.[23] Much of the research of mercury in aquatic ecosystems has been motivated by human health risks from consuming fish with elevated mercury levels.

Table 4.4-2 compares concentrations of mercury in several fish species within Big Stone Lake to averages in fish species in Minnesota lakes. The comparison shows that the tissue mercury levels in fish, except for sunfish, in Big Stone Lake (the closest lake to the proposed plant) are less than the tissue levels within similar fish species on the average in lakes throughout Minnesota.

Actual emissions of mercury from the existing plant in 2004 were 189.6 lb. Design of the proposed Big Stone II plant includes air emission controls that would reduce the combined mercury emissions from the existing and proposed plants to levels lower than the current emissions from the existing plant (see discussion of mercury emissions controls in Section 4.1.2.1). The Co-owners commit to install technologies that are most likely to result in removal of at least 90 percent of the mercury emitted from the existing plant and the proposed Big Stone II plant. The combined emissions of mercury from the existing and proposed plants (approximately 81.5 lb per year) would decrease from current emission rates for the existing plant. Therefore, the proposed Project would not cause an increase in the rate of accumulation of methylmercury concentrations in fish, although bioaccumulation of methylmercury would continue at a reduced rate. According to information from the MPCA (not necessarily specific to Big Stone Lake), declines in mercury emission and deposition should result in reduced mercury concentrations in fish (MPCA, 2007). The reduced rate of bioaccumulation, when considering the MPCA information, suggests that the lower mercury emissions from the existing and proposed plant could contribute to lower mercury concentrations in fish over time.

[23] USGS, undated. Mercury Contamination of Aquatic Ecosystems. Fact Sheet FS-216-95.

Table 4.4-2. Parts per Million Concentrations for Mercury within Sampled Species

Species	Big Stone Reservoir (ppm)[a]	State-Wide Average (ppm)
Bass	0.23633	0.38722
Carp	0.03775	0.11768
Catfish	-	0.24901
Northern Pike	0.12333	0.37083
Perch	0.0675	0.15750
Sunfish	0.11300	0.09016
Trout	-	0.26619
Walleye	0.16795	0.38722

[a]No data available for catfish or trout
Source: Western, 2007d.

The proposed Big Stone II plant would also be a source of CO_2 (a GHG), which could have an undetermined effect on local, regional, or global climate change. Western is unable to identify the specific impacts of the proposed plant's CO_2 emissions on global warming and climate change, because there is insufficient information and numerous models that produce widely divergent results. Therefore, it is difficult to state with any certainty what fisheries impacts may result from climate change, or to what extent the proposed Project would contribute to those impacts. As a result, Western believes that any attempt to analyze and predict the local or regional impacts of the proposed plant's CO_2 emissions on fish cannot be done in any way that produces reliable results. On May 14, 2008, the Director of the USFWS noted, "The best scientific data available today do not allow us to draw a casual connection between GHG emissions from a given facility and effects posed to listed species or their habitats, nor are there sufficient data to establish that such impacts are reasonably certain to occur." (USFWS, 2008)

<u>Summary of Impacts on Fisheries</u>

The construction and operation impacts of the proposed plant or groundwater system construction activities would not result in a violation of statutes or regulations which involve protection of fish habitat, including spawning areas. There would not be a loss of a population of aquatic species that would result in the species being listed or proposed for listing as threatened or endangered. Water withdrawal would not exceed State-permitted levels, and water intake would not result in a significant impact on fish populations. No residual impacts to fisheries are expected. Requiring BMPs for spill prevention during drilling activities, a Pipeline Construction Work Plan for proposed pipeline construction activities, implementing SMMs, and operating under required permits would minimize the impacts to fisheries from spills and erosion. Impacts to fisheries would not be significant by implementing SMMs, additional mitigation measure W-1 (if adopted), and operating under required permits.

The proposed Project would not cause an increase in the rate of accumulation of methylmercury concentrations in fish, although bioaccumulation of methylmercury would continue at a reduced rate. The reduced rate of bioaccumulation, when considering MPCA information, suggests that the lower mercury emissions from the existing and proposed plant could contribute to lower mercury concentrations in fish over time.

Special Status Species

The impacts and mitigation measures associated with special status species are the same for the proposed Project or Alternative 3. Suitable habitat for special status species has been identified on the proposed plant site and within the groundwater area. Initial surveys were conducted for some, but not all special status species. SSM Bio-1 requires the Co-owners to consult with the applicable State and Federal agencies concerning all special status species of concern prior to construction. Consultation with the USFWS has been conducted by Western to comply with Section 7 of the ESA for federally-listed, proposed, and candidate species. A Biological Assessment (BA) has been prepared by Western for construction and operation of the proposed Big Stone II Power Plant and groundwater system to determine effect on Federal special status species. Western made a determination of no effect to listed species. The USFWS concurred with Western's determination on October 9, 2007 (see Appendix L). Co-owners would adhere to the mitigation measures included in the BA (SMM Bio-2). No designated Critical Habitat for special status species is located on the proposed plant site or the groundwater area.

Upland special status species are not dependent on groundwater, and changes in groundwater levels due to groundwater pumping would not affect these species. Groundwater contribution to the Whetstone River (as discussed in Section 4.2.2.1) and to local wetlands (as discussed in Section 4.4.2.1) is minor during most of the year, especially during periods of peak activity for special status species.

The average contribution of groundwater to the flow of the Whetstone River during groundwater pumping (1.36 cfs) is about one percent of the river's 110 cfs high flows during the April-July period when most special status species are in active reproductive and/or growth stages of their annual life cycles. Therefore, reduction of the groundwater contribution to the Whetstone River would not result in a substantial reduction in the river's flow, and impact on special status species using the Whetstone River and/or local wetlands would be less than significant.

<u>Vegetation</u>

The impact analysis for special status plant species focused on those species identified as possibly occurring within the proposed Big Stone II plant site and groundwater area. Special status species that may occur on the proposed plant site or groundwater area include 27 terrestrial and aquatic plant species (nine special status species and 18 species of special concern) (Appendix F, Table 2).

Sensitive plant species that are potentially present on the Big Stone property would most likely be found within the less-disturbed, higher quality vegetation communities. Since there are no proposed short- or long-term impacts to these areas, there is no anticipated loss of sensitive plant species that may exist within these areas.

Impacts to special status plant species in low-quality vegetation communities could include the loss of individuals or local populations as a result of crushing from construction vehicles and equipment, clearing and construction of plant components, groundwater wells, pipelines, and electrical distribution lines. Construction impacts from the construction laydown, parking facilities, and pipelines would be short-term and the sites would be reclaimed and reseeded (SMM Bio-5). The proposed groundwater pipeline system is still being designed; therefore, the exact routes of pipelines connecting the proposed groundwater production wells to the proposed plant are not currently known. To minimize disturbances to special status species, proposed pipelines, and electrical distribution lines would be constructed, to the extent possible, along the ROW of county roads and roads along section lines, to avoid wetlands, streams, and tributaries in accordance with SMM Land-12.

Surveys conducted in June 2005 and June 2006 for the federally-threatened western prairie fringed-orchid (*Platanthera praeclara*) found no individuals or populations of this species within the proposed Project area or adjacent property. Moreover, with the proposed Project, potential impacts to this species have been greatly reduced, if not eliminated. Land use within the expanded groundwater area is primarily cultivated and/or grazed. In addition, the majority of wetlands in the area is either dominated by dense cattail and reed canary grass or are farmed. Neither of these conditions promotes use by the western prairie fringed-orchid. Therefore, it is unlikely that the western prairie fringed-orchid is present in the groundwater areas. Presence/absence surveys for the western prairie fringed-orchid and other special status species would be conducted at the groundwater well sites, pipeline routes, and electrical distribution routes prior to construction in accordance with SMM Bio-1.

Invasion of suitable habitat by noxious weed species could occur from construction activities. This would constitute a significant impact. If adopted, development and implementation of an Integrated Weed Management Plan (additional mitigation measure V-1) would minimize impacts from noxious and invasive weeds to less than significant. Population level impacts on special status plant species would not be significant since surface disturbance within the proposed Big Stone II plant site and groundwater area would be localized to specific areas.

The effects of air emissions from the proposed Big Stone II plant in relation to special status plant species would be the same as discussed for vegetation. By implementing all applicable Federal, State, and local regulations (SMMs Gen-1 and Gen-2), adverse air impacts to special status species related to constructing and operating the proposed Big Stone II plant would not be expected. Impacts to special status plant species from maintenance activities would be the same as discussed for construction. Under SMM Gen-3, all personnel entering construction areas will be instructed on protecting all ecological resources, including special status plant species.
Discussion of other special status plant species:

Sharp-pointed umbrella sedge, yellow-fruited sedge, small white lady's-slipper, prairie mimosa, few-flowered spike-rush, mudwort, sea naiad, hair-like beak rush, widgeon grass, and larger water-starwort

These species could occur in wetland/riparian habitats along the drainages to the Whetstone River. In accordance with SMM Bio-3, all wetland and riparian areas would be avoided to the extent practical. Indirect impacts to these species could include displacement as a result of noxious or invasive species competition. Suitable habitat may be created or enhanced at off-site locations as a result of wetland mitigation following USACE requirements.

Red three-awn, eared false foxglove, Sullivant's milkweed, Missouri milkvetch, prairie moonwort, white prairie clover, plains prickly pear, soft goldenrod, yellow prairie violet, slender milkvetch, and tumblegrass

Impacts to these special status plant species would be the same as that discussed for the sharp-pointed umbrella sedge, except that impacts would include the short-term loss of approximately 18.3 acres and the long-term loss of 2.6 acres of prairie remnant and grassland habitat. The proposed plant site has suitable habitat for all of these species; however, only the slender milkvetch and the tumblegrass have been found there.

Cutleaf ironplant, clustered broomrape, black disc lichen, and ball cactus

Impacts to these special status plant species would be the same as discussed for the sharp-pointed umbrella sedge. The proposed plant site has suitable habitat for all of these species, however, only the black disc lichen and ball cactus have been found. Impacts would occur with the loss of suitable rock outcrop habitat. However, no rock outcrops located on the plant site would be lost or impacted.

Snow trillium

Impacts to the snow trillium would be the same as discussed for the sharp-pointed umbrella sedge, except that impacts would include the long-term loss of approximately 0.4 acre of forested habitat. The snow trillium is not a listed species, but is monitored under the Natural Heritage Program. No known occurrences have been documented within the proposed plant site; however, suitable habitat exists.

American spikenard

A survey was conducted (Barr, 2006b) for the State-listed species American spikenard (*Aralia racemosa*) because the South Dakota Natural Heritage Database listed this species as potentially present in Grant County. The intent of the survey was to provide objective, scientifically valid documentation of the actual presence of the species on the Big Stone property. The results of the survey indicated that the species is not present on the Big Stone property.

Impacts for special status plants would include the long-term net loss of suitable special status plant species habitat (prairie and forest vegetation) of approximately 3.0 acres within the proposed plant site and 1.4 acres within the proposed groundwater areas. However, none of the lost prairie or forest habitat was ranked as high- or medium-quality. There would be no impacts to high-quality vegetation communities, which are more likely to provide habitat and refuge for sensitive plant species. By implementing the SMMs, and the additional mitigation measures (if adopted) previously listed, no significant residual impacts to special status plant species are expected as a result of construction and operational activities.

<u>Wildlife</u>

Sixteen terrestrial wildlife species (six special status species and 10 species of concern) may occur within the proposed plant site and groundwater areas (Appendix F). Direct impacts from constructing and operating the proposed plant and groundwater system would include the loss or alteration of breeding and foraging habitats and increased disturbance. Mortality could also occur to less mobile or burrowing species. Abandonment of a nest site and the loss of eggs and/or young may also occur.

There are no anticipated impacts to State or federally-listed species. This is because there are no long-term impacts that would result in the loss of wetlands or prairies that support most sensitive species in the region. Potential habitat for the Dakota skipper (*Hesperia dacotae*), a federally-listed candidate butterfly, would not be impacted by the proposed activities. Based on the results of field surveys for sensitive species, and on known locations of existing eagle nests, there is no identified need for further consultation with USFWS, as well as no cause for an application for a State takings permit, unless the results of preconstruction surveys discover nesting birds within areas proposed for disturbance.

Indirect impacts would include additional disturbance resulting from elevated noise, increased human presence, and dispersal of noxious and invasive weed species. Dust deposition may extend beyond the boundaries of the construction area, resulting in a larger overall area of disturbance. Implementing SMM Air-1 would minimize dust deposition. Construction of the proposed plant may result in changes in habitat quality, habitat loss, reductions in local wildlife populations, and changes in species composition. However, the severity of these effects on terrestrial wildlife depends on factors such as sensitivity of the species, seasonal use, type and timing of construction activities, and physical parameters (e.g., topography, cover, forage, and climate). Noise impacts would be minimized by SMMs Noise-1 and -3, which provide an adequate buffer around the plant site and mufflers for internal combustion engines, respectively. Upon completion of construction of the proposed Big Stone II plant, mitigation of disturbed areas to restore habitat by grading and planting native seed mixes (SMM Bio-5) would occur. Coal and limestone handling particulate emission controls would minimize dust deposition near the proposed plant during operation.

Mammals

No federally-listed special status species have been identified on the proposed plant site or expanded groundwater area. The only State-listed special status species known in these areas is the northern river otter. This species was observed in the Whetstone River during field surveys in July 2006, approximately 0.8 miles southeast of the existing Big Stone plant entrance. Critical stages in the life cycle of this species, including location of a mate, reproduction, rearing of young, and foraging, all occur during high-flow periods, when surface runoff primarily feeds the Whetstone River flow. During this time, the contribution of groundwater to the river's flow is approximately one percent of the total flow. Reductions in groundwater flow due to pumping activities would, therefore, have a negligible impact on the Whetstone River flow and on the northern river otter's use of the river.

Indirect impacts would include amplified noise levels, increased human presence during construction, and short-term displacement. However, because the proposed plant would be constructed immediately adjacent to an existing plant, it is assumed that the northern river otter, if present, is acclimated to existing disturbance (e.g., noise and human activity). Noise impacts would be minimized by SMMs Noise-1 and -3, which provide an adequate buffer around the plant site and mufflers for internal combustion engines, respectively.

A survey was conducted (Barr, 2006b) for the State-listed eastern grey squirrel (*Sciurus caroliniensis*) because the South Dakota Natural Heritage Database listed this species as potentially present in Grant County. The survey followed USFWS Habitat Suitability Index protocols to determine forage, cover, and reproductive habitat for the species. The intent of the survey was to provide objective, scientifically valid documentation of the actual presence of the species on the Big Stone property. The results of the survey indicated that the species is not present on the Big Stone property. Moreover, the small average wooded stand size and configuration have an adverse effect on eastern gray squirrel populations, and tend to favor colonization by fox squirrels (*Sciurus niger*), a competing species. Overall, if eastern gray squirrels are present on the Big Stone property, they are likely limited to small populations in the oak-dominated stands adjacent to the Whetstone River, where there is no proposed disturbance related to the proposed Project.

Birds

One Federal special status bird species, the bald eagle, is known to occur in the vicinity of the proposed plant site. The American woodcock, a South Dakota special status bird species, may occur, but has not been documented within the proposed Project area. In accordance with SMM Bio-1, all areas would be surveyed for presence/absence of nests prior to commencement of construction activities.

Bald eagle

A bald eagle nest was observed in September 2004 approximately 0.3 mile from the proposed Project site boundary and approximately 1.3 miles from the primary proposed plant construction area (OTP, 2008a). This nest continued to be utilized by eagles until May 2007, when the tree in which it was built was blown down in a storm. Subsequent to the loss of the nest, a pair of eagles built another nest in a nearby tree. This nest is more than 0.25 mile from the proposed Project site boundary and approximately 1.25 miles from the proposed plant construction area. Eagles have nested and raised young at this distance from the proposed Project site for at least five years under the current level of disturbance from the existing power plant facility. As a result, no additional direct or indirect impacts to the current eagle nest are anticipated from constructing and operating the proposed plant, since the nest site is greater than one mile from the proposed plant construction area. However, in the unlikely event that another new eagle nest site is established within a mile of the proposed plant site, possible impacts could include abandonment of a breeding territory or nest site or the loss of eggs or young. In the event that another new eagle nest is found closer to the power plant prior to construction, the Co-owners would contact USFWS agency staff about implementing additional special mitigation measures.

As discussed in Section 3.4.2.4, wintering bald eagles have been documented in the vicinity of the proposed plant site (SDGFP, 2004a). However, no historic or active communal roost sites or winter roosts have been identified within the proposed plant site. As a result, impacts to wintering bald eagles would be limited to the irregular occurrence of roosting or migrating individuals within the proposed plant site. Based on the infrequent occurrence of wintering eagles in the immediate vicinity of the proposed plant site and the current level of human activity associated with the existing plant, no additional direct or indirect impacts to wintering eagles would be anticipated from the proposed plant.

Bald eagle wetland/riparian habitat would be created or enhanced at off-site locations following USACE requirements (SMM Bio-3) and pollutants to nearby waters would be avoided by preventing accidental spillage as stated in SMM Water-3.

Another direct impact for the bald eagle is exposure to toxic chemicals through plant emissions. Atmospheric mercury is a worldwide problem and can be transported by runoff into waterways (Section 4.1). Biological processes transform inorganic mercury into toxic organic forms (i.e., methylmercury). Methylmercury can be found in fish and high concentrations of methylmercury can cause fish-eating birds, such as the bald eagle, to experience damage to the central nervous system, birth defects, and cancer. As discussed in Section 4.1.2, mercury emissions would be addressed in the Settlement Agreement (see Appendix K, Volume III of the Final EIS). The terms of the Settlement Agreement were included as a condition to the Certificate of Need, issued March 17, 2009. Western's BA included a Bald Eagle Mercury Exposure Assessment that assessed the potential impact of mercury exposure on eagles (see Appendix L).

Based on the assessment, Western determined that the proposed Project may affect, but is not likely to adversely affect, the bald eagle.

American woodcock

The American woodcock is a South Dakota imperiled species due to its rarity. Impacts to the American woodcock would be the same as those for terrestrial wildlife. Direct impacts to this special status bird could result in the incremental reduction of habitat and increased disturbance. Nest abandonment and loss of eggs or young could result from crushing by vehicles and equipment. Mortality to nesting birds would be minimized through additional mitigation measure WL-1, if adopted, which requires preconstruction surveys within construction boundaries and permits for removal of any bird nests.

Indirect impacts would include increased noise levels and human presence, dispersal of noxious weeds and dust effects from traffic on unpaved roads. When construction activities subside, noxious weeds and disturbed areas would be mitigated by grading and planting native seed mixes (SMM Bio-5) to restore wildlife habitat.

Reptiles

Spiny softshell turtle

The spiny softshell turtle is an imperiled South Dakota rare species. As identified in Appendix F, Table 2, this species occurs in streams, rivers, and lakes with sandy bottoms. No habitat has been identified on the plant site for this species. If this species is found, the Co-owners will coordinate with appropriate Federal and State resources management agencies to address appropriate mitigation (e.g., construction windows, buffer zones, and/or animal relocations).

Invertebrate Species

The Dakota skipper is a candidate for Federal listing. Impacts to this invertebrate species could include the long-term loss of approximately 2.6 acres of prairie remnant and grassland habitat within the construction parking area of the proposed plant site, long-term loss of approximately 1.4 acres of prairie remnant and grassland habitat within the groundwater areas, and increased disturbance, as discussed in the wildlife impact section. If the Dakota skipper is encountered, mortality could also result from crushing by vehicles and equipment. Indirect impacts would include increased noise levels and human presence, dispersal of noxious weeds, and dust effects from traffic on unpaved roads. However, three field surveys conducted between June 2005 and July 2006 did not identify any suitable habitat for the Dakota skipper on the proposed Big Stone II plant site. Additionally, since areas in the groundwater areas have been degraded by agricultural practices and grazing, suitable habitat is not likely present within the groundwater areas. Nevertheless, if this species is found, Western will coordinate with appropriate Federal and State resources management agencies to address appropriate mitigation (e.g., construction windows, buffer zones, and/or animal relocations).

Fisheries

Impact analysis on special status fish and mussels focused on six fish (lake sturgeon, blue sucker, blackside darter, rosyface shiner, horney chub, and golden redhorse) and five mussels (threeridge, cylindrical papershell, Wabash pigtoe, plain pocketbook, and fatmucket) (Appendix F, Table 2). These species, which may occur in the Minnesota, North Fork of the Whetstone, and Whetstone Rivers, are State-listed or special-status species in Minnesota and/or South Dakota. No federally-listed aquatic species or designated Critical Habitat occur in waterbodies within or downstream of the proposed plant site.

Construction activities that may affect aquatic habitat in these rivers would include surface disturbance at the proposed plant site and groundwater area. As discussed in the fisheries impacts, implementing SMMs Bio-5, Water-2, and Water-5 would minimize sediment input to drainages and would not cause a long-term loss or alteration of habitat used by special status fish species for spawning or rearing and mussel species for attachment to bottom substrates.

Water withdrawal from Big Stone Lake would result in flow changes in the Minnesota River for short durations but would not cause any loss of individuals (see Fisheries discussion). Flow reductions are not expected to affect mussel species habitat, if present, since they typically occur in the deeper portions of the river. Water withdrawal would not be an issue for special status aquatic species because: (1) special status species are not known to occur in the vicinity of the intake facility, based on Natural Heritage Program data and (2) water use would follow existing criteria for minimizing impingement and entrainment impacts on aquatic species.

Minor and episodic reductions in the flow of the Whetstone River due to proposed groundwater pumping would occur. Reductions in groundwater flows contributing to aquatic habitats would have a negligible impact on the quality and availability of those habitats. Therefore, impacts to special status species that use the Whetstone River or wetlands in the groundwater areas would be less than significant.

The use of petroleum products and other hazardous materials during construction and operation could pose a risk of spills or leaks that could enter Big Stone Lake or the Whetstone River. However, implementing SMMs Water-3 and -5 would minimize spill risks for adjacent water bodies or downstream areas such as the Minnesota River that could contain habitat for special status mussels and fish species such as lake sturgeon and blue sucker.

The possible effects of air emissions on acid rain and mercury contamination in surface waters are discussed in Sections 4.1 and 4.2. Based on predicted air emissions data, operating the proposed plant would not contribute particulates with pH levels or mercury that would measurably change background concentrations at the proposed plant site.

Summary of Impacts to Special Status Species

None of the anticipated impacts on special status species from construction and operation of the proposed Big Stone II plant or groundwater system for the proposed Project or Alternative 3 would violate Federal or other applicable statutes or regulations pertaining to special status species, jeopardize the continued existence of a federally-listed species, or cause a loss of individuals of a population of species that would result in a change in species status. No designated Critical Habitat is present within the proposed plant site or groundwater area. A bald eagle nesting site is located near the proposed plant site. Through implementation of SMM Bio-3, impacts to bald eagles in the proposed Project vicinity would not be significant. The proposed Project would not adversely impact habitat used by special status species for spawning or rearing, or habitat used by mussel species. Western determined that construction and operation of the proposed power plant and groundwater system would not affect any federally-listed species. The USFWS concurred with Western's determination. In the event that another new eagle nest, is found closer to the power plant prior to construction, the Co-owners would contact USFWS agency staff about implementing additional special mitigation measures.

The impacts of mercury and CO_2 on special status species would be the same as discussed under the vegetation and wildlife subsections above.

Wetland/Riparian Areas

The construction and operation impacts and mitigation measures associated with wetlands and riparian areas for Alternative 3 would be the same as the proposed Project. Protecting South Dakota wetland/riparian areas is a high priority to nearby communities. The landscape southwest of the existing Big Stone plant and northeast of Milbank has relatively few wetlands, especially compared to the area north of the existing Big Stone plant, which is dotted with numerous small wetlands (Barr, 2007c). These wetlands are typical of the Prairie Pothole Region (PPR). These are typically small (less than one acre) isolated depressions in the flat to gently rolling landscape, formed by the retreat of glaciers approximately 12,000 years ago. Wetlands in the PPR have water budgets that are driven principally, if not entirely, by surface water runoff and direct precipitation (Mitsch and Gosselink 2000).

The majority of PPR wetlands have water regimes that involve annual cycles of early season surface water followed by drying down. The amount of water in a given wetland depends on seasonal rainfall and spring snowmelt from surrounding agricultural fields and grasslands. In addition, PPR wetlands tend to go through 5-10 year cycles of drought and wet periods, resulting in vegetation patterns that vary with alterations in water depth (Richardson 2000).

<u>Proposed Big Stone II Plant Site</u>

A wetlands delineation for the proposed plant site was completed in September 2004 and June 2005, and is shown in Table 3.4-5. Under the proposed Project or Alternative 3, none of the proposed plant facilities are located within any wetland areas, including USACE jurisdictional or non-jurisdictional wetlands.

Water quality issues pertaining to surface and groundwater resources are discussed in Section 4.2. SMM Water-2 requires compliance with the NPDES requirements of the CWA, which would reduce adverse impacts to receiving wetland and riparian water bodies within the proposed Big Stone II plant site.

No surface drainage features were identified as perennial riverine systems within the proposed Big Stone II plant site; therefore, no adverse impacts to perennial riverine systems are expected as a result of constructing and operating the proposed plant. SMMs established to minimize adverse impacts to wetland/riparian areas within the proposed Big Stone II plant site include Water-2, which requires construction activities to comply with NPDES Stormwater Construction permit requirements, Water-3, which requires prevention of spills that could enter water bodies and Water-5, which controls wastewater from concrete batching without an appropriate permit.

No wetland losses are anticipated from constructing or operating the proposed Big Stone II plant.

Mercury deposition from coal-fired power plants would occur on wetland/riparian habitats. Mercury, while naturally present in small amounts in soils and bedrock, is known to enter watersheds through atmospheric deposition. Mercury emitted from coal-fired power plants comes from mercury in coal, which is released when coal is burned. While fossil fuel-fired power plants are the largest source of human-generated mercury emissions in the U.S., they contribute only about one percent of the total annual emissions worldwide. USEPA has concluded that mercury from U.S. coal-fired power plants is responsible for very little of the mercury present in U.S. waters, with the majority resulting from sources outside the U.S. (USEPA, 2005f). In wetland/riparian areas, natural processes can convert certain forms of mercury to methylmercury – an organic form considered more toxic than other mercury compounds. Methylmercury contamination in water bodies may cause physiological effects to aquatic and semi-aquatic plants and physiological and neurological effects to animals, as well as altering the physical properties of the water body's substrate. As discussed in the subsection under Vegetation, if the proposed Big Stone II plant is constructed (and after implementation of emissions controls), mercury emissions from both plants would be less than the emissions from the existing plant. Although the combined plants would continue to emit mercury, the decrease in mercury emissions would result in reduced impacts to wetland/riparian areas in the vicinity. Additional detailed discussion on mercury may be found in the Mercury Response Paper (Response Paper A, Volume II).

Groundwater Areas

Vegetation in wetlands typical of those in the groundwater area consists primarily of grasses and sedges, as well as cattails. The majority of the wetlands in the area are dominated by reed canary grass (*Phalaris arundinacea*), an invasive grass species that typically forms monocultures in small temporarily or seasonally flooded wetlands. Cattails (*Typha latifolia, T. angustifolia*) tend to dominate in wetlands with prolonged surface inundation and higher soil moisture.

Most of the wetlands in the groundwater areas collect precipitation and local surface runoff. Precipitation is the main source of water in these wetlands, and runoff from snowmelt is the next most important source. It is possible that some of the wetlands also have shallow groundwater contributing to their hydrology. However, regardless of the degree to which a wetland is hydraulically connected to the groundwater, the general water budgets for PPR wetlands have rainfall, early season snowmelt, and surface runoff as major inputs, and groundwater as a negligible contributor. As a result, wetlands in the area tend to have widely fluctuating water levels because of their dependence on surface water inflows and direct inputs from precipitation.

An important factor in considering the hydrology of wetlands in the groundwater study area is the thickness of clay layers beneath the surface soils. Soil boring data available from SDDENR and the Co-owners' hydrogeological investigations were used to identify areas where the thickness of the clay layer is less than 10 feet. Wetlands could be in hydraulic contact with groundwater and more influenced by variability in the water table in such areas. Conversely, the water table has little if any influence on wetlands sitting above thicker clay deposits. These wetlands are likely perched above the water table surface and would not be affected by changes in groundwater levels.

Riparian areas within the groundwater areas are restricted to a few reaches of the Whetstone River main branch and its north and south forks. Along much of the Whetstone and its forks, adjacent vegetation immediately abuts the stream, with no riparian area. Other stretches of the Whetstone River have steep banks that drop nearly vertically to the streambed, leaving an abrupt change from upland vegetation to the stream itself, with no riparian transition.

Well Drilling and Installation Construction

In accordance with additional mitigation measure W-3, if adopted, well drilling, and well installation activities within the groundwater areas would not occur within wetland/riparian areas.

- **W-3.** The drilling and installation of wells would avoid wetland/riparian areas.

With implementation of additional mitigation measure W-3 (if adopted), no impacts to wetland/riparian areas are expected to occur during the additional proposed well drilling and installation activities conducted within the expanded groundwater area.

Pipeline Construction

Impacts to wetlands from pipeline construction include the loss or reduction of jurisdictional and isolated wetland or riparian areas or a decline in wetland or riparian community functionality. The NWI provides information on the types and size of wetlands in the groundwater areas. Based on this information, the proposed pipelines can be routed to avoid most wetlands. Therefore, disturbance to wetland/riparian areas during proposed pipeline construction is likely to be small. Any wetland crossed by the proposed pipeline corridors would be delineated to determine the amount of wetlands impacted. The USACE would review each crossing to determine the appropriate wetland approval. Because of the small number of wetlands or riparian areas impacted by pipeline construction activities, USACE Nationwide Permits would most likely apply to crossing locations. These impacts would also be temporary, since the original ground contour would be restored after the installation of the pipeline. Mitigation for jurisdictional wetlands would be required as part of the CWA Section 404 permit.

The Co-owners would maintain sound water and soil conservation practices during proposed pipeline construction activities to protect topsoil and adjacent water resources and minimize soil erosion in accordance with SMMs Bio-3 and Water-2 thru Water-10. Implementation of SMM Land-12 would route the pipeline along ROWs within county roads, section lines, and along well access roads. By avoiding sensitive wetland and riparian communities and implementing mitigation in accordance with USACE requirements, construction and operation impacts associated with the proposed pipeline would be minimized. Following the implementation of the SMMs, no significant impacts are expected as a result of construction and operation of the proposed pipelines.

Indirect loss of wetlands and riparian areas include the alteration of local drainage patterns, degradation of water quality, erosion and sedimentation, and the introduction of invasive plant species or creation of conditions that favor these species. There would be no alteration of local drainage patterns, because pre-construction ground contours would be restored, in accordance with SMM Geo-5. Water quality and erosion and sedimentation impacts can be eliminated through the implementation of SMM Water-2 during construction to control the amount and quality of runoff. However, introduction of invasive plant species is possible because of the disturbance of the ground and the prevalence of invasive species along the proposed pipeline route. Invasive species would be minimized in accordance with SMM Bio-5 and additional mitigation measure V-1, if adopted (described in Section 4.4.2.1). With implementation of the SMMs noted above, indirect loss of wetland/riparian areas from proposed construction and operation would not be significant.

Electricity Distribution to Wells

Construction activities associated with the erection of proposed utility poles and stringing of line for electricity distribution to wells would avoid direct impacts to wetland/riparian areas to the extent possible, in accordance with SMM Bio-3. Since all the streams in the groundwater supply area are small and can be spanned, no direct impacts are expected. Therefore, any impacts to wetland/riparian areas that may occur due to construction of the proposed electricity distribution network would be minimal.

Well Operations

The proposed Project includes a provision for pumping groundwater from the Veblen Aquifer to supplement appropriations from Big Stone Lake, which is the primary water source for the plant. The results of the groundwater modeling indicate that the Veblen Aquifer is a confined aquifer where a thick sequence of surficial clay overlies the aquifer. This occurs over large portions of the modeled area. In areas where a thin clay layer overlies the aquifer, or where a clay layer is absent, the Veblen Aquifer would be unconfined. This means that portions of the ground surface in the area of the groundwater wells are isolated from shallow water table conditions by a thick sequence of surficial clay. Wetlands over thick surficial clays are referred to as "perched" wetlands. In other areas near the groundwater wells, the clay layer is either absent or sufficiently thin to allow contact between the aquifer and the water table. In these areas, drawdown from proposed groundwater pumping would form a cone of depression at the surface of the water table in the vicinity of the wells. Wetlands in these areas are referred to as "non-perched" wetlands, and have at least some degree of groundwater contributing to their overall water budget. These wetlands would potentially lose a portion of the groundwater that would normally discharge into them. However, as discussed below, the contribution of groundwater to non-perched wetlands is very small relative to the contribution of surface runoff to the wetlands.

The degree of groundwater drawdown was modeled to determine the cones of depression and the maximum extent of a minimum two-foot (~0.6-meter) drawdown area. Combining the model results with soil boring logs that show the extent of thick surficial clay layers, it is possible to determine the locations of wetlands within the drawdown area and whether each wetland is perched or non-perched. The distribution and status (perched/non-perched) of wetlands within the proposed Project and Alternative 3 drawdown areas is shown on Figure 4.4-1.

There are 105 wetlands within the minimum two-foot drawdown area for the proposed Project. Of these, 67 are perched above the groundwater on thick surficial clay, and would not be affected by drawdown of the aquifer. The remaining 38 wetlands are above thinner clays, and are thus non-perched. Under Alternative 3, the modeled drawdown area is smaller. There are 39 wetlands within the drawdown area, 23 of which are non-perched. Table 4.4-3 summarizes wetland impacts for the alternatives. The percentage of non-perched wetlands in the Alternative 3 drawdown area is higher (59 percent) than in the proposed Project (36 percent). However, the number of non-perched wetlands and the area of non-perched wetlands is higher in the proposed Project.

Pumping of groundwater would not result in the loss of wetland area in either perched or non-perched wetlands within the drawdown area. This is because the contribution of groundwater to non-perched wetlands is very low relative to surface water inputs, and is insufficient to change the water regime of non-perched wetlands.

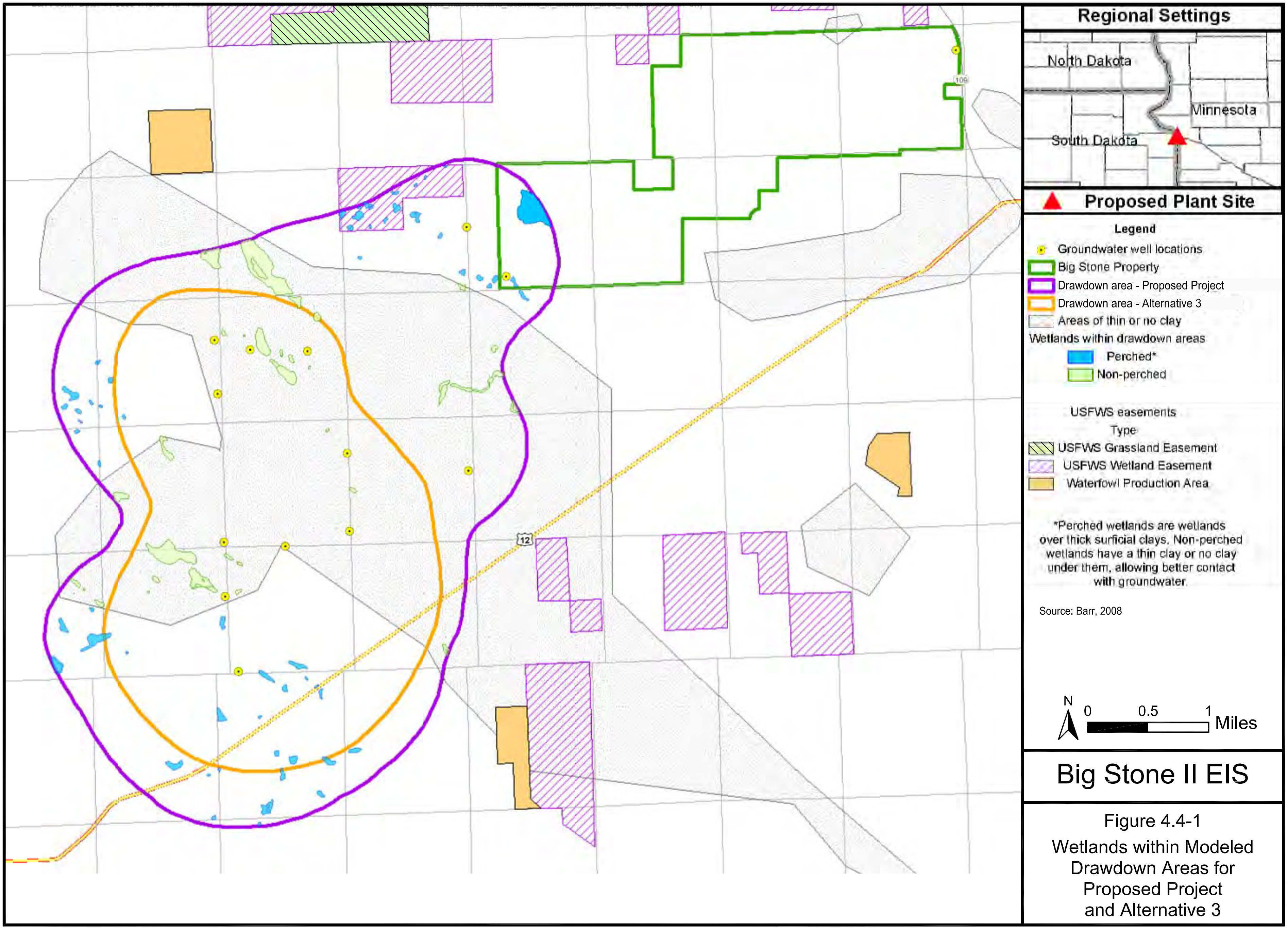

Figure 4.4-1
Wetlands within Modeled Drawdown Areas for Proposed Project and Alternative 3

Table 4.4-3. Comparison of Wetlands in Contact with Groundwater

Alternative	No. of Wetlands[a]	Total Area (acres)	No. of Wetlands in Contact with Groundwater[b]	Area (acres)
Proposed Project	105	256.6	38	148.6
Alternative 3	39	86.6	23	68.4

[a]The number of wetlands in the two-foot minimum drawdown area modeled for the Alternative.
[b]As determined by the depth of clay layers beneath the wetlands. Wetlands above thin clay are in potential contact with groundwater; wetlands above thicker clays are not.

Source: Barr, 2008.

As noted above, the wetlands in the drawdown area are part of the PPR. PPR wetlands derive their hydrology principally, if not entirely, from surface water runoff and direct precipitation (Mitsch and Gosselink 2000), regardless of contact with groundwater. Groundwater studies have determined that the groundwater contribution to the Whetstone River is approximately 1.6 percent of the base flow. The analogous contribution of groundwater to non-perched wetlands is estimated to be approximately the same or less, i.e., less than two percent of wetland hydrology. Reduction of so small an input to a wetland's water regime is unlikely to result in a noticeable shift in the period of saturation or inundation. The effect of surface runoff on a wetland's water regime is too strong to be significantly countered by decreases in an already small groundwater contribution. As a result, pumping of groundwater would have no impact on non-perched wetlands.

Moreover, shifts in water regime or vegetation community composition may occur in PPR wetlands as the region experiences cycles of drought and wet periods. Historical FSA aerial photographs of the wetlands in the area show the variability in area and estimated hydrology of wetlands during wet and dry years. The FSA aerial photos suggest that many of the wetlands in the area dry down during periods of drought, to the point where they are farmed for a period of years until drought conditions ease. Because of the cyclical variation in the hydrology of PPR wetlands, any changes in the water regime or vegetation of non-perched wetlands potentially attributable to utilization of groundwater would be indistinguishable from natural occurrences. In any event, appropriation of groundwater would not result in the loss of wetland area or function and would not drain any wetlands.

No calculation has been made of the acres of wetlands impacted by reduction of groundwater contribution, since the impact of reduced groundwater contribution to non-perched wetlands would not result in a loss of wetland area, even on a seasonal basis. As stated above, periodic reduction in the groundwater input is considered to be insufficient to offset the effect of surface water runoff and direct precipitation on water regime. No notable or consistently measurable wetland impacts are anticipated in any wetlands.

The USFWS was contacted to determine the location of USFWS land interests relative to the modeled drawdown areas. There are no USFWS land interests within the Alternative 3 modeled drawdown area. However, as shown by Figure 4.4-1, there is a USFWS wetland easement occupying most of the northern half of Section 16, Township 12 North, Range 47 West. This easement is west of the Big Stone property, at the northern edge of the drawdown area for the proposed Project. The minimum two-foot drawdown boundary for the proposed Project includes approximately the southern half and all of the eastern portion of this easement. According to NWI maps, there are approximately 22 wetlands in the easement. As indicated on Figure 4.4-1, twelve of these lie within the drawdown area. They range in size from 0.25 acre to 2.8 acres, with eight of the twelve under one acre. All of these wetlands are underlain by thick surficial clays, and are thus perched wetlands. Well operations would not result in loss of wetland area or function within this easement or in any USFWS land interests.

Based on Figure 4.4-1, which was derived from the groundwater modeling, no impacts would occur to wetlands, perched or non-perched, outside of the drawdown areas. This includes the numerous small isolated wetlands to the north of the Big Stone property, which typify PPR wetlands. This also includes the wetlands, lakes, rivers, and streams on the Lake Traverse Indian Reservation, including Owens Creek Fen.

There is no identified need for mitigation of wetland impacts related to construction and operation of the proposed plant site or the groundwater areas.

<u>Summary of Impacts to Wetland/Riparian Areas</u>

By implementing the SMMs, no significant impacts to wetlands or riparian areas are expected as a result of construction and operation activities from the proposed plant and its components under the proposed Project or Alternative 3. Construction and operation of the proposed plant would not result in the loss of any jurisdictional or non-jurisdictional wetlands. Indirect loss of wetland/riparian areas from construction and operation is not expected to result in a significant impact. Impacts on plants and animals that use wetlands are covered in the respective sections that cover plants and animals.

Under both the proposed Project and Alternative 3 there are non-perched wetlands that may have hydraulic contact with groundwater. Due to the low relative contribution of groundwater to the water regimes of non-perched wetlands, a reduction in groundwater would not result in a shift in water regime in those wetlands.

Wetlands would not be lost or permanently de-watered by groundwater pumping. There are no anticipated losses of wetlands, no loss of riparian areas, and no degradation or loss of any Federal- or State-protected wetlands as defined by Section 404 of the CWA or other applicable regulations. Degradation of water quality, diversion of water sources, or erosion and sedimentation resulting from altered drainage patterns would not result in an indirect loss of wetland or riparian areas. Since all the streams in the groundwater supply area are small and can be spanned, no direct impacts to riparian areas or wetlands are expected from the electrical distribution system.

Under both the proposed Project and Alternative 3, reductions in the flow of the Whetstone River from proposed groundwater pumping (see Section 4.2.1) would be less than significant and would represent only a small fraction of the river's flow. This would result in no reduction of or adverse impact to riparian areas.

Following the implementation of the SMMs and permitting procedures of the USACE, no significant impacts to wetland/riparian areas would occur from the proposed well installation, pipeline construction, and electrical distribution line construction activities.

4.4.2.2 Transmission Corridors, Substations, and Other System Improvements

This EIS addresses impacts that would occur by constructing and operating a high-voltage transmission line within a corridor. Since the specific route would be approved during the Minnesota and South Dakota permitting processes, the EIS addresses mitigation requirements for reducing impacts during the design and construction.

All corridors contain numerous special wildlife and vegetation areas including NWR, game production areas (GPA), WPA, SWMA, State identified rock outcrops, and high priority areas. Other areas include those identified by the MCBS as moderate to outstanding habitat and classified as a Minnesota Site of Biodiversity Significance (MSBS). Other vegetation features include tree lines, wind breaks, and remnant hardwood forests. SMM Bio-7 requires that these areas be avoided to the extent possible.

Vegetation

<u>All Corridors and Substations</u>

Short-term vegetation disturbances associated with construction activities of the proposed transmission lines would occur during construction of structures and pads, access roads, turnarounds, pulling and tensioning sites, access roads, and staging areas. All of the vegetation cover types would be impacted during transmission line construction. Long-term vegetation impacts associated with transmission line construction activities would occur within the wetland/riparian, shrubland, and upland forested communities due to their extended recovery timeframes. The vegetation would return to pre-disturbance conditions following successful reclamation within two years after short-term disturbances depending on the sensitivity of the plant communities, the timing and extent of the disturbance, and the geographic and topographic location. Long-term disturbances would result from maintaining structures and access roads. Table 4.4-4 summarizes the short-term and long-term disturbances for each vegetation type within the proposed corridors.

The majority of short-term impacts would occur in agricultural areas, which would be returned to production after completion of construction activities. Non-agricultural areas would be reclaimed and reseeded, with seeds native to the area in a seed mixture certified as free of noxious or invasive weeds or left in a condition which would facilitate natural revegetation (SMM Bio-5). Due to safety and reliability concerns, including fire and electrocution risks, trees 15-feet tall or greater within 15 feet of the transmission line may be selectively cut and removed from the ROW. Surface disturbance may create opportunities for the establishment of noxious and invasive weed species.

Long-term impacts would range from 21.8 to 49.1 acres per corridor as a result of long-term net loss of vegetation due to transmission line pads and access roads. In Corridor A, Corridor B, and Corridor B1, about half of these losses would be to agriculture lands. Landowners would be compensated for these losses. In Corridor C and Corridor C1, the majority of losses (Table 4.4-4) would be to forested land. Forested areas require clearing for safe operation of the transmission line, and vegetation must be kept low to prevent fire and line outages. If adopted, mitigation measure V-2 would help reduce adverse impacts to forested lands.

- **V-2**. Sensitive habitats including remnant native prairie ecosystems, high value wetland/prairie complexes, State identified rock outcrops, tree lines, wind breaks, and remnant hardwood forests, would be avoided, to the extent possible, during transmission line route selection.

Table 4.4-4. Acres of Land Cover Types Affected by the Construction and Operation of the Transmission Lines

Facilities	Agriculture		Wetland/ Riparian[c]		Open Water[d]		Forest[c]		Shrubland[c]		Prairie		Developed		Total	
	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term
Corridor A[a]																
Access Road (20'width)[e]	100.1	0	0	4.8	0	0	0	0.8	0	0.1	0.3	0	0.7	0	**101.1**	**5.7**
Temporary Structure Impact[f]	143.0	0	0	6.8	0	0	0	1.1	0	0.1	0.4	0	1.0	0	**144.4**	**8.0**
Permanent Structure Impact[g]	0	7.2	0	0.3	0	0	0	0.1	0	0	0	0	0	0	**0.0**	**7.6**
Pulling/tensioning Sites[h]	7.1	0	0	0.3	0	0	0	0.1	0	0	0	0	0	0	**7.1**	**0.4**
Staging Areas[i]	1.9	0	0	0.1	0	0	0	0	0	0	0	0	0	0	**1.9**	**0.1**
Total	**252.1**	**7.2**	**0.0**	**12.3**	**0.0**	**0.0**	**0.0**	**2.1**	**0.0**	**0.2**	**0.7**	**0.0**	**1.7**	**0.0**	**254.5**	**21.8**
Corridor B[a]																
Access Road (20'width)[e]	195.9	0	0	3.6	0	0	0	2.0	0	0.9	0.1	0	1.1	0	**197.1**	**6.5**
Temporary Structure Impact[f]	279.9	0	0	5.2	0	0	0	2.8	0	1.3	0.1	0	1.6	0	**281.7**	**9.3**
Permanent Structure Impact[g]	0	14.0	0	0.3	0	0	0	0.1	0	0.1	0	0	0	0.1	**0.0**	**14.6**
Pulling/tensioning Sites[h]	13.9	0	0	0.3	0	0	0	0.1	0	0.1	0	0	0.1	0	**14.0**	**0.5**
Staging Areas[i]	2.9	0	0	0.1	0	0	0	0	0	0	0	0	0	0	**2.9**	**0.1**
Total	**492.6**	**14.0**	**0.0**	**9.5**	**0.0**	**0.0**	**0.0**	**5.0**	**0.0**	**2.4**	**0.2**	**0.0**	**2.8**	**0.1**	**495.6**	**31.0**
Corridor B1[a]																
Access Road (20'width)[e]	199.2	0	0	3.2	0.0	0	0	2.0	0	0.9	0.1	0	0.9	0	**200.2**	**6.1**
Temporary Structure Impact[f]	284.5	0	0	4.5	0.0	0	0	2.8	0	1.2	0.1	0	1.2	0	**285.8**	**8.5**
Permanent Structure Impact[g]	0	14.2	0	0.2	0	0	0	0.1	0	0.1	0	0	0	0.1	**0.0**	**14.7**
Pulling/tensioning Sites[h]	14.3	0	0	0.2	0	0	0	0.1	0	0.1	0	0	0.1	0	**14.4**	**0.4**
Staging Areas[i]	2.9	0	0	0	0	0	0	0	0	0	0	0	0	0	**2.9**	**0.0**
Total	**500.9**	**14.2**	**0.0**	**8.1**	**0.0**	**0.0**	**0.0**	**5.0**	**0.0**	**2.3**	**0.2**	**0.0**	**2.2**	**0.1**	**503.3**	**29.7**
Corridor C[b]																
Access Road (20'width)[e]	208.3	0	0	7.6	0	0	0	4.8	0	1.1	0	0	1.1	0	**209.4**	**13.5**
Temporary Structure Impact[f]	320.7	0	0	11.7	0	0	0	7.4	0	1.7	0	0	1.8	0	**322.5**	**20.8**

Facilities	Agriculture		Wetland/ Riparian[c]		Open Water[d]		Forest[c]		Shrubland[c]		Prairie		Developed		Total	
	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term
Permanent Structure Impact[g]	0	13.3	0	0.5	0	0	0	0.3	0	0.1	0	0	0	0.1	**0.0**	**14.3**
Pulling/tensioning Sites[h]	2.6	0	0	0.1	0	0	0	0.1	0	0	0	0	0	0.1	**2.6**	**0.3**
Staging Areas[i]	3.7	0	0	0.1	0	0	0	0.1	0	0	0	0	0	0	**3.7**	**0.2**
Total	**535.3**	**13.3**	**0.0**	**20.0**	**0.0**	**0.0**	**0.0**	**12.7**	**0.0**	**2.9**	**0.0**	**0.0**	**2.9**	**0.2**	**538.2**	**49.1**
Corridor C1[b]																
Access Road (20'width)[e]	213.4	0	0	3.9	0	0	0	3.3	0	1.2	0	0	1.1	0	**214.5**	**8.4**
Temporary Structure Impact[f]	328.5	0	0	6.1	0	0	0	5.1	0	1.8	0	0	1.7	0	**330.2**	**13.0**
Permanent Structure Impact[g]	0	13.7	0	0.3	0	0	0	0.2	0	0.1	0	0	0	0.1	**0.0**	**14.4**
Pulling/tensioning Sites[h]	15.2	0	0	0.3	0	0	0	0.2	0	0.1	0	0	0.1	0	**15.3**	**0.6**
Staging Areas[i]	3.8	0	0	0.1	0	0	0	0.1	0	0	0	0	0	0	**3.8**	**0.2**
Total	**560.9**	**13.7**	**0.0**	**10.7**	**0.0**	**0.0**	**0.0**	**8.9**	**0.0**	**3.2**	**0.0**	**0.0**	**2.9**	**0.1**	**563.8**	**36.6**

[a]Calculations based on the H-frame structure, 230-kv alternative.

[b]Calculations based on the H-frame structure, 230-kv and 345-kV alternative.

[c]Any impact to forest, shrubland, and wetland vegetation cover types are considered a long-term impact based on length of recovery time subsequent to construction and reclamation.

[d]No impacts would occur in open water.

[e]Temporary access roads are inclusive within the construction ROW and are included as part of the ROW width calculation. Access road use is limited to the proposed Project's construction activities, however, vegetation impacts may be short-term or long-term based on the size and type of the plant species present. Permanent access roads were not included in this analysis due to the lack of information regarding the number and location of these roads. Turnaround areas (60-foot diameter) at each structure would be included in structure temporary impacts areas.

[f]All temporary structure impacts are inclusive within the construction ROW and are included as part of the ROW width calculation. These impacts were calculated using the following dimensions: 20,000 square feet per 700 feet (230-kV corridors) and 25,000 square feet per 800 feet (345-kV corridors).

[g]All permanent structure impacts are inclusive within the construction ROW and are included as part of the ROW width calculation. These impacts were calculated using the following dimensions: 1,000 square feet per 700 feet (230-kV corridors) and 1,000 square feet per 800 feet (345-kV corridors).

[h]Pulling and tensioning sites were calculated using the following dimension: 15,000 square feet every two miles.

[i]Staging areas were calculated using the following dimension: one acre per 25 miles.

Several SMMs are designed to reduce impacts to vegetation during construction activities. By implementing SMMs Gen-1, Gen-2, and Water-2, all construction and operation activities would be performed following Federal, State, and local environmental laws, orders, permits, and regulations. To assure that all personnel are knowledgeable about these requirements, SMM Gen-3 requires that all construction personnel and heavy equipment operators are instructed about protecting ecological resources, including sensitive plant communities within the selected route and substations.

SMM Bio-4 would be applied to preserve the natural landscape and vegetation. Construction activities would be conducted to minimize unnecessary destruction, scarring, or defacing of the natural surroundings, vegetation, trees, and native shrubbery in the vicinity of the work. SMMs Bio-6, Bio-8, and Bio-9 would be implemented to preserve or minimize disturbances to trees, native shrubs, and vegetation (in accordance with NERC safety and reliability requirements) to the maximum extent practical.

SMMs Bio-5 and Bio-6 would be implemented to facilitate successful reclamation of disturbed land by regrading to the original contour after disturbance and reseeding with a native seed mixture certified as free of noxious or invasive weeds, or left in a condition to facilitate natural revegetation. SMM Land-10 would be implemented to maintain sound soil practices with regards to ruts, scars, and compacted soils from construction activities in pastures and cultivated productive land.

Noxious Weeds

The introduction of noxious weeds and other undesirable plant species within disturbed areas of the proposed corridors and substation expansions could occur during construction from off-road driving, unwashed vehicles, and improper maintenance of temporary construction laydown and parking areas. Noxious weeds could also be introduced through transferring topsoil, construction materials, and/or soil stabilizing materials with noxious weeds into a previously uninfested area. Noxious species are generally fast-growing and could displace native species and inhibit the establishment of native grass, forb, and shrub species in areas beyond the construction areas. Any increase in noxious weed introduction would constitute a significant impact. If adopted, implementing additional mitigation measure V-1 would address noxious weed introduction, and there would be no residual short- or long-term impacts associated with introducing or spreading noxious weeds.

<u>Substations</u>

Modification to the existing substations (Morris Substation and Johnson Junction Switching Station in Corridor A; Willmar Substation in Corridor B; and Granite Falls Substation in Corridor C or C1) would result in the long-term removal of agricultural cropland (i.e., soybean or corn) if the substations require expansion. Relocation of the Canby Substation would result in long-term removal of agricultural cropland within Corridor C. Approximately 8.3 acres of vegetation would be impacted by the new construction. Except for the relocation of the Canby Substation, exact acreages for habitat alteration are unknown at this time. The mitigation measures outlined for the transmission corridors, including additional mitigation measure V-1, if adopted, to prevent the introduction or spread of noxious weeds, would apply at non-Western owned substations. For Morris and Granite Falls substations and in relocating the Canby Substation, Western's SMMs would be applied. By implementing these measures, impacts to vegetation at the substations from construction activities would be less than significant.

Other System Improvements

The exact number and extent of structure modifications required for the Hankinson Line upgrades is not yet known. As a result, the locations of vegetation disturbance are not yet known. After the existing line is surveyed and the locations of upgrades are determined, SMMs are in place for protection of sensitive vegetation communities and habitats. Therefore, regardless of the locations of the upgrades, the Co-owners would implement vegetation-related protection mitigation measures. With these measures, the improvements to the existing Hankinson Line would not cause any significant impacts to vegetation.

Summary of Impacts to Vegetation

Following implementation of the SMMs and the additional mitigation measures (if adopted), no significant residual impacts resulting in the loss of functionality of plant communities within the proposed corridors would be expected as a result of construction and operation. There would be no loss of any plant population that would result in a species being listed or proposed listing as threatened or endangered. Significant impacts to native vegetation may occur as a result of introducing noxious weeds during construction and operation. These impacts would be mitigated by implementing the SMMs and additional mitigation measures, particularly a noxious weed control plan (additional mitigation measure V-1, if adopted) for construction activities.

Wildlife

All Corridors

Direct short-term impacts to wildlife from constructing and operating the proposed transmission line would occur during construction due to elevated noise levels and increased human presence. Short-term and long-term impacts would occur from the loss of vegetation from transmission line construction activities. All corridors contain special wildlife areas including NWR, GPA, WPA, SWMA, and high priority areas. Other areas include those identified by the MCBS as moderate to outstanding habitat classified as a MSBS. Additionally, the Mound Springs Prairie SNA occurs within Corridor C. SNAs are legally designated public nature preserves established to protect the rarest natural resources and sensitive resources. No transmission line construction would be permitted within an SNA boundary (MnDNR, 2005b). Specific impacts to these areas would not be known until the transmission line route has been approved. By implementing SMM Bio-7, transmission line routing would avoid these areas.

A short-term loss or alteration of breeding and foraging habitats may occur resulting in increased habitat fragmentation. Mortalities of less mobile or burrowing species from vehicles and heavy equipment may also occur, as well as the abandonment of a nest site resulting in the loss of eggs and/or young. By implementing SMM Bio-10, impacts to nest sites would be avoided. Dust deposition could extend beyond the boundaries of the construction area, resulting in a larger overall area of disturbance. These effects may result in changes in habitat quality, habitat loss, increased animal displacement, reductions in local wildlife populations, and changes in species composition. However, the severity of these effects on terrestrial wildlife depends on factors such as sensitivity of the species, seasonal use, type and timing of activities, and physical parameters (e.g., topography, cover, forage, and climate). Since transmission line construction activities are sequential and move from one structure to the next, effects in one location would be short term. Displaced animals would likely return to the disturbed areas following construction activities. SMM Water-3 would control the introduction of constituents (spills, garbage, wastes, and other pollutants) into rivers, streams, and other water bodies.

Noise impacts from vehicles would be minimized by proper maintenance (SMM Noise-3). Implementing SMMs Air-1 and Air-4 would control fugitive dust. Upon completing construction of the proposed transmission lines, disturbed areas would be graded and revegetated with native seed mixes (SMM Bio-5) to restore wildlife habitat.

Long-term impacts would also result from the increased potential for collision of migrating and foraging birds with overhead wires (Avian Power Line Interaction Committee (APLIC), 1994). Collision likelihood depends on variables such as the transmission line orientation to flight patterns and movement corridors, species composition, visibility, and line design. In the event that the proposed Project activities were to occur during the breeding season for migratory bird species, activities could result in the abandonment of a nest site or territory resulting in the loss of eggs or young and the loss of productivity for the breeding season. Loss of an active nest, incubating adults, eggs, or young would violate the MBTA. However, SMM Bio-10 would avoid construction during the breeding season when practical. If construction were to occur during the breeding season, biological surveys would be performed and permits for take would be sought by the Co-owners.

Because the configuration of the proposed transmission lines (separation distance between energized conductors and between energized conductors and grounded hardware) would not present an electrocution potential to raptor species, electrocution impacts to foraging and roosting raptors (e.g., buteos and eagles) are not likely to occur from operating the transmission lines.

A summary of short- and long-term disturbed areas in each corridor is shown in Table 4.4-5.

Table 4.4-5. Wildlife Habitat Disturbance Acreage

Corridor	Short-term Disturbance (acres)	Long-term Disturbance (acres)
Corridor A	254.5	21.8
Corridor B	495.6	31.0
Corridor B1	503.3	29.7
Corridor C	538.2	49.1
Corridor C1	563.8	36.6

Sources: MnDNR, 2002, 2005d; HDR, 2005d, 2005e.

Long-term impacts would include the long-term net loss of wildlife habitat. Acreages of long-term impact would vary depending upon the corridors selected (Table 4.4-5). By implementing mitigation measures, no significant impacts would occur to terrestrial wildlife species.

<u>Substations and Other System Improvements</u>

Long-term impacts from modifying existing substations and relocation of the Canby Substation, and improvements to the existing Hankinson Line would include loss or alteration of habitat. Construction could also result in mortality of less mobile or burrowing species and abandoned nest sites resulting in the loss of eggs or young. Direct impacts to wildlife would also include limited direct mortality from construction activities, habitat loss, alteration or disturbance, and animal displacement. Indirect impacts, such as habitat fragmentation are not likely to occur due to the small acreage of agricultural land lost and noise levels that already occur at the substation sites and along the existing Hankinson Line. Mitigation would be the same as that described under substation vegetation impacts. If the substations did not require expansion, all work would occur within the fence line and no impacts to wildlife would occur. By implementing the SMMs and the additional mitigation measures (if adopted) discussed above, no significant impacts would occur to terrestrial wildlife species from substation modifications, relocation of Canby Substation, or upgrades to the existing Hankinson Line.

Avian Protection Plan

Long-term impacts to bird species would result from the increased potential for collision of migrating and foraging birds with overhead wires. The Co-owners would develop an Avian Protection Plan to minimize impacts to nesting birds, as well as to minimize the electrocution and collision of migratory and resident bird species. Collision likelihood is dependent on variables such as the height of the transmission towers, transmission line orientation to flight patterns and movement, species composition, visibility, and line design. The Co-owners propose to mark transmission lines in avian high-use areas (i.e., WPAs and WMAs and communication flyways (i.e., those areas birds use to move back and forth from feeding to loafing areas)) in cooperation with the appropriate agencies. The transmission lines and substation modifications would be designed and built in accordance with "Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 2006."

Summary of Impacts to Wildlife

With the implementation of standard and additional mitigation measures (if adopted) and development of an Aviation Protection Plan, there would be no significant impact to wildlife species. There would be no loss of individuals that would result in the species being listed or proposed for listing as threatened or endangered. There would be no violation of any statute or regulation pertaining to wildlife. No constituents would be introduced into any water body that would cause an adverse effect on wildlife.

Fisheries

All Corridors

Constructing a transmission line in any of the corridors may affect fish and invertebrate species depending on the location of the water body to the final route approved. In general, most of the construction activities would occur at least 50 feet from water bodies. However, soil from disturbed areas could still enter water bodies during runoff and cause an increase in sediment load with possible deposition on bottom substrates. The location of some small to mid-sized streams (widths less than about 30 feet and depths less than one foot) may require that short-term bridge structures be placed in the stream to allow crossing of vehicles and heavy equipment. Flow would be maintained but surface disturbance could result in localized suspended sediment or alteration of bottom substrates during construction. Possible effects on aquatic biota could include physiological stress, movement to avoid the affected area, or alteration of spawning or rearing areas as a result of sediment deposition (Waters, 1995). Typically, sedimentation effects are short-term in duration and localized. Standard mitigation practices would require recontouring disturbed areas to the terrain and reseeding to blend with native vegetation (SMM Bio-5). SMM Water-2 requires operation under an appropriate NPDES permit, which would coincide with SMMs Water-4, -9, and -10 to manage excavated materials and equipment movement along streambanks. SMMs Water-6 and -7 require structure sites and access ways to be located at least 300 feet, where practical, from banks of streams and rivers. With these measures, sediment input should be minor except for areas with existing erosion problems. Flows would be maintained at stream crossings using culverts (SMM Water-9) and would be covered under a Section 404 CWA permit from USACE. By implementing the SMMs, impacts to fisheries would be less than significant.

Riparian vegetation could be removed or damaged as a result of equipment or vehicle movements near water bodies. SMM Bio-8 would be implemented to minimize impacts on riparian vegetation adjacent to water bodies. As a result, no long-term alteration of fish habitat is anticipated.

Possible spills or leaks of petroleum products or hydraulic oil could also accidentally enter a water body during equipment or vehicle operation. Implementing SMM Water-3 and -5 practices would prevent a spill or contain a spill if one occurs.

Transmission line maintenance would involve periodic vegetation clearing and surface disturbance from vehicle movement. Impacts to aquatic habitat would be considered minimal since work would be infrequent and short-term in duration. Maintenance of culverts within water bodies would require a permit at the time of the action.

Transmission line operation would be limited to energizing the conductors. This type of activity would not affect fish species or their habitat.

After implementing SMMs for water bodies that might contain habitat for game and native fish species, no residual significant impacts to fisheries would occur.

<u>Substations and Other System Improvements</u>

Construction work related to modifying existing substations such as Morris and Granite Falls, relocation of the Canby Substation, and improvements to the existing Hankinson Line could result in surface disturbance in the Muddy Creek and Minnesota River drainages, both of which support game fish species. The types of impacts (i.e., surface disturbance/sedimentation) would be similar to those discussed for the proposed plant site. Modifications to Western's substation would be conducted under Western's standard construction practices (Table 2.2-9). SMMs would be implemented to minimize erosion input to surface water drainages. As described under vegetation, the Co-owners would apply SMMs at Willmar Substation. These measures would ensure that no long-term loss or alteration of habitat or water quality changes would affect game fish species.

<u>Summary of Impacts to Fisheries</u>

After implementing standard and additional mitigation measures (if adopted) for water bodies that might contain habitat for game and native fish species, no residual impacts from constructing transmission lines within any corridor, during substation modifications, or during improvements to the existing Hankinson line would occur. There would not be loss of individuals of an aquatic species that would result in the species being listed or proposed for listing as threatened or endangered. By implementing mitigation measures and complying with permit requirements there would be no significant impacts to fisheries from constructing these facilities.

Special Status Species

<u>All Corridors</u>

Vegetation

As discussed in Section 3.4.3.4, a total of 27 special status plant species (nine special status species and 18 species of special concern) were identified as occurring within the proposed corridors (Appendix F, Table 2). Overall, the mechanism for impacts to occur to special status species would be similar to those described for the proposed Big Stone II plant site. Direct impacts to special status plants occur from the loss of individuals during construction. The long-term loss of habitat for special status species associated with relatively small non-agricultural areas, most of which would occur in forested areas. Habitat type losses and species that may be impacted are shown in Table 4.4-6. Specific acreages of lost habitat would depend on final transmission structure placement within the corridor. Although specific acreages of habitat lost are unknown, habitat of this type does occur in the corridor and may be impacted by construction activities. Implementing SMM Bio-1 requires surveys for all species of concern in construction areas. Any impacts to species of concern would be mitigated following State and Federal procedures.

By implementing all applicable Federal, State, and local regulations (SMMs Gen-1 and Gen-2), adverse construction and operational-related impacts to special status species would not be expected for the proposed transmission lines. Under SMM Gen-3, all construction personnel and heavy equipment operators would be instructed on protecting all ecological resources, including special status plant species, within each proposed transmission corridor. Suitable habitat for these wetland/riparian habitat species would be created or enhanced at off-site locations following USACE requirements (SMM Bio-3). All additional mitigation measures (if adopted) identified in this Section 4.4 apply to special status species.

Following implementation of the SMMs and the additional mitigation measures (if adopted) previously listed, no significant impacts to special status plant species are expected as a result of construction and operational activities. A significant impact would occur if the continued existence of any western prairie fringed-orchid species or population were jeopardized; or if the loss of individuals or a population of species would result in upgrading of any listed special status species. In addition, a significant impact would occur if any Federal or other applicable statutes and regulations pertaining to special status species were violated. Western will provide these determinations regarding effects to federally-listed species once it completes a Biological Assessment for the proposed transmission corridors. Western will complete its obligation under the ESA prior to authorizing interconnections with its system.

Wildlife

A total of 16 terrestrial wildlife special status species (six special status species and 10 species of concern) may occur within the proposed corridors (Appendix F, Table 2). All special status species are protected under Federal, State, or local environmental laws, orders, and regulations. SMMs Gen-1 and Bio-2 require compliance with these regulations. SMM Bio-1 requires approved routes to be surveyed for all species of concern during transmission line design. Habitat losses by corridor are shown in Table 4.4-7**.** The table illustrates the total temporary and permanent acreage disturbance for each species. For some species, these impacts would occur incrementally over several years. Additionally, a loss in agricultural areas would be short term, providing habitat and/or food for wildlife within a year after disturbance.

Direct impacts to special status species from constructing and operating transmission lines within the proposed corridors may include the loss of individuals, the loss or alteration of breeding and foraging habitats, and increased habitat fragmentation. Mortality could also occur for less mobile or burrowing species, as well as the abandonment of a nest site and the loss of eggs and/or young, which constitutes a significant impact. If adopted, implementing additional mitigation measure WL-1, which requires preconstruction surveys within construction boundaries to identify sensitive species or their habitat, would minimize impacts to less than significant.

Table 4.4-6. Habitat Where Special Status Plant Species May Occur

Corridor	Habitat Type	Species	Total Short-term Disturbance[a]	Total Long-term Disturbance[a]
Corridor A	Wetland/ riparian	Sharp-pointed umbrella sedge, yellow-fruited sedge, small white lady's-slipper, few-flowered spike-rush, sea naiad, western prairie fringed-orchid, hair-like beak rush, widgeon grass, larger water-starwort[a], prairie mimosa[a], and mudwort[a]	0 acres – Gap Analysis Project (GAP)	12.3 acres – GAP
	Prairie remnant and grassland	Red three-awn, eared false foxglove, Sullivant's milkweed, prairie moonwort, white prairie clover, plains prickly pear, soft goldenrod, yellow prairie violet, slender milkvetch[a], Missouri milkvetch[a], and tumblegrass[a]	0.7 acres - GAP; 9.8 acres – MCBS; 24 acres – Prairie survey	0 acres – GAP; 0.7 acre – MCBS; 1.6 acres – Prairie survey
	Rock outcrop	Cutleaf ironplant, clustered broomrape, black disc lichen[a], and ball cactus[a]	1.3 acres – MCBS; 7 acres – Prairie survey	0.1 acre – MCBS; 0.5 acre – Prairie survey
	Forested	Snow trillium	0 acre - GAP	2.1 acres – GAP
Corridor B	Wetland/ riparian	Sharp-pointed umbrella sedge, yellow-fruited sedge, prairie mimosa, sea naiad, western prairie fringed-orchid, widgeon grass, larger water-starwort[a], small white lady's-slipper[a], mudwort[a], few-flowered spike-rush[a], and hair-like beak rush[a]	0 acre - GAP	9.5 acres – GAP
	Prairie remnant and grassland	Red three-awn, Sullivant's milkweed, Missouri milkvetch, prairie moonwort, white prairie clover, plains prickly pear, soft goldenrod, yellow prairie violet, eared false foxglove[a], slender milkvetch[a], and tumblegrass[a]	0.2 acre – GAP; 11.1 acres – MCBS; 26.5 acres – Prairie survey	0 acre – GAP; 0.7 acre – MCBS; 0.5 acre – Prairie survey
	Rock outcrop	Clustered broomrape, black disc lichen[a], ball cactus[a], and cutleaf ironplant[a]	1.3 – MCBS; 7 acres – Prairie survey	0.1 acre – MCBS; 0.5 acre – Prairie survey
	Forested	Snow trillium	0 acres –GAP	5 acres – GAP
Corridor B1	Wetland/ riparian	Sharp-pointed umbrella sedge, yellow-fruited sedge, prairie mimosa, sea naiad, western prairie fringed-orchid, widgeon grass, larger water-starwort[a], small white lady's-slipper[a], mudwort[a], few-flowered spike-rush[a], and hair-like beak rush[a]	0 acres - GAP	8.1 acres – GAP
	Prairie remnant and grassland	Red three-awn, Sullivant's milkweed, Missouri milkvetch, prairie moonwort, white prairie clover, plains prickly pear, soft goldenrod, yellow prairie violet, eared false foxglove[a], slender milkvetch[a], and tumblegrass[a]	0.2 acre – GAP; 12.4 acres – MCBS; 28.9 acres – Prairie survey	0 acres – GAP; 0.8 acre – MCBS; 1.9 acres – Prairie survey
	Rock outcrop	Clustered broomrape, black disc lichen[a], ball cactus[a], and cutleaf ironplant[a]	1.3 – MCBS; 7.0 acres – Prairie survey	0.1 acre – MCBS; 0.5 acre – Prairie survey
	Forested	Snow trillium	0 acre - GAP	5.0 acres – GAP
Corridor C	Wetland/ riparian	Sharp-pointed umbrella sedge, small white lady's-slipper, prairie mimosa, few-flowered spike-rush, mudwort, sea naiad, western prairie fringed-orchid, hair-like beak rush, widgeon grass, larger water-starwort[a], and yellow-fruited sedge[a]	0 acre – GAP; 0.1 acre - MCBS	20 acres – GAP; 0 acre – MCBS
	Prairie remnant and grassland	Eared false foxglove, red three-awn, slender milkvetch, prairie moonwort, tumblegrass, soft goldenrod, Sullivant's milkweed[a], Missouri milkvetch[a], white prairie clover[a], plains prickly pear[a], and yellow prairie violet[a]	0 acre – GAP; 10.1 – MCBS; 76.2 – Prairie survey	0 acre – GAP; 0.7 acre – MCBS; 5.1 acres – Prairie survey
	Rock outcrop	Ball cactus, cutleaf ironplant, clustered broomrape, and black disc lichen[a]	3.1 acres – MCBS; 14.2 – Prairie survey	0.3 acre – MCBS; 1 acre – Prairie survey
	Forested	Snow trillium	0 acre – GAP; 0.1 acre - MCBS	12.7 acres – GAP; 0 acre – MCBS;
Corridor C1	Wetland/ riparian	Sharp-pointed umbrella sedge, yellow-fruited sedge, small white lady's-slipper, prairie mimosa, few-flowered spike-rush, mudwort, sea naiad, western prairie fringed-orchid, hair-like beak rush, widgeon grass, and larger water-starwort[a]	0 acre - GAP	10.7 acres – GAP
	Prairie remnant and grassland	Eared false foxglove, white prairie clover[a], tumblegrass[a], red three-awn[a], Sullivant's milkweed[a], slender milkvetch[a], Missouri milkvetch[a], prairie moonwort[a], plains prickly pear[a], soft goldenrod[a], and yellow prairie violet[a]	0 acre – GAP; 16 acres – MCBS; 10.3 acres – Prairie survey	0 acre – GAP; 1 acre – MCBS; 0.6 – Prairie survey
	Rock outcrop	Ball cactus, black disc lichen[a], cutleaf ironplant[a], and clustered broomrape[a]	3.1 acres- MCBS; 14.2 acres – Prairie survey	0.3 acre – MCBS; 1 acre – Prairie survey
	Forested	Snow trillium	0 acre – GAP; 0.1 acre - MCBS	8.9 acres – GAP; 0 acre – MCBS

[a]Documented occurrence within corridor.
[b]Acres are not mutually exclusive and may overlap in areas and is therefore an overestimate of the habitat present within each proposed corridor. These acreages are representative of three different data sources (i.e., GAP data, MCBS Native Prairie Community data, and native prairie remnant survey results).

Sources: MnDNR, 2002; MnDNR, 2005e; HDR, 2005d.

Table 4.4-7. Habitat Where Special Status Wildlife Species May Occur

Corridor	Habitat Type[b]	Species	Total Short-term Disturbance[c]	Total Long-term Disturbance[c]
Corridor A	Wetland/ riparian	Northern river otter, bald eagle, loggerhead shrike, Wilson's phalarope, western hognose snake, and spiny softshell turtle	0.0 acres – GAP; 0.0 acres – MSBS; 0.0 acres – Prairie survey	12.3 acres – GAP; 0.0 acres – MSBS; 0.0 acres – Prairie survey
	Prairie remnant and grassland	Prairie vole, burrowing owl, loggerhead shrike, western hognose snake, Arogos skipper, Dakota skipper, Pawnee skipper, Powesheik skipper, red-tailed prairie leafhopper, and regal fritillary	0.7 acres - GAP; 9.8 acres – MCBS; 24.0 acres – Prairie survey	0.0 acres – GAP; 0.7 acres – MCBS; 1.6 acres – Prairie survey
	Rock outcrop[d]	Five-lined skink	0.0 acres – GAP; 1.3 acres – MCBS; 7.0 acres – Prairie survey	0.0 acres – GAP; 0.1 acres – MCBS; 0.5 acres – Prairie survey
Corridor B	Wetland/ riparian	Northern river otter, bald eagle, loggerhead shrike, Wilson's phalarope, western hognose snake, and spiny softshell turtle	0.0 acres – GAP; 0.0 acres – MSBS; 0.0 acres – Prairie survey	9.5 acres – GAP; 0.0 acres – MSBS; 0.0 acres – Prairie survey
	Prairie remnant and grassland	Prairie vole, burrowing owl, loggerhead shrike, western hognose snake, Arogos skipper, Dakota skipper, Pawnee skipper, Powesheik skipper, red-tailed prairie leafhopper, and regal fritillary	0.2 acres – GAP; 11.1 acres – MCBS; 26.5 acres – Prairie survey	0.0 acres – GAP; 0.7 acres – MCBS; 0.5 acres – Prairie survey
	Rock outcrop[d]	Five-lined skink	0.0 acres – GAP; 1.3 acres – MCBS; 7.0 acres – Prairie survey	0.0 acres – GAP; 0.1 acres – MCBS; 0.5 acres – Prairie survey
Corridor B1	Wetland/ riparian	Northern river otter, bald eagle, loggerhead shrike, Wilson's phalarope, western hognose snake, and spiny softshell turtle	0.0 acres – GAP; 0.0 acres – MSBS; 0.0 acres – Prairie survey	8.1 acres – GAP; 0.0 acres – MSBS; 0.0 acres – Prairie survey
	Prairie remnant and grassland	Prairie vole, burrowing owl, loggerhead shrike, western hognose snake, Arogos skipper, Dakota skipper, Pawnee skipper, Powesheik skipper, red-tailed prairie leafhopper, and regal fritillary	0.2 acres – GAP; 12.4 acres – MCBS; 28.9 acres – Prairie survey	0.0 acres – GAP; 0.8 acres – MCBS; 1.9 acres – Prairie survey
	Rock outcrop[d]	Five-lined skink	0.0 acres – GAP; 1.3 acres– MCBS; 7.0 acres – Prairie survey	0.0 acres – GAP; 0.1 acres – MCBS; 0.5 acres – Prairie survey
Corridor C	Wetland/ riparian	Northern river otter, bald eagle, loggerhead shrike, Wilson's phalarope, western hognose snake, and spiny softshell turtle	0.0 acres – GAP; 0.1 acres – MCBS; 0.0 acres – Prairie survey	20.0 acres – GAP; 0.0 acre – MCBS; 0.0 acres – Prairie survey
	Prairie remnant and grassland	Prairie vole, burrowing owl, loggerhead shrike, western hognose snake, Arogos skipper, Dakota skipper, Pawnee skipper, Powesheik skipper, red-tailed prairie leafhopper, and regal fritillary	0.0 acres – GAP; 10.1 acres – MCBS; 76.2 acres – Prairie survey	0.0 acres – GAP; 0.7 acres – MCBS; 5.1 acres – Prairie survey
	Rock outcrop[d]	Five-lined skink	0.0 acres – GAP; 3.1 acres – MCBS; 14.2 acres– Prairie survey	0.0 acres – GAP; 0.3 acres – MCBS; 1.0 acres – Prairie survey
Corridor C1	Wetland/ riparian	Northern river otter, bald eagle, loggerhead shrike, Wilson's phalarope, western hognose snake, and spiny softshell turtle	0.0 acres – GAP; 0.0 acres – MSBS; 0.0 acres – Prairie survey	10.7 acres – GAP; 0.0 acres – MSBS; 0.0 acres – Prairie survey
	Prairie remnant and grassland	Prairie vole, burrowing owl, loggerhead shrike, western hognose snake, Arogos skipper, Dakota skipper, Pawnee skipper, Powesheik skipper, red-tailed prairie leafhopper, and regal fritillary	0.0 acres – GAP; 16.0 acres – MCBS; 10.3 acres – Prairie survey	0.0 acres – GAP; 1.0 acres – MCBS; 0.6 acres – Prairie survey
	Rock outcrop[d]	Five-lined skink	0.0 acres – GAP; 3.1 acres- MCBS; 14.2 acres – Prairie survey	0.0 acres – GAP; 0.3 acres – MCBS; 1.0 acres – Prairie survey

[a]Habitat disturbance is based on the percentage estimate of available vegetation cover types within each corridor as identified in Table 4.4-4.
[b]No species occur in forested habitat and therefore, were not analyzed in this table.
[c]Acres are not mutually exclusive and may overlap in areas and are therefore an overestimate of the habitat present within each proposed corridor. These acreages are representative of the three different data sources (i.e., GAP data, MCBS native Prairie Community data, and native prairie remnant survey results).
[d]Rock outcrop disturbance is based on the percentage estimate of available rock cover types within each corridor as identified in Table 4.4-4.

Sources: MnDNR, 2002; MnDNR, 2005e; HDR, 2005d.

Indirect impacts would include habitat fragmentation resulting from elevated noise, increased human presence, dispersal of noxious and invasive weed species, and dust deposition. These impacts would extend well beyond the boundaries of the construction area. These effects may result in changes in habitat quality, habitat loss, animal displacement, and changes in species composition. However, the severity of these effects depends on factors such as sensitivity of the species, seasonal use, type and timing of construction activities and topography, cover, forage, and climate. Noise impacts would be minimized by SMM Noise-3, which requires proper maintenance of internal combustion engine mufflers to control noise. Upon completion of construction, noxious weeds and disturbed areas would be mitigated by grading and planting native seed mixes (SMM Bio-5), to restore wildlife habitat. If adopted, implementing a weed control plan (V-1) would further mitigate noxious weed invasion, avoiding wildlife habitat invasion and significant impacts to wildlife would not occur.

Mammals

Two special status mammal species (northern river otter and prairie vole) may occur within the proposed corridors. Habitat for the northern river otter occurs in wetland/riparian areas that may be impacted by construction activities. Mitigation for this species habitat would be created or enhanced at off-site locations in accordance with USACE requirements (SMM Bio-3). Prairie voles are found in tall grass habitats within the corridors. If prairie voles are present, direct impacts would include mortality. Preconstruction surveys within construction boundaries, as outlined in additional mitigation measure WL-1, if adopted, would increase avoidance and minimize direct impacts to prairie voles.

Birds

Impacts to special status birds (bald eagle, burrowing owl, loggerhead shrike, and Wilson's phalarope) would be similar to those discussed for the proposed plant site, except the additional impacts due to collision. Electrocutions would be minimized because 230-kV and 345-kV transmission lines and tower design would have enough separation distance between energized conductors and between energized conductors and grounded hardware. Additionally, the collision likelihood would decrease by implementing SMM Bio-10, which would require installing state-of-the-art line marking devices where appropriate.

Bald eagle

Impacts to bald eagles would depend on a number of variables, including: (1) the distance from a nest to the transmission line route; (2) possible topographical shielding; (3) the types of activities planned for that portion of the route; (4) age of the nestlings; and (5) duration of the activities. Direct impacts to the bald eagle foraging habitat would result in a short-term loss of foraging habitat (e.g., open water, wetland) within the corridors. Two bald eagle nests have been found in the studied corridors: one in Corridor C and one in Corridor C1. Although wintering bald eagles are known to occur within the proposed Project area, no historic or active winter roosts or winter concentration areas have been identified within the proposed corridors. Based on the infrequent occurrence of wintering eagles in the proposed corridors, no direct or indirect impacts to roosting eagles would be anticipated from constructing and operating a transmission line. Surveys would be conducted to determine if any bald eagles or their nests are present within the construction area (SMM Bio-1). If bald eagles or their nests are found, the following additional mitigation measure WL-2 would be implemented if adopted:

- **WL-2**. During preconstruction surveys, if eagles are found to be nesting within one-half mile of the approved ROW for the proposed transmission line, construction activities would not occur between January and August.

As discussed in the previous subsection, the presence of a new transmission line may increase the potential for collision by migrating and foraging bald eagles (APLIC, 1994). However, collisions are typically associated with variables such as the location in relation to high-use habitat areas (e.g., nesting, foraging, and roosting), line orientation to flight patterns and movement corridors, species composition, visibility, and line design. Additionally, collision likelihood is decreased by implementing SMM Bio-10, which would require installing state-of-the-art line marking devices where appropriate.

Burrowing owl, loggerhead shrike, and Wilson's phalarope

Impacts to special status bird species (i.e., burrowing owl, loggerhead shrike, and Wilson's phalarope) would be the same as discussed for the proposed plant. Direct impacts to special status bird species could result in reducing habitat and increased habitat fragmentation. Foraging habitat for the Wilson's phalarope (i.e., wetland/riparian) would be created or enhanced at off-site locations following USACE requirements (SMM Bio-3).

Additional mitigation measure WL-1, if adopted, would minimize nest abandonment resulting in loss of eggs or young and to nesting birds. WL-1 requires construction areas to be surveyed for birds and their nests.

Reptiles

Construction of the proposed transmission lines within the corridors may impact three reptile species:

Five-lined skink

Five-lined skink may be present in rock outcrops in the proposed corridors. However, rock outcrops and vegetation around the margins are protected under Minnesota Endangered Species law (MS 84.0895). Impacts would be minimized through SMM Bio-1, which calls for surveys of approved routes for threatened and endangered species prior to construction, and, if this species is found during the surveys, an action plan would be implemented incorporating procedures recommended from State agency consultations (e.g., buffer zones, construction windows, and/or relocation of animals).

Spiny softshell turtle

Direct and indirect impacts to the spiny softshell turtle would include a short-term loss of wetland/riparian habitat within the corridors. This habitat would be created or enhanced at off-site locations following USACE requirements (SMM Bio-3). Pollutants to nearby waters would be minimized by SMM Water-3. In accordance with SMM Bio-1, if this species is found, an action plan would be implemented.

Western hognose snake

Impacts to the western hognose snake would be similar to those discussed for the western hognose snake at the proposed plant site. If this species is present within the corridors, direct impacts may include mortality. Impacts would be minimized through SMM Bio-1, which states that approved routes would be surveyed for threatened and endangered species prior to construction, and, if this species is found, an action plan would be implemented.

Invertebrates

Impacts to special status invertebrate species (i.e., Arogos skipper, Dakota skipper, Pawnee skipper, Powesheik skipper, red-tailed prairie leafhopper, and regal fritillary) would be the same as discussed for the proposed plant. Direct impacts to invertebrate species may include the short-term reduction of suitable habitat and increased habitat fragmentation. Long-term impacts would include the loss of approximately one acre of suitable habitat. Impacts could also result in mortality. Indirect impacts would include increased noise levels and human presence, dispersal of noxious weeds, and dust effects from unpaved road traffic. Implementing SMM Bio-1 would minimize the impacts to special status invertebrate species from construction activities. If these special status invertebrates are discovered during surveys, an action plan would be implemented (e.g., appropriate buffer zones, construction windows, and/or relocation of animals). If the Dakota skipper, a Federal candidate species, is present, the USFWS would be contacted immediately providing location information and plans to minimize impacts.

Fisheries

Impacts to fisheries from constructing and operating transmission lines within the corridors may result from increased sedimentation in water bodies that contain special status fish and mussel species. These impacts may be significant if construction activities alter spawning or rearing habitat.

Corridor A

Construction in Corridor A may result in increased sedimentation input to the Minnesota, North Fork of the Whetstone, and Whetstone rivers, which contain possible habitat for nine State-listed or special status fish species and six mussel species.

Corridor B

Increased sedimentation may impact three water bodies (Minnesota River, Pomme de Terre River, and Chippewa River), which may contain habitat for nine special status fish species and nine mussel species. These species are State-listed or special status species in Minnesota or South Dakota. No federally-listed species are known to occur within Corridor B. No direct alteration of habitat would be expected, since instream construction (e.g., short-term bridge structure or vehicle use in the river) would not occur.

Corridor B1

Impacts to special status fish and mussel species would be similar to Corridor B. The Chippewa River crossing would be located approximately five to 10 miles south of the Corridor B crossing. Suitable habitat for creek heelsplitter, spike, and black sandshell may also exist within Corridor B1.

Corridors C and C1

Increased sediment may impact numerous streams (Minnesota River, Lac qui Parle River, Yellow Bank River, South Fork Yellow Bank River, Monighan Creek, Cobb Creek, Whetstone River, North Fork of the Whetstone River) that may contain habitat for nine special status fish species and 15 mussel species. Mussel concentration areas also have been identified in portions of the Minnesota and Lac qui Parle rivers within the Corridor C. No direct alteration of habitat would be expected, since instream construction (e.g., short-term bridge structure or vehicle use in the river) is not planned for these streams.

Substations

Vegetation

As discussed in Section 3.4.2, no special status plant species were identified as occurring within the proposed substations modification areas (Appendix F, Table 2). The Canby Substation would be relocated to agricultural land absent of special status plant species. Therefore, no short-term or long-term impacts are expected as a result of substation modification or relocation of the Canby Substation.

Wildlife

A total of four terrestrial wildlife species (bald eagle, burrowing owl, loggerhead shrike, and western hognose snake) may occur within the substation areas (Appendix F, Table 2). Impacts to these species would be the same as described in the transmission line corridors. Mitigation measures, surveys, and action plans to avoid impacts would be same as discussed for the corridors.

Fisheries

Construction work related to modifications at Granite Falls Substation could result in surface disturbance in the Minnesota River drainage, which supports special status fish and mussel species. The types of impacts (i.e., surface disturbance/sedimentation) would be similar to those discussed for transmission line construction. Mitigation for these impacts would follow Western's standard construction practices. These measures would ensure that no long-term loss, habitat alteration, or water quality changes would affect special status fish and mussel species. Morris and Willmar substations are not located near surface waters and no impacts to fisheries would occur.

Other System Improvements

The improvements to the existing Hankinson line would occur within an existing corridor that has been subject to on-going maintenance activities. Upon completion of the engineering survey to determine which structures require modification or replacement along the Hankinson line, a survey for special status species would be conducted in accordance with the transmission-related SMMs. In accordance with SMM Bio-1, the results of the site-specific environmental surveys would be used by the Co-owners to determine the need for additional agencies consultations and define an action plan to minimize impacts (e.g., buffer zones, construction windows, animal relocations) in the event species of concern are found during surveys.

Summary of Impacts to Special Status Species

Standard mitigation practices would require recontouring disturbed areas to the terrain and reseeding to blend with native vegetation (SMM Bio-5). SMM Water-2 requires operation under an appropriate NPDES permit), which would coincide with SMMs Water-3, -4, -5, -9, and -10 to manage excavated materials and equipment movement along streambanks to prevent erosion and to prevent materials from entering surface waters. SMMs Water-6 and 7 requires structure sites and access ways to be located at least

300 feet, where practical, from banks of streams and rivers. Implementing these measures would minimize sediment input to the rivers reducing impacts to a level considered less than significant. If adopted, the implementation of additional mitigation measures SS-1 and SS-2 would reduce the severity of the adverse impacts.

- **SS-1**. If instream construction activities are required for streams/rivers that may contain spawning habitat for game fish or sensitive fish species, a habitat survey would be conducted to determine if spawning substrates are present. Additional mitigation would be applied involving avoidance of the spawning period and returning bottom characteristics to pre-construction conditions.

- **SS-2**. If instream construction activities are required for streams/rivers that contain possible habitat for sensitive mussel species, a mussel survey would be conducted. If sensitive mussels are present, the crossing location would be moved to avoid impacting the habitat.

Following the implementation of the SMMs and the additional mitigation measures (if adopted), no significant impacts to special status plant species are expected as a result of construction and operational activities. A significant impact would occur if the continued existence of any western prairie fringed-orchid species or population were jeopardized; or if the loss of individuals or a population of species would result in upgrading of any listed special status species. In addition, a significant impact would occur if any Federal or other applicable statutes and regulations pertaining to special status species were violated. Western will provide these determinations regarding effects to federally-listed species once it completes a BA for the proposed transmission corridors. Western will complete its obligation under the ESA prior to authorizing interconnections with its system.

Wetland/Riparian Areas

<u>All Corridors</u>

The States of South Dakota and Minnesota have jurisdiction over determining the specific routes within the proposed corridors under their permitting processes. Therefore, the Final EIS evaluates the resources within three- to four-mile-wide corridors instead of specific routes. The SDPUC selected a centerline for the South Dakota portion of the lines as part of the January 16, 2007 Decision and Order Approving Stipulation and Granting Permit to Construct Transmission Facilities. The MnPUC authorized the transmission line route for the Minnesota portion of the proposed Project on January 15, 2009, by approving the Co-owners' preferred route: Alternative A (Corridor A to Morris, Minnesota and Corridor C to Granite Falls, Minnesota). The MnPUC issued their final written order granting the Certificate of Need and the Route Permit on March 17, 2009. The Co-owners would identify a transmission line centerline and acquire an easement from the landowners for the transmission ROW within the designated route approved by the MnPUC.

Several analyses would be completed by USACE as part of its evaluation of a CWA Section 404 permit application. USACE follows a sequence of three determinations in evaluating impacts to aquatic resources (USACE, 2006). The first step is to evaluate whether impacts to wetlands have been avoided to the maximum extent practicable, looking specifically for practicable alternatives that avoid impacts. If impacts cannot be avoided, the USACE then looks for steps taken by the applicant to minimize unavoidable impacts. Last in the sequence is compensating for unavoidable impacts. The permitting process in South Dakota and Minnesota are described in the following paragraphs.

A wetland delineation was completed for the South Dakota route in the summer of 2006. Prior to initiating the delineation, the USACE was consulted regarding the methodology. In a May 31, 2006 conference call, staff from the South Dakota Regulatory Office of the Omaha District USACE agreed with the proposed delineation approach of combining routine determination off-site and on-site inspection methods. In accordance with SMM Bio-3 (see Table 2.2-8 in the Final EIS), construction of permanent structures would avoid wetland and riparian areas to the extent practical. If wetland or riparian areas are unavoidable, impacts would be minimized or mitigated in accordance with USACE and State requirements. If design of the transmission lines located in South Dakota cannot avoid impacts to wetlands, the Co-owners would prepare and submit a Section 404 permit application to the USACE. The USACE would coordinate Section 401 certification with the SDDENR. Compensatory mitigation to offset unavoidable losses, if any, would be included with the permit applications the South Dakota route. Wetlands along the South Dakota centerline are generally narrower than the maximum span and long-term impacts are not anticipated. However, final pole placement has not been determined, and therefore, specific wetland impacts have not been calculated.

Once a centerline route has been established for each corridor through the State of Minnesota process, the Co-owners would survey a 150-foot wide ROW to identify wetlands. Wetland determinations would be conducted using a combination of two USACE methods since the proposed Project area is primarily agricultural land: routine determination and on-site inspection unnecessary, and routine determination and on-site inspection necessary. The Co-owners would discuss this approach with the regulatory agencies prior to beginning field work as part of its CWA Section 404 permit for the transmission lines. Once wetlands have been identified, the transmission line would be routed to avoid and minimize impacts to wetlands. This would include adjusting pole placement and span widths for both construction of a new line or upgrading an existing line. A wetland delineation report would be prepared to document the findings of the field survey and identify necessary permits for the proposed Project construction.

A permit application for Public Utility Projects would be prepared by the Co-owners if the route in Minnesota could not avoid or minimize wetland impacts. The application is a joint form that would meet the permitting requirements of Section 404 with the USACE, Section 401 Water Quality Certification with the MPCA, Permit to Work in Public Waters with the MnDNR, and the Minnesota WCA with the Local Government Units. Proposed changes to the Minnesota Wetland Conservation Act include a de minimus of between 400 and 2,000 square feet (depending on wetland type) of impact for a project in this area of Minnesota; impacts greater than this amount would require mitigation. It is likely that wetland impacts resulting from the proposed Project would be higher than the de minimus amount, and mitigation would be required. Mitigation, either through the use of wetland banks or through creation or restoration, would be designed to comply with appropriate regulations, and the Co-owners would work with the Local Government Units, the USACE and the MnDNR throughout the design and implementation process.

The total wetland/riparian habitat within the corridors that may be impacted are summarized in Table 4.4-8. The acreage of wetlands that may be impacted was calculated based on the percentage of wetland habitat within each corridor (see Table 3.4-8), in proportion to the facility impacts described in Table 4.4-4. These acreages are substantially higher than the actual surface disturbance that would occur within each of the proposed corridors. Impacts on plants and animals that would use these wetlands are addressed in the respective sections addressing impacts to plants and animals.

Table 4.4-8. Summary of Affected Wetlands Within Each Proposed Corridor

Transmission Line Corridor	Acres		
	Short-term Impacts[a]	Long-term Impacts	Total Impacts
Corridor A	--[a]	12.3	12.3
Corridor B	--[a]	9.5	9.5
Corridor B1	--[a]	8.1	8.1
Corridor C	--[a]	20.0	20.0
Corridor C1	--[a]	10.7	10.7

[a]The area of short-term impacts cannot be estimated at this time because transmission line routes have not been selected and most wetlands would be spanned (avoided). Short-term impacts could occur from driving across dry or frozen wetlands, mowing wetlands, soil sampling as part of a wetland determination and removal of poles from existing wetlands. Short-term impact to wetlands would not extend more than two reproductive cycles after construction.

Source: Table 4.4-4.

Upgrading existing transmission lines may have some advantages to wetlands over constructing a new transmission line. Poles currently located in wetlands would be removed where practical. Although a temporary impact from pole removal would occur, there would be a long-term beneficial impact. Upgrading existing lines would also reduce bird collisions due to larger conductors.

The Co-owners would maintain sound water and soil conservation practices during transmission line construction to protect topsoil and adjacent water resources and minimize soil erosion (SMMs Bio-3 and Water-2 thru Water-10). By implementing SMMs Bio-7 and Bio-3, involving avoidance of sensitive communities (i.e., wetland/riparian areas) and subsequent mitigation following USACE and Minnesota requirements, construction and operation impacts would be minimized. Following implementation of the SMMs, no significant impacts are expected from constructing and operating transmission lines within the proposed corridors. Indirect loss of wetland/riparian areas from construction and operation is not expected to result in a significant impact.

Substations

No wetland/riparian areas were identified as occurring within the proposed substation modification sites. No wetland areas are anticipated within the areas proposed for relocation of the Canby Substation. Therefore, no short-term or long-term impacts to wetland/riparian areas are expected from substation modifications or from relocation of the Canby Substation.

Other System Improvements

The exact number and extent of structure modifications required for the Hankinson Line upgrades is not yet known. As a result, the locations of improvements near wetlands is not yet known. After the existing line is surveyed and the locations of upgrades are determined, SMMs are in place for protection of wetland/riparian areas. The mitigation measures to prevent impacts to wetlands would be similar to those discussed for the transmission corridors. Therefore, regardless of the locations of the upgrades, the Co-owners would implement protection mitigation measures for wetland/riparian areas. With implementation of the SMMs, impacts to wetland/riparian areas along the Hankinson line would be minimal.

Summary of Impacts to Wetland/Riparian Areas

A significant impact would not occur as a result of any loss or degradation of any jurisdictional wetland, since these impacts would be mitigated under a Section 404 permit. Residual impacts would include the long-term net loss of wetland/riparian areas identified in Table 4.4-8. Construction of transmission lines within the corridors, modifications to substations, and relocation of Canby Substation would comply with regulations concerning wetlands. Any Federal- or State-protected wetlands would be avoided by implementing SMM Bio-3. Impacts to plants and animals that use wetland habitat are covered under parts of this section that address plants and wildlife. Measures to protect water quality and prevent diversion of water sources, erosion, and sedimentation have been adopted by the Co-owners. With implementation of the SMMs, impacts to wetland/riparian areas would be minimal.

Structure Alternatives

Analyses were conducted to quantify and compare impacts associated with using single-pole structures, rather than H-frame structures. The analyses assumed that reconstruction of the transmission lines from the existing Big Stone plant to Morris Substation (Corridor A) and to Willmar Substation (Corridor B) would be at 230-kV service. Assumptions also included that transmission line construction from Big Stone to Hazel Run (majority of Corridor C) would be at 345-kV service and Hazel Run to Granite Falls (minor portion of Corridor C) would be at 230-kV service. The results of the analyses are shown in Table 4.4-9.

Table 4.4-9. Comparison between the Two Structure Alternatives, H-frame and Single Pole

Proposed Transmission Line Corridors	H-Frame Structure		Single Pole Structure	
	Short-term[a] (acres)	Long-term[a] (acres)	Short-term[a] (acres)	Long-term[a] (acres)
Corridor A	957	7.6	1,027	5.3
Corridor B	1,827	14.6	1,960	10.2
Corridor B1	1,849	14.7	1,983	10.3
Corridor C	2,326	14.8	2,463	9.9
Corridor C1	2,251	14.3	2,383	9.6

[a]Totals are approximate due to rounding.

Source: OTP, 2005g.

Using single-pole structures would reduce long-term disturbance to vegetation communities by approximately 2.3 to 4.9 acres, or on average of 31.3 percent over H-frame structures. Short-term disturbance, however, would increase by 70 to 137 acres, or on average of 6.3 percent, because single pole structures generally require shorter spans. Consequently, installation of a greater number of structures per area would be necessary.

4.4.3 No Action Alternative

Under the No Action Alternative, Western would not grant the Co-owners' interconnection request, and the USACE would not issue any permits to the Co-owners related to the proposed Big Stone II. Under the No-Build Alternative, the proposed Big Stone II plant would not be constructed. None of the impacts associated with the proposed Project would occur to biological resources, except along the Ortonville-Johnson Junction-Morris 115-kV transmission line (within Corridor A), which would occur at a later date when the line is rebuilt. No additional disturbance would occur except for rebuilding the Ortonville-Johnson Junction-Morris 115-kV transmission line. Ongoing emergency and routine maintenance activities would continue. Impacts to vegetation, wildlife, fisheries, and wetland/riparian areas would continue to occur at current rates at the proposed plant site and along existing transmission lines. No impacts to special status species related to the proposed Project would occur, except for those associated with rebuilding the Ortonville-Johnson Junction-Morris 115-kV transmission line.

Under Sub-alternative 2, where the Co-owners would continue with the construction of the proposed plant and would seek alternate transmission capacity, the biological impacts associated with the construction, operation, and maintenance of the proposed plant would likely be identical to those presented above. Any impacts to the biological resources associated with the transmission component of the proposed Project would likely be similar to those presented as part of the potential impacts associated with the proposed Project, though their location is unknown.

4.5 Cultural Resources

4.5.1 Introduction

This cultural resources section discusses impacts to archaeological and historical resources that could occur as a result of constructing and operating the proposed Project.

Programmatic Agreement

A Programmatic Agreement (PA) has been developed for the proposed Project in accordance with the stipulations of Section 106 of the NHPA. The PA (Western, 2006c) was developed by Western and was completed after consultation with the Minnesota and South Dakota State Historic Preservation Officers (SHPO), the Co-owners, interested Tribes, cooperating agencies, and other interested parties. Mitigation measures as well as stipulations outlined in the PA are intended to eliminate or minimize adverse affects to cultural resources. Western, the South Dakota and Minnesota SHPOs, and other interested parties have signed the PA; it went into effect on January 9, 2007. Western has proposed revisions to the PA based on input provided by Tribal Historic Preservation Officers to include tribal values in the PA. The PA would apply to either action alternative.

The PA outlines the steps to be taken to identify cultural resources and to accomplish the following: evaluate them to determine eligibility for listing on the National Register of Historic Places (NRHP); identify potential adverse effects; develop measures to avoid, reduce, or mitigate adverse effects; and address inadvertent discoveries of cultural and paleontological resources. It also assigns roles and responsibilities for implementation of the PA, which ensures that all interested parties are involved in decisions regarding the treatment of historic and traditional cultural properties (TCPs) that may be affected by the proposed Project.

The proposed Project would be completed in accordance with the PA. By following the procedures outlined in Section 106 of the NHPA and the PA, adverse impacts (such as damage to, or loss of, archaeological and historic resources eligible for inclusion in the NRHP) would be avoided or mitigated. Unavoidable impacts to NRHP-eligible sites would be mitigated through implementation of a treatment plan in accordance with the PA. The proposed Project (with the exception of the upgrades required for the Hankinson line) is not located on any Native American lands.

In those instances where site avoidance is the agreed mitigation, activities within the expanded groundwater area and the proposed plant site would be monitored or sites flagged to prevent inadvertent destruction of cultural resources. Additionally, well drilling and construction crews would be monitored to the extent possible to prevent vandalism or unauthorized removal or disturbance of cultural artifacts or materials in accordance with SMM Cult-2.

Appropriate mitigation measures for protection of cultural and historical resources are included in the PA. Impacts to NRHP-eligible sites would not be significant with implementation of the PA and SMMs.

Identification of Issues

Development of the proposed Project could affect NRHP-eligible cultural resources, if they are present in the Area of Potential Effect (APE). The APE is defined as the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of NRHP-eligible cultural resources (i.e., historic properties), if any such properties exist. Additionally, the APE is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking (36 CFR 800.16[d]).

The following issues and concerns regarding impacts could occur as a result of constructing and operating the proposed Project.

- Impacts resulting from surface-disturbing activities, such as access to construction areas by large machinery, improvement of existing access roads, demolition activities, use of staging areas for storage of equipment and supplies, and future maintenance activities. These physical impacts could occur to both known sites and subsurface sites that could be discovered and disturbed during ground disturbing activities.
- Construction impacts that include changes in erosion patterns.
- Impacts to cultural resources associated with off-road vehicle traffic associated with construction or maintenance.
- Impacts to cultural resources from increased access to areas resulting in vandalism and illegal artifact collection.
- Impacts resulting from introducing visual or auditory elements associated with new structures and auditory emissions in an otherwise rural or natural setting that is out of character with a resource.

Impact Assessment Methods

The PA outlines the steps to be taken to identify cultural resources; to evaluate them to determine if they are eligible for listing on the NRHP; to identify potential adverse effects; to develop measures to avoid, reduce or mitigate adverse effects; and to address inadvertent discoveries of cultural resources. It also assigns roles and responsibilities for implementing the PA, which ensures that all interested parties are involved in decisions regarding treatment of historic properties and TCPs that may be affected by the proposed Project.

The first step in establishing the scope of needed cultural resources identification efforts is to determine the undertaking's APE. The APE for the proposed plant site includes the footprint of the plant and all adjacent facilities, plus a buffer extending 200 feet outward in all directions from the perimeter of the footprint. The APE for new access roads would be a 100-foot-wide corridor and for the staging/laydown area would include the footprint of each area, plus a buffer extending 200 feet outward in all directions from the perimeter of each footprint. For the transmission lines, the APE would be 200-foot-wide corridor centered on the transmission line centerline. To assess the visual effects of the proposed Project, the APE for the visual setting of cultural resources would include an area within 0.25 mile of each proposed transmission line centerline and within one mile of the proposed plant site.

Under the PA, an intensive Class III cultural resources inventory of archaeological sites, standing structures and other cultural resources would be conducted prior to the proposed Project's construction. The Class III field inventory, described in SMM Cult-1, would cover lands within the APEs for proposed Project components, and would include surface reconnaissance and/or subsurface testing as dictated by the given field conditions as agreed upon with the South Dakota and Minnesota SHPOs. A windshield survey of the built environment and cultural landscapes would be conducted within 0.25 mile of the centerline of each proposed corridor and within one mile of the proposed plant site to assess visual effects. All built environments that are 45 years or older would be recorded at a level adequate to determine the proposed Project effects. Any information on the location of cultural resources would be treated in accordance with Section 304 of the NHPA and Section 9 of the Archaeological Resources Protection Act of 1979.

In consultation with the South Dakota, North Dakota, and Minnesota SHPOs and interested Tribes, Western would determine whether construction of the proposed Project would affect any historic properties listed on, or eligible for listing on, the NRHP. If a property would be adversely affected, mitigation would be proposed in accordance with provisions proposed for the PA. Mitigation may include, but not be limited to, one or more of the following measures: (1) avoidance through the use of realignment of the transmission line route, relocation of staging/laydown areas, or changes in the construction and/or operational design; (2) data recovery, which may include the systematic professional excavation of an archaeological site or the preparation of photographic and/or measured drawings documenting standing structures; and (3) the use of landscaping or other techniques that would minimize or eliminate effects on the historic setting or ambience of standing structures.

Significance Criteria

A significant impact on cultural resources would result if any of the following were to occur as a result of construction or operation of the proposed Project:

- Damage to, or loss of, a site of archaeological or historical value that is listed, or eligible for listing, on the NRHP.

4.5.2 Proposed Project and Alternative 3

The cultural resources discussion for the proposed Project and Alternative 3 are the same.

4.5.2.1 Big Stone II Plant Site and Groundwater Areas

It is currently unknown how many archaeological and historical resources would be impacted by the proposed power plant facilities. Prior to the proposed Project construction, Western would oversee an intensive Class III pedestrian survey of lands within the APEs for the plant components as identified in Section 3.5. Under the PA, Western would consult with the South Dakota and Minnesota SHPOs and interested Tribes to determine whether construction of the proposed power plant facilities would affect any historic properties listed on, or eligible for listing on, the NRHP. Western anticipates that by following the procedures outlined in Section 106 of the NHPA and the PA, adverse impacts to archaeological and historic resources eligible for inclusion to the NRHP would be avoided or mitigated. Implementing a treatment plan under the PA would mitigate unavoidable impacts to NRHP-eligible sites.

Proposed drilling activities in areas that are not documented as disturbed or previously surveyed would undergo a Class III survey to determine the extent of cultural resources within the proposed expanded groundwater area. The survey would include surface reconnaissance and subsurface testing, as appropriate. If drilling was to occur during winter months and frozen ground conditions, monitoring may be considered as an alternative methodology. Potential impacts to the railroad located in the southeastern corner of the proposed expanded groundwater area and its relationship with Site 39GT2007 (see Section 3.5.2) would also be evaluated.

In those instances where site avoidance is the agreed mitigation, construction activities would be monitored or sites flagged to prevent inadvertent destruction of cultural resources. Additionally, construction crews would be monitored to the extent possible to prevent vandalism or unauthorized removal or disturbance of cultural artifacts or materials under SMM Cult-2.

Activities associated with constructing the proposed Project could adversely affect previously undiscovered archaeological and historic sites. Cultural resources inventories may not locate all sites. Buried sites may be missed in the course of field investigations. Per SMM Cult-2, if a previously unknown cultural resource is encountered during the proposed Project construction, all work within 200 feet of the discovery that might adversely affect the cultural resource would cease until Western, in consultation with the appropriate parties, could evaluate the discovery. Treatment of any discovered cultural material would be conducted following the procedures detailed in the PA.

If construction or other proposed Project personnel discover what they believe to be human remains, construction would cease within 200 feet of the discovery and the construction or environmental inspector notified of the find. The inspector would notify the cultural resources field director or cultural resources monitor of the discovery and would secure the area of the apparent human remains to ensure no further disturbance or removal of those remains and associated material occurs. Treatment of any discovered human remains would be conducted following the procedures detailed in the PA.

Appropriate mitigation to protect cultural and historical resources are included in the PA for the construction of the proposed plant facilities. Impacts to NRHP-eligible sites would not be significant by implementing the PA and SMMs.

4.5.2.2 Transmission Corridors, Substations, and Other System Improvements

Archaeological Resources

Archaeological resources previously recorded or documented within the proposed transmission corridors include prehistoric earthworks, cemeteries, artifact and lithic scatters, depressions, and rock alignments. An 1870s location of the town of Minnesota Falls, Minnesota, is located within Corridor C. Table 4.5-1 provides a summary of the archaeological resources previously recorded and the number of sites eligible for listing within the proposed transmission corridors.

Table 4.5-1. Archaeological and Cultural Resources Previously Recorded

Corridor	Archaeological Resources Previously Recorded	Eligible for NRHP	Historical Resources Previously Recorded	Eligible for NRHP
Corridor A	15	1	145	27
Corridor B	12	1	61	6
Corridor B1	13	1	64	3
Corridor C[a]	81	13	119	4
Corridor C1	60	3	131	5

[a]The file search for archaeological and historic standing structures was conducted for three-mile-wide corridors, with the exception of Corridor C where portions of the corridor are four miles wide.

Source: Derived from Appendix G.

Historical Resources

Historical resources previously recorded or documented within the proposed transmission corridors include houses, community and commercial buildings, churches, schools, bridges, and farmsteads. Table 4.5-1 summarizes the historical resources previously recorded and number of sites eligible for listing within the proposed transmission corridors. The 29 new historic properties identified as a result of the architectural history resource survey conducted in Deuel and Grant counties, South Dakota, are not included in the totals provided in Table 4.5-1. One of the 29 properties is considered eligible for listing in the NRHP.

Assessment of Impacts

It is currently unknown how many historical resources would be impacted by constructing the proposed transmission lines and the proposed substation modifications. Prior to construction, Western would oversee an intensive Class III pedestrian survey of lands within the APEs, as described in the PA. Provisions of the PA and SMM Cult-1 would be followed for consultation and discovery as outlined in the assessment of impacts for the proposed plant site.

Activities associated with constructing the proposed transmission lines could adversely affect previously undiscovered archaeological and historic sites. Cultural resources inventories may not locate all sites. Buried sites may be missed in the course of field investigations. Per SMM Cult-2, if a previously unknown cultural resource is encountered during the proposed Project construction, all work within 200 feet of the discovery that might adversely affect the cultural resource would cease until Western, in consultation with the appropriate parties, could evaluate the discovery. Treatment of any discovered cultural material would be conducted following the procedures detailed in the proposed PA.

If construction or other proposed Project personnel discover what they believe to be human remains, construction would cease within 200 feet of the discovery and the construction or environmental inspector notified of the find. The inspector would notify the cultural resources field director or cultural resources monitor of the discovery and would secure the area of the apparent human remains to ensure no further disturbance or removal of those remains and associated material occurs. Treatment of any discovered human remains would be conducted following the procedures detailed in the proposed PA.

Impacts to NRHP-eligible sites would not be significant by implementing the PA and SMMs.

Substations

The substations proposed for modification are located on previously disturbed sites and are within the APEs for the proposed corridors. Specific modifications, including expansion of the substations, will be determined during the system impact studies and design phases of the proposed Project. The Canby Substation would be relocated to agricultural land. For construction activities, all provisions for the PA described for the transmission corridors would apply.

Other System Improvements

The existing Hankinson line crosses the northeast corner of the Lake Traverse Indian Reservation in northern Roberts County, South Dakota and southern Richland County, North Dakota. The approximately 68-mile long existing Hankinson line traverses across approximately 25 miles of the Reservation along a north-south corridor. The required improvements to the existing Hankinson line are described in Section 2.2.3. The exact number and extent of structure modifications is not yet known. For improvement activities, all provisions for the PA described for the transmission corridors would apply.

4.5.3 No Action Alternative

Under the No Action Alternative, Western would not grant the Co-owners' interconnection request, and the USACE would not issue any permits to the Co-owners related to the proposed Big Stone II. Under the No-Build Alternative, the proposed Big Stone II plant would not be constructed. None of the impacts associated with the proposed Project would be realized, except for the Ortonville-Johnson Junction-Morris 115-kV transmission line (Corridor A), which would occur at a later date when the line is rebuilt. Except for those cultural resources that may be discovered along the Ortonville-Johnson Junction-Morris 115-kV transmission line, no cultural or historical resources would be affected, and none of the impacts to cultural resources as identified for the proposed Project would occur.

Under Sub-alternative 2, where the Co-owners would continue with the construction of the proposed plant and would seek alternate transmission capacity, the cultural resource impacts associated with the construction, operation, and maintenance of the proposed plant would likely be identical to those presented above. Any impacts to cultural resources associated with the transmission component of the proposed Project would likely be similar to those presented as part of the potential impacts associated with the proposed Project, though their location is unknown.

4.6 Land Use

4.6.1 Introduction

This section discusses the impacts to land uses associated with the proposed Project and includes a brief summary of issues related to land use, impact assessment methods, and significance criteria. Land use in this section encompasses land use planning, public facilities, recreation, agricultural practices, and prime or unique farmland. The proposed Project would require land use-related action, approvals or permits for construction and operation including building permits or land use approvals. These are listed in Table 1.5-1.

As shown by Table 2.3-1, land use impacts at the proposed plant site for Alternative 3 would be the same as the proposed Project because the construction laydown and parking areas would not change, and the construction of the cooling tower and dry towers would be in areas previously disturbed by the existing Big Stone plant. Additionally, since Alternative 3 would use the same number of groundwater wells and pipeline system as described for the proposed Project, these land use impacts would also be the same. Therefore, this section applies to both the proposed Project and Alternative 3.

Federal agencies have a mandate under the Farmland Protection Policy Act to minimize unnecessary and irreversible conversion of farmland to nonagricultural uses. A Farmland Conversion Impact Rating would be completed by the NRCS in South Dakota for the proposed plant site, the proposed groundwater well and groundwater pipeline installations, and proposed transmission lines located within South Dakota. The NRCS in Minnesota would complete a rating for the proposed transmission lines and, if required, for the substation modifications, located in Minnesota.

Identification of Issues

The main issues related to land use include conflicts with land use plans and policies, long-term loss of current land uses, conflicts with special use areas, adequacy of recreational opportunities, loss of prime farmland and agricultural productivity, and conflicts with center pivot irrigation systems.

The following additional issues related to land use, recreation, and agriculture were identified during the scoping process:

- Conflicts with various special management areas (Big Stone NWR, Wetland Management District properties, Wildlife Management Areas (WMAs), Federal and State managed lands, SNAs, CRP Lands, State and national parks, and natural and cultural resource areas).
- Conflicts with fishing, hunting, birding, and outdoor activities at regional lakes and rivers used for recreational purposes.
- Conflicts with local businesses, public facilities, airports, tourism, and personal property.
- Loss of wildlife and recreational hunting as a result of loss of wetlands.
- Transmission line structures interfering with crop dusting and ground spraying equipment.
- Damage to farm machinery from striking power line poles.
- Effects of mercury emissions on recreational and subsistence fishing.
- Easement acquisition.
- Electrical effects of the transmission lines on global positioning system (GPS) units used for guiding farm machinery and interference with UH7 two-way radio.

Impact Assessment Methods

The methodology used for assessing land use impacts is comparative in nature. Constructing and operating the proposed plant, transmission lines, and associated facilities and substation modifications, as well as their predicted effects, were compared against existing land uses, existing land use plans and zoning, public facilities, and recreational resources in the areas that would be influenced by the proposed Project.

Prime farmland assessments were based on soil inventory sources (Section 3.3). Prime farmland in the proposed Project area may consist of both naturally-drained and artificially drained soils. For this assessment, only naturally drained soils that were confirmed to be prime farmlands by NRCS are described. Additional acreages of prime farmland soils may occur as a result of artificial drainage systems, but the acreage of these areas would be difficult to determine with any reliability. Therefore, potential impacts to prime farmland soils are based on the confirmed identification of these resources in the available data. Any impacts to soils considered to be prime farmland are considered to be long-term impacts. To determine if an action may cause a significant impact, the context of the proposed Project was considered in conjunction with the intensity of the impact. The context of the proposed Project is the locally affected area. Significance depends upon the effects in the local area.

The assumptions for acreage calculations for impacts associated with the transmission lines are listed below.

Short-term disturbances:

- ROW widths in all land use or vegetation types except forest land are calculated using:
  - 125 feet for 230-kV transmission lines
  - 150 feet for 345-kV transmission lines
- Temporary access roads (20-foot wide) are included as part of the ROW width
- Temporary impacts at structures are included as part of the ROW width
  - 230-kV transmission lines: 20,000 square feet every 700 feet
  - 345-kV transmission lines: 25,000 square feet every 800 feet
- Pulling and tensioning areas
  - 15,000 square feet every 2 miles
- Turnarounds
  - 30-foot radius at each structure
- Staging Areas
  - One acre every 25 miles, with one staging area located at the plant site

Long-term disturbances:

- ROW widths in forest land are calculated using:
  - 125 feet for 230-kV transmission lines
  - 150 feet for 345-kV transmission lines
- Permanent impacts at structures
  - 230-kV transmission lines: 1,000 square feet every 700 feet
  - 345-kV transmission lines: 1,000 square feet every 800 feet

Additional assumptions are listed below:

- Any impact to forest land, shrubland, and prime farmland is considered a long-term impact.
- Impacts from temporary access roads and temporary impacts from structures are not counted separately, because they are within the ROW.
- No impacts would occur in open water.

- Acreages of impacts are divided proportionally to each land use type (except open water).
- Impacts due to permanent access roads are not calculated due to the lack of information regarding the number and location of these roads.

The assumptions for acreage calculation for land use impacts associated with the groundwater areas are listed below:

Short-term disturbances:

- A 20-foot wide construction zone would be required for proposed pipeline construction, with an estimated requirement of 80,000 linear feet.
- A 30-foot wide construction zone would be required for construction of proposed electricity distribution lines, with an estimated requirement of 43,300 linear feet.

Long-term disturbances:

- Each proposed well site would have a pre-engineered 10-foot by 15-foot pumphouse building surrounded by a 50-foot by 50-foot fence.
- All proposed access roads from the county roads to the proposed well sites would be 50 feet long and 12 feet wide, except two, which would be about 1,300 to 1,700 feet long.

Additional assumptions are listed below:

- All proposed wells would be drilled up to 300 feet deep in agricultural areas or uncultivated pastureland at the edge of farm fields. Drilling and installation of proposed wells would avoid wetland/riparian areas.
- To the extent possible, construction of the proposed pipelines and electrical distribution lines would occur within road ROWs.

Significance Criteria

A significant impact on land use would result if any of the following were to occur from constructing or operating the proposed Project:

- Conflict with applicable land use plans, policies, goals, or regulations.
- Conflict with State or federally-established, designated or reasonably foreseeable planned special use areas (e.g., recreation, wildlife management area, game management areas, waterfowl production areas, scientific and natural areas, wilderness areas, etc.).
- Increased demand for recreation activities due to the influx of people during construction and operation of the proposed Project that would exceed capacity for that activity in a given area such as a campground, wilderness, hunting area, and/or trails.

- Compaction of soils that would result in long-term loss of productivity.
- Substantial loss of prime or unique farmlands in the region or substantial interference with farming operations.

4.6.2 Proposed Project and Alternative 3

4.6.2.1 Big Stone II Plant Site and Groundwater Areas

Land Use Planning

Proposed Big Stone II Plant Site

Areas immediately adjacent to the proposed plant site are already used as an industrial site for the existing Big Stone plant. The proposed plant would use existing infrastructure including pumping system and delivery pipelines, coal delivery and handling facilities, solid waste disposal facilities, water storage ponds, cooling water intake structure, access roads, and rail spur. The estimated land requirements for the proposed plant components under the proposed Project or Alternative 3 are shown in Table 4.6-1**.** Land requirements are based on preliminary design. The actual location and configuration of project features would be developed during final design, but would not be substantially different that those shown. Additional construction laydown areas, pipelines, equipment storage areas, or a temporary rail spur for equipment delivery may be required based on final design parameters. Any additional land requirements would occur within the described proposed Project boundary in primarily agricultural areas. Most would occur within areas previously disturbed during construction of the existing Big Stone plant. The continued use and expansion of the Big Stone plant site as an industrial area is consistent with local land use plans, policies, and goals. No additional zoning would be required.

Table 4.6-1. Land Requirements for Proposed Big Stone II Components

Proposed Plant Component	Short Term Impacts (acres)	Long Term Impacts (acres)
New Plant Site	0.0	20.8
Cooling Tower	0.0	2.0
Construction Laydown	67.9	0.4
Construction Parking	12.2	4.3
Total	80.1	27.5

Source: Table 4.4-1.

Total impacts to land use from the proposed power plant construction and operation are shown in Table 4.6-2. There are no special management areas within the proposed plant site.

Table 4.6-2. Land Use Types Affected by Construction and Operation of the Proposed Plant

Land Use Type	Short-Term Impacts (acres)	Long-Term Impacts (acres)
Agricultural	61.8	0.0
Developed	0.0	24.5
Forest	0.0	0.4
Prairie	18.3	2.6
Wetland/Riparian	0.0	0.0
Total	80.1	27.5

Source: Table 4.4-1.

Groundwater Areas

The construction of the proposed groundwater wells, pipelines, and electrical distribution lines would occur at the plant site and the expanded groundwater areas. SMM Land-11 requires that all proposed well drilling and installation be completed in agricultural areas or uncultivated pastureland at the edge of farm fields. This would minimize impacts to forest land, prairie, shrublands, open water, or wetland/riparian areas. The estimated land requirements under the proposed Project or Alternative 3 for the groundwater components are shown in Table 4.6-3. Land requirements are based on preliminary design. The actual location and configuration of the proposed Project's features would be developed during final design, but would not be substantially different that those shown. Land use impacts for proposed well and pipeline installation for Alternative 3 would be the same as the proposed Project since the same number and locations of proposed wells would be used for both alternatives.

Table 4.6-3. Land Requirements for Proposed Groundwater Components

Groundwater Component	Short Term Impacts (acres)	Long Term Impacts (acres)
Groundwater Well Sites	3.5	1.9
Groundwater Pipelines	36.7	0.0
Electrical Distribution to Wells	29.8	9.9
Total	70.0	11.8

Source: Table 4.4-1.

Total impacts to land use from construction and operation of the groundwater components are shown in Table 4.6-4. The long-term land use impacts from construction and operation of the proposed well sites and access roads to the well sites would occur to agricultural land and uncultivated pastureland at the edge of farm fields. Construction and operation of the groundwater wells and pipelines is consistent with agricultural land use in the groundwater areas. The proposed well, pipeline installation, or electricity distribution lines under either alternative would not require zoning changes. There are no special management areas affected within the groundwater areas.

Table 4.6-4. Land Use Types Affected by Construction and Operation of the Groundwater Component

Land Use Type	Short-Term Impacts (acres)	Long-Term Impacts (acres)
Agricultural	9.7	2.4
Developed	55.7	8.0
Forest	0.0	0.0
Prairie	4.6	1.4
Wetland/Riparian	--[a]	0.0
Total	70.0	11.8

[a]The area of short-term impacts to wetlands cannot be estimated at this time because routes for proposed electric distribution lines and water pipelines have not been finalized. See section 4.4.2.1 for additional information on wetland impacts.

Source: Table 4.4-1.

Summary of Land Use Planning Impacts

Both the proposed Project and Alternative 3 would have a long-term impact to 27.5 acres of previously disturbed land for constructing and operating the proposed power plant, and 61.8 acres of agricultural land and 18.3 acres of prairie land (total of 80.1 acres) of short-term impacts for the temporary construction areas. Construction and operation of the groundwater system would have long-term impacts to 11.8 acres and short-term impacts to 70 acres, primarily of previously disturbed land within the ROW of county roads. No zoning changes would be required for construction activities at the proposed plant site or for the groundwater system and the proposed land uses do not conflict with applicable land use plans, policies, or goals. No conflict would arise with State or federally-established, designated, or reasonably foreseeable planned special use areas. Therefore, there would be no significant impacts related to land use planning for constructing and operating the proposed plant or groundwater system.

Public Facilities

No public facilities, such as day care centers, hospitals, or airports, are located within the area that would be affected by development of the proposed plant or groundwater areas; therefore, there would be no impacts to public facilities from constructing and operating the proposed plant.

Recreation

Recreational impacts are the same for the proposed Project and Alternative 3. Walk-in recreation areas are private lands where hunters can walk in and hunt for game during the appropriate seasons. Because the proposed plant site would be permanently fenced, approximately 80 acres of walk-in recreation land would be unavailable, while 109 acres would be temporarily disturbed during construction of the proposed plant. Most of the temporarily disturbed areas would be returned to their prior use after construction, dependent on the amount of actual land needed to operate the proposed plant. Construction workers for the proposed plant would use local recreational resources, but such use would not overburden local recreational resources, as many would work long hours or workweeks and return to their homes on their time off. Increases to the work force during proposed well drilling and installation and pipeline construction would not add a large number of recreational users to the area. Electrical workers installing the proposed electrical distribution line for the well pumping would be local and supplied by the local electrical utility installing the lines. Increased growth and a temporary increase in workforce would not overburden existing recreation resources nor would air pollutant emissions reduce recreational opportunities. Thus, no significant impacts from constructing and operating the proposed plant or the groundwater system are anticipated in terms of increased demand for recreation.

With implementation of conservation and restoration practices from the Big Stone Lake Restoration Project, increased recreational use of the lake has occurred on both the Minnesota and South Dakota sides of the lake (USEPA, 2002b; Roberts Conservation District, 2007). The proposed Big Stone II power plant would operate within the same withdrawal restrictions as the existing plant. In addition, based on the modeled lake levels with proposed Big Stone II water withdrawals, essentially no change in the relative frequency of attaining the target recreational season pool elevation (968 feet project datum) is expected (Barr, 2002). Therefore, the increase in water withdrawals from the proposed Big Stone II Project would not impact the Big Stone Lake Restoration Project long-term goal of increased recreation.

The Whetstone River receives recreational use for canoeing and wildlife watching. The currently observed flows over the course of the recreation season (late spring-early fall) would not be noticeably altered by the proposed groundwater pumping. Any reductions in flow and depth resulting from proposed groundwater pumping would be temporary and localized. Groundwater pumping would not affect most of the length of the Whetstone River, so impacts to recreational resources would not be significant. No additional mitigation measures would be required.

Agricultural Practices and Prime and Unique Farmland

Proposed Big Stone II Plant Site

The development within the proposed plant site would not affect center-pivot irrigation systems. If an area has been classified as having prime farmland soils, but is under a non-agricultural use, such as the existing Big Stone plant, it would no longer be classified as prime farmland. This is the case with the proposed plant and the new cooling tower site that are classified as prairie vegetation, and having prime farmland soils.

Long-term impacts would occur to prime farmland soils within the proposed plant site. As shown by Table 4.6-5, a total of 61.8 acres of prime farmland would be impacted by the construction laydown and construction parking areas. This represents a very small portion of the approximately 227,700 acres of prime farmland found in Grant County and would not be a substantial loss of prime farmland in the region. Therefore, there would not be a significant impact to prime farmland for constructing and operating the proposed plant. Those areas not required for permanent proposed plant components would be loosened and leveled by scarifying, harrowing, discing or other appropriate method, as outlined in SMM Land-10, and would not result in a long-term loss of productivity. Construction laydown and parking areas would be returned to agricultural use at the end of construction activities. No additional mitigation measures would be required.

Table 4.6-5. Prime Farmland Soils Affected by the Proposed Plant Site

Proposed Plant Component	Acres of Long-term Impact
New Power Plant	0.0
Cooling Tower	0.0
Construction Laydown	49.6
Construction Parking	12.2
Total	61.8

Source: Barr, 2008.

Groundwater Areas

Groundwater activities would not affect center-pivot irrigation systems. The acreages of soils classified as prime farmland impacted by groundwater activities are summarized in Table 4.6-6. Well drilling and installation activities would occur only on agricultural lands and on uncultivated pastureland at the edge of farm fields in accordance with SMM Land-11. Twelve of the proposed 14 well sites lie in soil units designated as prime farmland, or that would be prime farmland if soils were irrigated or drained. Two proposed well sites are in soils with no prime farmland designation. The proposed well sites, access roads, and electrical distribution lines would remove 2.1 acres of prime farmland from production. This loss would be a long-term impact. However, removal of 2.1 acres of prime farmland from the available 5,000 acres in the expanded groundwater area would not be a substantial loss of prime farmland in the region. After the life of the proposed Project, these areas could be reclaimed for agricultural use. In accordance with SMM Land-11, the construction or operation of the proposed well sites, pipelines, or electrical distribution lines would not impact center-pivot irrigation operations.

Table 4.6-6. Prime Farmland Soils Affected by the Groundwater Activities

Groundwater Component	Acres of Long-term Impact
Groundwater Well Sites	1.5
Groundwater Pipelines	0.0
Electrical Distribution to Wells	0.6
Total	2.1

Source: Barr, 2008.

<u>Summary of Impacts to Agricultural Practices and Prime and Unique Farmland</u>

Construction and operation of the proposed power plant and groundwater system would result in conversion (long-term impact) of 2.1 acres of prime farmland soils to other uses. Long-term impacts to prime farmland soils would occur to 61.8 acres for construction activities at the proposed plant site; however, these areas would be restored to production at the end of construction activities. Because this is a small portion of the prime and unique farmland in Grant County, South Dakota, this would not result in a substantial loss of prime or unique farmland in the area, and there would not be significant impacts. There would be no compaction of soils that would result in long-term loss of productivity.

4.6.2.2 Transmission Corridors, Substations, and Other System Improvements

The corridors proposed for constructing the transmission lines, including existing substations to be modified, are primarily agricultural or undeveloped, or already contain existing electrical transmission ROW.

SMMs Land-1 through Land-10, would be implemented to reduce impacts associated with the construction and operation of transmission line within all of the corridors (Table 2.2-8**)**.

Land Use Planning

<u>All Proposed Corridors</u>

Estimated acreages of short- and long-term impacts from constructing and operating the proposed transmission line corridors are summarized in Table 4.6-7 and Table 4.6-8, respectively. New land required for constructing the transmission lines (i.e., land that is not already within existing ROWs) would be acquired by negotiating easements with private landowners and/or with local, State, or Federal agencies. Since most of the land within the corridors is agriculture, the far majority of land would be agricultural property owned by private landowners. In some cases, though anticipated to be rare, land acquisition may require land purchase or right of use through eminent domain law.

Short-term impacts to land use due to construction activities would occur from temporary interruption of farming activities due to the presence of heavy equipment and line stringing activities. Short-term impacts would not be significant, and the loss of the use of agricultural land during construction activities would be compensated. After implementing SMMs Land-10, compaction of soils would not result in a long-term loss of productivity.

Table 4.6-7. Acreage of Short-term Land Use Impacts within the Proposed Corridors

Corridor	Agricultural Land	Developed[a]	Forest	Open Water	Prairie	Shrubland	Wetland/ Riparian	Total
Corridor A	252.1	1.7	0.0	0.0	0.7	0.0	0.0	254.5
Corridor B	492.6	2.8	0.0	0.0	0.2	0.0	0.0	495.6
Corridor B1	500.9	2.2	0.0	0.0	0.2	0.0	0.0	503.3
Corridor C	535.3	2.9	0.0	0.0	0.0	0.0	0.0	538.2
Corridor C1	560.9	2.9	0.0	0.0	0.0	0.0	0.0	563.8

[a]Includes residential, commercial, industrial and transportation uses.

Source: USGS, 2000.

Table 4.6-8. Acreage of Long-term Land Use Impacts within the Proposed Corridors

Corridor	Agricultural Land	Developed[a]	Forest	Open Water	Prairie	Shrubland	Wetland/ Riparian	Total
Corridor A	7.2	0.0	2.1	0.0	0.0	0.2	12.3	21.8
Corridor B	14.0	0.1	5.0	0.0	0.0	2.4	9.5	31.0
Corridor B1	14.2	0.1	5.0	0.0	0.0	2.3	8.1	29.7
Corridor C	13.3	0.1	12.7	0.0	0.0	2.9	20.0	49.0
Corridor C1	13.7	0.1	8.9	0.0	0.0	3.2	10.7	36.6

[a]Includes residential, commercial, industrial and transportation uses.

Source: USGS, 2000.

Impacts to NWRs within all proposed corridors are not anticipated, as the transmission line ROW would avoid these areas (SMM Land-3). Impacts to WPAs, MCBS areas of moderate or greater significance, MCBS Native Plant Communities, WMAs, or Railroad ROW Prairie areas would be minimized by coordinating with appropriate State agencies. SNAs are required to be avoided, while coordination is necessary for the other special management areas. SMM Bio-7 is designed to avoid these areas during transmission line routing.

Ortonville Municipal Airport is located in Corridor A and the flight path to the south crosses Corridors B and B1. Morris Municipal Airport is within 0.5 mile of Corridor A. No airports are located within Corridor B. Schwenk Airport is located in Corridor B1. One airport, Lundin, occurs approximately 2.7 miles west of Corridor C; no airports occur within Corridor C1. Impacts to airports would not occur since all safety zone regulations and height restrictions would be observed (SMM Gen-1).

Conflicts between the proposed Project and existing zoning in all the proposed corridors and the substations would be resolved (SMM Gen-1).

After implementing SMMs, there would be no significant impacts to land use in terms of conflicts with land use plans, zoning, or with special use areas. No additional mitigation measures would be required.

Substations and Other System Improvements

Land use criteria included efforts to develop interconnections to existing substations, rather than new substations, except for the relocation of the existing Canby Substation. Substation expansions and relocation of the Canby Substation (to a location on agricultural land approximately one mile to the northeast) would require a minimal amount of land purchase. For Granite Falls and Morris substations, Western would design and build any substation modifications following Western's SMMs. Land acquisition for any expansions would be performed by Western. The Co-owners have acquired 57 acres of land for the relocation of the Canby Substation. Modifications at the substation located in Willmar and Canby and the Johnson Junction Switchyard and relocation of the Canby Substation would be conducted following the mitigation measures outlined by the Co-owners and this EIS. In particular, the SMMs Land-5 (limiting contractor movements within previously assessed areas), Land-7 (repair of fences/gates), and Land-10 (level, fill, and grade hazardous ruts when weather and ground conditions permit or provide compensation, and correct damages to ditches, tile drains, terraces, roads, and other features) would be implemented to reduce impacts associated with constructing and operating these substations. No additional lands would be acquired for the upgrades to the existing Hankinson line; however, the same SMMs would apply to the upgrades for the Hankinson line.

After implementing SMMs, there would be no significant impacts to land use in terms of conflicts with land use plans, zoning, special use areas, or agriculture. No additional mitigation measures would be required.

Public Facilities

All Proposed Corridors and Substations

Table 4.6-9 summarizes the number of public facilities encountered within all of the proposed corridors. Visual impacts could occur at those public facilities if the transmission line were to be routed close to them. Health affects due to the proposed transmission lines are discussed in Section 4.7. The substations included in the proposed Project are not located near any public facilities.

One additional mitigation measure LU-1, if adopted, would reduce visual impacts to public facilities:

- **LU-1.** The transmission line centerline would be located, to the extent practicable, greater than 0.25 mile away from any identified recreational areas, churches, schools, hospitals, and registered day care providers.

Table 4.6-9. Number of Public Facilities

Corridor	Schools	Day Care Facilities	Hospitals	Churches	Cemeteries	Total
Corridor A	1	0	0	3	5	9
Corridor B	1	0	0	2	9	12
Corridor B1	0	0	0	6	3	9
Corridor C	3	2	1	12	14	32
Corridor C1	3	2	1	9	11	26

Source: HDR, 2005e.

Visual impacts to public facilities would occur from the presence of transmission structures. Visual impacts are addressed in Section 4.8.

No public facilities, such as day care centers, hospitals or airports, are located within the area that would be affected by upgrades to the Hankinson line; therefore, there would be no impacts to public facilities from upgrades to the Hankinson line.

Recreation

<u>All Proposed Corridors, Substations, and Other System Improvements</u>

Recreational areas within all five proposed corridors are discussed in Section 3.6.3.3. Visual quality would be impacted at recreation areas located near the transmission lines. See Section 4.8 for a more detailed discussion of these impacts.

Crews for constructing the transmission line, substation modifications, and improvements to the existing Hankinson line would number about 40 full-time personnel and some part-time workers. These amounts would not increase demand for recreation activities within the corridors or along the existing Hankinson line.

No significant impacts from the construction and operation of the proposed transmission lines, modifications to substations, or upgrades to the existing Hankinson Line would occur in terms of increased demand for recreation.

Agricultural Practices and Prime and Unique Farmland

<u>Electrical Interference</u>

Interference with farming and farming equipment was a concern identified during scoping. No impacts have been found relating to interference of GPS units by high-voltage transmission lines (MnOAH, 2005).

Wide Area Augmentation System (WAAS) is a system of satellites and ground stations that provide GPS signal corrections that provide a degree of position accuracy. WAAS was developed for the Federal Aviation Administration (FAA) and the Department of Transportation, for use in precision flight approaches. Using approximately 25 ground reference stations positioned across the U.S. that monitor GPS satellite data, WAAS corrects for GPS signal errors caused by ionospheric disturbances, timing, and satellite orbit errors. Farm machinery, such as tractors and combines, can be guided via GPS instrumentation, which may be referred to as “precision farming.” Accurate guidance systems minimize overlap in the field, which may correlate to less time in the field, fewer chemicals needed, and lower labor charges (i.e., reducing costs and waste). Potential interference with GPS used in farming was explored with contacts with the technical support departments of the corporate offices of John Deere and International Harvester and the customer support staff of regional agricultural equipment sales offices. The responses were mixed, in that some individuals stated that they were unaware of such problems, whereas one contact noted a relation between signal to noise ratio and interference, which could reduce GPS accuracy, as well as noting that two-way radios, high-voltage power lines, and buried gas lines can cause noise that degrades GPS accuracy (John Deere, 2006). Differential GPS systems are available for precision farming that are similar to FAA’s WAAS, but considerably more accurate due to a number of techniques that correct GPS signal errors and improve its receiver-end processing.

No significant impacts from electrical interference are anticipated from the construction and operation of the proposed transmission lines, modifications to substations, or upgrades to the existing Hankinson Line.

Irrigation Systems

Transmission lines can be incompatible with pivot irrigation systems depending on the geometry of the pivot circle and the transmission centerline (e.g., crossing along the edge or across the body of a circle). Corridor A is the only corridor that does not include center-pivot irrigation areas. Corridor B has 18, Corridor B1 has 25, Corridor C has one, and Corridor C1 has 10 center-pivot irrigation areas. Impacts could range from less than significant to having to remove the field from irrigation, depending on the location of transmission structures and conductors. For these reasons, potential interference with center-pivot irrigation systems would be a primary consideration when routing the transmission lines through irrigated areas (SMM Land-8). Additionally, irrigated areas are more sensitive during certain periods in the crop cycle. However, based on SMM Land-6, construction would be scheduled when the field is fallow, resulting in minimal impacts to agricultural practices.

There would be some adjustments necessary on the part of agriculturalists with regard to operating machinery and crop dusting to avoid collisions with transmission lines, but any impacts would be less than significant. Soil compaction would be mitigated according to SMM Land-10. Additional mitigation measure LU-2, if adopted, would further reduce adverse impacts to agricultural practices:

- **LU-2.** The Co-owners would work with landowners to avoid and minimize impacts to agricultural land and operation. Transmission line routing would avoid impacts to center-pivot irrigation areas to the extent practical. Landowners would be compensated for any disturbance to center-pivot irrigation agricultural areas. The Co-owners would minimize temporary impacts and compaction during construction and would compensate landowners accordingly.

Impacts to Farmland

Short-term impacts to farmland would occur from the activities performed for upgrading the existing Hankinson line. Long-term impacts would include all prime and unique farmland disturbed by construction activities and the permanent loss of land proposed to be occupied by the substation expansions, the relocation of the Canby Substation, and the presence of new structure pads for the transmission lines.

The level of impact from structure pads would vary slightly according to the type of structures used. H-frame structures have a larger footprint than single-pole structures and would result in a slightly greater long-term impact. Table 4.6-10 summarizes the amount of soils classified as prime farmland and projected permanent impacts within each corridor. These acreages were calculated based on the footprint of H-frame structures for either 230 kV or 345 kV, depending on what is proposed for the specific corridor.

Less than one percent of the amount of soils classified as prime farmland would be permanently lost within any of the proposed corridors and the Hankinson upgrades. Therefore, there would not be a substantial loss of prime farmland nor an adverse affect on agriculture in the region. Loss of prime and unique farmland would not comprise a significant loss to agricultural production within the corridors, and would not be a significant impact. Landowners would be compensated for any loss through implementation of the Co-owners' mitigation measures. Soil compaction would not result in a long-term loss of productivity of agricultural land.

Table 4.6-10. Acreage of Prime Farmland Disturbance for the Proposed Corridors

Corridor	Prime Farmland in the Corridor	Total Acreage of Corridor	Prime Farmland as a Percent of Corridor	Acres of Long-term Impacts to Prime Farmland
Corridor A	38,059	82,635	46.1	7.2
Corridor B	75,626	151,943	49.8	14.0
Corridor B1	80,985	158,431	51.1	14.2
Corridor C	102,183	200,371	51.0	13.3
Corridor C1	96,467	190,159	50.7	13.7

Source: HDR, 2005a.

4.6.3 No Action Alternative

Under the No Action Alternative, the proposed plant and associated facilities would not be constructed. Under the No Action Alternative, Western would not grant the Co-owners' interconnection request, and the USACE would not issue any permits to the Co-owners related to the proposed Big Stone II. Under the No-Build Alternative, the proposed Big Stone II plant would not be constructed. None of the land use impacts associated with the proposed Project would occur, except for the Ortonville-Johnson Junction-Morris 115-kV transmission line (Corridor A), which would occur at a later date when the line is rebuilt. In the short term, land uses would be likely to remain as they currently are in the absence of the proposed Project. In the long term, certain land uses unrelated to the existing plant would change with time (e.g., from agricultural to urban or commercial/industrial).

Under Sub-alternative 2, where the Co-owners would continue with the construction of the proposed plant and would seek alternate transmission capacity, the land use impacts associated with the construction, operation, and maintenance of the proposed plant would likely be identical to those presented above. Any impacts to land uses associated with the transmission component of the proposed Project would likely be similar to those presented as part of the potential impacts associated with the proposed Project, though their location is unknown.

4.7 Infrastructure, Public Health and Safety, and Waste Management

4.7.1 Introduction

Constructing and operating the proposed Project could create impacts related to infrastructure, public health and safety, or waste management. Infrastructure addresses road and railroad traffic and construction of temporary access roads and aircraft collisions. Public health and safety examines worker safety, plant safety, and public risks associated with increased traffic during construction, fugitive dust, proposed plant air emissions, noise, and electromagnetic field (EMF) exposure. Waste management includes hazardous and solid wastes. Analyses of these infrastructure, public health and safety, and waste management aspects include an overview of issues related to each component, methods used to address impacts, and mitigation measures that could be implemented to reduce the severity of impacts.

On December 1, 2006, the Secretary of Energy issued a memorandum concerning the "Need to Consider Intentional Destructive Acts in NEPA Documents." This section of the Final EIS has been modified to consider the impacts of "intentional destructive acts" (i.e., acts of sabotage or terrorism).

Identification of Issues

Infrastructure

The primary issues associated with transportation are congestion, travel impediments, and adequate emergency access.

Public Health and Safety

Issues or concerns regarding public health and safety include:

- Adverse health impacts from EMF and stray voltage associated with transmission lines.
- Safety issues associated with transmission lines acting as a lightning rod.
- Impacts from air pollution including possible mercury emissions and the effects on public health of communities in the vicinity of the plant site.
- Impacts associated with disposal of coal ash on human health, if disposal methods create human exposure to these materials.
- Issues that consider "intentional destructive acts," (i.e., acts of sabotage or terrorism), the potential environmental consequences of such acts, and identification of "reasonably foreseeable accidents."

Hazardous Materials and Waste Management

Issues regarding hazardous materials and waste management include:

- Management (transportation, storage, and disposal) of hazardous materials and solid wastes.
- The determination of the presence of previously released hazardous materials or solid wastes at proposed Project locations, so that construction activities do not occur at sites where contaminated materials would inadvertently expose workers or result in incurring cleanup liability.

Impact Assessment Methods

Infrastructure

Impacts to transportation were assessed by comparing projected additional travel demand due to project activities to existing daily traffic counts. Construction labor and operational staff projections for the proposed Big Stone II plant were used as a basis for identifying impacts that may occur during plant construction and operations. Impacts to the rail system were assessed by comparing existing and projected number of coal trains. Construction of transmission lines could be carried out using multiple work crews over wide-ranging time periods.

Public Health and Safety

Impacts to public health were evaluated based on a review of existing regulations, safety standards, the Co-owners' proposed operational procedures, and literature reviews. Industry practices are required to be protective of worker and public safety and health. Impacts associated with the proposed Project that could occur were assessed by comparing projected activities and impacts with existing safety standards and regulations to protect public health.

DOE's guidance document, "Recommendations for Analyzing Accidents under NEPA, July 2002" (DOE, 2002) was used to evaluate and discuss issues that consider "intentional destructive acts," the potential environmental consequences of such acts, and identification of "reasonably foreseeable accidents."

Hazardous Materials and Waste Management

Impact assessment was based on reviewing information from Federal and State databases and direct field surveys (HDR, 2005b; HDR, 2005e) as presented in Chapter 3, Section 3.7. Information in Table 3.7-1 was reviewed to assess uncontrolled releases that could occur at the proposed plant site and the potential magnitude of such releases at the proposed plant site. Information in Table 3.7-5 was reviewed to assess the potential for the presence of previous releases in the proposed corridors and the likelihood that such releases could affect transmission line construction.

The USEPA has acknowledged that in spite of the current regulatory structure, release of hazardous materials continues to be an on-going and pervasive problem across the country (USEPA, 2000). Compliance with applicable rules and regulations and adherence to best management practices cannot eliminate releases and associated impacts, but can help to reduce the frequency and magnitude of such events.

Significance Criteria

Infrastructure

A significant impact on transportation would result if any of the following were to occur from constructing and operating the proposed Project:

- Increases in traffic that exceed a level of service established by the local or State transportation management agency.
- Creation of road dust and/or severe road damage at levels that create hazardous situations for motorists and pedestrians.

Public Health and Safety

A significant impact on public health or safety would result if any of the following were to occur from constructing and operating the proposed Project:

- Interference with emergency response capabilities or resources.
- Serious injuries to workers, visitors to the area, or area land users.
- Creation of electric and magnetic fields near an existing or proposed sensitive land use, such as schools or hospitals, which would pose a plausible risk to human health.

- Creation of a substantial interference and disruption of emergency communications and electronic health/safety devices that results in substandard performance.
- Changes in traffic patterns that result in hazardous situations for motorists or pedestrians.
- An accident, weather event, act of sabotage, or terrorist act resulting in significant injury or significantly impairing the ability of the proposed plant to provide electrical power.

Hazardous Materials and Waste Management

A significant impact from hazardous materials and solid wastes would result if any of the following were to occur from constructing and operating the proposed Project:

- Improper disposal of solid or sanitary waste generated by the proposed Project that would pose a threat to the public health or the environment in the vicinity of the proposed Project.
- Spills or releases of hazardous materials, hazardous substances or oil in excess of reportable quantities within the proposed Project area that would pose a threat to public health or the environment in the vicinity of the proposed Project.
- Impaired implementation of or physical interference with a locally adopted emergency hazardous materials spill response plan or emergency evacuation plan.

4.7.2 Proposed Project and Alternative 3

4.7.2.1 Big Stone II Plant Site and Groundwater Areas

Infrastructure

Big Stone II Plant Site

Construction Impacts

The primary access to the proposed plant site is by U.S. Highway 12 and County Road 109. These roads have average daily traffic counts of 5,665 and 970, respectively (SDDOT, 2005). These two roads each have a capacity of approximately 1,600 vehicles per hour (Petrick, 2006). The construction of the proposed plant would occur over four years and would require approximately 1,400 workers at the peak of construction. Duration of the peak would be approximately one to two months as illustrated in Figure 2.2-8, with lesser numbers before and after the peak. At peak construction, approximately 1,050 daily trips to and from the proposed plant site would occur if 50 percent of the workers share a ride with another worker and commute two to a vehicle. The increase in private vehicle use during peak worker commute periods, in addition to trucks delivering equipment and supplies, would increase the overall daily traffic counts. Consequently, impacts to local transportation patterns on U.S. Highway 12 could be significant during peak employment. Impacts would likely be less than significant during most of the construction period at the plant site.

Implementing SMM Inf-1, Inf-2, and Inf-3 would reduce delays to railroad operations and automobile traffic and provide for the safe flow of traffic through the use of pilot vehicles and coordination of activities. The following additional mitigation measures TR-1 and TR-2, if adopted, would be implemented to reduce congestion in the plant site area during construction:

- **TR-1.** The construction contractor would be required to establish mitigation measures such as bus transportation or car pooling for workers from centralized locations to reduce the number of daily vehicle trips in the vicinity of the proposed plant.
- **TR-2.** The construction contractor would be required to plan and execute delivery of heavy equipment in such a manner that would avoid traffic congestion and reduce dangerous situations along local roadways (e.g., slow-moving vehicles entering and exiting roadways).

Access to the proposed plant is on paved roads, so increased traffic during construction would not cause road dust. Road damage may occur on the roads that provide access to the proposed plant site due to movement of heavy equipment. Any severe road damage that creates a hazardous condition would be mitigated if additional mitigation measure TR-3 were adopted:

- **TR-3.** The Co-owners would coordinate with the appropriate County personnel to mitigate severe road damage that could create a hazardous situation for motorists and pedestrians.

Airspace intrusion warning lighting would be required for structures exceeding 200 feet in height. During construction, the FAA would be notified that construction is ongoing. It is likely that the FAA would recommend temporary warning lights and would issue an advisory to aircraft operators.

Operation Impacts

During operation of the proposed plant, approximately 35 additional employees would travel to and from the proposed plant site during its operation. Approximately 5.5 additional trips per week would be required to provide chemicals and other necessities for maintaining plant operations. While these additional trips would represent an increase of greater than 100 percent over current traffic levels on County Road 109, the road is adequate to accommodate these additional trips without resulting in congestion, impaired emergency access, or reduced levels of service.

Approximately one unit train of coal per day, consisting of 120 cars, would be required to operate the existing and proposed plants. Although train numbers would nearly double current levels, the projected train traffic would be similar to that experienced in the area when the existing plant burned lignite coal in the 1970s and 1980s, and steel rail cars were used rather than the existing aluminum rail cars. Traffic was not impacted at the 484th and 485th street crossings at that time. The existing rail system is more than adequate to accommodate the increased volume load. Impacts associated with joint rail usage by the Poet Biorefining plant (formerly Northern Lights Ethanol) and the existing Big Stone plant have been reduced by constructing a new railroad siding.

Airspace intrusion warning lights would be required for structures exceeding 200 feet in height. The FAA would recommend the most appropriate lighting configurations to be installed on completed structures. The range of lighting options includes dual red flashing and white strobe. Lighting criteria are identified in FAA Circular AC7017560 “Obstruction Marking and Lighting.”

Groundwater Areas

Construction and Operation Impacts

Impact to existing infrastructure may occur associated with construction of the proposed well sites, pipelines, and electrical distribution lines. Impacts to road traffic would occur from movement of vehicles and equipment along county roads. To the extent possible, construction of the proposed pipelines would occur within ROWs. Limited segments of pipeline could be placed outside of these ROW areas or buried in agricultural fields. Some segments of the proposed electrical distribution lines could be buried.

Twelve of the 14 proposed well sites are located close to roads on agricultural land. However, two of these well sites are located further out in agricultural fields, approximately 1,300 feet to 1,700 feet from the county roads. Therefore, in some cases, extensions of the proposed pipelines and electrical distribution network (outside of the road ROWs) would be required to cross agricultural land to power these two well sites. Easements across private properties would require negotiations with landowners. Road traffic impacts could occur during a one- to two-month construction period along the road ROWs. These impacts would be short-term, and the increases in traffic would not exceed a level of service established by the local or State transportation management agency.

Underground utilities may exist in road ROWs where construction of proposed pipelines and electrical distribution lines would occur. In accordance with additional mitigation measure W-1, if adopted, prior to construction of proposed pipeline and electrical distribution lines, appropriate underground utility locating procedures would be implemented to avoid damage to those utilities in accordance with South Dakota requirements. Implementing mitigation measure W-1 would minimize the potential for adverse impacts to existing underground utilities.

Proposed operations associated with the groundwater areas are anticipated to include occasional visits to well locations, periodic collection of aquifer data from the monitoring wells, and nominal maintenance activities. These activities would be infrequent and consistent with activities in the area and would not interfere with any local traffic patterns. Therefore, there would be no significant impacts to infrastructure from operation of the proposed groundwater supply system.

Summary of Impacts

Increases in traffic volume on U.S. Highway 12 and County Road 109 during construction of the proposed Big Stone II plant would not exceed the level of service established for these roads except during the two-month period of peak construction. During this two-month period, there would be significant impacts on U.S. Highway 12 during peak commuter periods. After implementing the SMMs Inf-1, -2, and -3 and additional mitigation measures TR-1 and TR-2, if adopted, construction of the proposed Project would not create increases in traffic that exceed the current level of service of the local roads. Access to the proposed plant site would be on paved roads that would be kept in operable condition and any road damage caused by construction activities would be mitigated by implementing additional mitigation measure TR-3, if adopted. Therefore, road dust or road damage would not create hazardous situations for motorists and pedestrians during construction activities. During operation of the proposed Big Stone II plant, increases in traffic would not exceed the level of service on the existing local roads and rail system or create hazardous situations for motorists and pedestrians.

Less than significant impacts to traffic conditions could occur during movement of drilling equipment and other construction materials to the proposed well sites and during proposed pipeline construction activities along the ROWs close to roads. However, none of these activities would cause increases in traffic that exceed the level of service established by the local or State transportation management agency. None of the proposed activities within the groundwater areas would create road dust or severe road damage at levels to create hazardous situations for motorists and pedestrians. Potential impacts to existing underground utilities in road ROWs where proposed pipelines and electric distribution would be installed would be avoided by implementing mitigation measure W-1.

Public Health and Safety

Proposed Big Stone II Plant Site and Groundwater Areas

Construction Impacts

All work at the proposed plant site would be conducted following Occupational Safety and Health Administration (OSHA) and South Dakota Department of Health safety standards and procedures to reduce the occurrence of serious injury to workers. Potential health impacts to construction workers would include fugitive dust and noise levels typical of construction of a power plant and associated facilities. Construction workers may be exposed to airborne emissions from routine activities, such as welding, soldering, painting, and cleaning operations. Heavy equipment operations and activities such as cutting metal or grinding operations may pose higher noise levels to workers. These exposures would be intermittent but intense. Construction workers would also be at risk for typical construction site injuries such as trips and falls. Many of the risks and potential exposures to workers discussed above, such as exposures to welding and painting activities, also apply to proposed well drilling and installation, as well as pipeline and electrical distribution construction activities.

The risk of fire or explosion during construction of the proposed plant is considered to be extremely low. During construction, small quantities of flammable liquids and compressed gases would be stored and used. Flammable liquids may include construction equipment fuels, paints, and cleaning solvents. Compressed gases may include acetylene, oxygen, and hydrogen for welding. Hazards associated with these materials would be minimized by following OSHA's construction safety requirements. The facility health and safety program the Co-owners proposed in SMM PH-1 would also include OSHA requirements. The health and safety program would include requirements for hearing protection, personal protection equipment, site access, chemical exposure limits, and safe work practices. This would minimize adverse impacts to worker health and safety during construction.

Potential health impacts to the public from constructing the proposed Big Stone II plant and associated facilities, and proposed well drilling and installation, as well as pipeline and electrical distribution construction include fugitive dust, noise, and traffic injuries. Fugitive dust and noise impacts would be short-term and minimal due to the geographical isolation of the proposed plant site. An analysis of noise impacts (Section 4.9) shows there are no significant impacts from constructing and operating the proposed plant. Access to the proposed plant and construction sites would be controlled in accordance with PH-1. SMMs PH-2 and PH-3 would prevent any serious injuries to the public and local land users.

Construction activities for the proposed pipelines and electrical distribution lines within road ROWs would expose workers to risks associated with local traffic along the county roads. Adverse impacts from accidents and traffic risks to workers would be minimized if additional mitigation measure W-1 were adopted.

The potential for increased traffic injuries due to construction traffic volumes could be minimized by managing the additional traffic, as discussed above under infrastructure. If adopted, additional mitigation measures TR-1 and TR-2 would provide adequate control. There would not be significant traffic impacts from construction activities at the proposed plant site.

Operation Impacts

Coal-fired power plants have good operating safety records. According to the Co-owners, the OSHA safety rating for the existing plant has an excellent safety record, with incidence levels less than half of the national average for the electrical utility industry. The proposed plant would be expected to maintain a similar safety record. Workers would receive safety training and be required to follow safety procedures and OSHA regulations during workplace operations.

As discussed in Section 4.1.1, two types of national air quality standards are established by the Federal Clean Air Act and its amendments. Primary standards set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. Results of the air quality analysis for the proposed Project show that constructing and operating the proposed Big Stone II plant, transmission lines, and substation modifications would not cause or contribute to an exceedance of NAAQS or PSD increment thresholds.

Through the use of various types of emission controls for NO_X and SO_2, there would be no increase in NO_X or SO_2 emissions from the site as a result of the operation of the proposed Big Stone II. Particulate emissions from the proposed Project would increase, but would be controlled with a conventional jet-pulse fabric filter (baghouse) followed by a WFGD system to control SO_2 emissions. Detailed information about the emission controls for NOx, SO_2, and other types of emissions are discussed in Section 4.1.2.1 under the subheading "Plant Emissions and Air Quality Impacts Assessment."

As discussed in Section 4.1.2.1, the commitment of the Co-owners of the proposed Big Stone II Project is to install technologies that are most likely to result in removal of at least 90 percent of the mercury emitted from the existing plant and the proposed Big Stone II plant. This would result in mercury emissions of approximately 81.5 lb per year from the combined plants (a decrease of approximately 57 percent), which would still contribute mercury to the environment. If the proposed Big Stone II plant is constructed (and after implementation of emissions controls), mercury emissions from both plants would be less than the emissions from the existing plant. The combined plants would continue to emit mercury (although at a decreased rate). Mercury emissions from the proposed plant (as well as mercury emissions from any and all sources) would still bioaccumulate in fish and could affect those who eat fish and those concerned with neurological issues attributed to mercury. According to information from the MPCA, declines in mercury emission and deposition should result in reduced mercury concentrations in fish (MPCA, 2007). The reduced rate of bioaccumulation, when considering the MPCA information, suggests that the lower mercury emissions from the existing and proposed plant could contribute to lower mercury concentrations in fish over time. Even though the combined emissions of mercury from the existing and proposed Big Stone II plants would decrease from current emission levels for the existing plant, the question then becomes whether the impacts from these lower emissions are nonetheless harmful to health. Without question, mercury is a toxic substance. In particular, if a pregnant woman ingests significant amounts of methyl mercury, the developing brain of her offspring can be harmed. At even higher levels of exposure, the nervous systems of children and even adults may also be harmed.

Scientific researchers from the University of Rochester have extensively studied children who live in the Seychelles (islands in the Indian Ocean), where people's diets contain very large amounts of ocean fish (UR, 2008). These investigators found that amounts of mercury that are 10 – 20 times larger than amounts ingested in the U.S. are harmless. Many other groups of researchers have documented the health benefits of eating fish (due apparently to its healthful oils and other essential nutrients), despite the presence of small amounts of mercury in that fish (Mozaffarian, 2006; Nesheim, 2006; Cohen, 2005). This benefit is particularly important for the developing nervous system of the fetus.

It is the case that many streams, ponds, and lakes throughout the U.S. have been posed with fish advisories, warning people to limit their intake of local fish. Fortunately, these advisories are set with ample margins of safety, so that even people eating considerable amounts of fish from restricted areas are not expected to be harmed. See Section 4.1.2.1 and also in the Mercury Response Paper (Response Paper A, Volume II) for more information on the health impact of mercury emissions.

Even with the implementation of the air pollution controls, satisfaction of the conditions of the Settlement Agreement, compliance with the conditions of the air permit for the proposed plant, and compliance with NAAQS, the existing and proposed plants would still have emissions, but not at levels expected to exceed thresholds established by the State and USEPA for protection of human health and the environment.

The addition of the proposed plant would increase emissions of CO_2. Even though CO_2 is an unregulated emission, the impact of CO_2 and other GHGs on the health of millions is projected in IPCC's Fourth Assessment Report (IPCC, 2007) to include increased malnutrition, increased deaths, diseases, and injury due to extreme weather events, increased cardio-respiratory diseases, and the altered spatial distribution of some infections diseases. It is also projected to bring some benefits, including fewer deaths from cold exposure and changes in range and transmission potential of malaria in Africa.

Western concludes that the proposed plant would emit CO_2, which could have an undetermined effect on local, regional, or global climate change. Because numerous models produce widely divergent results, and there is insufficient information, Western is unable to identify the specific impacts of the proposed plant's CO_2 emissions on human health and the environment. The lack of information and differences in predictive models have made it difficult for scientists and other experts to link a direct cause and effect of anthropogenic impacts of climate change on a global scale, much less on a local scale. As a result, Western believes that any attempt to analyze and predict the local or regional impacts of the proposed plant's CO_2 emissions on human health and the environment cannot be done in any way that produces reliable results.

Existing roadways would adequately handle additional traffic during plant operation without creating hazardous situations for motorists or pedestrians. No sensitive receptors or land use is located near the proposed plant site that would be impacted by electric and magnetic fields from the proposed plant.

<u>Accidents, Natural Disasters, and Intentionally Destructive Acts</u>

As with a U.S. energy infrastructure, the proposed power plant could potentially be the target of terrorist attacks or sabotage. In light of decisions made by the U.S. Court of Appeals for the Ninth Circuit, DOE NEPA documents (including EISs) should explicitly address potential environmental consequences of intentional destructive acts (i.e., acts of sabotage or terrorism) (DOE, 2006b). This section addresses this issue, as well as identification of potential "reasonably foreseeable accidents" associated with the proposed Project and alternatives and their potential adverse consequences.

Although risks of terrorism or sabotage cannot be quantified as the probability of an attack is not known, the potential environmental impacts can be estimated. Effects may include localized impacts from releases from the proposed power plant and associated facilities, assuming that such releases would be similar to what would occur under an accident or natural disaster. To evaluate the potential impacts of terrorism, failure occurrences are identified without expressly identifying the cause. Therefore, the accident analysis recognizes the outcome of calamitous events without determining the cause or motivation behind the event. The accident analysis evaluated potential major and minor system failures at the proposed power plant site. These impacts from accidents could also be representative of the impacts from a terrorist attack.

A sliding scale approach to accident analyses was considered, using key factors outlined within the guidance. In addition, practical judgment was applied to accident scenarios that were considered to determine the extent that all possible scenarios were to be detailed for the proposed Project. The key factors that were applied as a sliding scale for each scenario included the:

- Probability that the accident will occur.
- Severity of the consequences.
- Degree of uncertainty regarding the analyses.
- Level of technical controversy regarding the potential impacts.

Analysis was conducted to determine a reasonable range of foreseeable accidents or intentionally destructive acts which could occur. This analysis was used to define the maximum reasonably foreseeable accident, or the one with the most severe consequences that can reasonably be expected to occur.

Reasonably foreseeable accidents include natural disasters and accidental disasters. Floods and tornadoes are common natural disasters which can occur in most areas. Accidents and fires are more predictable, and by nature can be avoided or minimized by proper training, security, and other measures. Emergency planning and management plans have been developed for the existing plant and are reviewed and updated as necessary on a regular basis with appropriate emergency training crews, including local fire and medical response personnel. Reasonably foreseeable accidents and natural disasters could include:

- Fire
- Flood
- Tornado
- Explosion
- Chemical Release

If a fire, explosion, or chemical release occurred at the proposed plant as the result of a terrorist attack, such events could cause injury and/or death of workers. The risk to workers or the public from damage to power plant facilities as a result of accidental or intentional actions by outside parties is low because public access would be controlled, and the site would be monitored by plant security. An emergency response plan and site security plan already exists for the existing Big Stone plant, and would be modified to include the proposed plant. Due to the sensitive nature of information contained within the Site Security Plan for the existing plant, the documents would not be available for general public review. However, these documents would be made available for inspection by an authorized governmental authority.

Summary of Impacts

Constructing and operating the proposed Big Stone II plant would not cause significant impacts to public health and safety. Implementing a facility health and safety plan would assure there would be no interference with local emergency response capabilities or resources and prevent serious injuries to workers. Controlling access to the proposed plant facilities and construction sites would prevent injury to the public and local land users. Since no sensitive receptors or land use is located near the proposed plant site, no impacts would result from electric and magnetic fields from the proposed plant. Because the plant is isolated, no substantial interference or disruption of any emergency or health and safety communication system would occur. Implementing SMMs and additional mitigation measures (if adopted) would control changes in traffic patterns. There would be no significant impacts to roads or traffic patterns. In addition, modification of the existing plant's emergency response plan and site security plan minimizes the impacts of any reasonably foreseeable accidents, natural disasters, or intentionally destructive acts.

No significant residual impacts to public health are anticipated from constructing and operating the proposed Big Stone II plant. The risks for exposure of workers during construction of proposed wells, pipelines, and electrical distribution lines would not be significant with implementation of SMM PH-1 and additional mitigation measure W-1, if adopted. Impacts to public health and safety associated with constructing and operating the proposed Project or Alternative 3 would be less than significant.

Even with the implementation of the air pollution controls, satisfaction of the conditions of the Settlement Agreement, compliance with the conditions of the air permit for the proposed plant, and compliance with NAAQS, the existing and proposed plants would still have air emissions (SO_2 would decrease, NO_X emissions would not increase, and particulate emissions would increase). However, the emissions would not exceed thresholds established by the State and USEPA for protection of human health and the environment. The combined plants would continue to emit mercury (although at a decreased rate), and mercury emissions from the proposed plant (as well as mercury emissions from any and all sources) would still bioaccumulate in fish and could affect those who eat fish and those concerned with neurological issues attributed to mercury. However, the reduced rate of bioaccumulation, when considering MPCA information (MPCA, 2007), suggests that the lower mercury emissions from the existing and proposed plant could contribute to lower mercury concentrations in fish over time. See the Mercury Emissions from the Existing and Proposed Plants subsection in Section 4.1.2.1 for more information identifying specific impacts related to mercury emissions from the proposed plant.

The addition of the proposed plant would increase emissions of CO_2. Even though CO_2 is an unregulated emission, the impact of CO_2 and other GHGs on the health of millions is projected in IPCC's Fourth Assessment Report (IPCC, 2007) to include increased malnutrition, increased deaths, diseases, and injury due to extreme weather events, increased cardio-respiratory diseases, and the altered spatial distribution of some infections diseases. It is also projected to bring some benefits, including fewer deaths from cold exposure and changes in range and transmission potential of malaria in Africa.

Hazardous Materials and Waste Management

Construction and Operation Impacts

Transportation, storage, and use of fuel, chemicals, lubricants, and other fluids during construction or operation of the proposed Big Stone II plant and associated facilities could create contamination hazards. A list of chemicals and materials that would be used during plant operation is included in Table 2.2-2. Some of the chemicals and materials are considered hazardous substances and require appropriate handling, storage equipment, and documentation. Similar to the existing plant, it is anticipated that the proposed plant would also generate very small amounts of hazardous waste. Spills or leaks of regulated fluids could contaminate groundwater and affect aquifer use if not cleaned up promptly. Proper management of chemicals and materials would minimize the potential for spills that would have the potential to impact plant personnel, personnel at the adjacent ethanol plant, or the public.

Solid wastes (including hazardous and industrial wastes and combustion byproducts) generated during construction and operation of the proposed plant would be managed and disposed according to applicable regulations. Adherence to applicable regulations and best management practices would reduce the likelihood of a significant spill or release. As described in Section 3.7, the documented spill history at the existing plant indicated that the historic spills have involved limited quantities of materials and impacts have been mitigated to the approval of the SDDENR. Therefore, construction crews would not be exposed to contaminated materials from previous spills and the construction contractor would not incur cleanup liability. During construction and the operational life of the proposed Project, spills and releases may occur. SMM PH-1 requires the Co-owners and their contractors to develop and implement a health and safety program. The health and safety program would include requirements for training employees to follow proper handling procedures and restricting the location of refueling activities to prevent leaks and spills that may impact soil and water resources during construction of the proposed plant. OTP operational health and safety procedures would be followed during operation, which includes procedures for the proper handling of chemicals.

Coal combustion byproducts include bottom ash, fly ash, and gypsum. These materials would be disposed of in the existing on-site landfill or hauled off-site by truck or rail for other uses (e.g., making sheetrock or wallboard from gypsum; using fly ash for soil stabilization, as structural fill, or as a replacement for Portland Cement in concrete). Operation of the on-site landfill is governed by SDDENR Administrative Rules, Article 74:27, Solid Waste. Employees are trained in the proper handling and disposal of these byproducts to minimize their risk of exposure in accordance with OTP's operational health and safety procedures. Proper handling and disposal by employees would minimize exposure or health-related issues to the public. As noted previously, the nearest resident is approximately 0.5 mile from the proposed plant site and public access is controlled. Therefore, there would be no public exposure to these coal combustion byproducts.

<u>Summary of Impacts</u>

Several SMMs are designed to control impacts from waste management activities. Management of solid wastes following the regulatory rules and standards and implementing best management practices would prevent any adverse impacts to human health and the environment (SMM Gen-1). SMM Air-3 prohibits burning or burying waste materials in the plant construction areas. SMM Water-3 requires that construction activities prevent the spillage, release, or dumping of hazardous materials or other solid wastes into water bodies. SMM Inf-4 stipulates fly ash and gypsum would be recycled under prevailing market conditions.

By implementing SMMs, impacts from hazardous materials and waste management during construction and operation of the proposed plant would not be significant. Disposal of wastes would be conducted in accordance with State and Federal regulations and would not impact public health. The Co-owners' health and safety program would establish procedures to control spill or releases of hazardous materials or substances, and the program would not interfere with any locally adopted emergency or response plan.

Groundwater Areas

Construction and Operation Impacts

Construction of the proposed well sites, pipelines, and electrical distribution line could result in accidental spills of oils, chemicals, and other fluids that may impact soils and water resources. Adherence to applicable regulations and best management practices would reduce the likelihood of a significant spill or release. To avoid potential spills during pipeline construction, additional mitigation measure W-1, if adopted, would require the drilling contractor to implement BMBs for spill prevention and the pipeline construction contractor to prepare a Pipeline Construction Work Plan to address the use of regulated substances and spill response. The potential for adverse impacts from spills would be minimized if additional mitigation measure W-1 were adopted.

Solid wastes (including hazardous wastes) generated during construction and operation activities would be managed and disposed of according to applicable regulations (SMM Gen-1), which would reduce the likelihood for adverse impacts to human health and the environment.

Summary of Impacts

With implementation of SMMs and additional mitigation measure W-1, if adopted, proposed construction activities would not result in improper disposal of solid or sanitary wastes or spills, and impacts from releases of hazardous materials, regulated substances, or oil would be minimized. These activities would not cause a significant impact due to hazardous material and waste management practices.

4.7.2.2 Transmission Corridors, Substations, and Other System Improvements

Infrastructure

All Corridors and Substations

Temporary access for constructing the new transmission lines within any of the corridors would be via a 20-foot-wide access trail constructed within the transmission line ROW or by short spur trails from the existing road network to the ROW. Temporary guard structures would be used to string conductors over existing roads and railroads. Transmission line structures typically consist of directly imbedded poles with a horizontal cross piece to support the conductor at sufficient height above traffic. Temporary traffic impacts associated with equipment are material delivery and worker transportation. Single-pole construction would require the use of foundations along many transmission line segments where lateral forces are expected to be relatively high. Construction of foundations typically requires boring/excavation of a six- to 12-foot diameter by 20-foot deep hole, installation of steel reinforcement, and installation of a steel mounting cap. Concrete requirements range from 25 to 100 cubic yards per structure, to be provided by five to six concrete trucks. Consequently, the use of single-pole structures would require substantially more truck traffic than would be needed for H-frame construction.

Construction activities for the transmission lines and substation modifications would create dust from equipment movement along unpaved construction roads within the ROW. Implementing SMM Air-1 and

Western's mitigation measures would control dust through proper control techniques. Impacts would not be significant.

Access to modify the existing substations and to relocate the Canby Substation would be from existing roads and would only cause minor and temporary disruption to traffic. It is estimated that constructing the transmission line and substation modifications would require 40 full-time employees with 25 devoted to transmission line construction and 15 to the substation modifications. Part-time personnel may also be needed. Given the small number of workers and construction vehicles, traffic disruptions would be minimal and localized.

SMM Inf-2 and Inf-3 would be implemented during transmission line and substation modification and construction activities to reduce traffic delays and safety hazards through pilot vehicles, control barriers, and other methods, when appropriate. If adopted, additional mitigation measure TR-3 would be implemented to reduce congestion on roadways serving the access routes to the corridors and the substations during construction.

Active rail lines are located in each of the proposed corridors (Table 3.7-3). SMM Inf-1 would be implemented during construction to minimize impacts to the railroad operations. SMM Inf-1 requires coordination with railroad operators and avoiding delays due to construction vehicles and equipment crossing tracks or conductor or overhead wire stringing operations.

Airports are located in and/or adjacent to the proposed corridors. Transmission lines can pose collision hazards to aircraft particularly during take-off and landing. Each airport has approach zones (safety zones) which are standards that regulate the height of objects within the area of the zone. Ortonville Municipal Airport (Martinson Field) is located within Corridor A and within 0.5 mile of Corridors B and B1. The Ortonville Airport flight path to the south crosses Corridors B and B1. There are plans to change the existing approach zone of 20:1 slope to a 40:1 slope. Based on this requirement, the height restriction for structures in the approach zone would be at a minimum of 70 feet on the northern edge of Corridor A. At the existing 115-kV transmission line location, the new 230-kV structures would be limited to 90 feet by the future runway approach zone. Pole heights within Corridor A would need to comply with these height restrictions to reduce the likelihood of aircraft collisions with the transmission lines. If required by the FAA or local regulations, marking of the line may occur to further reduce the likelihood of aircraft collision in the area. The maximum pole height in Corridors B and B1 would be 120 feet, which can be met if the transmission line is located just south of the existing Big Stone-to-Ortonville transmission line. SMM Gen-1 would require transmission lines to be constructed following FAA or local regulations, which would include height restrictions for the Ortonville Airport. By implementing this SMM, there would not be any impacts from the transmission line on local airports.

Other airports within the proposed Project's transmission line corridors could pose safety concerns similar to that of Ortonville. Airports and airfields within corridors include Lorenz and Murdock (Corridor B), Schwenk (Corridor B1), and Lundin (Corridor C). Transmission line routing near such airports and airfields would include consideration of airspace encroachment.

<u>Other System Improvements</u>

As noted in Section 2.2.3, an increase line rating of the existing Hankinson line (through Grant and Roberts counties, South Dakota and Richland County, North Dakota) would likely require some type of height enhancement of the transmission line or structure replacement to achieve more conductor ground clearance.

The exact number and extent of structure modifications is not yet known. The same mitigation measures noted above for transmission corridors would apply to work activities along the existing Hankinson line.

Summary of Impacts

Short-term localized traffic delays would occur from constructing the proposed transmission lines, modifying substations, relocating the Canby Substation, and upgrading the Hankinson line, even with implementation of SMMs and additional mitigation measures (if adopted). Increases in traffic due to construction and operation would not exceed the service level of any roadway within the corridors. Impacts resulting from constructing and operating these facilities would be less than significant for infrastructure.

Public Health and Safety

All Corridors, Substations, and Other System Improvements

Constructing and installing transmission structures and conductor/shield wires, modifying or constructing substations, and upgrading the Hankinson line may result in injuries to construction crews. Construction activities would be conducted following OSHA safety standards to minimize the incidence of injuries due to fire and use of heavy equipment, working at heights and working in the vicinity of high voltage equipment (PH-1). All construction sites would maintain firefighting equipment such as fire extinguishers and shovels. Vegetation would be cleared from construction sites to prevent contact with fire ignition sources such as vehicles.

During operations, there would be a slight risk for injuries to maintenance workers who travel in the corridor to perform maintenance on the transmission lines. Maintenance workers would follow OSHA standards and safe practices to reduce risks, following the Co-owners' procedures.

The transmission lines would be constructed and operated according to the National Electrical Safety Code (NESC) and the Co-owners' SMMs, which are designed to minimize the risk for shock (Inf-5). Therefore, the risk of electrocution during construction and operation is not expected. The shock a human or animal would receive by touching a metal object near a transmission line would be similar to that received after walking across carpet. Only maintenance workers would be expected to be near the transmission lines. The public would only be directly exposed to transmission lines if they were cut or otherwise downed. The lines are designed to trip out of service (turn off), if they fall or contact trees. Transmission lines would be monitored and maintained so the likelihood of this event is minimized.

Transmission lines would be designed to minimize EMF and would have EMF levels similar to other existing transmission lines. EMF strength depends on conductor capacity loads, voltage load, and distance from source. The strength of the field decreases rapidly with distance. Electric and magnetic fields that are applicable to 230-kV and 345-kV transmission lines that would be installed for the proposed Project are provided in Tables 4.7-1 and 4.7-2. Note that EMF levels differ in strength on both sides of single-pole structures due to the configuration of conductors. The projections are based on the use of 954 Aluminum Conductor Steel Supported (ACSS) conductor; analyses that are based on 1272 Aluminum Conductor Steel Reinforced (ACSR) conductor indicate lower values. Based on predicted estimates, electric and magnetic fields are expected to diminish rapidly between 50 to 100 feet from the centerline. Magnetic fields within transmission line corridors constantly increase and decrease, with the highest fields resulting when the electrical demands are the greatest, typically in the winter months.

EMFs occur naturally, caused by weather and the earth's geomagnetic field. They are found around any electrical wiring, including household wiring and electrical appliances. The electric-field strength from wiring and appliances located within homes is typically less than 0.01 kilovolts per meter, however greater field strength can be found very close to some appliances, such as electric blankets. Typical homes produce background magnetic field levels (away from appliances and wiring) that range from 0.5 milligauss (mG) to four mG, with an average value of 0.9 mG (NIEHS and USEPA, 1995).

Table 4.7-1. Predicted Electric Fields from Proposed Transmission Lines, Operated at Maximum Capacity (kilovolts per meter)

Pole Type	Distance (feet) from centerline										
	-300	-200	-100	-50	-30	0	+30	+50	+100	+200	+300
H-frame, 230-kV	0.02	0.05	0.30	1.10	1.40	0.50	1.40	1.10	0.30	0.05	0.02
Single-pole, 230-kV[a]	0.02	0.06	0.20	0.70	1.00	0.60	0.70	0.70	0.30	0.07	0.02
H-frame, 345-kV, operated at 230-kV	0.03	0.09	0.40	1.00	1.00	0.20	1.00	1.00	0.40	0.09	0.03
Single-pole, 345-kV[a], operated at 230-kV	0.04	0.10	0.40	1.20	1.50	0.80	1.10	1.00	0.50	0.10	0.04

[a]Single-pole structures differ in EMF strength due to conductor orientation.
230-kV service, 954 ACSS conductor.
345-kV capacity, operated at 230-kV service, bundled 954 ACSS conductor.

Source: OTP, 2005h.

Table 4.7-2. Predicted Magnetic Field from Proposed Transmission Lines, Operated at Maximum Capacity (milligauss (mG))

Pole Type	Distance (feet) from centerline								
	-300	-200	-100	-50	0	+50	+100	+200	+300
H-frame, 230-kV	4.5	10.0	37.0	105.0	212.0	105.0	37.0	10.0	4.5
Single-pole, 230-kV	4.0	8.7	29.0	71.0	113.0	63.0	28.0	8.5	4.0
H-frame, 345-kV, operated at 230-kV	9.8	21.0	71.0	160.0	250.0	160.0	71.0	21.0	9.8
Single-pole, 345-kV, operated at 230-kV	10.0	22.0	72.0	154.0	214.0	137.0	68.0	22.0	10.0

230-kV service, 954 ACSS conductor.
345-kV capacity, operated at 230-kV service, bundled 954 ACSS conductor.

Source: OTP, 2005i.

During the past two decades, there have been mixed, and often conflicting opinions regarding health effects related to EMF exposure. Studies have indicated increased incidence of childhood leukemia, central nervous system tumors, and adult leukemia. Other studies have failed to indicate a correlation between exposure levels or exposure duration. The lack of definitive correlation has resulted in an absence of thresholds that can be used regarding EMF parameters that are considered to be acceptable. The International Committee on Non-Ionizing Radiation Protection has set a voluntary protection level for electrical fields for the general public of 4.2 kilovolts per meter (International Commission on Non-Ionizing Radiation Protection, 1998). Due to the lack of exposure threshold values, applicable mitigation measures are limited to prudent avoidance. The practice of prudent avoidance is based on limiting exposure to electric and magnetic fields, to the extent practical. Using this approach, transmission lines would not be routed in proximity to residential structures, schools, or other facilities.

Corona, a luminous electrical discharge on a transmission line, appears when the air adjacent to the conductor ionizes due to the applied potential exceeding a certain value. It can be seen as bluish tufts or streamers surrounding the conductor, and generally a hissing sound can be heard. Transmission line corona varies with atmospheric conditions, being more intense during wet weather. Corona on the surface of high voltage conductors can create signals that may interfere with radio and television reception. Modern line designs have reduced corona to a minimum and such design is proposed for the proposed Project (SMM Inf-8). Occasionally, more sensitive radio and television sets pick up on the "corona noise." The Co-owners' policy is to address problems on a case-by-case basis (SMM Inf-7).

Other health effects to construction workers and the public in the vicinity of the transmission line and substation construction activities include fugitive dust and increased noise levels. SMMs Air-1 and -4 (dust control) and Air-2 (proper vehicle maintenance) would be implemented during construction of the transmission line and substation modifications.

EMF effects, fugitive dust, and noise impacts would be the same for all of the transmission corridors. Impacts would be lessened by implementing SMMs. SMM Inf-5 through Inf-8 and Noise-2 would be implemented to minimize EMF and noise effects from operating the transmission lines. SMM PH-1 would require contractors to develop a health and safety program. SMMs PH-2 and -3, and the following additional mitigation measure PHS-1, if adopted, would reduce impacts to public health during construction and operation of the proposed transmission lines and substations.

- **PHS-1.** Fences and other metal objects on or near the proposed ROW would be grounded to reduce risk of electrocution during construction and operation. All maintenance workers would receive specific training on the appropriate procedures for equipment inspection and repairs, first aid training, and emergency response training with periodic refresher sessions. Maintenance vehicles would carry fire suppression equipment and communications equipment to facilitate contacting back-up emergency response personnel.

<u>Accidents, Natural Disasters, and Intentionally Destructive Acts</u>

The discussion of intentional destructive acts (i.e., acts of sabotage or terrorism) and reasonably foreseeable accidents in Section 4.7.2.2 also applies to the transmission lines, substations, and other system improvements.

<u>Summary of Impacts</u>

Implementing a health and safety plan would assure no interference with local emergency response capabilities or resources and prevent serious injuries to workers. Implementing SMMs PH-1 through -3 would control access to the proposed construction sites, and would prevent injury to the public and local land users. The transmission lines and substations would be designed to minimize electric and magnetic fields, corona effects, and interference with emergency communication and electronic health and safety devices. The transmission lines would be designed to not pose a health risk at sensitive receptors. Any residual interference would be mitigated through SMM Inf-6. Construction activities would not significantly change traffic patterns, so there would not be a hazardous situation for motorists or pedestrians. Construction and operation of the proposed transmission lines, substation modifications, and Hankinson line upgrades would not cause a significant impact to public health and safety by implementing standard and additional mitigation measures (if adopted). Residual impacts would be less than significant.

Hazardous Materials and Waste Management

All Corridors, Substations, and Other System Improvements

Based on a review of information presented in Section 3.7, there are documented contaminated sites and potentially contaminated sites within all of the proposed transmission corridors. However, all the transmission corridors provide a wide enough area that the actual ROW for a transmission line could be located to avoid or minimize encroachment on sites that may contain uncontrolled releases of hazardous materials or illegal dumping of solid waste. As part of the final selection of a transmission line route, surveys would be conducted so the proposed Project's elements can be located away from sites that may contain uncontrolled releases of hazardous materials or illegal dumping of solid waste.

During transmission line construction, substation addition activities, and upgrades to the existing Hankinson line, accidental spills of oils, chemicals, and other fluids during construction activities may impact soils and water resources. Adherence to applicable regulations and best management practices would reduce the likelihood of a substantial spill or release. Solid wastes (including hazardous wastes) used or generated during construction and operation of the proposed transmission lines would be managed and disposed of according to applicable regulations which would reduce the likelihood for adverse impacts to human health and the environment.

Constructing and operating the transmission lines, constructing or modifying substations, and upgrading the Hankinson line would be conducted to minimize the risk of impairment or interference with implementing adopted emergency response or evacuation plans.

Typically, substations contain oil-filled equipment and/or equipment filled with SF_6. Substation personnel would comply with Federal and State regulations for spill prevention, control, and countermeasures under the Resource Conservation and Recovery Act (RCRA). SF_6 gas is considered one of the best insulating gases available for electric equipment. However, it is a potent GHG and prevention of leaks is very important. There are no regulations established for SF_6 gas. OTP has recognized this concern and is a member of USEPA's SF_6 Emission Reduction Partnership. As part of the Partnership, it is OTP's goal to maintain SF_6 emission levels at less than two percent of system capacity. Western is also participating in the voluntary Emission Reduction Program. Western's and OTP's SF_6 programs are described in Section 4.1.2.2.

Summary of Impacts

SMM Air-3, Water-3, and Water-10 would be implemented to minimize impacts from hazardous wastes and ensure proper waste management during the activities associated with the transmission lines and substations. SMM Air-3 prohibits burning or burying waste materials in the plant construction areas. SMM Water-3 requires that construction activities be performed to prevent the spillage, release, or dumping of hazardous materials or other solid wastes into water bodies. By implementing these measures, there would be no improper disposal of wastes and spills. Releases of hazardous material, hazardous substances, or oil would not exceed reportable quantities. No impacts to public health from chemical management from constructing, improving, and operating transmission lines or substations for the proposed Project would occur. Implementing the health and safety plan required by SMM PH-1 would ensure there would be no impacts to any adopted emergency hazardous materials spill response plans or emergency evacuation plans.

4.7.3 No Action Alternative

Under the No Action Alternative, Western would not grant the Co-owners' interconnection request, and the USACE would not issue any permits to the Co-owners related to the proposed Big Stone II. Under the No-Build Alternative, the proposed Big Stone II plant would not be constructed. None of the impacts associated with the proposed Project would be realized, except for the Ortonville-Johnson Junction-Morris 115-kv transmission line (Corridor A), which would occur at a later date when the line is rebuilt. There would be no additional impacts to airports, railways, roads, and other infrastructure. Current trends would be expected to continue with little to no congestion problems. Traffic would continue to change according to population trends. Human exposures to fugitive dust and noise associated with the proposed Project would not occur. There would be no safety concerns due to construction of the proposed Project. Existing EMF levels and health and safety considerations from transmission lines and substations in the area would continue. Emission controls for the existing plant included as part of the proposed Project would not be installed, and certain emissions (such as SO_2 and mercury) that could affect public health would not be reduced. The potential for spills or wastes from the proposed Project to effect soils or water resources would not exist. Although there would be no increase in hazardous materials or solid waste generation as a result of the proposed Project, current trends in the area would be expected to continue, and the existing plant and substations would continue to use hazardous materials and generate solid waste.

Under Sub-alternative 2, where the Co-owners would continue with the construction of the proposed plant and would seek alternate transmission capacity, the impacts to infrastructure, public health and safety, and waste management associated with the construction, operation, and maintenance of the proposed plant would likely be identical to those presented above. Impacts associated with the transmission component of the proposed Project would likely be similar to those presented as part of the potential impacts associated with the proposed Project, though their location is unknown.

4.8 Visual Resources

4.8.1 Introduction

This section discusses visual impacts associated with the proposed Project and includes a summary of issues related to visual resources, impact assessment methods, and visual significance criteria.

Identification of Issues

Visual resource issues of particular concern are locations where new transmission lines would be constructed that would potentially attract the attention of the casual observer, including:

- Visual impacts associated with constructing transmission lines near Long Lake.
- Visual impacts to hobby farms along Corridor B.
- Visual impacts associated with the power plant stack.
- Visual impacts associated with proposed groundwater production well installations and the electrical distribution lines within the groundwater areas.
- Visual impacts associated with the transmission lines from the bluffs in Granite Falls, Minnesota.

- The difference in the visual impacts from a 345-kV transmission line and a 230-kV transmission line.

Impact Assessment Methods

The visual impact analysis relates to and records estimated changes to the visual landscape, as compared to the existing landscape. Visual resources in the vicinity of the proposed Project are consistent with landscapes addressed by the methods of the Bureau of Land Management's (BLM) Visual Resource Management (VRM) System (BLM, 1984). Effects to visual resources were assessed for constructing and operating the proposed Project. Relative value of the visual environment is defined by BLM Visual Resource Inventory classes. A description of management objectives for each class is provided in Appendix I. Specific indicators of the standard BLM visual resource elements include:

- Scenic quality of the characteristic landscape.
- View sensitivity of residents and visitors.
- Visual distance zones.
- VRM classes.

Existing views were inventoried and analyzed with consideration of the appearance of visual elements associated with the proposed plant, transmission lines, and substations. Estimated visual impacts were assessed based upon the degree of visual change in combination with the existing visual conditions and expectations of viewers. Visual impact levels were assessed with a relative scale of high, moderate, low, and none, with high indicating the most contrast with the existing landscape and having the greatest potential concern by viewers of the landscape. A total of 41 representative observation points were assessed (Table 3.8-1). Observation points included locations of residents, communities, travelers, and recreation users.

Impacts would occur for landscape modifications that affect visual contrasts for the following: the quality of any scenic resources; scenic resources having unique value; views from, or the visual setting of, designated or planned parks, wilderness, natural areas, or other visually sensitive land use; views from, or the visual setting of, established, designated, or planned recreational, educational, preservational, or scientific facility, use area, activity and viewpoint, or vista.

The extent to which the proposed Project would affect the scenic quality depends upon the amount of visual contrast created between the proposed Project facilities and the existing landscape elements (line, form, color, and texture) and features (land surface, vegetation, and structures).

The general types of visual impacts from the proposed Project facilities can include those caused by changes to the basic landscape elements of line, form, color, and texture. Below is a brief discussion of these elements.

- **Line -** Transmission line ROW can cause a linear band, sometimes enhanced by shadows, which divides an area; abrupt differences in color and texture create a line along the edge of the ROW, which can attract visual attention and can become a focal point in the landscape. The silhouette caused by the outline of a transmission structure creates a strong vertical line. Visual attention could be drawn to this vertical line where it interrupts a generally horizontal skyline.

This is also the case for the proposed plant stack. Conductors (transmission line wires) introduce an added linear element of horizontal line to the landscape.

- **Form** - The introduction of transmission line structures can result in contrast to the landscape due to changes in form. The degree of change is evaluated by how dissimilar the introduced form is to existing forms surrounding it. The large size and relative scale, as well as the vertical and angular shape, make transmission line structures and the boiler building prominent in the natural appearance of a rural landscape, which could attract visual attention. This may also be the case for the pumphouses and electrical distribution lines associated with the groundwater activities.
- **Color** - Changes in color attract attention. Structures typically are not the same color as the surrounding landscape features. Exposed soil caused by access roads or the clearing of vegetation around the structure base during construction may result in a noticeable degree of color contrast between the exposed soil and the surrounding vegetation. Glare caused by the sun shining on conductors and structures may create periodic contrast.
- **Texture** - When vegetation in the ROW appears different from the vegetation surrounding it, there are usually differences in texture (changes in the grain and density of surface features) that may attract attention.

These potential contrasts are influenced by a number of factors including time of day, distance, atmospheric conditions, lighting direction, duration of view, and viewing angle. The degree of these visual impacts is based on the criteria discussed earlier and includes the quality of the existing scenery, the visibility from sensitive viewpoints, and the inherent capability of the landscape to successfully absorb alteration.

Significance Criteria

A significant impact on visual resources would result if any of the following were to occur from constructing or operating the proposed Project:

- Substantial degradation of the foreground character or scenic quality of a visually important landscape.
- Substantial dominant visual changes in the landscape that are seen from highly sensitive viewer locations such as community enhancement areas (e.g., community gateways, roadside parks, viewpoints, and historic markers) or locations with special scenic, historic, recreational, cultural, archaeological, or natural qualities that have been recognized as such through legislation or some other official declaration.

4.8.2 Proposed Project and Alternative 3

4.8.2.1 Big Stone II Plant Site and Groundwater Areas

Big Stone II Plant Site

The proposed plant site is located within VRM Class IV (see Appendix I for a description of class designation). The landscape along U.S. Highway 12 is VRM Class II and landscapes between the highway and the existing and proposed plants that consist of interspersed farmsteads and agricultural areas are in VRM Class III. The objective of VRM Class II landscape is to retain the existing character of the landscape; therefore, the level of change to the landscape should be low. A VRM Class IV allows a proposed activity to attract attention and become a dominant feature of the landscape in terms of scale. A VRM Class III objective is to partially retain the existing character of the landscape; therefore, the level of change to the landscape would be moderate. Figure 3.8-5 displays the location of VRM classes around the proposed plant site. Since construction of the proposed plant would occur adjacent to the existing site, long-term additive impacts would result. No substantial degradation to scenery resources of the Class IV landscape would occur.

The proposed plant site is visible in the middleground distance zone from Big Stone City and from Ortonville, for several miles along U.S. Highway 12 south of the proposed plant site, and the U.S. Highway 12 rest stop. Figure 4.8-1 shows the existing plant site from the U.S. Highway 12 in Ortonville and Figure 4.8-2 shows the visual simulation of the proposed plant expansion. Figure 4.8-3 shows the existing plant site from the U.S. Highway 12 rest stop and Figure 4.8-4 shows the visual simulation of the proposed plant expansion and transmission line.

Additive sources of light or glare are expected to develop as a result of constructing and operating the proposed plant and stack. Construction activities would have temporary, short-term impacts from lighting at the proposed plant site; however, construction activities are expected to occur primarily during daylight hours. The major components of the proposed plant would illuminate at night, resulting in long-term additive visual impacts. Lighting would be seen from U.S. Highway 12 for short distances south of the proposed plant site, but would not draw any more visual attention than the existing plant. The major exterior metallic building components of the proposed plant would be painted with a flat or non-reflective finish to blend with the surrounding environment to avoid excess glare under SMM Vis-1.

Expansion and operation of the proposed plant would result in additive long-term low to moderate visual impacts due to the addition of the stack, water pretreatment building, and power plant building. This impact would be less than significant due to the existing influence of similar structural elements present at the existing Big Stone plant, which is located within a Class IV landscape. The residual visual impacts from constructing and operating the proposed plant and facilities would be less than significant. No additional mitigation measures are required to lessen impacts from the proposed power plant.

Figure 4.8-1
View from U.S. Highway 12
Entrance to Ortonville, Minnesota
Existing Condition

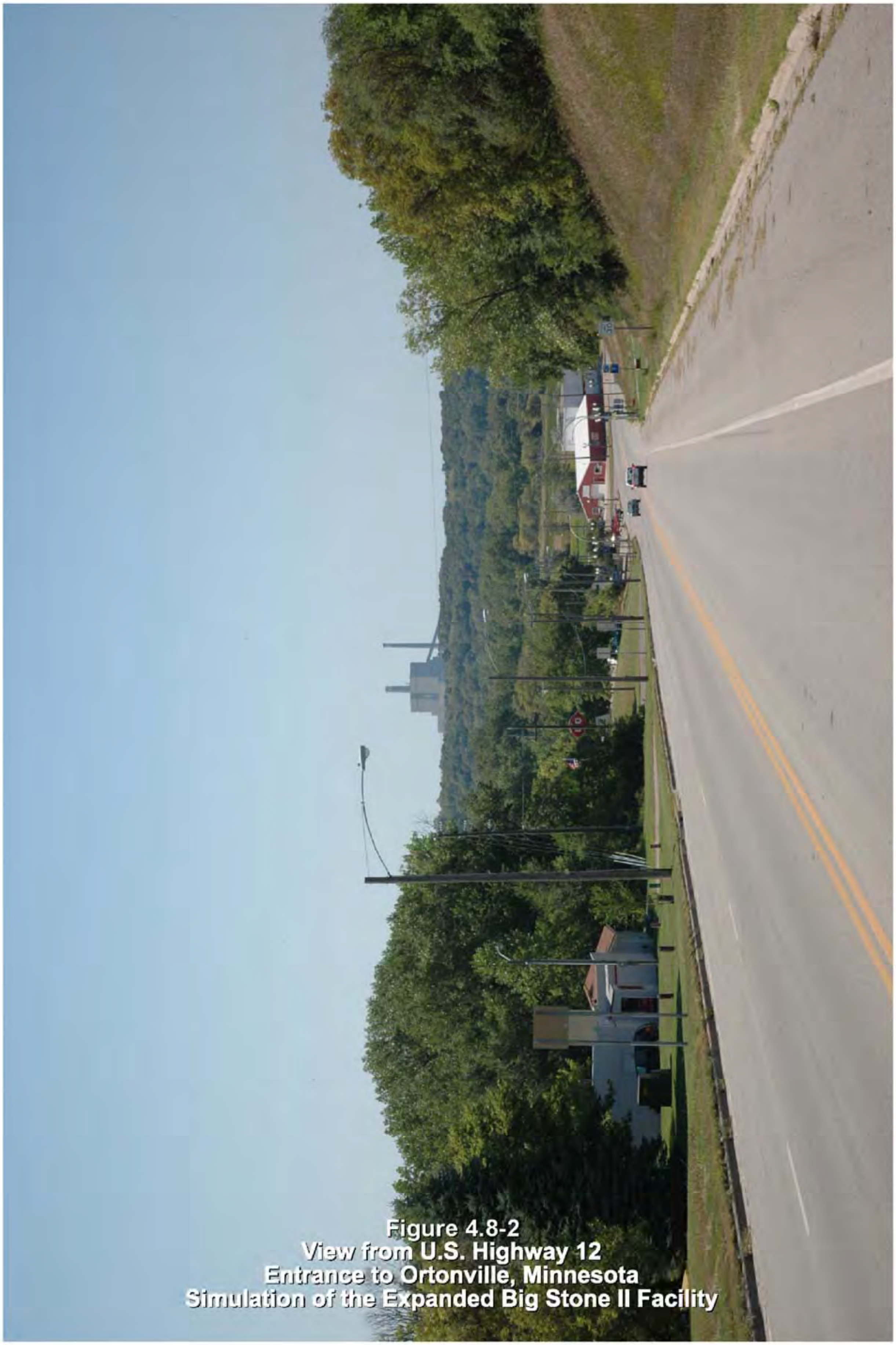

Figure 4.8-2
View from U.S. Highway 12
Entrance to Ortonville, Minnesota
Simulation of the Expanded Big Stone II Facility

Figure 4.8-3
View from U.S. Highway 12 Rest Stop
Existing Condition

Figure 4.8-4
View from U.S. Highway 12 Rest Stop
Simulation of Expansion Condition

Groundwater Areas

Visual impacts include proposed installation of the 7 to 14 groundwater production wells and associated buildings, fences, pipelines, and electrical distribution lines proposed under the proposed Project or Alternative 3.

VRM Class II areas are along portions of U.S. Highway 12 and along the Whetstone River valley tributaries. Areas of interspersed farmsteads, tree groves, and croplands were designated as Class III areas. Areas of unvegetated residential, commercial, and industrial development, open croplands, and background viewing situations were designated as Class IV. Any proposed wells, pipelines, electrical distribution lines, and buildings installed in the expanded groundwater area would be located on either VRM Class III lands at the edge of agricultural fields or within Class IV lands.

Installation of the proposed groundwater wells in the rural area would involve temporary drilling equipment for a few days. The proposed pipeline installation would also involve heavy equipment for installation, but this would also be temporary. Permanent facilities at the proposed well sites would be limited to a small pumphouse building and fencing. The proposed electric distribution lines required for the electric interconnection of the well sites would be of similar design and height as the existing distribution lines that serve rural farm houses in the area.

Summary of Impacts

The proposed Big Stone II plant would be located in a Class IV landscape, which is not considered a visually important landscape, so expansion and operation of the proposed Big Stone II plant would not result in a substantial degradation of the foreground character of scenic quality of a visually important landscape. Constructing and operating the proposed Big Stone II plant would not cause a substantial change in the landscape as seen from a highly sensitive viewer location due to the existing influence of similar structural elements present at the existing Big Stone plant. Visual impacts from constructing and operating the proposed Big Stone II plant would not be significant.

No significant long-term additive impacts would result from the proposed well installations, pipelines, pumphouse buildings, fences, and distribution lines; and no substantial degradation to scenery resources of the Class II, III, or IV landscapes would occur. No substantial degradation of the foreground character or scenic quality of a visually important landscape would occur. No substantial dominant visual changes would occur due to construction of the well-associated facilities. Visual impacts associated with proposed well and building installations within the groundwater areas would be less than significant. No additional mitigation measures are required to lessen impacts from the wells, buildings, fences, or distribution lines.

4.8.2.2 Transmission Corridors, Substations, and Other System Improvements

Levels of impact were based upon the VRM classification of lands crossed by each corridor, and then evaluated and compared to the significance criteria. Potentially high impacts would occur in distinctive scenic areas and Class II lands, moderate impacts on Class III lands, and low impacts on Class IV lands. The proposed corridors and the existing Hankinson line are located primarily on VRM Class III lands, where proposed Project facilities (e.g., transmission line structures and conductor, ROW, and access roads), and activities may be visible, but would not dominate the landscape.

From each observation point, field information was compiled and mapped for the proposed Project. Visual contrast information was compiled noting potential modification to landscape features and elements. The type of actual physical contrast was examined by evaluating landforms, landscape diversity, vegetative patterns (type, height, and density), and structure compatibility. Variables considered in establishing overall visibility levels included view orientation, lighting conditions, seasonal effects, view distance, duration of view, visibility, viewer numbers, and use association.

A visual contrast rating assessment was completed for each observation point noting the VRM category, existing visual condition, and visual absorption capability characteristics. An evaluation of visual change of features (e.g., landforms, vegetation, and structures) to landscape elements (e.g., form, line, texture, and color) was recorded. The evaluation was compared to the threshold defined by the VRM category to determine potential impact levels. Two other criteria, scale and special dominance, were also used to rate the level of visual change. The scale of proposed Project modifications was compared to the scale of the entire landscape setting and ROW placement in the viewshed.

Corridor A

Corridor A includes rebuilding the existing 115-kV wood structure transmission line and upgrading the line to 230 kV or constructing a new 230-kV transmission line. The southern portion of Corridor A consists primarily of VRM Class II landscape. The northern portion is composed of Class III and IV landscape. Upgrading the transmission line or constructing a new transmission line within Corridor A would result in long-term, low to moderate additive visual impacts to the northern portion of the corridor and moderate additive visual impacts to the southern portion of the corridor. The proposed transmission upgrade would have similar forms, lines, colors, and textures as the existing line. The most visual contrast within the corridor would be the larger size or scale of the proposed H-frame structures. This may draw visual attention during the construction phase. This larger scale, however, would not draw additional visual attention in the long-term from sensitive viewing points or locations of travelers, recreation users, or residents. In the event a new 230-kV line is built and the 115-kV line is left in place, the use of similar H-frame structures would result in a low to moderate visual impact. Another structure type may result in a higher impact. Impacts may be higher if the new line does not parallel, or is built away from, the viewshed or visual range of the existing line. The transmission lines would not directly impact the visual resources associated with Long Lake.

The Co-owners have committed to reducing visual impacts to sensitive travel and recreation corridors such as highway and trail crossings by placing the structures at the maximum feasible distance from the crossings, within limits of structure design (SMM Vis-2). Additionally, the structure types would be uniform to the extent practical (SMM Vis-3). This mitigation would apply if a new transmission line were built in the corridor, but would not apply to rebuilding or reconductoring the existing line. Visual impacts would be effectively reduced by implementing the SMMs and would minimize visibility of the proposed transmission lines from sensitive viewpoints in Corridor A. No additional mitigation measures would be required. Visual impacts associated with transmission line construction, rebuilding, or reconductoring would be less than significant.

Corridor B

Most of Corridor B is a VRM Class III landscape. Class II landscapes were identified along major travel routes, particularly river crossings. Corridor B contains 58 miles of U.S. Highway 12 and crosses the Minnesota River near Ortonville, Minnesota. In these VRM Class II areas, there is a high visual sensitivity and concern for scenery. Portions of Corridor B contain existing transmission lines where additive visual impacts would result. For the most part, low to moderate impacts from a new transmission would result to Corridor B. However, at locations where the line may cross foreground locations of U.S. Highway 12, particularly at water crossings, higher impacts would occur. At these locations, a new line would draw visual attention and cause long-term higher impacts to viewers, recreation users, and residents. The Co-owners would mitigate these higher impacts from constructing and operating a transmission line in Corridor B by placing the structures at the maximum feasible distance from the crossings, within limits of structure design (SMM Vis-2), resulting in impacts that would be less than significant.

Corridor B1

Similar to Corridor B, Corridor B1 traverses mostly VRM Class III landscapes, although this corridor contains more VRM Class IV landscapes (i.e., landscapes of lesser sensitivity) than Corridor B. Several existing transmission lines cross through the corridor. The corridor contains 39 miles of U.S. Highway 12 and crosses the Minnesota River near Ortonville. In these areas, Class II landscapes occur. Similar high impacts as described for Alternative B at major highway crossings containing water features in foreground view distance zones would result to Corridor B1, but would be mitigated by implementing SMM Vis-2. Elsewhere in the corridor, impacts to visual resources would mostly be low to moderate where other transmission lines are nearby. At locations where no other lines are present, impacts would be slightly higher. The impact of constructing and operating a transmission line in Corridor B1 would be less than significant. No additional mitigation measures would be required.

Corridor C

Corridor C traverses mostly VRM Class III and IV landscapes. A portion of the corridor traverses Class II areas including the Minnesota River near Granite Falls, the Big Stone NWR, U.S. Highway 12, U.S. Highway 212 crossing, and the southwestern portion of Corridor C near Gary, South Dakota. Corridor C would consist of constructing a new transmission line from the proposed plant to the relocated Canby Substation and rebuilding an existing line from the relocated Canby Substation to the Granite Falls Substation. Most of the western segment of Corridor C is centered on an existing transmission line route. If the new line parallels or generally parallels within the viewshed of the existing line, low to moderate additive long-term visual impacts would result. Locations elsewhere away from the existing line would result in slightly higher impacts.

It is proposed that in either Corridors C or C1 the transmission line would be constructed to 345 kV. Either an H-frame or single-shaft steel transmission structure is proposed. Figures 2.2-10 and 2.2-11 display the different configurations and sizes of the proposed 230-kV and 345-kV structure alternatives. The photo simulations for each structure configuration indicate that matching the existing H-frame structure type (Figure 4.8-5) with a similar but taller "H" frame structure (Figure 4.8-6) would create a less additive visual contrast than the single-shaft steel structure (Figure 4.8-7). Neither of the additive impacts caused by either structure type would be significant. If adopted, implementing additional mitigation measure VR-1 would further reduce adverse visual impacts from constructing the proposed transmission line in Corridor C.

- **VR-1.** Where the new line parallels the existing line, similar structural design would be used to lessen the additive visual impacts to the greatest extent possible.

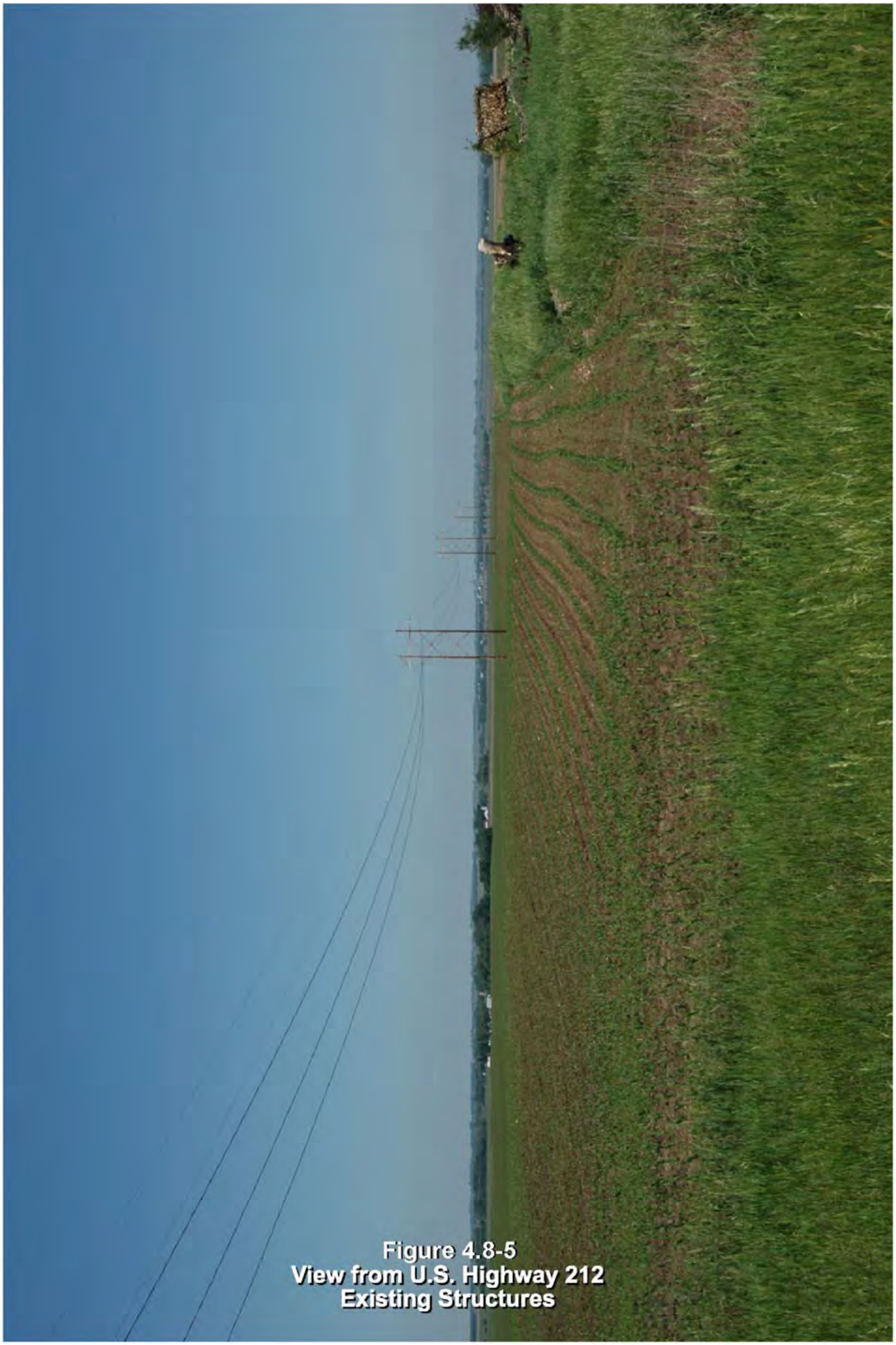

Figure 4.8-5
View from U.S. Highway 212
Existing Structures

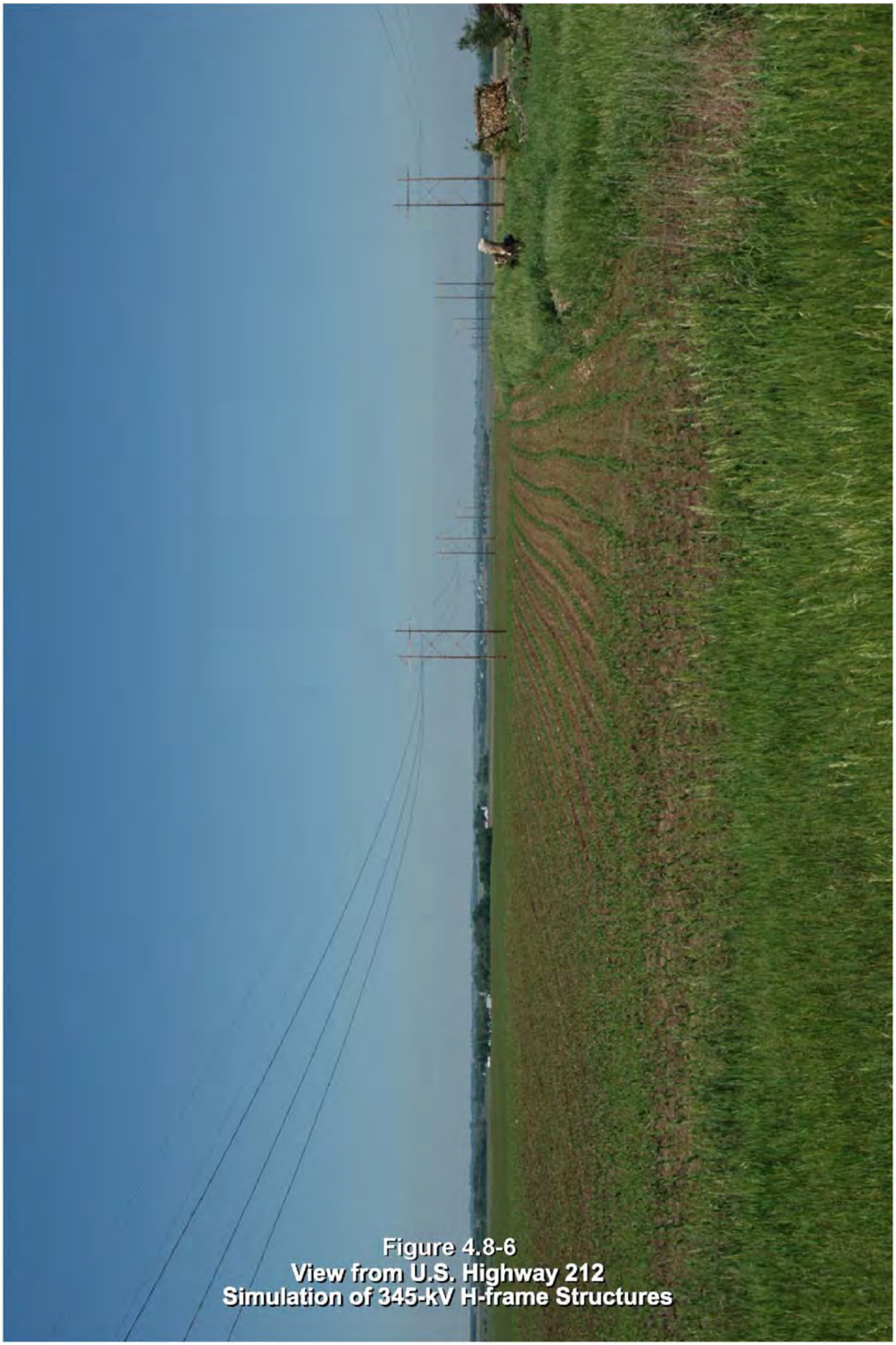

Figure 4.8-6
View from U.S. Highway 212
Simulation of 345-kV H-frame Structures

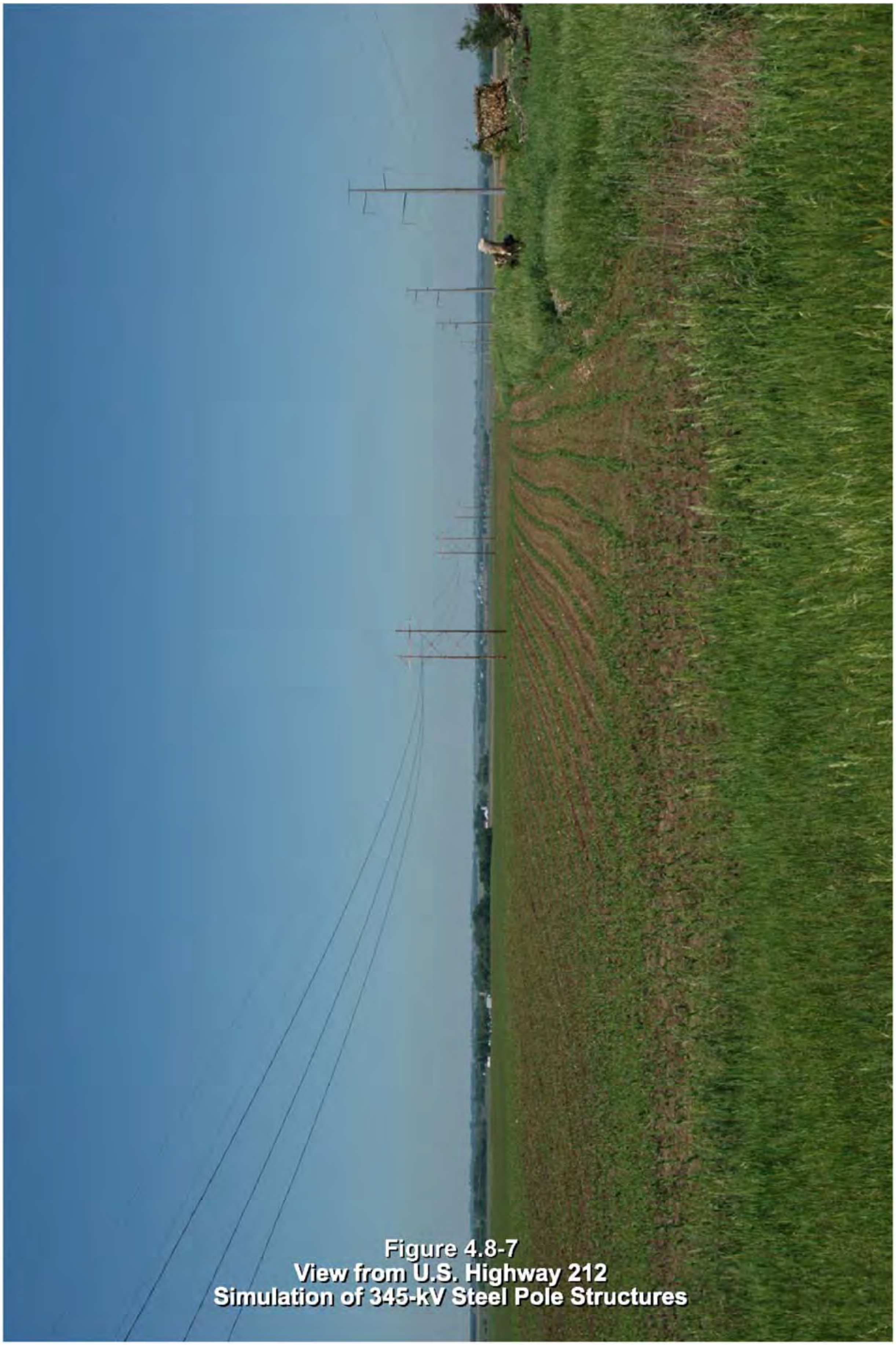

Figure 4.8-7
View from U.S. Highway 212
Simulation of 345-kV Steel Pole Structures

Installing structures, conductors, and maintenance roads for the 345-kV transmission line would result in a moderate additive visual impact to VRM Class II and foreground landscapes and the immediate surroundings, particularly in the southwestern portion of Corridor C near Gary; Big Stone NWR tour route regions; the U.S. Highway 212 Overlook near Granite Falls, Minnesota; and at the crossings of U.S. Highways 59, 75, and 212. Visual impact would be higher if the new line is located away from the viewshed of the existing lines.

Constructing and operating a transmission line in Corridor C would result in new and additive low to moderate impacts due to the introduction of transmission structures, conductors, and clearing. Additive impacts caused by either structure type would not be significant. If adopted, potential initial adverse visual impacts could be effectively reduced in the southwestern portion of Corridor C near Gary and the Minnesota River Valley areas by implementing additional mitigation measure VR-2.

- **VR-2.** In areas of tree vegetation, consideration would be given to minimize clearing, yet maintain adequate conductor to ground clearance.

In addition, the SMMs described for Corridor A would be implemented. These measures would minimize visibility of the proposed Corridor C from sensitive viewpoints and visual impacts associated especially with installation of the new line (e.g., structures, conductors, access roads).

By implementing the SMMs and the additional mitigation measures (if adopted), the residual impact of construction and operation of a transmission line in Corridor C would be less than significant.

Corridor C1

Corridor C1 also traverses Class III and IV landscapes. Corridor C1 contains Class II landscapes for portions of the Minnesota River near Granite Falls, Minnesota and Big Stone NWR, and crosses U.S. Highway 12 and U.S. Highway 212.

Most of the Corridor C1 segment from the proposed plant to Canby is centered on an existing transmission line route. Placement of a new line, which generally parallels the existing route or is within visual range or the same viewshed as the existing route, would result in low to moderate additive long-term impacts. Placement elsewhere in the corridor would result in higher new impacts. The segment from Canby to Granite Falls would result in the same impacts as described for Corridor C, which would be low to moderate long-term additive effects. Higher impacts would result if the new line does not parallel or is not within visual range of existing transmission lines.

Installation of structures, conductors, and maintenance roads for the 345-kV transmission line would result in low to moderate visual impacts; and in certain areas (e.g., major highway crossing near water features), the installations would result in potentially higher visual impacts to VRM Class II and foreground landscapes. Additive impacts caused by either structure type would not be significant. If adopted, additional mitigation measure VR-1 (use of similar structural design) would be used to the extent possible to lessen the additive visual impacts, and would further reduce the potential for adverse impacts to visual resources in rural landscapes, especially in cases where structures would be sited adjacent to an existing structure (e.g., points of intersection).

Constructing and operating a transmission line in Corridor C1 would result in low to moderate additive impacts due to the introduction of transmission structures, conductors, and clearing. Additive impacts from introducing either structure type would not result in significant impacts. If adopted, potential initial adverse visual impacts in the Minnesota River Valley areas could be effectively reduced by implementing additional mitigation measure VR-2. These measures, as well as those described for Corridor A, would reduce visibility of the proposed transmission line from sensitive viewpoints and visual impacts associated with installing the new line (e.g., structures, conductors, access roads). The impacts resulting from constructing and operating a transmission line in Corridor C1 would be less than significant.

Substations

Visual impacts to the three potential substation expansions and relocation of the Canby Substation would result in low additive long-term effects. The substations would use similar form, line, texture, and color elements as the existing structures in the yard. Substation expansions would not draw any additional visual attention. The transmission line interconnections would require modifications to existing substations to support higher-voltage operations. Although the extent of such modifications cannot be determined without detailed engineering, they would likely include replacement or upgrading of existing transformers, switching equipment, and other components. Such modifications may require the acquisition of additional land to accommodate expansion requirements, which would be in Class IV landscapes.

Other System Improvements

Height enhancement of the existing Hankinson line to achieve more conductor ground clearance would most likely be accomplished by raising the cross-arms on the affected structures, which would increase the height of the conductors, and by increasing the height of the static wire. The exact number and extent of structure modifications is not yet known. Visual impacts along the existing Hankinson line after the upgrade would not be substantially different than existing conditions.

4.8.3 No Action Alternative

Under the No Action Alternative, Western would not grant the Co-owners' interconnection request, and the USACE would not issue any permits to the Co-owners related to the proposed Big Stone II. Under the No-Build Alternative, the proposed Big Stone II plant would not be constructed. The No-Build Alternative would result in no additional visual impacts to existing visual resources of the region, except for minor differences to the Ortonville-Johnson Junction-Morris 115-kV transmission line after it is rebuilt (such as slightly larger structures).

Under Sub-alternative 2, where the Co-owners would continue with the construction of the proposed plant and would seek alternate transmission capacity, the visual resource impacts associated with the construction, operation, and maintenance of the proposed plant would likely be identical to those presented above. Any impacts to visual resources associated with the transmission component of the proposed Project would likely be similar to those presented as part of the potential impacts associated with the proposed Project, though their location is unknown.

4.9 Noise

4.9.1 Introduction

Noise impacts would originate from constructing and operating the proposed plant and related activities, such as increased coal and limestone deliveries during the life of the proposed Project. Noise impacts would also occur from proposed well drilling and installation, pipeline construction, construction of electrical distribution lines, and groundwater production activities associated with the proposed Project. Noise impacts associated with the proposed corridors, modifications to the existing substations, and relocation of the Canby Substation would largely be limited to construction activities. The analyses includes an overview of issues related to potential noise impacts, methodologies used to address impacts, and measures that would be implemented to reduce the severity of impacts.

Identification of Issues

Issues related to noise include:

- Daytime noise levels above 60 decibels on the A-weighted scale (dBA) and nighttime levels above 50 dBA for residential receptors (dBA that may be exceeded 50 percent of the time within an hour (L_{50}).
- An increase in noise levels greater than five dBA.
- Impacting “Quiet Cities” initiative.

Impact Assessment Methods

Noise impacts were assessed by modeling projected levels of noise associated with the proposed plant added to the existing values found in the noise survey conducted in the vicinity of the existing plant. Noise modeling associated with the proposed plant was performed with SPM9613 software. Inputs for the model included standard octave band sound frequencies (i.e., 31.5, 63, 125, 250, 500, 1000, 2000, 4000 and 8000 Hertz bands), in unweighted decibels (dB), for each modeled source. The model was used to calculate projected noise levels at the four monitoring locations described in Section 3.9. The SPM9613 model calculates noise levels under ideal conditions for noise propagation, yielding appropriately conservative results. Predicted noise levels were then compared to established standards.

No noise standards have been promulgated in South Dakota. The MPCA has established standards for environmental noise in Minnesota (Minnesota Rule 7030.0030 and 7030.0050). While the Minnesota standards do not apply in South Dakota where the proposed plant site is located, they do provide a reasonable benchmark to evaluate measured noise levels near residences and are used to assess impacts for the proposed Project. Minnesota standards for receivers within agricultural-use areas are the same for daytime and nighttime periods, but differ for dBA that may be exceeded 10 percent of the time within an hour (L_{10}) and L_{50} data. Maximum daytime and nighttime L_{10} standards are 80 dB; maximum daytime and nighttime L_{50} standards are 75 dB.

Significance Criteria

A significant impact from noise would result if any of the following were to occur from constructing or operating the proposed Project:

- Exceeding local, State, or Federal noise regulations or guidelines at sensitive receptors, such as residences, hospitals, or schools.
- Substantial permanent increase in ambient noise levels at the nearest sensitive receptors within the proposed Project vicinity. An increase of 10 decibels, perceived as a doubling of noise, is generally considered to be substantial.

4.9.2 Proposed Project and Alternative 3

4.9.2.1 Big Stone II Plant Site and Groundwater Areas

Proposed Big Stone II Plant Site

Noise levels would increase during the construction of the proposed power plant, particularly in the vicinity of construction activity. The increases in noise levels would occur from such activities as steel erection, batch concrete operations, construction traffic, etc. Such increases in noise levels would occur only during the construction period and as such, are considered short-term impacts. SMMs Noise-1, maintaining an adequate buffer around the plant site, and Noise-3, avoiding nuisance conditions from construction equipment during construction, would further reduce short-term impacts. Some construction would take place at night.

Projected operational noise levels from the addition of the proposed plant are shown in Tables 4.9-1 and 4.9-2. Monitored levels indicated daytime noise levels from 55 to 67 dBA (L_{50}) and nighttime noise levels from 43 to 66 dBA (L_{50}).

Table 4.9-1. Projected Daytime Noise Levels

	Monitored			Predicted			Minnesota NAC[a]-3 Standard	
Location	L_{50}	L_{10}	L_{eq}[b]	L_{50}	L_{10}	L_{eq}[b]	L_{50}	L_{10}
A	59	69	61	60	69	61	75	80
B	67	75	69	67	75	69	75	80
C	55	68	56	56	68	56	75	80
D	66	80	66	66	80	66	75	80

[a]Noise Area Classification (NAC).
[b]Equivalent Noise Level (Leq)
Note: Values from SPM9613 model are +/-3 dB.

Source: Barr, 2005a.

Table 4.9-2. Projected Nighttime Noise Levels

	Monitored			Predicted			Minnesota NAC[a]-3 Standard	
Location	L_{50}	L_{10}	L_{eq}[b]	L_{50}	L_{10}	L_{eq}[b]	L_{50}	L_{10}
A	54	60	55	55	60	55	75	80
B	66	68	67	67	68	67	75	80
C	43	55	46	47	55	48	75	80
D	50	59	51	50	59	51	75	80

Values from SPM9613 model are +/-3 dB.
[a]Noise Area Classification (NAC).
[b]Equivalent Noise Level (Leq)

Source: Barr, 2005a.

The largest difference in predicted noise levels is an increase of four dB at Site C at night (L_{50}). A three dB increase is just barely noticeable to the human ear. Site C would experience a slightly noticeable increase in noise, primarily from the cooling tower units. All the other sites are projected to show increases of less than three dB.

Monitoring data indicate monitored and predicted L_{10} noise levels at Location D would equal the Minnesota Noise Area Classification (NAC)-3 standards for manufacturing (80 dBA) during daytime. Monitored and predicted levels at this location would be below standards for nighttime (75 dBA) and for L_{50} values. Monitored and predicted L_{10} and L_{50} daytime and nighttime levels would be below the Minnesota NAC-3 standards for NAC manufacturing areas at monitoring locations A, B and C.

Monitoring Location C is closest to the nearest residential receptor, the Rabe homestead, which would be classified as NAC-1 (residential) or NAC-3 (agricultural) under the Minnesota standards. The monitored daytime levels at Location C were 55 dBA L_{50} and 68 dBA L_{10}. The 12 dB difference between L_{50} and L_{10} is a clear indicator that the higher noise levels are of shorter duration than the lower levels (i.e., noise levels exceeded 68 dBA only 10 percent of the monitoring period, while 55 dBA was exceeded for 50 percent of the monitoring period). Continuous noise sources, such as the existing Big Stone plant and the Poet Biorefining plant, are usually evidenced by L_{50} levels. The predicted L_{50} levels would be 54 dBA or less at the residence due to increased distance from the plants. L_{10} levels measure infrequent noise, such as automobile traffic or rail movement. During monitoring, it was noted that the audible noise at Location C consisted of only truck traffic on 484th Avenue, which runs north/south immediately east of the Rabe homestead.

SMM N-1 is intended to minimize impact to sensitive receptors as much as practical by maintaining an adequate buffer around the proposed plant site. Noise levels at the Rabe homestead would be the same as current background levels during operation of the proposed plant; therefore, there would not be a significant increase in ambient noise levels, and the noise levels would be below the NAC-1 L_{50} residential noise level requirement. NAC-1 L_{10} levels may be exceeded at the residence due to increased construction traffic on 484th Avenue. However, Minnesota statutes exempt transportation impacts associated with county roads, which would be the cause of higher background levels near the residence. In order to assure that noise impacts are less than significant, if adopted, additional mitigation measure N-1 would be implemented.

- **N-1**. If noise complaints are received from local area residents during construction or operation of the proposed Big Stone II plant, the Co-owners would work with the local resident(s) to develop and implement mitigation of the noise impacts to acceptable levels. Mitigation would be as agreed with the landowner and may include screening at the plant site or residence, erection of noise barriers, landowner compensation, or other appropriate measures.

Additional noise impacts are expected to originate from increased rail activity to meet coal and limestone delivery requirements for the proposed plant's operations and periodic short-term activities that could result in brief, but elevated, noise levels that would surpass those of normal operations. Noise levels associated with increased rail activities would not exceed ongoing levels associated with support of the existing plant; however, the number of events would likely result in increased averages over time. Similar potential noise impacts would result from increased numbers of automobiles and trucks that would be required to support the proposed plant operations. These impacts are short-term and would not pose a significant impact to any sensitive receptors due to the distance of the nearest resident to the rail line.

A scoping comment expressed concern that operation of the proposed plant would exceed the intent of "Quiet Cities." The "Quiet Cities" movement was established in Minnesota during the mid-1960s to promote "quietude" within urban areas. The movement recognizes urban areas where human-induced noise is relatively absent; "if you can hear man-made sounds that last longer than three minutes and 36 seconds in any given hour, there is no quietude" (QuietCities.com, 2008). Big Stone plant operations would not be discernable within area cities due to distance and intervening landforms and vegetation. Therefore, potential impacts to "Quiet Cities" criteria are not anticipated.

The addition of the proposed plant would result in a slightly noticeable increase over existing nighttime noise levels that are generated from the existing plant. The operation of the proposed plant would meet Minnesota noise standards for agricultural and industrial areas. There would be no incremental noise increases above 5 dBA. By implementing additional mitigation measure N-1, if adopted, higher noise levels due to increased traffic near the closest residential receptor would be mitigated, and this impact would be less than significant.

Groundwater Areas

Noise impacts that would result from proposed well drilling and installation, pipeline construction, construction of electrical distribution lines and groundwater production activities are the same for the proposed Project and Alternative 3.

Well Drilling and Installation Impacts

Noise impacts associated with well drilling would largely be associated with the drilling rigs and pumping equipment. Gasoline or diesel engines would be used to power the equipment needed to drill the proposed wells and perform pump testing, resulting in minor noise from internal combustion engines. These activities are short-term in nature and would not exceed any noise regulations.

Pipeline Construction

Noise impacts associated with proposed pipelines would largely be limited to construction activities. Proposed construction activities would include trenching and covering the piping after its placement in the trench. Gasoline or diesel engines would be used to power the trenching equipment, resulting in minor noise from internal combustion engines. These activities are short-term in nature and would not exceed any noise regulations.

Groundwater Production Impacts

Noise from the operation of the proposed wells would be limited to the pump motor, which would be inside a small building surrounding the well. With the pump noise attenuated by the buildings, there would be no substantial increase in the ambient noise levels in the groundwater areas.

The adoption of additional mitigation measure N-2 would minimize the adverse impacts from noise.

- **N-2.** If noise complaints are received from local area residents during construction or operation of the groundwater activities, the Co-owners would work with the local resident(s) to mitigate their complaints.

The proposed well drilling and installation, pipeline and electrical distribution line construction, and groundwater production activities are not expected to exceed any local, State, or Federal noise regulations or guidelines at sensitive receptors. However, in order to assure that noise impacts are less than significant, if adopted, additional mitigation measure N-2 would be implemented.

Summary of Impacts

Construction and operation of the proposed Big Stone II plant and groundwater system would not exceed local, State, or Federal noise regulations or guidelines at sensitive receptors. Ambient noise levels at the nearest sensitive receptors would not increase substantially during operation of the groundwater wells. At the plant site, ambient noise levels would increase by less than five decibels, which would not be substantial. Noise complaints during construction would be mitigated through implementation of additional mitigation measures N-1 and N-2, if adopted, and these impacts would not be significant.

4.9.2.2 Transmission Corridors, Substations, and Other System Improvements

All Proposed Corridors

Transmission lines would be constructed primarily in NAC-3 agricultural areas, as well as some NAC-1 residential areas. Noise during construction would occur from operating equipment to erect transmission lines, foundations, earthwork, etc. Although noise level impacts that are generated during construction could impact sensitive receptors in proximity of work sites, such impacts would be short-term and occur for brief periods of time, usually one or two days at each location. Such impacts would be minimized by scheduling activities to coincide with daylight hours and periods that would be relatively non-disruptive to local residents (SMM Noise-4). All internal combustion engines would be fitted with approved mufflers and spark arresters to avoid nuisance noise (SMM Noise-3). The Co-owners would address audible noise during construction and operation of the proposed Project on a case-by-case basis as necessary (SMM Inf-7). With these measures, impacts would be less than significant because no violations of noise regulations or permanent increases in ambient noise levels would occur.

Operational noise, or corona, occurs from electrical current moving through transmission line conductors. This noise is only noticeable when standing directly under the transmission line.

Operation of the proposed transmission lines would meet State of Minnesota noise standards for agricultural land use. SMM Noise-2 would require transmission line design to incorporate measures to reduce noise effects from the conductors. There would be short-term impacts from construction, but these would be of short duration. There would be no long-term incremental noise above five dBA. Construction and operation of the proposed transmission line would result in less than significant noise impacts. No additional mitigation measures are needed.

Substations and Other System Improvements

Short-term noise impacts would occur during construction activities to upgrade substations, for new construction at the relocated Canby Substation, and for upgrades along the existing Hankinson Line. These activities may include removal and installation of electrical equipment within a substation and, if required, expansion of a substation site. At Willmar Substation, the Johnson Junction Switching Station, and the relocated Canby Substation, SMM Noise-3 and Noise-4 would reduce impacts to below significant levels. The Co-owners' SMM would reduce noise impacts below significance at the Morris and Granite Falls substations. Long-term noise impacts would not be substantially higher than those that exist due to operation of electrical equipment at the substation. The only incremental noise increases occur during opening and closing breakers, which would be infrequent instantaneous sounds. Construction and operation of the proposed substation modifications would result in less than significant noise impacts. The same mitigation measures noted above for transmission corridors would apply to work activities and operations along the existing Hankinson line. Construction and operation of the proposed Hankinson upgrade would result in less than significant noise impacts.

4.9.3 No Action Alternative

Under the No Action Alternative, Western would not grant the Co-owners' interconnection request, and the USACE would not issue any permits to the Co-owners related to the proposed Big Stone II. Under the No-Build Alternative, the proposed Big Stone II plant would not be constructed. None of the impacts associated with the proposed Project would be realized, except for the Ortonville-Johnson Junction-Morris 115-kV transmission line (Corridor A), which would occur at a later date when the line is rebuilt. Noise levels would remain unchanged in the proposed Project vicinity under the No-Build Alternative. Noise levels and related activities associated with the existing plant, such as rail operations and the existing substations would continue at the current frequency into the foreseeable future. Short-term noise that would be associated with constructing the proposed plant, transmission lines, and substation modifications within the proposed corridors would not occur, except those associated with the Ortonville-Johnson Junction-Morris 115-kV transmission line rebuild.

Under Sub-alternative 2, where the Co-owners would continue with the construction of the proposed plant and would seek alternate transmission capacity, the noise impacts associated with the construction, operation, and maintenance of the proposed plant would likely be identical to those presented above. Any noise impacts associated with the transmission component of the proposed Project would likely be similar to those presented as part of the potential impacts associated with the proposed Project, though their location is unknown.

4.10 Social and Economic Values and Environmental Justice

4.10.1 Introduction

This section discusses social, economic, and environmental justice impacts from the proposed Project, and the impact assessment methods, mitigation measures, and significance criteria used in assessing the impacts.

Identification of Issues

Social and Economic Values

Primary issues associated with social and economic value impacts are effects on economic activity as measured by changes in employment and earnings, changes in populations, and the demand for housing and community services.

The following additional issues related to socioeconomics were identified during the scoping process:

- Economic impacts associated with pollution from mercury and other metals.
- Economic impacts on pollution control, water quality, and flood control due to the loss of wetlands.
- Impacts of transmission lines on property values.
- Loss of economic opportunities as a result of the proposed Project.

- Costs to ratepayers and residents.
- Costs associated with reducing CO_2 emissions, including the costs of retrofitting both plants for CCS.
- Additional costs to ratepayers associated with complying with future carbon regulations to reduce global warming.

Assessing the economic opportunities lost due to the construction of the proposed plant is beyond the scope of this EIS. Costs to ratepayers and residents for constructing the proposed Project are subject to the rate-setting processes of each of the Co-owners. Rate increases for each of the Co-owner utilities are approved by the local or State utility commissions, through their respective processes. Assessment of the costs to ratepayers associated with complying with future carbon regulations is part of the Federal legislative process. As noted in Section 2.5.1.11, advances in CCS technology offer promising prospects to be part of the future solution regarding the control of GHGs. However, currently no commercial CCS technologies are available to the proposed Project. Since CCS was eliminated from detailed analysis, an evaluation of the costs associated with reducing carbon dioxide emissions, including the costs of retrofitting both plants was not performed.

<u>Environmental Justice</u>

Issues regarding environmental justice involve having disproportionate adverse impacts on minority or low-income populations caused by constructing and operating the proposed Project.

Impact Assessment Methods

<u>Social and Economic Values</u>

Socioeconomic impacts of the proposed Project were evaluated by examining the availability of labor, potential changes in local population, and changes in demand for housing and community services.

The economic multiplier estimation product used in the analysis is IMpact Analysis for PLANning (IMPLAN). IMPLAN was developed at the University of Minnesota over a period of years in conjunction with the U.S. Forest Service's Land Management Planning Unit in Fort Collins, Colorado. Governmental agencies and leading universities across the nation use this product for estimating economic impacts. IMPLAN is an input-output estimation model. The versatility of this model enables specific analysis for each area of interest, including county, multi-county regions, a State, or a group of States.

<u>Environmental Justice</u>

Census data were collected for the counties and States affected by the proposed Project. A comparison of affected census block groups (race) and census tracts (income) was made to determine whether disproportionately high minority or low income populations would be affected by the construction and/or operating the proposed Project.

Significance Criteria

<u>Social and Economic Values</u>

A significant impact on social and economic values would result if any of the following were to occur from constructing or operating the proposed Project:

- An increase in population that would create shortages of housing and place an excessive burden on local services.
- Uncompensated permanent displacement of an existing residence or business.
- Long-term loss of economic viability of a farm or other business.
- Permanent and irreversible loss of work for a major sector of a community.
- Physical division of an established community.
- Substantial economic benefit (a positive economic impact could be considered significant).

Environmental Justice

A significant impact related to environmental justice would occur from constructing and operating the proposed Project if there were a disproportionate effect on minority or low-income populations in the area.

4.10.2 Proposed Project and Alternative 3

4.10.2.1 Big Stone II Plant Site and Groundwater Areas

Social and Economic Values

Proposed Big Stone II Plant Site

Constructing the proposed plant would cost approximately $616 million (labor costs only), and would require as many as 1,400 workers during peak periods (approximately November and December 2013). A total of approximately 5.1 million man-hours are projected to build the proposed plant. The proposed plant would require an operating staff of 35 employees in addition to the existing 74 employees now working at the existing plant. All of these employees would be full time.

Population

According to the 2000 census, 3,028 vacant housing units are located in the census block groups that have a portion of their boundaries within 30 miles of the proposed plant site. A peak influx of 1,400 workers would create a relatively large short-term increase in population during construction of the proposed plant. Increased market rental and housing costs would be caused by temporarily increased demand for housing during construction. These costs would likely decrease after construction and leave a surplus of housing. The temporary increase in rent could result in permanent displacement of current residents who cannot afford increased rental costs. The influx of construction workers could also put a strain on community services such as fire and police. These short-term impacts would be considered significant. A Local Review Committee has been designated by the SDPUC to assess the extent of the potential social and economic effects that would be generated by the proposed plant and to assess the affected areas' capacity to absorb those effects at various states of construction. The Local Review Committee is chartered to propose mitigation measures for approval by the SDPUC. Additional mitigation measure SE-1, if adopted, would lessen the socioeconomic impacts to the surrounding communities. By implementing this measure, residual impacts to housing and local services would be less than significant. Housing and impacts on community services are issues that would be ongoing throughout construction.

- **SE-1.** For construction at the proposed plant, the Co-owners would consult with local authorities and the construction contractor prior to start of construction to identify specific mitigation measures to alleviate impacts to housing, transportation, law enforcement, and emergency and other services. These mitigation measures would be consistent with the Local Review Committee's report to the SDPUC (Appendix J). Unanticipated housing and service issues that arise during construction would be mitigated in coordination with local authorities, as needed.

Economic Base

The following analysis comes from the 2005 report titled "Economic Impact of Constructing the Big Stone II Power Plant" by Stuefen Research & Business Research Bureau. Four counties are included in the economic impact analysis for the proposed plant site. Grant County is the focus of the analysis because of the proposed plant's location within its borders. Codington County, South Dakota is also included because of the economic prominence of Watertown in the area. Two Minnesota counties are included in the analysis: Big Stone and Lac qui Parle counties. Both jurisdictions intersect not more than five miles from the existing plant and are expected to benefit from the economic activity created by constructing the proposed plant. Constructing and operating the proposed plant would have a direct impact on the economies of this four-county area and the State of South Dakota.

The budget for the construction of the proposed plant in 2008 dollars is $616 million for labor costs. In addition to this amount, $46.5 million has been budgeted as a contingency to cover cost overruns and the cost of inflation between the construction start date and the construction completion date, for a total of $662.5 million. The cash expenditure on the construction of the proposed plant is expected to fall between $616 million and $662.5 million for labor.

IMPLAN Results

For purposes of the analysis, the IMPLAN model provided projections for employment and economic spending based on two scenarios: 50 percent of the money earned by the construction workforce was assumed to be spent in the local four-county area and 50 percent spent in the State of South Dakota.

Four-County Multipliers

The estimated four-county economic output multiplier for constructing the proposed plant is 1.27; assuming 50 percent of the money earned by workers would be spent in communities outside the four-county area (Table 4.10-1). For each $1 million of construction activity, total employment is estimated as 8.6 full-time positions made up of 4.8 full time positions at the site, and 3.8 people employed full-time or part-time in the local communities due to indirect or induced spending. The $1 million of economic activity and the employment of the workers (8.6) would result in the wealth of the area being increased by more than one-half million ($0.5393 million).

Table 4.10-1. Four-County Construction Economic Impact Multipliers

Impact Type	Total Output	Value Added	Employment
Direct	1.0000	0.3969	4.8
Indirect	0.1746	0.0903	2.5
Induced	0.1908	0.1043	2.6
Total	1.3654	0.5915	9.9
Total (With 50 percent of induced spending)	1.2700	0.5393	8.6

Source: Stuefen Research & Business Research Bureau, 2005.

Induced spending is reduced to 50 percent recognizing that a substantial number of workers on the proposed Project would have residences outside the four-county area and a substantial portion of their earnings would be used to support their distant households. The same is true when looking at the induced spending associated with the State estimated impacts.

State of South Dakota Multipliers

The estimated South Dakota economic output multiplier for constructing the proposed plant is more inclusive than the four-county estimate. More businesses are expected to sell goods and services to the proposed Project's workers and more workers are expected to be from other locations in South Dakota, rather than from the four-county area. The State economic output multiplier is approximately 1.48 assuming that 50 percent of the money earned by workers would be spent outside the State of South Dakota (Table 4.10-2). For each $1 million of construction activity, 11.1 people would be employed directly, indirectly or as a result of induced spending in the area. Direct employment is in full-time equivalents assuming a full working year per position. Employment associated with indirect and induced impacts include both full- and part-time positions. The result of a million dollars of economic activity and the employment of the workers would increase the wealth or income of the State by approximately $672,500.

Table 4.10-2. South Dakota Construction Economic Impact Multipliers

Impact Type	Total Output	Value Added	Employment
Direct	1.0000	0.4001	4.8
Indirect	0.3056	0.1748	3.9
Induced	0.3538	0.1951	4.7
Total	1.6594	0.7700	13.4
Total (With 50 percent of Induced Spending)	1.4825	0.6725	11.1

Source: Stuefen Research & Business Research Bureau, 2005.

Four-County Economic Impact

Construction economic impacts in 2008 dollars, with escalation money included, are presented for the four-county area in Table 4.10-1. The size of the proposed construction Project is defined by Burns and McDonnell Engineering as costing $616 million (labor costs) in 2008 dollars and requiring 2,550 worker years or jobs over the life of the proposed Project. Construction activity and worker spending would create an additional 1,997 full- and part-time jobs in the communities throughout the four-county area, assuming 50 percent indirect spending.

State of South Dakota Economic Impact

Construction economic impacts in 2008 dollars, with escalation money included, are presented for the State of South Dakota in Table 4.10-2. Construction activity and worker spending would create an additional 3,322 full- and part-time jobs in the communities throughout the State for a total of 5,872 jobs, assuming 50 percent indirect spending. An additional $11 million in sales tax, use tax, and contractor's excise tax would be generated for the State of South Dakota during construction of the proposed plant (Big Stone II, 2005b).

The proposed Big Stone II plant would permanently displace three occupied residences. OTP has purchased three occupied residences on or near the proposed plant site. All purchases were voluntary/sale transactions. The first occupied residence included an 80-acre parcel and a farm residence. A second occupied residence to the northwest of the proposed Project has been purchased as site buffer area. This residence is outside the proposed Big Stone II property boundary. The third purchased residence is located southwest of the plant property, within the proposed Project boundary.

Operation of the Proposed Plant

The Co-owners estimate the proposed plant would require an additional 35 employees at an annual payroll cost, including benefits, of approximately $2.5 million at 2004 wage levels. Estimated annual economic impact on the four-county economy of increased employment is presented in Table 4.10-3. The 35 additional jobs at the proposed plant are estimated to create another 28.8 jobs throughout the economy. The associated $2.5 million payroll is expected to result in a total economic activity increase of $3.1 million annually, as these new households purchase goods and services in the area, and the money makes its way through the economy. The income generated in households outside those directly employed at the proposed plant would be an additional $1.1 million annually. An additional $4.7 million in property taxes would be generated annually for the State of South Dakota during operation of the proposed plant (Big Stone II, 2005e).

Table 4.10-3. Economic Impact in 2004 Dollars Employing 35 People with Payroll of $2.5 Million

Impact Type	Total Output	Value Added	Employment
Induced Initial Impact	$2,500,000	$793,527	19.7
Induced Subsequent Impacts	$603,864	$314,460	9.1
Total	$3,103,864	$1,107,987	28.8

Source: Stuefen Research & Business Research Bureau, 2005.

No negative impacts are anticipated from uncompensated losses to existing businesses or residences; additional healthcare costs; long-term loss of economic viability of a farm or business; permanent and irreversible loss of work for a major sector of the community; induced growth; or physical division of established communities. Potential economic benefits could result from excess capacity in transmission lines being available for other power producers such as renewable energy facilities (Shouse, 2005).

Economic Impacts of Mercury Emissions

The economic impacts (including health related economic impacts) associated with mercury contamination in the environment were raised during scoping and public comments received on the Draft and Supplemental Draft EIS. Without question, mercury is a toxic substance. The primary pathway of human exposure to mercury is through eating fish containing methylmercury. According to the USEPA, individuals may also become exposed to elemental mercury vapor. However, the number of individuals exposed in the U.S. in this way is very small. Regarding the economic and health impact of mercury emissions from the proposed Big Stone II plant, the fraction of mercury emitted to the atmosphere from a specific source that eventually is inhaled or enters a waterbody, becomes converted to methylmercury, is taken up into fish, and is consumed by a person, is dependent on a vast range of source and site-specific conditions. The chemical and physical forms of the mercury emissions strongly influence where and how the emitted mercury deposits from the air. Local geography, geology, and meteorology also affect the fraction of mercury deposited to soils, foliage, and surface water (which also receives secondary loadings from soil erosion and leaf litter). Chemical, physical, and ecological conditions present in a specific waterbody determine the degree to which waterborne mercury is converted to methylmercury and is bioaccumulated as it moves up the food chain. Finally, the rate at which humans ingest mercury in the fish will depend on the location and fish type. Many of these conditions can vary widely from place to place, even among otherwise very similar sites. Without access to emissions data[24] from the proposed Project necessary to evaluate the vast range of source and site-specific conditions, the economic impact (including health) cannot be measured. As discussed in Section 4.1.2.1, the commitment of the Co-owners of the proposed Big Stone II Project is to install technologies that are most likely to result in removal of at least 90 percent of the mercury emitted from the existing plant and the proposed Big Stone II plant. This would result in mercury emissions of approximately 81.5 lb per year from the combined plants (a decrease of approximately 57 percent). If the proposed Big Stone II plant is constructed (and after implementation of emissions controls), mercury emissions from both plants would be less than the emissions from the existing plant. The combined plants would continue to emit mercury (although at a decreased rate); however, since the mercury emissions from the operation of the proposed plant would be less than current conditions, the proposed Project would not produce any incrementally greater adverse economic effects on property values, lakes, or health. A detailed discussion of power plant mercury emissions and the regulations to control and protect public health is presented in Section 4.1 and also in the Mercury Response Paper (Response Paper A, Volume II).

Indirect economic impacts that may be attributed to plant operations could result in reduced recreational fishing and other activities in the area, and reduced revenues associated with such activities. Any estimation of impacts of mercury emissions from a single source, such as a coal-fired power plant, contains a large amount of uncertainty because the processes and parameters that influence the many stages of mercury transport and transformation are not yet fully understood, or sufficiently well-characterized to make robust predictions. Section 4.6 covers impacts to recreation.

<u>Groundwater Areas</u>

The proposed groundwater activities (i.e., well drilling and installation, pipeline construction, and construction of electrical distribution lines) within the groundwater areas would require specialty contractors for construction activities. This work would be short-term (about one to two months in duration) and would require local accommodations and food services. However, there would be no excessive burdens placed on local services, since the activities would be short-term. Since the proposed construction activities would take place in rural areas, no dislocation of or economic losses to any businesses or residences would take place. Land owners would receive compensation for any loss of land that would occur due to proposed construction and operation of the groundwater activities. There would be no permanent loss of work for any sector of the community, or any division of established communities. Minor economic benefits to the community may occur due to contractors using local services for one to two months, but the effects would not be substantial. Therefore, no significant impacts to social and economic values in the region are anticipated due to the groundwater activities.

<u>Summary of Social and Economic Impacts</u>

The short-term impacts on housing and public services during construction of the proposed plant could be significant. Implementing additional mitigation measure SE-1, if adopted, would alleviate any shortages of housing or burdens on local services so that these impacts would be less than significant. Direct and indirect economic benefits from construction activities to the surrounding four-county region and the State of

[24] Because the plant has not been constructed, no emissions have occurred, and therefore, emissions data do not exist.

South Dakota would be a significant beneficial impact. Creation of temporary and permanent jobs in the community would also be a beneficial impact.

Residual impacts to social and economic values resulting from operating the proposed plant would be long-term beneficial impact creating 35 new jobs in the local area and additions to the local and State tax base. The proposed Project would permanently displace three existing residences. There would be no uncompensated impacts to residences due to constructing the proposed plant.

Based on the social and economic analysis, no significant short-term or long-term negative residual impacts are anticipated from uncompensated losses to existing businesses or residences, loss of economic viability of a farm or other business, permanent and irreversible loss of work for a major sector of the community, or the physical division of an established community.

Constructing and operating the proposed groundwater wells, pipelines, and electrical distribution system would not result in any shortage of housing or place an excessive burden on local services. No residents or businesses would be displaced. While approximately 2.4 acres of farmland would be used for the groundwater system, this would not create a long-term loss of economic viability of a farm or business. There would not be any significant social impacts from constructing and operating the proposed groundwater system.

Environmental Justice

No impacts to environmental justice communities would occur as a result of constructing the proposed plant or groundwater areas. The poverty rate for the census tracts affected by the proposed plant site is 10.4 percent, while minorities comprise 1.2 percent of the population in the census block groups in which the proposed plant site is located. This poverty rate is less than the State of South Dakota's poverty rate of 13.2 percent, and comparable to Grant County's poverty rate of 9.9 percent. The minority population for the affected area is lower than the State of South Dakota (11.3 percent) and comparable to Grant County (1.4 percent). No additional mitigation measures are proposed.

Methylmercury contamination in waterbodies may cause physiological effects to aquatic and semi-aquatic plants and physiological and neurological effects to animals, as well as alter the physical properties of the waterbody's substrate. Methylmercury can be found in fish, which may be consumed by the general population and minority and low income populations. The combined emissions of mercury from the existing and proposed Big Stone II plants would decrease from current emission rates for the existing plant. As discussed in Section 4.4.2.1 (see the Fisheries subsection), the proposed Project would not cause an increase in the rate of accumulation of methylmercury concentrations in fish, although bioaccumulation of methylmercury would continue at a reduced rate. According to information from the MPCA, declines in mercury emission and deposition should result in reduced mercury concentrations in fish (MPCA, 2007). The reduced rate of bioaccumulation, when considering the MPCA information, suggests that the lower mercury emissions from the existing and proposed plant could contribute to lower mercury concentrations in fish over time. Any such resulting effect of lower mercury concentrations in fish over time would likely affect all surrounding lakes that are impacted by emissions from the Big Stone site, including lakes on the Lake Traverse Reservation.

Mercury emissions from the existing and proposed plant would be less than total mercury emissions from the existing plant due to the planned implementation of the air pollution controls. Therefore, the rate of mercury deposition due to emissions from the combined existing and proposed plants would decrease (compared to the existing plant alone), as a result of the proposed plant being constructed. If the fish consumption advisories currently developed by State agencies (SDDENR, 2008a; MnDOH, 2008) are followed, there would not be a disproportionate impact from consumption of fish on any population (including minority or low income populations) concerned with neurological issues attributed to mercury. However, even if fish are consumed by minority and low income populations in quantities greater than the State advisories, it is reasonable to assume that more mercury would be ingested, but the mercury contained in fish would be reduced over time with the lower mercury emissions from the proposed plant.

4.10.2.2 Transmission Corridors, Substations, and Other System Improvements

Social and Economic Values

<u>All Proposed Corridors, Substations, and Other System Improvements</u>

Constructing the transmission lines and substation modifications for the proposed Project would require 40 full-time personnel, 25 of which would be needed for transmission line construction with the remainder devoted to substation modification construction. Part-time personnel also may be needed during construction. Activities associated with the upgrades to the existing Hankinson line would require one to two construction crews, each consisting of about two workers. Construction activities and modifications associated with the proposed transmission lines, substations, and Hankinson line upgrades would extend from January 2012 through December 2014.

Population

Construction of transmission lines and substation modifications associated with the proposed Project would create approximately 40 jobs. Construction personnel would primarily use temporary housing at local motels in the area, although some may be local. The number of new employees would have a less than significant impact on the local population or housing in the proposed Project area.

Economic Base

Construction of transmission lines and substation modifications associated with the proposed Project would provide some additional employment opportunities in the region. Assuming a total of approximately 275,000 man-hours paid at pay rates commensurate with local construction salaries, a total of about $4.4 million in payroll would be generated by constructing the transmission lines and substation modifications.

Property Values

While no studies have been done in the specific study area, various studies have been conducted to determine the effect of transmission lines on the value of single family residences. Estimates of the decrease in property values are generally less than 10 percent, but can range up to 15 percent (VDPS, 2005). A Minnesota survey conducted by St. Cloud State University found that both homeowners (living near power lines) and appraisers concluded that the average negative impact on residential values was approximately 4.1 percent (REC, 1999). Based on this research, a small adverse impact could be experienced by residents in close proximity to the new transmission lines. In areas that already have existing transmission lines, no change in property values would be anticipated. No information is readily available for the effect of substation modifications on property values, but since the proposed substations already exist, these impacts would not be any greater than they are currently. There are no homes near the site for the relocated Canby Substation. No uncompensated impacts would occur to agricultural lands, in accordance with SMM Land-9.

Impacts Related to the Additional Issues Identified during the Scoping Process

There would be a net decrease in wetlands from constructing the proposed transmission lines, which would be mitigated under a Section 404 CWA wetland permit issued by the USACE (SMM Bio-3). Socioeconomic impacts associated with the localized loss of wetlands would be less than significant and would be more than offset by increases in wetlands in other locations.

Transmission lines would be built in accordance with NESC and the Co-owners' procedures, which are designed to minimize the risk for shock (SMM Inf-5). In locations where trees would interfere with the reliability of the transmission lines, clearance and/or removal of trees would be required. Removal of trees would be compensated as part of the ROW acquisition process.

After implementing the SMMs, no significant negative residual impacts are anticipated from uncompensated losses to existing businesses or residences, loss of economic viability of a farm or other business, permanent and irreversible loss of work for a major sector of the community, or the physical division of an established community. No additional mitigation measures would be required.

Environmental Justice

The poverty rates and minority population percentages for the census tracts affected by each of the proposed corridors are shown in Table 3.10-1. The poverty rates and minority population percentages for all proposed corridors are less than or comparable to rates for those counties and States through which they pass. There is not a disproportionate amount of minority or low-income populations in the proposed corridors.

An approximately 25-mile long segment of the existing 68-mile long Hankinson line crosses the Lake Traverse Indian Reservation of the Sisseton-Wahpeton Oyate, a minority population cluster in western Grant and Roberts counties, South Dakota (approximately 23 miles west of the proposed Big Stone II plant). As indicated in Section 2.2.3, upgrades to the Hankinson line would be required. The exact number and extent of structure modifications is not yet known. As shown by Table 3.10-1, the minority populations of Grant and Roberts counties are 1.4 percent and 31.7 percent, respectively; and the percentage of persons living below the poverty level in Grant and Roberts counties are 9.9 percent and 22.1 percent, respectively.

There would be no residual impacts to environmental justice communities. The proposed Project would not have a disproportionate negative effect on minority or low-income populations in the area. Any impacts to environmental justice communities from constructing and operating the proposed transmission lines, substations, relocating the Canby Substation, and upgrading the Hankinson line would be less than significant.

4.10.3 No Action Alternative

Under the No Action Alternative, Western would not grant the Co-owners' interconnection request, and the USACE would not issue any permits to the Co-owners related to the proposed Big Stone II. Under the No-Build Alternative, the proposed Big Stone II plant would not be constructed. None of the impacts associated with the proposed Project would be realized, except for the Ortonville-Johnson Junction-Morris 115-kV transmission line (Corridor A), which would occur at a later date when the line is rebuilt. Under the No-Build Alternative, growth in population and housing would likely continue along present trends. The increase in jobs and revenue to the local economy, described in the previous sections, would not occur. No environmental justice impacts would occur.

Under Sub-alternative 2, where the Co-owners would continue with the construction of the proposed plant and would seek alternate transmission capacity, social, economic, and environmental justice impacts associated with the construction, operation, and maintenance of the proposed plant would likely be identical to those presented above. Impacts associated with the transmission component of the proposed Project would likely be similar to those presented as part of the potential impacts associated with the proposed Project, though their location is unknown.

4.11 Cumulative Impacts

This section of Chapter 4 defines cumulative impacts, describes the methodology for assessing cumulative impacts, describes projects and activities considered in this assessment, and presents the results of the cumulative impacts assessment by resource topic.

4.11.1 Introduction

CEQ regulations for NEPA define "cumulative impact" as "… the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency … or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7). Guidance from the CEQ states that cumulative effects analysis should be conducted within the context of physical resource, ecosystem, and human community thresholds (CEQ, 1997), which are characterized as follows:

- Cumulative effects are caused by the aggregate of past, present, and reasonably foreseeable future actions.
- Cumulative effects are the total effect, including both direct and indirect effects on a given physical resource, ecosystem, and human community of all actions taken, no matter who has taken the action.
- Cumulative effects are analyzed in terms of the specific physical resource, ecosystem, and human community being affected. Environmental effects are often evaluated from the perspective of the proposed Project.
- It is not practical to analyze the cumulative effects of an action on the universe; the list of environmental effects must focus on those that are truly meaningful.
- Cumulative effects on a given physical resource, ecosystem, and human community are rarely aligned with political or administrative boundaries.
- Cumulative effects may result from the accumulation of similar effects or the synergistic interaction of different effects.
- Cumulative effects may last for many years beyond the life of the action that caused the effects.
- Each affected physical resource, ecosystem, and human community must be analyzed in terms of its capacity to accommodate additional effects, based on its own time and space parameters.

4.11.2 Impact Assessment Methodology

The cumulative impacts analysis places the proposed Big Stone II Project-specific impacts into a broader context that takes into account the range of impacts from actions taking place over a given space (geographic region of influence) and time (temporal parameters). In the cumulative analysis for the proposed Big Stone II Project, the geographic region of influence is specific to each resource and is generally the same as presented for each resource in Chapters 3.0 and 4.0. The geographic regions of influence addressed in the cumulative analysis are summarized in Table 4.11-1.

Temporal parameters consist of the construction period and the life of the proposed Big Stone II Project. Construction periods include four years for the proposed Big Stone II plant (including the associated groundwater system) and approximately three years for the proposed transmission lines (including the Canby Substation relocation and other substation modifications). The extent of the modifications to the substations is unknown at this time; however, modifications could require approximately less than a year to complete. The life of the proposed Big Stone II plant is estimated to exceed 40 years. The transmission lines and substations would operate as long as they are maintained and needed to transfer electricity throughout the region, which could be 50 years or more.

The cumulative impact analyses are based on the construction and operation impacts of the proposed Project and take into account issues identified through public scoping. The cumulative effects on each specific resource are identified by adding the impacts of the proposed Big Stone II Project to identified past, present, and reasonably foreseeable future actions in the proposed Project area. This includes projects or activities that have already occurred, are ongoing, are funded for future implementation, or are included in firm near-term plans. Reported projects or activities that could not be substantiated were excluded from the cumulative impacts analysis. Significance criteria of cumulative impacts for each resource are the same as presented in sections 4.1 through 4.10.

4.11.3 Projects and Activities Considered

Past, present, and reasonably foreseeable future projects and activities that occur or may occur in the future within the geographic regions of influence identified in Table 4.11-1 are described in this section. Each would potentially contribute to cumulative impacts if the proposed Project is implemented. The CEQ guidelines suggest that agencies should focus on "… the current aggregate effects of past actions without delving into the historical details of individual past actions." (CEQ, 2005) Foreseeable future actions have been identified based on public documents prepared by agencies of the Federal, State, and local governments, news releases by project developers, and trends that have taken place and those that are likely to continue into the future.

Table 4.11-1. Geographic Regions of Relevant Influence by Resource

Geographic Region of Relevant Influence	Resource
Project Region[a] South Dakota, North Dakota, and Minnesota region[b]	Air Quality (air emissions except mercury and CO_2) Mercury, CO_2
Within the boundaries or the immediate vicinity of the existing and proposed Big Stone II plants and the width of the proposed transmission corridors.	Floodplains Geology and Minerals Paleontological Resources Soils Vegetation Noxious Weeds Cultural Resources Transportation Land Use and Agricultural Practices Noise Public Health and Safety Hazardous Materials and Wastes
Areas of the Veblen aquifer that would be impacted by groundwater withdrawals for the proposed Big Stone II plant.	Groundwater Resources
Whetstone River watershed, Big Stone Lake and Little Minnesota River watershed, and the Minnesota River for a distance of 10 miles downstream from Big Stone Lake.	Surface Water Resources Fisheries Recreation Wetlands/Riparian Areas
Viewshed of sensitive receptors.	Native American Concerns Visual Resources
Within one mile from the existing and proposed Big Stone II plants and the width of the proposed transmission corridors.	Wildlife Special Status Species
Codington and Grant counties in South Dakota, and Big Stone and Lac qui Parle counties in Minnesota for the proposed plant site; Grant and Deuel counties in South Dakota, and Big Stone, Chippewa, Kandiyohi, Lac qui Parle, Stevens, Swift, and Yellow Medicine counties in Minnesota for the proposed transmission corridors.	Social and Economic Values Environmental Justice

[a] The Region of Relevant Influence for criteria pollutant emissions from the proposed Project is pollutant dependent. For example, impacts of particulate matter would be expected to be highest near the property line while maximum impacts of other pollutants, such as CO, would be expected some distance from the site. Regardless of the location of maximum impact, all criteria pollutants would not be expected to have an impact at a distance of 100 km from the proposed Project site.

[b] For mercury and CO_2, Western has defined the region of influence as the fossil fuel-fired power plants located within the States of South Dakota, North Dakota, and Minnesota. Western believes that including national or global mercury and CO_2 emissions in the region of influence would trivialize these emission contributions from the proposed Big Stone II plant.

Big Stone Plant

The existing Big Stone plant is located in Grant County, South Dakota, east of Milbank and northwest of Big Stone City. The existing 450-megawatt (MW) plant is located on a 2,271-acre parcel and was constructed in 1975. Existing plant infrastructure includes rail and road facilities. The plant operates at a coal burn rate of approximately 270 tons per hour. The existing plant is currently permitted by the State of South Dakota to withdraw up to 100 cfs and up to 8,000 afy of water from Big Stone Lake. The existing Big Stone Substation currently has four electrical outlets: two 115-kV lines and two 230-kV lines.

Existing Substations

Western's Substations

Morris 230-kV Substation is located approximately four miles west of Morris, in Stevens County, Minnesota. It was constructed in the early 1960s on 18.6 acres. There are a total of eight transmission lines at this substation: two 230-kV, three 115-kV, and three 41.6-kV lines.

Granite Falls 230-kV Substation is located 1.5 miles north of Granite Falls, in Chippewa County, Minnesota. Substation construction began in 1957 but was not completed until 1963. The substation sits on 16.8 acres on a bluff above the Minnesota River. The substation has a total of 13 transmission lines: three 69-kV, four 115-kV, and six 230-kV lines.

Other Substations

Ortonville 115-kV Substation was built in 1951. It includes three 115-kV transmission lines and two 41.6-kV lines. It is owned by OTP and is located in Big Stone County, Minnesota.

Willmar Substation is located on the south side of the City of Willmar, within the city limits. It was constructed on 5.2 acres of land and became operational about 1974. It is jointly owned by Willmar Municipal Utilities, Xcel Energy and Great River Energy (GRE). There are a total of eight transmission lines: five 69 kV, two 115 kV, and one 230 kV.

Johnson Junction Switch Station was constructed in approximately 1951 on 1.4 acres. It is located in Big Stone County and includes three 115-kV transmission lines. GRE owns this switch station.

Transmission Lines

Transmission lines have been constructed within each of the proposed corridors. They vary in capacity from 115 kV to 230 kV. Distribution lines (any transmission line less than 115 kV) are also present. Ownership includes Western, utility companies, and municipalities.

Future construction of transmission lines, substations, and ancillary facilities is expected as the demand for power increases in response to new generating facilities, construction of ethanol production plants, and as cities such as Willmar continue to experience growth. Regional transmission plans indicate a future 345-kV substation may be constructed in the vicinity of Hazel Run, Minnesota. As part of other regional transmission projects under study, an independent project would construct and connect a 345-kV transmission line from the proposed Big Stone-to-Granite Falls transmission line to a 345-kV substation at Hazel Run. No specific dates have been identified for constructing this Big Stone-to-Hazel Run transmission component. Corridor C or C1 would be built at 345-kV, but operated at 230-kV in anticipation of this project. Future construction of the transmission line and substation would depend on the future need for transmission capacity and location of that need. Demands for power and the development of new power sources in South Dakota have contributed, in part, to the development of planning studies to identify and address long-range transmission needs (CapX 2020, 2002). Near-term objectives include providing an outlet for the high wind resource area near Gary, South Dakota. Other objectives call for improvements to transmission to bring power to the Minneapolis area from North Dakota, northern Minnesota, and Wisconsin.

Ethanol Plants

Ethanol production has reached importance as a substitute for gasoline and an additive to gasoline to reduce air pollutants. Ethanol production is one of the prominent industries in the proposed Project area and is likely to remain so into the future. Minnesota's governor recently signed a bill into law that could require that the State's gasoline supplies contain 20 percent ethanol; twice the current 10 percent ethanol blend. South Dakota has a program of grants, loans, sales tax exemptions, and tax credits designed to promote development of ethanol production. Table 4.11-2 shows existing and planned production capacity in Minnesota and South Dakota.

Table 4.11-2. Existing and Planned Ethanol Production

State	Existing Production		Planned Production[a]	
	Plants	gallons per year	Plants	gallons per year
Minnesota	18	747,100,000	3	290,000,000
South Dakota	14	848,000,000	1	118,000,000

[a]Includes expansion of existing facilities.

Source: Renewable Fuels Association, 2006, OTP, 2008a.

Ethanol plants require supplies of corn, water, fuel for boiler(s), and grain dryer(s). Typically, the fuel is natural gas and electricity. Ethanol, wet grains, and dry grains are the products, with possibly CO_2 being sold to a nearby user, if available. Five ethanol plants are located within the region of influence for air quality. The same level of information was not uniformly attainable for each plant.

Poet Biorefining Plant – Big Stone, SD

The existing Poet Biorefining plant is located immediately south of the existing Big Stone plant. The ethanol plant was built on a 20-acre site that was disturbed by construction of the existing Big Stone plant. Full operation of the ethanol plant began in June 2002. Initially producing 45 million gallons per year (mgpy) of ethanol, the plant was expanded and increased its production to 79 mgpy in Spring 2007. The plant expansion occurred entirely within the existing, already disturbed site. The ethanol plant is jointly owned by Northern Growers, LLC of Milbank and Broin Investments of Sioux Falls, South Dakota (Poet, 2008). The existing Big Stone plant supplies the Poet plant with process steam as well as other support services including water for fire protection and process water and rail system. Poet Biorefining purchases approximately 130,000 lb per hour of process steam and also has its own natural gas-fired boiler to produce its own steam whenever it is more economical than purchasing steam from the power plant.

Granite Falls Energy, L.L.C. Ethanol Plant

The Granite Falls Energy, L.L.C. (GFE), originally Granite Falls Community Ethanol Plant, is located approximately 1.5 miles east of Granite Falls, in Chippewa County, Minnesota. Construction of the plant began in August 2004; ethanol production began in November 2005. The plant was built on approximately 50 acres of farmland (Granite Falls Community Ethanol Plant LLC, 2004). GFE had proposed to expand the plant's permitted capacity from 45 mgpy to 57.2 mgpy of 200-proof ethanol. However, the expansion did not occur and the plant's capacity remains at 45 mgpy. The Twin Cities and Western Railroad is adjacent to the plant.

Chippewa Valley Ethanol Company L.L.C.

Chippewa Valley Ethanol Company L.L.C is located approximately one mile west of Benson, Minnesota on a 190-acre site adjacent to the Benson Airport and the former Agralite Cooperative Generating Plant. The plant and associated facilities occupy 14 acres of the site. The plant was initially designed to process approximately 8.3 million bushels of corn per year to produce 22.4 mgpy of undenatured ethanol. The facility was expanded to process approximately 18.3 million bushels to produce 49.5 mgpy of undenatured ethanol (Chippeway Valley Ethanol Plant Expansion, 2002).

Glacial Lakes Energy Ethanol Plant

Glacial Lakes Energy Ethanol Plant is a dry mill 200-proof ethanol production facility that processes 22 million bushels of corn annually to produce a maximum of 60 mgpy of ethanol (Glacial Lakes Energy, LLC, 2004). The plant, employing 44 persons, is located on a 50-acre site within the industrially zoned Hanten Industrial Park in Watertown, South Dakota. The plant was constructed in 2002 and began operating in 2003. As a byproduct, the facility also produces 198,000 tons per year of distiller's dry grains with solubles for use as animal feed (Glacial Lakes Energy, LLC, 2006).

North Country Ethanol Plant, LLC

The North Country Ethanol, LLC plant is located about 0.5 mile northeast of Rosholt, South Dakota. The plant is capable of processing up to seven million bushels of corn to produce 20 million gallons of ethanol and 65,000 tons of distiller's grains annually (North Country Ethanol, LLC, 2004). United Bio Energy of Wichita, Kansas, manages plant operations with a staff of 34 persons and markets the ethanol and distillers grains output. The facility includes grain load-out and storage, cooling system, and related industrial buildings. The site is approximately 20 acres and includes access to rail and road transportation. Land use in the area around the plant site is agricultural (United BioEnergy, LLC, 2005).

Water Resource Projects

Lac qui Parle Flood Control and Water Conservation Project

This project is located on the upper Minnesota River in western Minnesota near the South Dakota border. It was authorized by Congress in 1936 and is currently operated by USACE. Project components include the Lac qui Parle dam, Marsh Lake dam, Highway 75 dam, and the Watson Sag Weir and diversion channel on the Chippewa River. The Highway 75 dam impounds water for the Big Stone NWR. Recreational opportunities provided by this project include sport fishing, waterfowl hunting, wildlife viewing, campgrounds, and day use facilities such as picnic areas and playgrounds.

Big Stone Lake – Whetstone River Flood Control Upstream Works – Minnesota River Project, Big Stone County, Minnesota

This project was authorized under the Flood Control Act of 1965 to provide flood control, general recreation, and fish and wildlife enhancement on Big Stone Lake and the Whetstone River in Minnesota and South Dakota. USACE awarded contracts in May 1983 and August 1986 for channel improvements to the Minnesota River, modifications to the Big Stone Lake outlet control structure and silt barrier, and construction of a debris deflection/collection structure across the Whetstone River. The channel improvements included channel widening and excavating a new channel. The improvements extended 3.5 miles downstream from Big Stone Lake to the upstream end of the Highway 75 reservoir. The silt barrier was raised one foot. This was done to raise the lake level to improve the quality and recreational value of the lake. All work was completed by December 1986. USACE transferred the project to the Upper Minnesota River Watershed District who is responsible for operation and maintenance.

<u>Big Stone Lake Restoration Project</u>

Big Stone Lake is an important recreational attraction for Ortonville and Big Stone City, Minnesota, and surrounding communities in Minnesota and South Dakota. The citizens of South Dakota and Minnesota requested assistance in the early 1980s from the USEPA and both States to restore the quality of Big Stone Lake. The issues included poor water quality, excessive algal blooms, sedimentation, rooted aquatic vegetation, and reduced recreation (USEPA, 2002b). Funding for this restoration project began in 1982 through the USEPA Clean Lakes Program. Over the years, funding has been provided through various grants from the USEPA and the NRCS with matching funds from various sources in both Minnesota and South Dakota. Restoration activities were designed to control pollutant sources to the lake and reverse the water quality degradation in an effort to maintain or increase the recreation potential and the life span of Big Stone Lake (HDR, 1994). Restoration implementation includes feedlot management, watershed management, lake level management, monitoring, wetland restoration, Whetstone River flow management, and public involvement. The restoration project has resulted in improved water quality and fisheries and increased recreational use of the lake.

Planned Substations

A new 345-kV substation may be constructed approximately 1.5 miles south of the existing Big Stone plant. The Big Stone 345-kV Substation would be needed when the proposed Big Stone 230-kV line to Hazel Run begins operation at its design capacity of 345 kV. The timing for construction of this substation depends on the timing and construction of the potential transmission line and substation at Hazel Run (described in Transmission Lines). If constructed, the 345-kV Big Stone Substation would be located on a 40-acre parcel that is presently used for agricultural purposes. Approximately 8.5 acres would be required to construct the substation. The substation would likely be owned by the Co-owners of the proposed Big Stone II Project. Such future foreseeable projects as renewable energy projects could take advantage of the 345-kV service.

Roadway Infrastructure

Highway construction and maintenance activities in Grant, Roberts, and Codington counties are described in the 2009-2013 South Dakota Statewide Transportation Improvement Program published in 2008 by the South Dakota Department of Transportation. Review of the planned projects shows that they generally consist of typical maintenance activities such as road and highway surfacing, asphalt surface treatment, and bridge repair. The one major project during the 2009-2013 time period is improvements to Interstate-29S and Interstate-29N in Codington, Grant, and Roberts counties at a cost of $19,091,000 and $22,739,000, respectively. An additional project in Codington County is the realignment of the intersection of U.S. 212 and U.S. 81 in at a cost of $11,568,000 (SDDOT, 2008).

The Minnesota Department of Transportation Statewide Transportation Improvement Program document for the period 2009-2012 identifies projects for Area Transportation. Review of the planned projects for Big Stone and Lac qui Parle counties (in Districts 4 and 8) shows that projects generally consist of typical maintenance activities such as road and highway surfacing, asphalt surface treatment, bridge repair, bituminous overlay, milling and overlay, concrete pavement, railroad crossings, and bridge repair (MnDOT, 2008.

Additional Minnesota Department of Highways project work planned for 2006-2008 in the other Minnesota counties where transmission corridors are located is described below.

Big Stone County

Bituminous overlay of 33.7 miles of pavement on State Highways 7 and 75, enhancement of five miles of prairie wetlands trail along the Minnesota River and construction of a two-mile pedestrian-bike trail in the Minnesota River Headwater Recreation area. Expenditures total $7 million.

Chippewa County

Grading and surfacing, one mile of State highway 7 and 29, and bituminous overlay of 17.9 miles of pavement on State Highways 7 and 29. Expenditures total $6.01 million.

Kandiyohi County

Grading and surfacing 16.6 miles of County State Aid Highways 7, 10, and 47; bituminous overlay of 6.7 miles of State Highway 71; construction of turn lanes for State Highway 12; landscaping of State Highway 23; and railroad crossing improvements. Expenditures total $7.715 million.

Stevens County

No construction or maintenance activities are planned.

Swift County

Grading and surfacing of five miles of County State Aid Highway 20, bituminous overlay of 21.3 miles of State Highway 59 and County State Aid Highway 6, mill and overlay of 25.8 miles of State Highway 9, and installation of railroad signals. Expenditures total $9.976 million.

Yellow Medicine County

Grading and surfacing of 24.2 miles of County State Aid Highway 3. Expenditures total $2.836 million.

4.11.4 Cumulative Impacts Resource Analysis

Cumulative impacts from the proposed Project when combined with other past, present, and reasonably foreseeable future projects could affect all resources. Resources addressed include those assessed for the proposed Project. Due to the wide geographic regions of influence of the cumulative impact assessment and the variety of projects and activities assessed, cumulative impacts are commonly examined at a more qualitative level than are direct and indirect impacts caused by the proposed Project. Quantification of project and activity impacts is provided where possible for present and future projects and activities. Resource impacts associated with the existing Big Stone plant, the Poet Biorefining plant, and the future 345-kV Big Stone Substation are addressed collectively when possible due to their proximity.

Air Quality

General Issues

Construction impacts from past, present, and reasonably foreseeable projects would have only a short-term, localized effect on air quality. Effects include emissions of gaseous pollutants from construction equipment and vehicles and particulate emissions from earth-moving activities. These short-term impacts are not expected to exceed Federal or State air quality standards.

Air resources for the existing Big Stone plant were included in the evaluation of impacts for the proposed Big Stone II plant. Overall, operation of the existing Big Stone and proposed Big Stone II plants would not exceed significance criteria for air resources and would not conflict with or obstruct implementation of any applicable air quality plan. Visibility impacts to Class I and Class II areas would be less than significant. The Grant County, South Dakota area is in attainment or is unclassifiable for all criteria pollutants. The Co-owners would be required to comply with permit limits and conditions required by the SDDENR. SDDENR would monitor emissions for the plant and take regulatory action if conditions are not met. As such, any short-term and long-term residual impacts would meet regulatory requirements and would be less than significant.

Air emissions from ethanol plants are typically low enough to remain under the 100 tons per year threshold such that the plants can be permitted as synthetic minor sources under PSD and Title V regulations. Emitted pollutants subject to limitation are NO_X, CO, hydrocarbons (HC), and SO_2. Facility air permits include specific limits on emission of pollutants and/or operational limits to assure emissions remain below the 100 tons per year threshold. Odors are controlled by use of thermal oxidation equipment. Four of the five ethanol facilities described above are at least 40 miles from the proposed Big Stone II power plant and no closer than 35 miles from one another, making it unlikely that air emission impacts will be additive in a manner that would exceed significance criteria.

Planned roadway infrastructure maintenance and repair activities are typical of a State/county highway system. No new construction of highways, bridges, or other major structures are planned for the seven Minnesota counties where the proposed transmission corridors are located. Environmental impacts are expected to consist of short-term air emissions including fugitive dust and construction vehicle emissions associated with paving, grading, and milling activities and disruptions to local traffic. Duration of impacts is limited to the time when maintenance work is occurring and to daylight hours. Overall there is no potential for significant cumulative impacts from the planned infrastructure maintenance activities.

By implementing SMMs, the proposed Big Stone II Project, when added to past, present, and reasonably foreseeable future actions, would not exceed the significance criteria for regulated pollutants.

Mercury

Ongoing accumulation of mercury is expected to continue from various sources, including regional and global airborne emissions and past deposition on croplands and waterbodies. Mercury effects on the environment from all sources are expected to remain a long-term impact issue. Because many factors influence the transport and behavior of mercury in the environment, it is not appropriate to assess the likely environmental impacts of mercury emissions from the proposed Big Stone II plant by simply extrapolating from the results of either national or regional-scale mercury impact studies or from the results of dissimilar local-scale emission and transport studies. To estimate how emissions from a single source of atmospheric mercury might affect mercury levels in a local environment, it is necessary to consider a large amount of data regarding the emissions and the environmental conditions in the area surrounding the source. Among the vital data are the forms of mercury in the emissions; local meteorological, geographical, geological, and ecological data; and information on consumption of locally caught fish. Since proposed plant is not operating, Western does not have access to mercury emission data that can be used to determine the forms of mercury in the emissions. Western does have access to emission data from tests performed on the existing plant that could be used to analyze deposition, but planned emission controls at the existing plant and proposed new plant would change the amount of the various forms of mercury emitted. Thus, without this emissions data, Western cannot perform an analysis to assess the cumulative impact of mercury emissions from the existing or proposed Project. However, since mercury emissions from the existing and proposed plant combined would be lower than mercury emissions from the existing plant alone, it is reasonable to assume the cumulative impacts of mercury would also decrease.

Using data from the Emissions and Generation Resource Integrated Database ("eGRID") of the USEPA, 2004 mercury emissions from fossil-fired power plants in Minnesota, North Dakota, and South Dakota region were reported to be approximately 4,047 lb (USEPA, 2008d). Based on new generation currently permitted and proposed in the referenced region, the 2015 projected regional mercury emissions from fossil-fired power generation, including the proposed Big Stone II plant, would be approximately 4,871 lb (R. W. Beck, 2008c). The projected 47 lb of mercury that would be emitted from the proposed plant (approximately 58 percent of the estimated 81.5 lb site emissions, based on a ratio of the unit capacities of the existing plant and the proposed plant) would make up 0.96 percent (R. W. Beck, 2008c) of projected regional mercury emissions from fossil-fired power generation in 2015. When considering that a very large percentage, 70 percent and greater in most of Minnesota and 80 to 100 percent in most of South Dakota, of mercury deposition in the area originates from sources outside of the region (EPRI, 2008a), mercury emissions from the proposed plant would contribute to an even smaller percentage of regional deposition.

Carbon Dioxide

Emissions of CO_2 would occur from the combustion of coal at the existing Big Stone plant and the combustion of fuels during operations at off-site stationary sources, such as ethanol plants and miscellaneous construction projects, as well as mobile sources such as vehicles. The existing Big Stone plant's boiler emitted 4.23 million tons of CO_2 in 2004. Since CO_2 is relatively stable in the atmosphere and generally mixed well in the troposphere and stratosphere, the impacts of CO_2 emissions are essentially independent of where the emissions occur and, due to the relatively small fraction of emissions projected to be generated by the proposed Big Stone II plant when compared to regional or global emission levels, it is expected that CO_2 emissions from Big Stone II would have only a negligible impact on both local and global ambient concentrations of CO_2. The operation of the proposed Big Stone II plant would release an estimated 4.7 million tons of CO_2 annually, which represents about one one-hundredth of one percent (0.00014) of global anthropogenic emissions.

As discussed in the subsection, Greenhouse Gas Emissions from the Existing and Proposed Plants (see Section 4.1.2.1), emissions of CO_2 in 2006 were reported to be approximately 79.24 million tons from fossil-fired generation sources in the Minnesota, North Dakota, and South Dakota region (R. W. Beck, 2008b). Based on new generation currently permitted and proposed in the referenced region, the 2015 projected regional CO_2 emissions from fossil-fired power generation would be approximately 97.16 million tons. The projected 4.7 million tons of CO_2 that would be emitted from the proposed plant, not including offsets, would make up 4.8 percent of projected regional CO_2 emissions from fossil-fired power generation in 2015. When considering the offsets pursuant to the Settlement Agreement, the projected 2015 CO_2 emissions from the proposed plant would amount to only about 2.7 percent of projected regional CO_2 emissions from fossil-fired power generation. If other anthropogenic CO_2 emissions sources were also considered, such as vehicles, ethanol plants, and manufacturing facilities, these percentages would be even lower.

The compounding of numerous minor or insignificant events can have a cumulative impact over a period of time. Thus, a continued increase in global CO_2 emissions could contribute to global events. Global events can then lead to localized impacts. In order to estimate a localized impact resulting from increased emissions, modeling to determine ground-level or atmospheric concentrations of CO_2 resulting from the action would need to be performed, and there would need to be a standard to which results could be compared. Currently, there are no Federal standards for CO_2.

Documentation concerning the decision process used in selecting the proposed technology for the proposed Big Stone II Project has been presented as part of the EIS process. This information includes the evaluation of other technologies, fuel sources, and plant site locations in order to determine which combination of these variables provides a solution that would best serve the electricity demands of the region. The Co-owners acknowledge the economic risk to the proposed Project that results from the uncertainty in the regulation of GHG emissions, including the potential requirement for retrofits to allow for CCS. However, through the use of super-critical technology, an efficient, state-of-the-art combustion technology, the proposed Big Stone II unit would meet future regulatory criteria for minimizing environmental impacts, given the contemporaneous laws and state of technology. As time progresses and a CO_2 regulatory program is implemented, the proposed Big Stone II unit, through its selection of technology and commitment to offset CO_2 emissions that are attributable to the generation of electricity for Minnesota consumers, can be viewed as one of the first units constructed in the effort to reduce the intensity of GHG emissions. Western concludes that the proposed plant, as well as other sources in the region, would emit CO_2, which could have an undetermined effect on local, regional, or global climate change. Because numerous models produce widely divergent results, and there is insufficient information, Western is unable to identify the specific impacts of regional CO_2 emissions on human health and the environment. The lack of information and differences in predictive models have made it difficult for scientists and other experts to link a direct cause and effect of anthropogenic impacts of climate change on a global scale, much less on a local scale. As a result, Western believes that any attempt to analyze and predict the local or regional impacts of the proposed plant's CO_2 emissions when added to other past, present, and reasonably foreseeable future actions cannot be done in any way that produces reliable results.

Surface Water Resources, Floodplains, and Groundwater

Surface water resources and floodplains for the existing Big Stone plant and the Poet Biorefining plant would be the same as described for the proposed Big Stone II plant in the Affected Environment (Section 3.2). The existing power plant operates as a zero wastewater discharge facility. The Grant-Roberts Rural Water System currently supplies domestic water needed by the existing plant. The existing plant utilizes an on-site sanitary sewage treatment facility. Overland flow patterns from the site of the existing power and ethanol plants are to the south through a series of wetlands to the intermittent stream and easterly to the Whetstone River. The existing Big Stone plant operates with a South Dakota water appropriation permit that allows withdrawal of up to 8,000 afy from Big Stone Lake. Operation of the existing and proposed Big Stone II plants would result in periodic reduced water levels (on average, a decrease of about 0.15 foot) within Big Stone Lake and reduced flows (reduced less than 50 cfs) downstream from the lake. The reach that could be affected would be the approximate 10-mile section from the Big Stone Dam downstream to Highway 75 Dam. Based on the lake modeling for the proposed Big Stone II Project, flow increases are anticipated to occur more frequently than flow decreases. This would provide beneficial effects on downstream water resources and associated habitats near the proposed Project area. At present, there are no reasonably foreseeable future projects that would require withdrawals from Big Stone Lake; therefore, additional cumulative impacts to the lake or downstream flows are not anticipated.

Ethanol plants are located in rural areas near the corn supply and typically do not have access to public water supply systems. While surface water may be available, it is not as reliable, accessible, or cost effective as groundwater is for a small industrial facility such as an ethanol plant. The ethanol plants, described above, are widely separated with no significant opportunity for additive impacts on groundwater resources. One plant, Glacial Lakes, is supplied from the Watertown municipal water system.

Process wastewater at ethanol plants is typically recycled for use within the plant. Non-process wastewater consisting of cooling tower blowdown, water treatment wastewater, and other miscellaneous wastewater is typically discharged from the plant to a surface drainage. Discharge to municipal wastewater systems is usually not an option because of the rural location of ethanol plants. A NPDES discharge permit must be obtained, which specifies the allowable pollutant discharge that is protective of State water quality standards for the receiving waters and includes consideration of the cumulative effect of pollutants discharged by other sources.

The 345-kV Big Stone Substation location does not include any surface waters or FEMA designated floodplains. It is, however, located south of the Whetstone River. Similar to the proposed Big Stone II plant, the Veblen Aquifer is likely to be the major water-bearing zone beneath the substation's location. Implementing erosion control measures would minimize impacts to the Whetstone River. Constructing and operating a 345-kV Big Stone Substation south of the existing Big Stone plant would not result in impacts to groundwater, surface water, or floodplains.

Short-term and long-term impacts to water resources and floodplains from future transmission line construction and roadway infrastructure projects are expected to be minimal, primarily due to Federal regulations that prohibit actions that would modify local hydrology or place fill material in rivers, streams, or other watercourses determined to be jurisdictional waters of the U.S.

The Big Stone Lake Restoration Project has already shown improved water quality to the 12,610-acre lake. Improvements are expected to continue with the ongoing restoration practices within the 740,157-acre watershed that contributes to Big Stone Lake.

Water resource issues relative to air emissions involves concerns about regional surface water quality impacts (including acidification and mercury concerns) from airborne plant emissions. Surface water resources and fisheries in the region of influence could be affected by ongoing accumulation of mercury that is expected to continue from various sources. With the combination of the WFGD system and addition of supplemental pollution controls (to be determined according to the Settlement Agreement between the Co-owners and the MnDOC), the combined emissions of mercury from the existing and proposed Big Stone II plants would decrease from current emission rates for the existing plant. Therefore, the proposed Project would not incrementally increase mercury accumulation currently experienced in surface water resources, and the proposed Project would not significantly contribute to cumulative impacts.

The acidification risk for Minnesota lakes is very low, and there is no evidence that any of Minnesota's lakes have been acidified by acid rain under existing conditions. SDDENR information shows the agency is not aware of any lakes in South Dakota currently being impacted by acid deposition. Surface water quality impacts from acid rain or acid runoff caused by additional plant emissions would not occur.

The proposed emission limits for NO_X and SO_2 would maintain future emissions of NO_X and SO_2 from both the existing power plant and the proposed plant at levels no greater than the average emissions in 2003 and 2004 from the existing power plant. The vast majority of nitrogen and other nutrient contributions to the lake result from municipal wastewater treatment and nonpoint runoff sources. The Big Stone Lake Restoration Project has done much to improve water quality, and long-term impacts to the lake from airborne emissions are expected to be minimal.

Individual projects would comply with standards and permit requirements (e.g., NPDES, State water quality standards, and floodplains regulations). As stated above, water consumption from the existing plant and ethanol projects is minimized by recycling wastewater.

As described in Section 3.2, there are several permitted users of the Veblen Aquifer in Grant County, including commercial and industrial users, municipalities, and irrigation permits holders. Farmers are allowed to draw two afy, but records indicate that the actual water used is only two to 20 percent of this, depending on yearly precipitation. Most of the surrounding domestic area uses municipal or rural water distribution systems.

SDDENR maintains a Web site for the Water Rights Program that provides information on pending applications to appropriate water. According to the SDDENR Web site (SDDENR, 2007a), there are no other future groundwater appropriation projects pending within the areas of predicted drawdown as shown in Figure 4.2-2. The list of past, present, and future projects listed above in Section 4.11.3 that would use groundwater are not located in the areas of predicted drawdown. Therefore, the reasonably foreseeable cumulative impacts associated with the use of groundwater would be the proposed plant and the current water users. By implementing standard and additional mitigation measures (if adopted) and permit requirements, the proposed plant, when added to past, present, and reasonably foreseeable future actions, is not expected to result in significant cumulative impacts to groundwater resources.

By implementing standard and additional mitigation measures (if adopted) and permit requirements, the proposed Big Stone II Project, when added to past, present, and reasonably foreseeable future actions, is not expected to result in significant cumulative impacts to water resources.

Geology and Minerals, Paleontological Resources, and Soils

Geology and Minerals

The geological and mineral resources for the existing Big Stone plant, the Poet Biorefining plant (which expanded at its existing site in Spring 2007), and the future 345-kV Big Stone Substation would be the same as described for the proposed Big Stone II plant. The area is considered seismically inactive and landslides rarely occur due to the general low relief of the area. No unique geologic features are present. The nearest quarry is south of this substation location. Construction of the substation would not preclude mineral resources from development. Construction and operation activities would not impact geological or mineral resources.

The relatively small footprint of transmission lines and roadway improvement projects make it unlikely that their location would impact geological or mineral resources.

Paleontological Resources

It is unlikely that construction of the 345-kV Big Stone Substation would impact scientifically important paleontological resources. Similar to the proposed Big Stone II plant site, Milbank granite is igneous and would not contain fossils. In addition, Cretaceous bedrock is primarily covered by surficial glacial deposits and is not exposed in the area.

Soils

Impacts to soil would be associated with soil disturbance due to constructing power plants, substations, transmission lines, ethanol plants, and roadway improvements. Impacts to soils from the Poet Biorefining plant expansion were not substantial because expansion occurred in previously disturbed areas, and the disturbance area was minimal. Soil impacts from the other ethanol plants were localized and were not likely substantial given the relatively small areas affected. Best management practices to reduce soil erosion would be implemented.

By implementing standard and additional mitigation measures (if adopted), the proposed Big Stone II Project, when added to past, present, and reasonably foreseeable future actions is not expected to result in significant cumulative impact for geology, minerals, paleontological resources or soils.

Biological Resources

Vegetation, Including Noxious Weeds

All of the past, present, and reasonably foreseeable future actions would result in some disturbance to vegetation. Depending on the decade when the past projects were constructed, some type of mitigation may have been required to minimize the impact to less than significant.

Over the past century, artificially maintained vegetation communities, specifically row-crop agriculture and non-native dominated pasturelands, have increasingly dominated vegetation in the non-industrial portions of the proposed plant site and the expanded groundwater area. These vegetation types currently account for over half of the expanded groundwater area. The majority of this vegetation cover receives water from precipitation and early spring snowmelt. A minor portion of the agricultural land has center-pivot irrigation drawing on local wells. Wooded areas and native prairies are primarily dependent on precipitation and spring snowmelt.

The proposed Project is located in predominantly rural areas. Construction and operation of the proposed Big Stone II plant would result in the removal of approximately 6.8 acres of vegetation within the proposed plant vicinity and expanded groundwater areas. Approximately 2.4 acres would be in agricultural areas. Because the make-up water storage pond would not be constructed under the proposed Project or Alternative 3, cumulative vegetation loss would be 6.8 acres. Additionally, the construction of the proposed transmission lines would remove between 21.8 to 48.9 acres of vegetation, depending upon the corridor selected.

The impact of lower groundwater levels within the expanded groundwater area would have a negligible effect for the reasonably foreseeable future on vegetation in the area. The localized and episodic occurrence of groundwater reduction, coupled with the minimal dependence of local vegetation on groundwater, would not result in significant changes to the composition or quality of existing vegetation communities.

Construction of the ethanol plants resulted in the disturbance of relatively small amounts of agricultural land. While the typical ethanol plant site is 40 to 60 acres, the buildings, grain storage, and other equipment occupy about two acres. Increased production capacity, as planned for several plants, would require construction of new equipment, but is unlikely to require a significant increase in the overall plant acreage. Therefore, impacts to vegetation would be less than significant. The States of Minnesota and South Dakota have laws regarding the control and eradication of noxious weeds.

Construction and operation of the 345-kV Big Stone Substation would result in permanent removal of 8.5 acres of agricultural cropland. The extent of impacts from constructing the 345-kV substation, when added to those from the proposed Big Stone II plant, would represent a cumulative loss of approximately 23.8 acres of habitat within or adjacent to the existing Big Stone plant boundaries.

Development of the 345-kV substation could contribute to the introduction and spread of noxious weeds during and following construction. It is likely the Co-owners would implement the same mitigation measures for substation construction as identified for the proposed Project. An additional mitigation measure, if adopted, was identified for the proposed Project to prevent the introduction and spread of noxious weeds and other undesirable plant species.

The Big Stone Lake Restoration Project includes the restoration of 100 acres and creation of 360 acres of wetlands.

Because the proposed Project is located in a rural area and the vegetation losses would range from 28.6 to 55.7 acres, the proposed Project, when added to past, present and reasonably foreseeable future actions, is not expected to result in significant cumulative impacts to vegetation resources.

Wildlife and Fisheries

The loss of habitat associated with the construction of past, present, and reasonably foreseeable future projects would result in direct impacts to wildlife. Direct short-term impacts to wildlife from constructing and operating projects would occur during construction due to elevated noise and increased human presence. A short-term loss or alteration of breeding and foraging habitats may occur resulting in increased habitat fragmentation. Long-term impacts could occur as a result of permanent loss of habitat due to construction activities and construction of structures such as buildings, transmission lines, and substations. To the extent such actions require State or Federal permits, they must comply with resource protection statutes. These impacts would not be in sufficient quantities to cause a species to become listed or proposed for listing as threatened or endangered. Therefore, there would not be a significant long-term impact to wildlife due to habitat alteration.

Small and large game animals and fur-bearing mammals dominate the past wildlife in the proposed Project area. Nearby larger lakes have been and continue to be important stopover areas for migratory waterfowl.

The potential reduction of groundwater input to the flow of the Whetstone River, both from the proposed Project and continued existing uses of groundwater, would have a negligible effect for the reasonably foreseeable future on fisheries and aquatic wildlife in the area. This is because the contribution of groundwater to the Whetstone River flow is minor during periods of high flows. Moreover, flows in the reasonably foreseeable future would not be significantly lower than the current low flows observed during the winter.

Atmospheric mercury is a worldwide problem and can be transported by runoff into waterways (Section 4.1). Biological processes transform inorganic mercury into toxic organic forms (i.e., methylmercury). In wetland/riparian areas, natural processes can convert certain forms of mercury to methylmercury – an organic form considered more toxic than other mercury compounds. Methylmercury can be found in fish and high concentrations of methylmercury can cause fish-eating birds, such as the bald eagle, to experience damage to the central nervous system, birth defects, and cancer. Methylmercury contamination in waterbodies may cause physiological effects to aquatic and semi-aquatic plants and physiological and neurological effects to animals, as well as altering the physical properties of the waterbody's substrate. The combined emission rates of mercury from the existing and proposed Big Stone II plants would decrease from current emission rates for the existing plant. As discussed in Section 4.4.2.1 (see the Fisheries subsection), the proposed Project would not cause an increase in the rate of accumulation of methylmercury concentrations in fish, although bioaccumulation of methylmercury would continue at a reduced rate. According to information from the MPCA, declines in mercury emission and deposition should result in reduced mercury concentrations in fish (MPCA, 2007). The reduced rate of bioaccumulation, when considering the MPCA information, suggests that the lower mercury emissions from the existing and proposed plant could contribute to lower mercury concentrations in fish over time. The proposed Project would not incrementally increase the bioaccumulation rate of methylmercury in fish and wildlife.

As noted above in the cumulative impacts mercury discussion under Air Quality, there is a lack of appropriate mercury emissions data from regional coal-fired power plants, as well as transport, deposition, and transformation information. Therefore, Western has concluded that it is not possible to reasonably identify the cumulative impacts on wildlife and fisheries as it relates to mercury emissions from the proposed plant, when added to past, present, or reasonably foreseeable future projects.

New transmission and distribution lines and new substations would likely be required as new industrial facilities and residential areas are constructed. Long-term impacts to wildlife would also result from the increased potential for collision of migrating and foraging birds with overhead wires. Collision likelihood is dependent on variables such as the transmission line orientation to flight patterns and movement, species composition, visibility, and line design. Although impacts to avian species are likely to increase as a cumulative result of additional transmission facilities, levels of cumulative impacts would not be expected to be significant.

Construction of the 345-kV Big Stone Substation would result in surface disturbance and possible sediment input into the Whetstone River drainage. Implementation of erosion control measures would minimize impacts to fish species and their habitat.

Short- and long-term impacts to fisheries could occur from roadway infrastructure projects and the construction of additional new transmission lines and substations, depending on their location with respect to the location of a waterbody. In general, soil from disturbed areas could enter water bodies during runoff and cause an increase in sediment load with possible deposition on bottom substrates. Typically, sedimentation effects are short-term in duration and localized.

Improvement of the fisheries at Big Stone Lake has been realized with the Big Stone Lake Restoration Project; improvements are expected to continue.

The proposed Project, when added to past, present and reasonably foreseeable future actions, is not expected to result in significant cumulative impacts to wildlife and fisheries.

Special Status Species

Depending on the decade during which a past project was constructed, impacts to Federal or State listed species would have been addressed with the USFWS, the SDDENR or the MnDNR. Any modifications to the projects built prior to 1973 and the passage of the ESA would have required informal or formal consultation with the appropriate Federal or State agency to evaluate impacts to special status species.

The possible presence of special status species at ethanol facility sites in Minnesota (Chippewa and Granite Falls) is initially addressed through completion of the Environmental Assessment Worksheet as required by the MnDOC (formerly known as the Minnesota Environmental Quality Board). The MnDNR found the facilities would not adversely impact any special status species. The SDDENR, when issuing a NPDES permit, identifies and assesses the impact of the project on species listed on the South Dakota endangered species list. The NPDES permit for the North Country plant prepared by SDDENR stated that no impacts on endangered species were anticipated. Assessment of impacts on endangered species for the other South Dakota plants would have been identified through the NPDES permitting process for those facilities and compliance with resource protection statutes.

The potential reduction of groundwater input to the flow of the Whetstone River and local wetlands, both from the proposed Project and continued existing uses of groundwater, would have a negligible effect for the reasonably foreseeable future on special status species in the area. This is because groundwater contribution to the Whetstone River during the peak flow period is minor, and reductions would not significantly reduce flows. In addition, most wetlands within the groundwater areas are isolated from groundwater by thick clay deposits.

No special status plant species were identified as occurring within the 345-kV Big Stone Substation proposed site. Construction of the substation would not affect special status fish and mussel species, since none are known to occur in the Whetstone River. Impacts to other special status species would be comparable to those of the proposed Big Stone II plant, except that a smaller acreage of potential forage habitat would be permanently disturbed.

Construction of new transmission lines and substations and roadway infrastructure may temporarily and permanently adversely affect terrestrial and aquatic special status species. The extent of impacts, when combined with those from the proposed Big Stone II Project, would represent a continued loss of habitat within the geographic regions of influence identified in Table 4.11-1.

SMMs and agency protection measures would be followed at the proposed Big Stone II plant site, along the proposed transmission line corridors, and at the future 345-kV Big Stone Substation to minimize impacts to special status species. Similar mitigation measures are likely to be followed for constructing future transmission lines and roadway infrastructure projects that require State and/or Federal permitting.

By implementing standard and additional mitigation measures (if adopted), the proposed Big Stone II Project, when added to past, present, and reasonably foreseeable future actions would not expected to result in cumulative impacts to special status species.

Wetlands/Riparian Areas

Construction of ethanol plants requires adherence to regulations that apply to construction in WUS as administered by USACE through the CWA Section 404 permit program. The relatively small site for a typical ethanol plant allows for flexibility in avoiding wetlands. The land purchased for the Chippewa plant included 23 acres of wetlands but the location of the plant building and equipment avoided the wetland areas.

There are no National Wetlands Inventory wetlands identified within the Poet Biorefining plant or the 345-kV Big Stone Substation site. Construction and operation of the expanded ethanol plant and the substation would not impact wetlands or riparian areas.

There are 14,892 acres of wetlands within the watershed contributing to Big Stone Lake. The Big Stone Lake Restoration Project includes the restoration of 100 acres and creation of 360 acres of wetlands.

The decline in wetlands has been an ongoing problem in the U.S. for decades. Significant impacts to wetlands associated with constructing the proposed Big Stone II Project are not expected, largely because mitigation measures would be required to offset jurisdictional wetland losses. Similar mitigation measures would be required for constructing reasonably foreseeable future transmission line and roadway infrastructure projects, which would also reduce the potential for cumulative impacts.

The potential reduction of groundwater input to local wetlands, both from the proposed Project and continued existing uses of groundwater, would have a negligible effect for the reasonably foreseeable future on wetlands in the groundwater areas. As noted above, most wetlands within the groundwater areas are isolated from and perched above groundwater. The contribution of groundwater to non-perched wetlands is low relative to surface water runoff, and is insufficient to alter the water regime of non-perched wetlands.

By implementing standard and additional mitigation measures (if adopted), permits issued through Section 404 of the CWA, and Section 7 consultation requirements, the proposed Big Stone II Project, when added to past, present, and reasonably foreseeable future actions, is not expected to result in significant cumulative impacts to wetland or riparian resources.

Summary of Cumulative Impacts to Biological Resources

By implementing standard and additional mitigation measures (if adopted) and permit requirements, the proposed Big Stone II Project, when added to past, present, and reasonably foreseeable future actions, would not be expected to result in significant cumulative impacts to biological resources.

Cultural Resources and Native American Concerns

It is likely that cultural resource surveys were not conducted for projects undertaken prior to regulatory requirements for environmental review, including the NHPA, which requires consultation with a SHPO. Any modifications to past projects that occurred in or after 1966, would have required consultation.

The possible presence of archaeological, historical, or architectural resources at ethanol facility sites in Minnesota (Chippewa and Granite Falls) was addressed through completion of the Environmental Assessment Worksheet as required by the MnDOC. No such resources were identified at either site. State agencies in South Dakota and Minnesota issuing Federal permits (administered by the State agency) must comply with the NHPA.

Cultural resource surveys would be completed prior to construction of the 345-kV Big Stone Substation.

The Big Stone Lake Restoration Project included cultural resources inventory on all project sites prior to construction. If cultural resources were found, steps were taken to ensure all cultural resources were avoided and left in place (Roberts Conservation District, et al., 1995).

Cultural resources and Native American concerns are protected under Federal law, which largely precludes unmitigated impacts from federally-mandated/permitted projects. In addition, the PA has been prepared to mitigate the impacts to cultural resources associated with the proposed Project. Therefore, the proposed Big Stone II Project, when added to past, present, and reasonably foreseeable future actions, is not expected to result in significant cumulative impacts to cultural resources in the area.

Land Use and Agricultural Practices

None of the past and present actions are known to have resulted in any substantive inconsistency with land use laws, ordinances, or regulations, which are administered by the applicable local units of government.

The site acreage requirement for ethanol plants are in the range of 40 to 60 acres with the footprint of buildings and related equipment amounting to less than two acres. The plants are typically located in rural areas near the centers of corn production and therefore it is possible that a relatively small amount of acreage was converted from agricultural to industrial use after the appropriate changes in zoning and/or granting of a special use permit by local governments.

Construction of the 345-kV Big Stone Substation would permanently remove 8.5 acres of soil. Aerial photography indicates the area has been used for cropland. Permanent removal of this soil and the loss of agricultural productivity would create a less than significant impact to local soil resources. No public facilities are located within the area that would be affected by expanding the ethanol plant and constructing the substation; therefore, there are no impacts to public facilities from constructing and operating either facility.

To the extent that future transmission lines and substations are constructed/rebuilt within existing corridors comparable to certain of the transmission lines for the proposed Big Stone II Project, the cumulative impacts to land use and agricultural activities would be minimized. Where there are existing land use/zoning laws, typically at the county level, future actions must comply with such laws thus further reducing cumulative impacts from foreseeable future actions. In addition, it is customary to reimburse land owners for loss of agricultural activity associated with a specific action that impacts an owner’s agricultural activity.

With approval of appropriate zoning changes and implementing standard and additional mitigation measures (if adopted), the proposed Big Stone II Project, when added to past, present, and reasonably foreseeable future actions is not expected to result in significant cumulative impacts for land use and agricultural practices.

Recreation

No changes are expected in the recreational opportunities associated with the Lac qui Parle Flood Control and Water Conservation Project. The Big Stone Lake Restoration Project has resulted in water quality improvements to the lake. Attendance records at Big Stone Lake State Park, Minnesota and Hartford Beach State Park, South Dakota have documented substantial increases in the use of Big Stone Lake (USEPA, 2002b). A national walleye circuit fishing tournament is now held annually due to the improved fisheries of the lake.

The proposed Big Stone II Project, when added to past, present, and reasonably foreseeable future actions is not expected to result in significant cumulative impacts to recreation in the area.

Infrastructure, Public Health and Safety and Waste Management

<u>Infrastructure</u>

Past and present projects would continue to use existing roads and rail lines. Typical maintenance activities that may occur in the future could result in temporary delays to motorized traffic. However, these are generally short-term and localized.

Ethanol production typically requires highway and rail access to transport grain and ship the finished product. This pattern can be seen when facility locations are mapped along with highways and major arterials. Ethanol facilities need to be located close to the sources of biomass production because of sensitivity to transportation costs. While the number of daily truck arrivals can be significant, the traffic is local to the ethanol plant and the surrounding corn producers and cumulative impacts are not expected to be significant.

The 345-kV Big Stone Substation would be located in a rural area where other existing industrial facilities are limited to the existing Big Stone plant and the Poet Biorefining plant. The existing county road system using 484th Avenue and/or 145th Street would provide access to the substation during construction. No staff would be required to operate the substation. Only routine maintenance would be required once the substation is constructed. The Poet Biorefining plant and the existing Big Stone plant have separate access roads from 144th Street. Operation of the proposed Big Stone II plant would result in a 30-percent increase in plant workers. When combined with the existing Big Stone plant, the increase in the number of workers from the proposed Big Stone II plant and the expanded ethanol plant is not expected to result in significant cumulative transportation impacts. The Poet Biorefining plant has added additional spur trackage to avoid potential conflicts with increased rail activity that would be associated with the proposed Big Stone II operations (Stratt, 2005). Therefore, cumulative impacts associated with additional rail activity are not anticipated.

Therefore, by implementing SMMs and additional mitigation measures (if adopted), the proposed Project, when added to past, present, and reasonably foreseeable future projects, would not contribute to cumulative impacts to infrastructure.

Public Health and Safety

Potential cumulative impacts to public health from EMF exposure from the construction of future transmission lines are likely to generate EMF levels similar to those of existing transmission lines. Public health and safety associated with future transmission lines would be the same as described for the proposed Project. The practice of prudent avoidance would not route future transmission lines in proximity to residential structures, schools, or other facilities to limit exposure to electric and magnetic fields. Since EMF levels are spatially limited, cumulative impacts from past, present, and reasonably foreseeable future projects would not be anticipated.

The proposed Project, as well as other existing and future projects, would be required to comply with applicable State and Federal air emissions regulations. These regulations are designed to protect public health, including the health of “sensitive” populations. Therefore, the proposed Project, when added to past, present, and reasonably foreseeable future projects, would not contribute to cumulative impacts to public health from regulated pollutants.

As discussed in Section 4.4.2.1 (see the Fisheries subsection), the proposed Project would not cause an increase in the rate of accumulation of methylmercury concentrations in fish, although bioaccumulation of methylmercury would continue at a reduced rate. According to information from the MPCA, declines in mercury emission and deposition should result in reduced mercury concentrations in fish (MPCA, 2007). The reduced rate of bioaccumulation, when considering the MPCA information, suggests that the lower mercury emissions from the existing and proposed plant could contribute to lower mercury concentrations in fish over time. Without the transport, deposition, and transformation information for mercury, it is not possible to study the impacts of mercury emissions on public health from the proposed Project or from past, present, and reasonably foreseeable future projects. However, mercury emissions from the existing and proposed plant would be less than total mercury emissions from the existing plant due to the planned implementation of the air pollution controls, so the rate of mercury deposition from the combined existing and proposed plants would decrease as a result of the proposed plant being constructed. Since mercury emissions from the existing and proposed plant combined would be lower than mercury emissions from the existing plant alone, it is reasonable to assume the incremental impacts of the proposed Project when added to past, present, and reasonably foreseeable future projects would also decrease.

Western concludes that the proposed plant and other fossil fuel-fired power plants within the geographic region of influence would emit CO_2, which could have an undetermined effect on local, regional, or global climate change. Because numerous models produce widely divergent results, and there is insufficient information, Western is unable to identify what incremental impacts the proposed Project's CO_2 emissions would have on public health when added to other past, present, and reasonably foreseeable future projects.

Hazardous Materials and Wastes

The existing Big Stone Substation includes three circuit breakers insulated with SF_6. Some of the circuit breakers at Western's Morris and Granite Falls substations are SF_6 breakers. The 345-kV Big Stone Substation would include five new SF_6 circuit breakers. SF_6 is considered one of the best insulating gases available for electric equipment. However, it is a potent GHG and for that reason, prevention of leaks is very important. Currently, emission of SF_6 gas is not regulated. OTP has recognized the concerns about leaks and is a member of USEPA's SF_6 Emission Reduction Partnership. As part of the Partnership, it is OTP's goal to maintain SF_6 emission levels at less than two percent of system capacity. Western also is participating in this partnership on a limited basis. Existing substations would continue following applicable regulations regarding proper use and disposal of hazardous materials and wastes.

Hazardous materials would be transported to, and stored at, the existing and proposed Big Stone II plants as part of daily operations. Wastes (primarily ash) would be generated and disposed of on-site.

Any hazardous materials used at the ethanol plants would be required to be transported to and managed at the sites following Federal and State regulations that apply to such activities. Any wastes generated at the ethanol plants would be required to be disposed following applicable Federal and State regulations.

By implementing standard and additional mitigation measures (if adopted), the proposed Big Stone II Project, when added to past, present, and reasonably foreseeable future actions is not expected to result in significant cumulative impacts from hazardous materials and wastes.

Visual Resources

Ethanol plants are typically located in rural areas with good access to highways and would likely be visible from those highways. Building height is in the range of 20 to 45 feet with dryer stacks up to 75 feet in height. Plant building and equipment occupy approximately two acres within a site of 40 to 60 acres.

Construction and operation of the 345-kV Big Stone Substation would result in moderate visual impacts due to the addition of the transmission structures, electrical elements, fencing, and gravel flatwork. The substation would contribute to visual impacts in the vicinity of the proposed Big Stone II plant. The substation would be located closer to U.S. Highway 12 than the proposed Big Stone II plant. Potential impacts to visual resources from the substation could be effectively reduced by implementing mitigation measures, such as subtle colors on structures and dull-finish structures. These mitigation measures would minimize the magnitude of visibility of the substation from sensitive viewpoints and the visual impacts associated with the substation. The visual impact from the substation would not be significant due to the existing influence of plant site elements in the background view.

Increased industrialization and development in and around Willmar would likely require construction of new transmission lines. Impacts of future (currently undefined) transmission lines could contribute to a degradation of visual qualities within the area.

By implementing standard and additional mitigation measures (if adopted), the proposed Big Stone II Project, when added to past, present, and reasonably foreseeable future actions is not expected to result in significant cumulative impacts for visual resources.

Noise

Ethanol plants have equipment (e.g., hammer mills, fans, vents) that are significant sources of noise within the plant site. Enclosed buildings and isolation of buildings within the plant site reduce the potential impact to off-site receptors. Local and State noise regulations must be followed.

The 345-kV Big Stone Substation would be located in an undeveloped area. Using Minnesota standards, the location would be classified NAC-3 due to the proximity of manufacturing and agricultural activities. The nearest occupied residence would be located about 0.25 mile north of the substation site; a second occupied residence is located 0.5 mile east of the site. Noise levels would increase during substation construction; however, these would be short-term impacts. Operation of the 345-kV substation would introduce a new noise source in the area. Based on the noise levels at the 230-kV substations that may be modified as part of the proposed Big Stone II Project (range from 51 to 59 dBA at 100 feet and from 45 to 53 dBA at 200 feet), noise levels are expected to be equivalent at the future 345-kV Big Stone Substation. Noise levels from the 345-kV substation are expected to be less than the Minnesota NAC-3 standards. Construction and operation of the substation would result in less than significant noise impacts.

By implementing standard and additional mitigation measures (if adopted), the proposed Big Stone II Project, when added to past, present, and reasonably foreseeable future actions is not expected to result in significant cumulative noise impacts.

Social and Economic Values

Most of the construction workforce for the 345-kV substation would likely be OTP employees. Construction is estimated to require 8 to 10 full-time personnel over an estimated one-year period. Some contracted employees could come from as far away as the Minneapolis area. No personnel would be required to operate the substation; only routine maintenance would be required. The minimal number of people required to construct and operate or maintain each project would not impact local housing or public services. Any long-term beneficial impact that may occur with the creation of new jobs in the local area and additions to the local and State tax base would be minor.

Future transmission lines and roadway projects would likely require a small construction workforce. No impact is expected to occur to local housing or public services. The number of workers required to construct the roadway projects is unknown. However, given the cost of the projects and the fact that all projects would not occur simultaneously, cumulative impacts are not expected to be significant.

The Big Stone Lake Restoration Project would continue to draw recreational users to the area with the improvement of the water quality and fisheries of the lake. This would provide some long-term beneficial impact and add to the local and State tax base, especially the annual walleye fishing tournament.

Environmental Justice

Expansion of the ethanol plants, construction of the 345-kV Big Stone Substation, future transmission line construction, other substation modifications and construction, improvements to the existing Hankinson line, and roadway improvements are not expected to have a disproportionately negative effect on minority or low-income populations.

By implementing standard and additional mitigation measures (if adopted), the proposed Big Stone II Project, when added to past, present, and reasonably foreseeable future actions is not expected to result in significant cumulative impacts for social and economic values or environmental justice.

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Final Environmental Impact Statement

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Big Stone II Power Plant and Transmission Project

Prepared for:

Lead Agency:
Western Area Power Administration

Cooperating Agency:
U.S. Army Corps of Engineers

OTHER REQUIRED CONSIDERATIONS

CHAPTER 5

Chapter 5 Changes

Changes to Chapter 5:

- Updated the unavoidable adverse environmental impacts for the resource areas.
- Updated long-term productivity impacts with minor edits.
- Updated irreversible/irretrievable commitment section, primarily for use of groundwater resources.

CHAPTER 5
OTHER REQUIRED CONSIDERATIONS

5.0 Other Required Considerations

5.1 Unavoidable Adverse Environmental Impacts

Unavoidable adverse environmental impacts are those that would occur from constructing and operating the proposed Project after implementing standard and additional mitigation measures. Based on completion of the impact analyses using significance criteria, unavoidable adverse impacts would occur for air quality, water, soils, biological, land use, visual, and socioeconomic resources. Significance criteria were provided for each resource in Chapter 4. Mitigation measures associated with these resources have been provided in their respective sections in Chapter 2 and Chapter 4.

Air Quality

The proposed Big Stone II plant would generate unavoidable emissions of air pollutants that would adversely impact the environment. The proposed plant would operate under a Prevention of Significant Deterioration (PSD) construction permit and a Clean Air Act Title V permit from the South Dakota Board of Minerals and Environment. These air permits require operation of the plant under regulatory limits designed to protect public health and the environment. Emissions would be controlled through various equipment designed to reduce air emissions for the proposed plant as well as the existing plant. Even with the permit requirements and air emission control equipment, these impacts would be adverse and unavoidable.

The proposed Big Stone II plant would emit mercury. At this time, no Federal regulations exist limiting the emissions of mercury; however, the Co-owners have entered into a Settlement Agreement with the Minnesota Department of Commerce to limit mercury emissions. Mercury would be controlled through the installation and operation of an emission control technology that is most likely to result in removal of at least 90 percent of the mercury emitted from both the existing plant and the proposed Big Stone II plant. The proposed Big Stone II plant and the existing Big Stone plant would emit less mercury combined than the existing plant emits presently; however, there would still be an emission. The impacts of mercury from the proposed Big Stone II plant are unknown at this time, because the speciation of the proposed plant's mercury emissions will be unknown until the plant becomes operational, and the Co-owners have implemented the control technology required by the Settlement Agreement.

The proposed Big Stone II plant would emit carbon dioxide, a greenhouse gas. Since the predicted effects of climate change are subject to substantial scientific uncertainty, the degree of adverse impacts caused either directly or indirectly by the construction and operation of the proposed Project cannot be estimated. However, since climate change has been determined to be "reasonably foreseeable," the Co-owners propose the use of efficient combustion technologies to reduce the carbon intensity of emissions, as well as offsetting 100 percent of the emissions of CO_2 from the proposed Big Stone II plant that are attributable to the generation of electricity for Minnesota consumers, for a period not to exceed four years after the commercial operation date of the proposed Big Stone II plant.

Water Resources

Based on the proposed water requirements of the proposed Project, operation of the existing plant and the proposed Big Stone II plant would require about 13,000 acre-feet per year (afy) of fresh water, which includes an additional 8,800 afy of fresh water for the proposed plant. Under Alternative 3, the combined water requirement would be about 11,500 afy for the existing and proposed plants, which includes about 7,300 afy for the proposed plant.

Water use modeling for the proposed Project estimates that surface water appropriations from Big Stone Lake would be approximately 9,317 afy, with a supplement of approximately 3,720 afy of groundwater to meet combined plant needs under average annual conditions. Water use modeling for Alternative 3 estimates that surface water appropriations from Big Stone Lake would be approximately 5,236 afy, with a supplement of approximately 2,036 afy of groundwater to meet combined plant needs under average annual conditions. Under the proposed Project or Alternative 3, increased water withdrawals would result in minor and infrequent effects on lake levels and outflows at Big Stone Lake during operation of the proposed plant.

If surface water withdrawals are restricted from Big Stone Lake for a one-year period, annual groundwater consumptive use could rise to about 10,000 acre-feet using wet cooling under the proposed Project and about 7,300 acre-feet using wet/dry cooling under Alternative 3.

Several isolated flood hazard zones within the proposed plant site would be regraded by the construction of new facilities. Given the width of the floodplains within the proposed transmission corridors, it is likely that permanent transmission tower installations would occur on them. However, the relatively small structural dimensions for transmission line towers would not provide sufficient cross section to obstruct overbank flows on river floodplains. Other constructed features (e.g., access road culverts) within smaller drainages may create flow obstructions and modify floodwater surface elevations and velocities.

Because the existing and proposed plants would continue to emit sulfur dioxide (SO_2), nitrogen oxides (NO_X), particulates, and mercury, there would be an unavoidable adverse impact to water resources. However, the impacts due to SO_2 and mercury would be reduced when compared to any impacts caused by emissions from the existing plant. There would be no increase in NO_X emissions, and, as a result, acid deposition is not expected to increase. An increase in particulate emissions would occur, however, the projected increase is mostly attributable to the emissions from increased coal consumption by the additional unit at the proposed plant.

Even with implementing standard and additional mitigation measures, the proposed Project would cause an unavoidable adverse impact to water resources. As described above, these impacts include the following: surface water consumption, groundwater consumption, water quality impacts due to airborne contaminants, and construction in the floodplains.

Soils

Under the proposed Project or Alternative 3, construction of the proposed plant would permanently remove approximately 27.5 acres of existing soils (instead of 532 acres, as described in the Draft Environmental Impact Statement. An additional 11.8 acres of long-term impacts to soils would occur; these impacts are associated with construction and installation of groundwater production wells, ancillary facilities, electrical distribution lines, and the pipeline to carry the groundwater from the wells to the proposed plant. The 11.8 acres impacted would occur primarily in previously developed areas.

Unavoidable adverse impacts would include the loss of 58.4 to 80.1 acres of soils from the construction and operation of transmission lines within the proposed corridors and approximately 8.3 acres at the relocated Canby Substation. Small areas of soils may be permanently removed at the substations if the modifications require substation expansion. Stockpiling topsoil for future use, erosion control, and recontouring practices, as described in the mitigation measures for soils and water and implemented under approved permits, would reduce impacts, but the losses would still constitute an unavoidable adverse impact.

Biological Resources

Construction of the proposed plant, installation of the groundwater system, and placement of transmission poles, laydown areas, pulling and tensioning sites, and substation expansions, and the new site for the relocated Canby Substation within the corridors would require areas to be cleared. Unavoidable adverse impacts would include the loss of 3.0 acres of vegetation from the construction and operation of the proposed plant. About 11.8 acres of vegetation and soils would be disturbed during well and pipeline installation associated with groundwater activities; almost all of these areas would be re-seeded and restored. The loss of 58.4 to 80.1 acres of vegetation would occur from the construction and operation of transmission lines within the proposed corridors.

Unavoidable adverse impacts to wildlife species would include the loss or alteration of breeding and foraging habitats and increased habitat fragmentation (approximately 6.8 acres for the proposed plant site and groundwater areas, approximately 58.4 to 80.1 acres within the transmission corridors, and approximately 8.3 acres at the relocated Canby Substation). Mortality could also occur to less mobile or burrowing species. Abandonment of a nest site and the loss of eggs or young may also occur. Unavoidable adverse impacts to migrating and foraging birds would also result from the increased potential for collision with overhead wires associated with the transmission lines.

Indirect unavoidable impacts would include habitat fragmentation resulting from elevated noise, increased human presence, dispersal of noxious and invasive weed species, and dust deposition. These impacts would extend well beyond the boundaries of the construction area. These effects may result in changes in habitat quality, habitat loss, animal displacement, and changes in species composition.

Surveys for special status species within the proposed corridors would be conducted once transmission line routes are selected. With implementing Standard Mitigation Measures (SMM), the proposed transmission lines may affect, but not adversely affect federally-listed special status species.

No loss of wetland/riparian areas would occur due to construction and operation of the proposed plant site. Any impacts to wetland/riparian areas that may occur due to construction of the proposed electricity distribution network would be minimal. The acreage of wetlands that may be impacted within each transmission-alternative varies from approximately 18.8 to 32.3-acres. A Clean Water Act Section 404 permit would require the mitigation of loss or degradation of any jurisdictional wetlands, but any residual loss would be an unavoidable adverse impact.

Land Use

No agricultural lands would be converted to commercial use at the proposed plant site. Construction of the groundwater system would result in the unavoidable conversion of 2.4 acres from agricultural use to commercial use. Unavoidable loss of prime and unique farmland would be 61.8 acres at the proposed plant site and about 2.1 acres due to construction of the groundwater system, which includes groundwater wells and pipelines. Approximately 80 acres of walk-in recreation land would no longer be available for recreation at the proposed plant site. Construction and operation of the proposed Project would result in the unavoidable adverse loss of approximately 21 to 28 acres of prime farmland within the proposed corridors.

Visual Resources

The expansion and operation of the proposed plant would result in additive long-term low to moderate visual impacts due to the addition of the stack and power plant building, which would be considered unavoidable adverse impacts. Upgrading the transmission line or constructing a new transmission line would result in long-term, new, or additive low to moderate visual impacts within the corridors, creating an unavoidable adverse impact. Additionally, the potential expansion of three substations and the relocation of the Canby Substation would yield low additive long-term visual impacts.

Social and Economic Values

Unavoidable adverse impacts would include the short-term effects on housing and public services during the construction phase of the proposed plant. Unavoidable adverse impacts are not expected from transmission line construction or operation.

5.2 Short-term Uses of the Environment and Long-term Productivity

The National Environmental Policy Act (NEPA) stipulates that the Environmental Impact Statement include a description of the "…the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity…" (NEPA, 42 USC § 4332(C)(iv)). Construction and operation of the proposed Project would have an impact on the environment until the project components are reclaimed, which are considered short-term for this discussion. Long-term productivity refers to the sustainability of the resources.

The impacts to the physical, social, and biological resources for the proposed Project are addressed in Chapter 4 and summarized in Section 2.6. The short-term uses of these resources for the proposed Project would result in electricity being generated and distributed for use in the areas serviced by the Co-owners. The electricity would provide heating, cooling, lighting, and other residential and commercial uses.

Once the proposed plant is decommissioned, the land would be reclaimed for other uses. The proposed transmission lines and substations would remain in operation for their given life, often over 50 years, as long as they are maintained and needed to transfer electricity through the region. The environmental resources within the proposed Project area would generally return to their long-term productivity with the following exceptions:

- Wetlands may be unavoidably impacted for the construction of the electrical distribution network and the proposed transmission lines. These losses would be mitigated through reclaiming, restoring, or permanently protecting other wetlands, resulting in an offset of wetland losses.
- Construction of the proposed Project would permanently alter the long-term productivity of impacted prime and unique farmlands at the proposed plant site, within the groundwater areas, and within the proposed corridors. Although these sites may be reclaimed for productive farming, they will not have the characteristics required for classification as prime and unique.
- For the proposed transmission lines, long-term losses in productivity to vegetation would occur where forest land would be kept clear for reliability and safety reasons. This land would not return to productivity until the transmission lines are removed.

5.3 Irreversible or Irretrievable Commitment of Resources

Construction and operation of the proposed Project may result in either the irreversible or irretrievable commitment of certain resources. A commitment of resources is irreversible when the impacts limit the future options for a resource. An irretrievable commitment refers to the use or consumption of a resource that is neither renewable nor recoverable for use by future generations. Irretrievable commitment of resources applies to loss of nonrenewable resources such as minerals or cultural resources, or to those factors, such as soil productivity, that are renewable only over very long periods of time.

After the life of the proposed plant (which is expected to exceed 40 years), the facility would be decommissioned and the site reclaimed. The transmission lines and substations would operate for their given life, often over 50 years, as long as they are maintained and needed to transfer electricity through the region. After their life these sites would be reclaimed.

Energy sources such as coal are non-renewable, and therefore irretrievable. The proposed plant would use 3.3 million tons of coal per year for an estimated 40 years or more, with a total use of approximately 132 million tons (assuming 40 years). Use of this non-renewable resource would prevent it from future use as a fuel source.

Cultural resources are non-renewable, and any loss of a site is an irretrievable impact to that resource. Preservation of archaeological and historical sites would be pursued through cultural resource site avoidance and recovery as part of the Programmatic Agreement for these resources.

Construction of the proposed Project would require the irretrievable commitment of some non-recyclable building materials and fuel for construction equipment. Many components of the proposed Project would be recycled after their life, particularly metal components. Construction of facilities would be a reversible commitment of land and water.

Installation of the groundwater system is a commitment to use these groundwater resources as a back-up to the surface water supply for the proposed Project or Alternative 3. The consumptive use of surface water and groundwater is an irretrievable commitment of these resources, as long as operation of the plant continues.

CONSULTATION AND COORDINATION

CHAPTER 6

Chapter 6 Changes

Changes to Chapter 6 include:

- Updated the consultation and agency coordination efforts undertaken for the proposed Project.
- Added a section for Native American Government consultation.

CHAPTER 6
CONSULTATION AND COORDINATION

6.0 Consultation and Coordination

This chapter summarizes the consultation and agency coordination efforts undertaken for the proposed Project.

6.1 Consultation

6.1.1 U.S. Fish and Wildlife Service

The proposed Big Stone II Power Plant and Transmission Project requires consultation with the U.S. Fish and Wildlife Service (USFWS) under Section 7 of the Endangered Species Act. Informal consultation with the USFWS was requested on June 2, 2005 and began July 7, 2005. Western Area Power Administration (Western) prepared a Biological Assessment (BA) for constructing and operating the proposed Big Stone II plant and groundwater wells and pipelines. The BA was submitted to the South Dakota Ecological Services Office of the USFWS on August 30, 2007. Based on the BA, Western concluded that the construction and operation of the proposed Big Stone II power plant would not adversely affect federally-listed species. The USFWS concurred with this determination on October 9, 2007 (USFWS, 2007). Copies of the BA and the USFWS concurrence are provided in Appendix L, Volume III.

A separate BA is being prepared for the transmission lines and substation modifications, including the relocation of the Canby Substation. The transmission line BA will outline specific measures for siting transmission lines, biological surveys, limitations for construction activities (timing and extent of disturbance), and revegetation and contouring of disturbed areas. The BA will also provide measures for protection of federally-listed species. The BA and informal consultation with the Minnesota Ecological Services Office of the USFWS would be completed prior to authorizing interconnections with its system.

6.1.2 State Historic Preservation Offices

Federal agencies are required to identify historical and archaeological properties that could be affected by the proposed Project, including sites listed on or potentially eligible for listing on the National Register of Historic Properties (NRHP). Under Section 106 of the National Historic Preservation Act (NHPA), Federal agencies must consult with the State Historic Preservation Office(s), tribes, and interested parties. If NRHP-listed or eligible for listing properties would be adversely affected by the proposed Project, consultation with the State Historic Preservation Office/Officers (SHPO), tribes, and interested parties is conducted to plan for any mitigation of adverse effects.

Class I cultural resource surveys have been completed for the proposed plant site and groundwater areas, and the transmission corridor alternatives. Class III cultural resource and architectural surveys have been conducted for the proposed plant site and groundwater areas, and for the transmission corridors located in South Dakota. The remaining transmission corridors, located in Minnesota, will be surveyed once a Minnesota Public Utilities Commission High Voltage Transmission Route Permit is issued. Additionally, a tribal ethnographic study of the proposed transmission corridors and plant site is planned for summer 2009. Consultation must be completed prior to commencement of construction activities in accordance with the executed Programmatic Agreement (PA) developed for the proposed Project.

The PA was forwarded to all interested parties for review and comment in March 2006. The PA was signed by Western, the South Dakota and Minnesota SHPOs, Otter Tail Corporation, the U.S. Army Corps of Engineers (USACE) Omaha District, and the South Dakota Public Utilities Commission and went into effect in January 2007. As part of continuing consultation with Native American tribes concerning cultural issues, three meetings were held between Western and Tribal Historic Preservation Officers and tribal representatives in April, May, and June 2007. Based on the results of these meetings, the PA was revised and reissued in July 2007 for review by the SHPOs and other interested parties, including Native American Tribes. The USACE was the only signatory to provide comments. The January 2007 PA was signed by the required parties and will remain in effect until a revised PA is executed.

6.1.3 Native American Government Consultation

Western initiated informal consultation with the Native American tribes during the Environmental Impact Statement (EIS) scoping period. Scoping letters were mailed to notify the tribes about the proposed Project and inviting them to comment during the scoping period. Western did not receive any comments from any of the tribes during scoping. Tribes were notified through consultation of the availability of the Draft EIS and Supplemental Draft EIS, and copies were provided as requested. The Sisseton-Wahpeton Oyate Office of Environmental Protection was the only tribe that provided comments on the Draft or Supplemental EIS.

Western participated in an informational meeting with several tribes on March 9, 2007, in Hankinson, North Dakota. At the request of the Sisseton-Wahpeton Oyate Tribal Council, a consultation meeting was held on June 20, 2007, in tribal chambers. The purpose of this meeting was to provide the tribal council with an overview of the proposed Project, the EIS, and to discuss concerns of the tribe. On May 12, 2008, the Sisseton-Wahpeton Oyate Tribal Council adopted a resolution opposing the proposed Big Stone II Project. Western has proposed a follow-up meeting with the Sisseton-Wahpeton Oyate Tribal Council prior to issuing a Record of Decision.

Additionally, Western met with representatives of the Upper Sioux Community Board of Trustees on August 8, 2007, to discuss the status of the EIS and transmission lines that are proposed near the Upper Sioux Reservation. A second meeting was held with the Board of Trustees on April 15, 2008, at which time, the Upper Sioux Community expressed concerns about impacts to groundwater, rivers, lakes, and wetlands. In response to these concerns, Western has provided the Upper Sioux Community with a comprehensive document that describes the groundwater modeling effort and results and the modeling quality assurance steps.

Future consultation meetings with Tribes will be planned and executed per NHPA, Section 106 requirements and U.S. Department of Energy (DOE) Native American policy (DOE, 2000). Western will continue to provide opportunities for government-to-government consultation with Native American Tribes throughout the EIS process.

6.2 Agency Coordination

The proposed development of the Big Stone II Project requires multiple State and Federal permits and approvals. The State and Federal permitting and approval processes are being conducted concurrently and provide numerous opportunities for public input. In addition to the Federal National Environmental Policy Act (NEPA) process, the proposed plant site and portions of the transmission lines require permitting in South Dakota. The remaining portion of the transmission lines require permitting in Minnesota. The following describes the status of the permit applications filed by the Co-owners and the interactions between Western and the States. Each of the permits required by the States of South Dakota and Minnesota are described in Chapter 1.

6.2.1 U.S. Army Corps of Engineers

Western met with the USACE on November 17, 2005, to discuss their role as Cooperating Agency and the Clean Water Act Section 404 Permitting process for the proposed Project. The status for the Federal and State permitting processes were discussed as well as the schedule for the agency review of the Federal Administrative Draft EIS. Western has periodically reviewed the progress of the EIS process with USACE, and provided opportunities for USACE to provide comments on the Draft EIS, Supplemental Draft EIS, and revised chapters (Volume I) and comment summaries and responses (Volume II) of the Final EIS. The USACE, St. Paul District became a cooperating agency on June 10, 2005, and the Omaha District on July 21, 2005.

6.2.2 Rural Utilities Service

The U.S. Department of Agriculture, Rural Utilities Service (RUS) became a cooperating agency on July 26, 2005. Western has periodically reviewed the progress of the EIS process with RUS, and provided opportunities for RUS to provide comments on the Draft EIS and Supplemental Draft EIS. With the withdrawal of Great River Energy as a Co-owner, RUS withdrew participation as a cooperating agency on March 13, 2008.

6.2.3 South Dakota Public Utilities Commission

The South Dakota Public Utilities Commission (SDPUC) approved the Energy Conversion Facility Permit on July 21, 2006 (SDPUC, 2006) and issued their Final Decision and Order on January 16, 2007 (SDPUC, 2007) for the Route Permit for the South Dakota portion of the transmission lines (see Section 1.4.3). Both permits relied on the Draft EIS for environmental review requirements, and the SDPUC decisions require the Co-owners to comply with all mitigation measures outlined in Western's Record of Decision. Western attended one hearing in September 2005 for the facility permit. Western provided the SDPUC with a copy of the Federal Administrative Draft EIS and the Supplemental Draft EIS for their review.

6.2.4 Minnesota Public Utilities Commission

The Certificate of Need application was filed by the Co-owners with the Minnesota Public Utility Commission (MnPUC) in October 2005. The application for a High Voltage Transmission Line Route Permit was filed with the MnPUC in December 2005. The route permit requires the State of Minnesota to prepare a State EIS for the transmission lines located in Minnesota. The Minnesota

Department of Commerce (MnDOC) issued a draft EIS on July 31, 2006, and a final EIS on December 1, 2006 (MnDOC, 2006). The MnPUC issued their final written order granting the Certificate of Need and the route permit on March 17, 2009 (MnPUC, 2009). Western attended the public meetings held by the MnPUC for both the Certificate of Need and the transmission line route permits, provided comments on the MnDOC draft EIS, and provided testimony to the MnPUC regarding the EIS process in October 2006. Western provided the MnPUC and the Minnesota Department of Commerce with the Federal Administrative Draft EIS for their respective reviews.

6.3 List of Government Agencies, Organizations and Individuals to Receive the EIS

The government agencies, organizations, and individuals to receive the Final EIS are provided in Appendix N, Volume III**.**

6.4 Public and Agency Involvement

Four formal public hearings were held on the Draft EIS during June 2006 and one formal public hearing was held on the Supplemental Draft EIS on November 13, 2007 (see Section 1.5.2). A summary of the comments received during the hearings and public comment period and Western's responses are included in Volume II of this Final EIS. The actual comment letters, e-mails, postcards, and public hearing comments are provided in Volume IV of this Final EIS (available in electronic format on compact disk).

The Final EIS is available at the following local libraries and DOE Reading Rooms for 30 days from the U.S. Environmental Protection Agency's publication of the notice of its availability for the Final EIS:

Appleton City Library
Benson Public Library
Canby Public Library
Granite Falls Public Library
Grant County Public Library
Kerkhoven Public Library
Morris City Library
Ortonville Public Library
Watertown Regional Library
Willmar Public Library

Western Area Power Administration
Upper Great Plains Customer Service Region
South Dakota Maintenance Office
200 4th Street SW
Huron, SD 57350

Western Area Power Administration
Corporate Services Office
12155 West Alameda Parkway
Lakewood, CO 80228

U.S. Department of Energy
Forrestal Building, Reading Room 1E-190
1000 Independence Avenue SW
Washington DC 20585

LIST OF PREPARERS

CHAPTER 7

Chapter 7 Changes

Chapter 7 includes an update to the List of Preparers.

CHAPTER 7
LIST OF PREPARERS

7.0 List of Preparers

The National Environmental Policy Act (NEPA) requires the Environmental Impact Statement (EIS) be prepared using an interdisciplinary approach. The NEPA evaluation integrates all aspects of the environment, including the natural sciences, social sciences, and environmental design arts. Table 7.1-1 lists the preparers and reviewers who participated in preparing the Big Stone II Power Plant and Transmission Project EIS. The EIS was prepared under the supervision of Western.

Table 7.1-1. List of Preparers and Reviewers for the EIS

Name	Education/Experience	Project Role
Western Area Power Administration – Lead Agency		
Lynn Almer	B.S. Chemistry, Earth Science Master of Natural Sciences 27 years experience	Technical review, water resources, overall review, and coordination
Mary Barger	B.A. Anthropology 27 years experience	Technical review, cultural resources for the Draft EIS and Supplemental Draft EIS
Matthew Blevins	B.S. Chemistry M.S. Environmental Engineering 13 years experience	Project Manager NEPA document manager for the Final EIS Technical and NEPA compliance review of the Final EIS
John M. Bridges	B.S. Zoology M.S. Zoology 33 years experience	Technical review, biological resources, ESA Section 7 consultation
Gary Burton	B.S. Fish Disease Technology 33 years experience	Technical review, fisheries for the Draft EIS
Kelly Connor	B.A. Global Studies J.D. Environmental & Natural Resources Law 4 years experience	Technical and NEPA compliance review, climate change for the Final EIS
Joe Giliberti	B.S. Anthropology – emphasis on Archaeology M.A. Anthropology/Archaeology 18 years experience	Technical review, cultural resources for the Draft EIS
Ken Mathias	B.S. Mechanical Engineering M.S. Geophysics 30 years experience	Technical review, air quality, noise, health and safety, waste management for the Draft EIS and the Supplemental Draft EIS
Misti Kae Schriner	B.S. Biology M.S. Environmental Science 7 years experience	Technical review, biological resources, ESA Section 7 consultation
Robert Scott	MLA, Landscape Architecture & Environmental Planning 33 years experience	Technical review, visual resources for the Draft EIS and the Supplemental Draft EIS
Dirk Shulund	B.S. Environmental Studies MBA Studies 7 years experience	Technical and NEPA compliance review
Dave Swanson	B.A. Biological Sciences 31 years experience	Technical and NEPA compliance review

Name	Education/Experience	Project Role
Stephen Tromly	B.S. Resource Conservation M.A. Anthropology with emphasis in Physical Archaeology 18 years experience	Technical review, Native American Concerns for the Draft EIS, the Supplemental Draft EIS, and Final EIS
Erika Walters	B.S. Biochemistry and Biology M.B.A. 3 years experience	Technical review, air quality, land use, infrastructure, public health and safety, waste management, socioeconomics
Nancy Werdel	B.S. Mechanical Engineer Master of Urban and Regional Planning 19 years experience	NEPA document manager for the Draft EIS and the Supplemental Draft EIS
Randy Wilkerson	B.A. Botany with Highest Honors 18 years experience	Editorial review
Rural Utilities Services – Cooperating Agency on Draft EIS and Supplemental Draft EIS		
Ayesh M. Abu-Eid, P.E.	Registered P.E. MA, NY, Washington DC M.SC.E.E.-Boston 38 yrs experience	Technical review
Nurul Islam	Ph. D. Agriculture Project Manager in Federal and State governments 37 yrs experience	Overall review
Dennis Rankin	M.A. Biology 31 years experience	Overall review
U.S. Army Corps of Engineers – Cooperating Agency		
Cheryl Goldsberry	32 years experience	Project manager, Regulatory Branch, Omaha District
John “Andy” Mitzel	B.S. Abused Land Rehabilitation 7 years experience	Project manager, South Dakota Regulatory Office
Steve Naylor	B.S. Biology M.S. Environmental Engineering 23 years experience	South Dakota State Regulatory Program Manager Regulatory Branch, Omaha District
Eric Norton	B.S. Hydrology & Watershed Management 4 years experience	Project Manager Regulatory Branch, St. Paul District
Todd Vesperman	B.S. Natural Resources 1 year experience	Project manager, Regulatory Branch, St. Paul District
ENSR – Preparers of Draft EIS		
Traci Allen	M.S. Ecology M.S. Biology B.J. Journalism 5 years experience	Wildlife/T&E species
Jon Alstad	B.S. Animal Science M.S. Range Science 17 years experience	Assistant project manager, wetlands/riparian
Bill Berg	B.S. Geology M.S. Geology 26 years experience	Geologic resources
Jim Burrell	B.S. Forest Management M.S. Civil Engineering 26 years experience	Water resources
Elizabeth Caldwell	Ph.D. Environmental Toxicology 17 years experience	Public safety

Name	Education/Experience	Project Role
Sue Coughenour	College coursework 20 years experience	Document preparation/editing
Rollin Daggett	B.S. Zoology M.S. Aquatic Biology 30 years experience	Fisheries/T&E species
Adele Gard	18 years experience	Document preparation
Allie Grow	B.S. Rangeland Ecosystem Sciences B.S. Soil and Crop Sciences	Vegetation/noxious weeds, wetlands/riparian
George High	B.S. Biology 32 years experience	Project manager
Charles Johnson	B.S. Biology M.A. Ecology 14 years experience	Wildlife/T&E species
Drew Ludwig	B.S. Zoology M.S. Zoology M.S. Resource Planning and Conservation 33 years experience	Senior technical review
Scott MacKinnon	B.S. Physical Geography 4 years experience	Geographic Information Systems
Kim Munson	B.A. Anthropology M.A. Anthropology 12 years experience	Cultural resources/Native American concerns
Merlyn Paulson	B.LA. (Landscape Architecture) M.LA. (Landscape Architecture) 33 years experience	Simulations, baseline, VRM mapping
Peggy Roberts	B.J. Journalism/Public Relations 9 years experience	Project coordinator, public involvement
Vince Scheetz	B.S. Mathematics M.S. Systems Management 30+ years experience	Air quality
Heidi Tillquist	B.S. Wildlife and Fisheries Biology M.S. Environmental Toxicology 17 years experience	Public safety, hazardous materials
Chris White	B.S. Chemical Engineering 26 years experience	Air quality
Todd White	B.A. Geology M.A. Anthropology M.En. Environmental Science AICP 14 years experience	Socioeconomics, land use, transportation, GIS
Don Wodek	B.S. Biology M.A. Biology J.D. Law 26 years experience	Stakeholder coordination
R. W. Beck – Preparers of Supplemental Draft EIS and Final EIS		
Steve Becker	B.S. Business M.A. Economics M.B.A Finance and Accounting 18 years experience	Greenhouse gas and mercury emissions
Donna Brannan	Technical Editing Certificate	Editor
Steve Brodsky	B.S. Electrical Engineering M.S. Electrical Engineering M.B.A. 27 years experience	Proposed action, description of alternatives
Kate Charlton	B.S. Environmental Engineering 1 year experience	EIS reviewer Administrative Record preparation

Name	Education/Experience	Project Role
Ivan Clark	B.S. Electrical Engineering 38 years experience	Project manager, proposed action, description of alternatives, water resources, noise
Evis Couppis	B.S. Chemical Engineering M.S. Chemical Engineering Ph.D. Chemical Engineering 34 years experience	Air quality, EIS reviewer
Dale Langan	Project design, AutoCad, and ArcGIS 34 years experience	Geographical Information Systems
Julie Lee	B.S. Civil Engineering 12 years experience	Description of alternatives, accident analysis, water resources
John McNurney	B.S. General Biology M.S. Environmental Engineering 38 years experience	Biological resources, visual resources
William Mundt	B.S. Geology 38 years experience	Assistant Project Manager, biological resources, geology, soil, cultural resources, land use, infrastructure, waste management, water resources, socioeconomics
Brian Nelson	B.S. Environmental Engineering M.S. Chemical Engineering 10 years experience	Air quality
Jim Sauvageau, P.E.	B.S. Environmental Engineering 14 years experience	EIS reviewer
Robert Schafish	B.S. Civil Engineering 40 years experience	Water resources reviewer
Rebecca Shiflea	MBA Marketing 18 years experience	Document review, public involvement
William Stark	B.S. Petroleum Engineering 22 years experience	Air quality

Disclaimer

National Environmental Policy Act (NEPA) Disclosure Statement
Western Area Power Administration Environmental Impact Statement
Big Stone II Power Plant and Transmission Project

The President's Council on Environmental Quality (CEQ) regulations at 40 CFR 1506.5(c) require that consultants preparing an environmental impact statement (EIS) execute a disclosure specifying that they have no financial or other interest in the outcome of the project. The term "financial interest or other interest in the outcome of the project" for the purposes of this disclosure is defined in the March 23, 1981, guidance "Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations," 46 FR 18-26-18038 at questions 17a and b.

"Financial or other interest in the outcome of the project" includes "any financial benefit such as a promise of future construction or design work in the project, as well as indirect benefits the contractor is aware of (e.g., if the project would aid proposals sponsored by the firm's other clients)." 46 FR 18026-18038 at 18031.

In accordance with these requirements, ENSR has prepared this EIS on behalf of Western Area Power Administration and declares no financial or other interest in the outcome of the proposed project.

Certified by:

George R. High, EIS Manager	April 12, 2006 Date

ENSR Corporation
1601 Prospect Parkway
Fort Collins, CO 80525

STATEMENT OF NO FINANCIAL OR OTHER INTEREST

Big Stone II Power Plant and Transmission Project EIS

As required by 40 CFR 1506.5(c), I certify that I do not have any financial or other interest in the outcome of the proposed Big Stone II Power Plant and Transmission Project that is the subject of this environmental impact statement.

Robert Scott
Technical Reviewer

May 1, 2006
Date

Disclosure Statement

Attachment:

National Environmental Policy Act Disclosure Statement for the Environmental Impact Statement for the Big Stone II Power Plant and Transmission Project

The Council on Environmental Quality (CEQ) regulations at 40 CFR 1506.5 (c), which have been adopted by the Department of Energy (10 CFR 1021), require contractors who will prepare an Environmental Impact Statement (EIS) to execute a disclosure specifying that they have no financial or other interest in the outcome of the project. The term "financial or other interest in the outcome of the project" is defined for the purposes of this disclosure in Question 17 of the CEQ guidance "Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations," (46 FR 18026 – 18038).

> "Financial or other interest in the outcome of the project' includes "Any financial benefit such as promise of future construction or design work in the project, as well as indirect benefits the contractor is aware of (e.g., if the project would aid proposals sponsored by the firm's other clients)."

In accordance with these requirements, R. W. Beck, Inc. ("R. W. Beck") hereby certifies that it has no financial or other interest in the outcome of the Environmental Impact Statement for the Big Stone II Power Plant and Transmission Project ("Project"). R. W. Beck provides consulting engineering services on an on-going basis to some of the Project participants and such services do not involve any financial or other interest in the outcome of the Environmental Impact Statement for the Project.

Certified by:

Ivan L. Clark

Signature

Ivan L. Clark

Name

Project Manager

Title

June 2009

Date

REFERENCES

CHAPTER 8

Chapter 8 Changes

Chapter 8 changes include:

- Added new references used in the preparation of the Final EIS.
- Modified references to reflect current availability of reference resources.

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GLOSSARY

GLOSSARY

Acre-foot	The volume of water that would be contained within a surface area of one-acre and one-foot deep.
Aquifer	A body of rock or unconsolidated geologic materials that are sufficiently permeable to conduct groundwater and to yield economically significant quantities of water to wells and springs.
Archaeological site	A geographic locale that contains the material remains of prehistoric and/or historic human activity.
Archaeology	The reconstruction of past cultures through their material remains and the study of how cultures change over time.
Association, Soil	A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single soil map unit.
Auxiliary electrical load	Power uses at a power plant, such as those required for fans for dry cooling, water treatment systems, and water pumps, which are drains on net power output, and therefore impact the amount of net power delivered to the electric grid.
Base saturation	The degree to which the nutrient exchange sites within a soil are occupied by chemical bases (as opposed to acids). Usually expressed as a percentage.
Beneficial use	Any of various designated uses of water in an area. Water may be for agricultural, domestic or industrial use, fish spawning, recreation, wildlife habitat or other uses.
Biological diversity, Biodiversity	The variety of all forms of life, used herein primarily in a general sense to refer to variety of both species and communities.
Blowdown	A continuous or periodic discharge of cooling water or water from the steam boiler that is released to control solids or other dissolved constituents in the respective system.
Calcareous (soil)	A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.
Channelized	The restriction of a stream or river to a man-made, constructed flow path.

Clay	As a soil separate, the mineral soil particles less than 0.002 millimeters in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand and less than 40 percent silt.
Clayey soil	Silty clay, sandy clay, or clay.
Community	A group of potentially interacting species living in close proximity and commonly recurring under similar conditions of soil, moisture and topography at other locations within a landscape.
Compaction, Soil	An increase in soil bulk density of 15 percent or more from the undisturbed level.
Confined aquifer	An aquifer that is overlain by a confining bed (i.e., a stratigraphic layer, such as a clay or a shale), which has a significantly lower permeability than the underlying aquifer zone. A confining layer significantly decreases the hydraulic connection between the confined aquifer and layers above the confining layer, including surface water features.
Cone of depression	In a confined aquifer, a depression in the potentiometric surface of a body of groundwater that has the shape of an inverted cone. In an unconfined aquifer, the surface of the cone is the level of saturation of the aquifer. The cone develops around a well from which water is being withdrawn and defines the area of influence of a well.
Coniferous	A tree of the order *Coniferae* with cones and needle-shaped or scale-like leaves.
Control	Control means, as appropriate, eradicating, suppressing, reducing, or managing invasive species populations, preventing spread of invasive species from areas where they are present and taking steps such as restoration of native species and habitats to reduce the effects of invasive species and to prevent further invasions.
Co-owners	Otter Tail Power Company, Central Minnesota Municipal Power Agency, Great River Energy, Heartland Consumers Power District, Montana-Dakota Utilities Co., Southern Minnesota Municipal Power Agency and Western Minnesota Municipal Power Agency (dba Missouri River Energy Services) – the seven electrical utilities that would be constructing and operating the proposed Project.

Cooling system	Technology used to condense and cool exhaust steam from the steam turbine using circulating water as a working fluid.
Cultural resources	A broad, general term meaning any cultural property and any traditional lifeway value (BLM Manual 8100).
Cumulative effect	The impact that results from identified actions when they are added to other past, present and reasonably foreseeable future actions regardless of who undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.
Dabbling (duck)	Any of various ducks, chiefly of the genus *Anas,* including the mallards, teals and shovelers, that feed by dabbling in shallow water and are favored as game birds.
Deciduous	Plants and trees that shed leaves seasonally, and are leafless for part of the year.
Deep (soil)	A soil that is greater than 40 inches deep to bedrock or other significant geologic contact. Also, a depth of 40 inches or more to a characteristic of interest within a soil profile.
Disturbance	Human activities or natural events that affect components or processes in an ecological system, usually in an abrupt manner, resulting in observable changes in the ecological system.
Diversity	(1) The absolute number of species in a community; species richness; (2) A measure of the number of species and their relative abundance in a community; low diversity refers to few species or unequal abundances, high diversity to many species or equal abundances.
Diving (duck)	Any of various ducks of the subfamily *Aythyinae*, including the scoters, eiders, goldeneyes and scaups that feed by diving beneath the surface of the water.
Drawdown	The lowering of the water level in a well as a result of groundwater withdrawal.
Dry cooling	A type of cooling system using large fans and air to pass over a heat exchanger to condense and cool exhaust steam from a steam turbine.

Endangered species	Any species defined through the Endangered Species Act as being in danger of extinction throughout all or a significant portion of its range and published in the Federal Register.
Environmental Impact Statement (EIS)	A formal document to be filed with the Environmental Protection Agency and that considers significant environmental impacts expected from implementing a major federal action, as required under NEPA.
Ephemeral	A stream that flows only in direct response to precipitation. It receives no continuous supply from melting snow or other source and its channel is above the water table at all times.
Erosion	Detachment and movement of soil or rock fragments by water, wind, ice or gravity.
Erosion (Accelerated)	Erosion much more rapid than background geologic erosion rates, occurring mainly as a result of human or animal activities or a natural catastrophe such as fire.
Existing plant	The existing Big Stone unit I plant.
Existing plant site	The area associated with the operation of the existing Big Stone unit I plant.
Factors	The individual component items or processes that make up an ecological system, e.g., soil, moisture, exposure, competition, herbivory or predation, disease, etc.
Fen	A tract of low, wet ground containing sedge peat, relatively rich in mineral salts, alkaline in reaction and characterized by slowly flowing water. Vegetation is generally sedges and grasses, often with low shrubs and sometimes a sparse cover of trees. *Sphagnum* mosses are absent or of low cover.
Floodplain	A nearly level alluvial plain that borders a stream and is subject to inundation under flood-stage conditions unless protected artificially. It is usually a landform built of sediment deposited during overflow and shifting of the stream.
Forb	Any herbaceous plant not a grass or a grasslike species.

Fragmentation	Process of reducing the size and connectivity of vegetated stands and/or habitat that comprise a rangeland or forest; a measure of connectivity in vegetative and/or habitat conditions across a landscape.
Fugitive dust	Small airborne particles (such as dust) that originate from sources such as unpaved roads, construction activities on exposed soil areas, and agricultural activities.
Functions	Any of a wide variety of natural processes that fit within the general definition of ecological processes.
Furbearer	An animal bearing fur of commercial value.
Gravel	Rock fragments greater than 2 millimeters in diameter. Sizes range from pebbles (0.008 to 2.5 inches) to cobbles (2.5 to 10 inches) to boulders (greater than 10 inches).
Groundwater	Subsurface water that is stored in the zone of saturation. When at atmospheric pressure, the uppermost surface of groundwater is the "water table." A source of water for wells, seepage and springs.
Groundwater inflow	The rate of water flux (in units of volume over time) from an aquifer system into a portion of a surface water body.
Habitat	The natural abode of a plant or animal, including all biotic, climatic and edaphic factors affecting life.
Heat Rate	A measurement to calculate how efficiently a generator produces electric energy, and is expressed as the number of British thermal units (Btu's) required to produce a kilowatt-hour of electrical energy.
Historic	Period wherein nonnative cultural activities took place, based primarily upon European roots, having no origin in the traditional Native American culture(s).
Historic property	"any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places. The term includes, artifacts, records and remains that are related to and located within such properties. The term 'eligible for inclusion in the National Register' includes both properties formally determined as such by the Secretary of the Interior and all other properties that meet National Register listing criteria" {quoted from 36 CFR 900.2(e)}.

Hummocky	Topographic expressions of uneven landforms, such as knolls, mounds, or other small elevation rises.
Hydraulic conductivity	A measure of an aquifer's ability to transmit water.
Hydric soil	A soil that is saturated, flooded, or retains water long enough during the growing season to develop anaerobic (without oxygen) conditions.
Incremental	The process of increasing or decreasing in number, size, quantity or extent of habitat.
Intermittent stream	A stream that flows for prolonged portions of a year when it receives seasonal contributions from groundwater discharge, melting snow or other surface and shallow subsurface sources.
Introduction	Intentional or unintentional escape, release, dissemination or placement of a species into an ecosystem as a result of human activity.
Invasive	Any plant species which has been introduced by human action to a location, area or region where it did not previously occur naturally (i.e., is not native), becomes capable of establishing a breeding population in the new location without further intervention by humans and becomes a pest in the new location, threatening the local biodiversity.
Invasive species	An alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health.
Invertebrate	An animal, such as an insect or mollusk, which lacks a backbone or spinal column.
Kilovolt	A unit of electrical potential equal to a thousand volts.
Lacustrine	This system includes inland water bodies that are situated in topographic depressions, lack emergent trees and shrubs, have less than 30% vegetation cover and occupy at least 20 acres (8 ha). Includes lakes, larger ponds, sloughs, lochs, bayous, etc.
Loam	Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles and less than 52 percent sand particles.

Macroinvertebrate
An organism that lacks a backbone and can be seen with the naked eye.

Make-up water
Water which is supplied to cooling tower or steam boiler to compensate for losses from evaporation and releases necessary to control water quality.

Megawatt
A unit for measuring power that is equal to one million (106) watts.

Mesic
Refers to sites or habitats characterized by intermediate moisture conditions, (i.e., neither decidedly wet [hydric] nor decidedly dry [xeric]).

National Environmental Policy Act of 1969 (NEPA)
NEPA is the basic national charter for protecting the environment. It establishes policy, sets goals and provides means for carrying out the policy.

National Register of Historic Places
A register of districts, sites, buildings, structures and objects, significant in American history, architecture, archaeology and culture, established by the "Historic Preservation Act" of 1966 and maintained by the Secretary of the Interior.

Native species
With respect to a particular ecological system, a species that, other than as a result of an introduction, historically occurred or currently occurs in that ecological system.

Natural Resources
These include topography (consider slope and drainage patterns), soil, water courses and/or water bodies, geological formations, vegetation (consider rare, threatened or endangered species), and fish and wildlife.

Navigable Waters of the U.S.
Navigable waters of the United States, as described in 33 CFR Part 329, are those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. A determination of navigability, once made, applies laterally over the entire surface of the waterbody, and is not extinguished by later actions or events which impede or destroy navigable capacity. Navigable water of the United States fall under the jurisdiction of the U.S. Army Corps of Engineers

Noxious weed
Any plant designated by a federal, state or county government as injurious to public health, agriculture, recreation, wildlife or property.

Organic matter	Plant and animal residue in the soil in various stages of decomposition.
Paleontology	The study of fossils; what fossils tell us about the ecologies of the past, about evolution, and about place, as humans, in the world. Informs us about interrelationship between the biological and geological components of ecosystems over time.
Palustrine	All non-tidal wetlands that are substantially covered with emergent vegetation--trees, shrubs, moss, etc. Most bogs, swamps, floodplains and marshes fall in this system, which also includes small bodies of open water (< 20 acres), as well as playas, mudflats and salt pans that may be devoid of vegetation much of the time. Water chemistry is normally fresh but may range to brackish and saline in semiarid and arid climates.
Perennial	Present during all seasons of the year.
Poorly drained	A natural drainage class wherein water is removed so slowly that the soil is wet at shallow depths periodically during the growing season or remains wet for long periods. The occurrence of internal free water is shallow or very shallow and common or persistent. Free water is commonly at or near the surface long enough during the growing season so that many common agricultural crops cannot be grown unless the soil is artificially drained.
Potentiometric water level	The level to which water will rise in a tightly cased (sealed) well, typically from a confined aquifer.
Prairie Coteau	A geomorphic province located in eastern South Dakota that is approximately defined by a rolling plain of glacial origin.
Project area	The cumulative area within the proposed plant site and transmission line corridors, including substation modification locations.
Project vicinity	The cumulative area within the proposed plant site, proposed transmission line corridors and variations, substation modification locations and adjacent areas.
Proposed plant	The proposed Big Stone II plant.
Proposed plant site	The area associated with the construction and operation of the proposed Big Stone II plant.

Proposed project	The proposed plant site, transmission line corridors, variations (inclusive of these components) and substation modifications.
Riffle	A stretch of choppy water caused by such a shoal or sandbar; a rapid.
Riparian	Referring to or relating to areas adjacent to water or influenced by free water associated with streams or rivers on geologic surfaces occupying the lowest position of a watershed. Pertaining to, living or situated on, the banks of rivers and streams. 'Xeroriparian' refers to being situated on dry washes (ephemeral streams).
Riverine	Freshwater, perennial streams comprised of the deepwater habitat contained within a channel. This restrictive system excludes floodplains adjacent to the channel as well as habitats with more than 0.5 percent salinity.
Runoff	Excess water discharged into stream channels from rainfall or snowmelt on a land area. The water that flows off the surface of the land without sinking into the soil may be called surface runoff.
Sacred site	Any specific, discrete, narrowly delineated location of federal land that is identified by an Indian tribe or individual to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion; provided that the tribe or appropriately representative of an Indian religion has informed the agency of the existence of such a site (quoted from Executive Order 13007, Section 7 1(b) (iii)).
Sand	Individual mineral particles ranging in diameter from the upper limit of silt (0.05 millimeter) to the lower limit of fine gravel (2.0 millimeter).
Scrub	Refers to a stand of vegetation characterized by thick growth of dwarf or stunted trees and shrubs and a poor soil.
Sediment	Soil, rock particles and organic or other debris carried from one place to another by wind, water or gravity.

Sensitive species	All species that are under status review, have small or declining populations, live in unique habitats, or need special management. Sensitive species include threatened, endangered, and proposed species as classified by the Fish and Wildlife Service and National Marine Fisheries Service.
SF_6	SF6 (sulfur hexafluoride) is a non toxic gas with cooling and insulating capabilities used by the electrical industry on high-voltage circuit breakers, switchgear, and other electrical equipment, often replacing harmful PCBs.
Shallow (soil)	A soil having a depth of 20 inches or less to bedrock or other significant geologic contact. Also, a depth of 20 inches or less to a characteristic of interest within a soil profile.
Shrub	A low woody plant.
Silt	Individual mineral particles ranging in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class: Soil that is 80 percent or more silt and less than 12 percent clay.
Special status species	Plant or animal species known or suspected to be limited in distribution, rare or uncommon within a specific area, and/or vulnerable to activities that may affect their survival.
Species	A taxon of the rank species; which is the basic unit and lowest principal category, of biological classification; in the hierarchy of biological classification, the category below genus; a group of organisms formally recognized as distinct from other groups.
Spring	Flowing water originating from an underground source.
Standard mitigation measures	Mitigation measures that are part of the proposed Project, which would be completed by the Co-owners to avoid or minimize impacts to various resources.
State Wildlife Management Area (SWMA)	State-managed wildlife production areas which support a variety of game species including waterfowl, pheasant and white-tailed deer.
Storativity	The volume of water an aquifer releases or intakes per unit surface area of the aquifer per unit change in head.

Substations	An assemblage of electrical equipment, such as transformers, circuit breakers, relays, etc., used to switch, control or regulate electrical voltage.
Surface Water	Water that occurs at the surface of the earth in the form of rivers and streams, ponds, or lakes.
Switching Station	Switching stations divert electrical power from one circuit to another for electrical disturbution.
Terrestrial	Living or growing on land; not aquatic (e.g., a terrestrial plant or animal).
Threatened species	Any plant or animal species defined under the Endangered Species Act as likely to become endangered within the foreseeable future throughout all or a significant portion of its range; listings are published in the Federal Register.
Ton	As used in the Final EIS, a ton is 2,000 pounds. A metric ton is 2,204.6 pounds.
Topographic shielding	Habitat which is shielded by manmade (e.g., bridges and buildings) and natural features (e.g., mountains and rivers).
Total dissolved solids	Total amount of dissolved material, organic or inorganic, contained in a sample of water.
Traditional cultural property	A cultural property that derives significance from traditional lifeway values associated with it. A traditional cultural property may qualify for the National Register if it meets the criteria and criteria exceptions at 36 Code of Federal Regulations 60.4 (BLM Manual 8100 – The Foundations for Managing Cultural Resources, page 34).
Transmissivity	The rate at which water is transmitted through a unit of width of an aquifer.
Unconfined aquifer	An aquifer whose water surface is exposed to atmospheric pressure via the pore space of overlying sediments. Also known as a water table aquifer.
Upland	Terrestrial ecosystems located away from riparian zones, wetlands, springs, seeps and dry washes; ecosystems made up of vegetation not in contact with groundwater or other permanent water sources.

Waterfowl Production Area (WPA)	Public lands, managed by the U.S. Fish and Wildlife Service, included in the National Wildlife Refuge System in 1966 through the National Wildlife Refuge Administration Act. The objective is to preserve wetlands and grasslands critical to waterfowl and other wildlife.
Water regime	A characterization of the frequency and degree of flooding and/or saturation in a wetland. Water regime is a function of the wetland's water budget (inflow and outflow water balance) and storage capacity, which is affected by the surface contours of the landscape and subsurface soil, geology and groundwater conditions.
Weed	A plant considered undesirable, unattractive or troublesome, usually introduced and growing without intentional cultivation.
Weighted Average of Sound Level (L) for Day (d) and Night (n)(L_{dn})	The day-night average sound level that is equal to the 24-hour A-weighted equivalent sound level with a ten-decibel penalty applied to nighttime levels.
Well drained	A natural drainage class wherein water is removed from the soil readily but not rapidly. The occurrence of internal free water commonly is deep or very deep; annual duration is not specified. Water is available to plants throughout most of the growing season in humid regions. Wetness does not inhibit the growth of roots for significant periods during most growing seasons.
Wetland	(1) Lands where saturation with water is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface. (2) A general term for sites which are permanently, seasonally, rarely, or never flooded, but which support plants characteristic of saturated soils. Dominant plants, or at least one co-dominant plant, are terrestrial or emergent, with subaerial stems and leaves.
Windshield survey	Observations made from automobile, while driving.
Zero liquid discharge facility	A facility whose wastewaters are contained within the property, and are not discharged to waters of the U.S.

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