

3.0 AFFECTED ENVIRONMENT

The affected environment is the physical area in which resources could be impacted by Western's and RUS's Federal actions and the construction, operation, and maintenance of Basin Electric's proposed Project. The boundaries of the region analyzed may vary depending on the resource. Because both sites are located in the same county and involve similar environmental resources, most statements generally describing the study area (figure 2-1) apply to both sites. This EIS addresses the requirements of all applicable laws and regulations including the requirements of section 102(2) of NEPA, the CEQ Regulations implementing the Procedural Provisions of NEPA (40 CFR parts 1500-1508), DOE NEPA Implementing Procedures (10 CFR part 1021), RUS Environmental Policies and Procedures (7 CFR part 1794, as amended), DOE regulations for Compliance with Floodplain and Wetland Environmental Review Requirements (10 CFR part 1022), and other applicable laws, regulations, and Executive Orders (EOs), including, but not limited to, the following:

- ESA, section 7
- Farmland Protection Policy Act
- MBTA
- NHPA, section 106
- EO 11988 (Floodplain Management)
- EO 11990 (Protection of Wetlands)
- EO 12898 (Environmental Justice)
- EO 13007 (Indian Sacred Sites)
- EO 13045 (Protection of Children from Environmental Health Risks and Safety Risks)
- EO 13112 (Invasive Species)
- EO 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds)

Where applicable, this EIS also identifies additional permits and approvals that may be needed under other environmental laws, including the CWA and Safe Drinking Water Act. No Federal land is needed for the two alternative plant sites, natural gas pipeline route alternatives, water supply wells, or water pipeline extension. Termination of the transmission line would be the White Substation, a federally owned facility.

Based on scoping and proposed Project characteristics, the following resources could potentially be impacted:

- Air Resources, including GHG emissions and climate change
- Geological Resources, including prime, unique, and important farmland
- Water Resources, including surface water, wetlands, floodplains, and groundwater
- Biological Resources, including vegetation, wildlife, and endangered and threatened species
- Socioeconomic Resources, including environmental justice and protection of children
- Land Use
- Recreation
- Transportation
- Visual Resources
- Noise
- Public Health and Safety, including intentional acts of destruction
- Cultural Resources, including Indian Sacred Sites and historic properties

For air resources and socioeconomic resources, the area assessed includes the county affected and adjacent counties (Brookings, Moody, Deuel, Lake, Kingsbury, and Hamlin SD, and Lincoln MN).

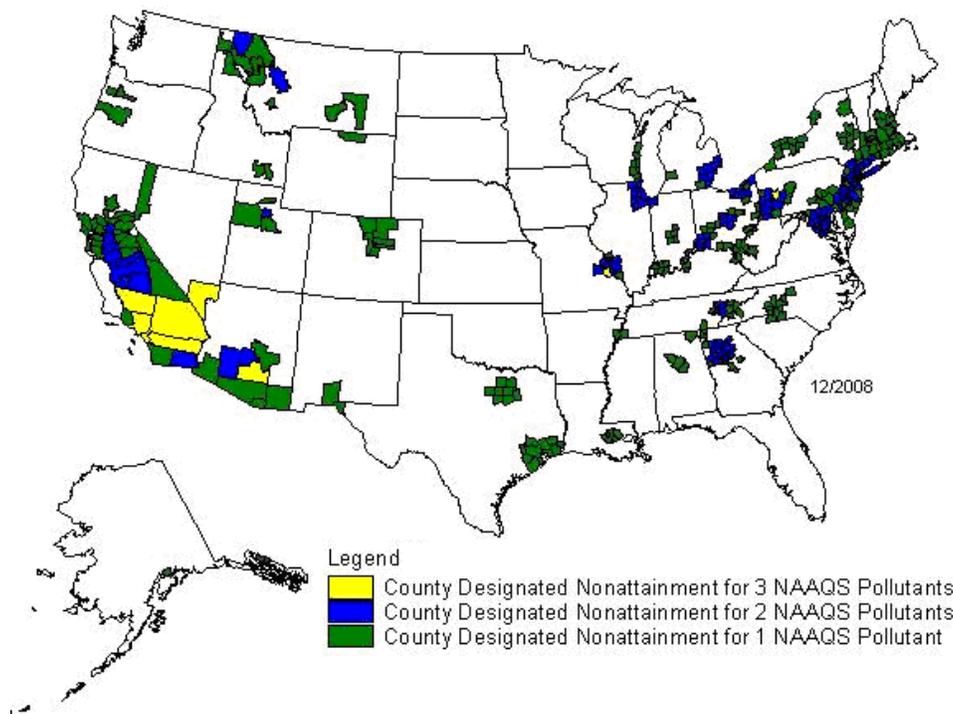
For aquatic resources, the area assessed includes the Lac Qui Parle River watershed upstream of Lake Hendricks, the poorly defined drainages in the vicinity of Oak Lake and Astoria Lake, and the Deer Creek and Six Mile Creek watersheds.

For terrestrial resources, the area assessed includes the ecoregion where the facilities are to be located. Ecoregions denote areas of general similarity in the type, quality, and quantity of environmental resources. According to the EPA, the proposed Project area is within the Northern Glaciated Plains, Big Sioux Basin ecoregion. The alternative pipeline routes extend into the Northern Glaciated Plains, Prairie Coteau ecoregion, in the area around Oak Lake and Lake Hendricks. The natural vegetation of both ecoregions is described as the tallgrass-shortgrass prairie transition (Bryce et al. 1998).

3.1 AIR RESOURCES

3.1.1 Air Quality Standards

All counties in South Dakota are currently in attainment for all National Ambient Air Quality Standards (NAAQS). (figure 3-1).

Figure 3-1: Counties Designated "Nonattainment" for NAAQS

Source: Environmental Protection Agency 2009b.

One air-monitoring site is operated in Brookings, located at the City Hall building in the center of the city. The area to the west of the site is residential and the areas north, east, and south have service-oriented businesses and light industry. Both PM_{10} and $PM_{2.5}$ are monitored at this location (AQS ID Number 46-011-0002).

PM_{10} sampling began at this site in 1989. The annual averages range from a high of $38 \mu\text{g}/\text{m}^3$ in 1990 to a low of $17 \mu\text{g}/\text{m}^3$ in 1993, compared to the annual standard of $50 \mu\text{g}/\text{m}^3$. The trend shows concentration levels declining over the 19 years the site has been operating. In 2007, PM_{10} concentrations were up slightly from the previous year but still well below the highest concentration in 1990 (SDDENR 2008a). The reasons for the decline in particulates are unknown, but the decline may be related to the near-normal moisture levels in the eastern part of South Dakota in recent years.

3.1.2 Greenhouse Gases and Climate Change

Climate change refers to changes in the long-term trends of many climatic factors such as temperature, precipitation, or wind. There continues to be a degree of uncertainty surrounding the contemporary causes of climate change, and the importance of those changes. Climate change may be the result of:

- Natural factors such as solar and orbital variations

- Natural processes and cycles 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 greenhouse gases (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. According to the IPCC, "very likely" indicates that there is a 90 percent chance that this is the case. In the IPCC Fourth Assessment Report (IPCC 2007), scientists conclude that "most of the observed increase in globally-averaged temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic GHG concentrations." The IPCC 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 CO₂ 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. Other GHGs such as fluorocarbons are created and emitted solely through human activities. The principal GHGs are CO₂, methane (CH₄), nitrous oxide (N₂O), and fluorocarbon gases (EPA 2009a).

CO₂ 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). Most CO₂ that is naturally produced through respiration and decomposition is taken up by photosynthesis of plants on land and in the oceans. CO₂ emitted by combustion of fossil fuels and industrial processes is causing CO₂ concentrations to increase in the atmosphere (IPCC 2007). CO₂ accounts for approximately 70 percent of global man-made GHG emissions (EPA 2006).

CH₄ is emitted during the production and transport of coal, natural gas, and oil; CH₄ is also emitted from livestock, agricultural processes, and organic waste decay and amounts to about 24 billion metric tons annually in the U.S. Natural CH₄ emissions globally are from wetlands, oceans, hydrates, and fires. CH₄ accounts for approximately 15 percent of global man-made GHG emissions (EPA 2006).

N₂O_s are emitted during the combustion of fossil fuels and solid wastes, as well as during agricultural and industrial activities. N₂O accounts for approximately eight percent of global man-made GHG emissions (EPA 2006).

Fluorocarbon gases such as perfluorocarbons, hydrofluorocarbons, and sulfur hexafluoride are emitted from a variety of industrial processes. They are seven percent of global GHG emissions. They are not naturally produced (EPA 2006).

3.2 GEOLOGY, SOILS AND FARMLAND

3.2.1 Glacial Geology

The entire area affected by the proposed Project was glaciated. However, during the last glaciation (Wisconsin), glaciers parted around both sides of the Big Sioux Basin. The river developed when glacial meltwater flowed southward between the two glacial lobes. This led to a better-developed drainage network, fewer wetlands, and less topographic relief. The Prairie Coteau is an area of outwash built up at the edge of the ice sheet under the two glacial lobes. The Prairie Coteau is a plateau approximately 200 miles in length and 100 miles in width, rising above the prairie flatlands in South Dakota and Minnesota. It is comprised of thick glacial deposits, reaching a thickness of approximately 900 feet. Pierre Shale of Cretaceous age (rocks dating from 145 to 65 million years in age) underlies the till in most of the area (Bryce et al. 1998). The shale is enriched in selenium and other trace elements (Leibbrand 1985). Precambrian rocks (with ages greater than 570 million years in age) occur at still deeper levels (Bryce et al. 1998). Granite is quarried at Milbank, South Dakota, and outcrops of Sioux Quartzite are common. Layers of silt in the quartzite near Pipestone, Minnesota, to the southeast of the proposed Project, were quarried by Native Americans, and the stone was carved for pipe bowls. Within the proposed Project area, there are no substantial mineral resources. Sand and gravel deposits exist within pockets which have been utilized for construction and road base and concrete aggregates (Martin et. al. 2004).

3.2.2 Soils and Agriculture

The dominant soil order in this area is Mollisols, which developed under grassland vegetation, and tends to be classified as prime farmland. The soils in the area have a soil temperature regime reflecting their northern location, a soil moisture regime reflecting a moist climate, and mixed mineralogy (USDA NRCS 2006). They generally are very deep, well drained to very poorly drained, and loamy. The soils in the proposed Project area are comprised of three main groups based on their geological history: loess (wind-blown sediment derived from finely ground rocks associated with glaciers) which lies on the ridge-tops, residual material that formed in glacial plains and moraines, and alluvial material that lies in stream

terraces and glacial outwash plains. The majority of the soil types in the proposed Project area of Brookings and Deuel counties are hydric, meaning that they contain standing water or are saturated most of the year; the hydric soils are associated with swales/potholes, floodplains, and outwashes. However, these soil types also contain drier areas and are extensively used for agriculture.

More than two-thirds of the proposed Project area in Brookings and Deuel counties is in farm production. Major soil resource concerns are wind erosion, water erosion, maintenance of the content of organic matter and productivity of the soils, soil wetness, and management of soil moisture. Conservation practices on cropland generally include systems of crop residue management, especially no-till or other conservation tillage systems that conserve moisture and contribute to soil quality. Other practices include terraces, vegetative wind barriers, grass waterways, and nutrient management (Brady and Weil 1996).

3.2.3 Farmland

Prime farmland, as defined by the USDA, is land that has been determined to have the best combination of physical and chemical properties for agricultural production and is available for farming (USDA NRCS 2009). In addition to prime farmland, land may be classified as unique farmland, which is used for the production of specific high value food or fiber crops, and farmland of statewide or local importance, as determined by the State or local jurisdiction.

In Brookings County, 51 soils are classified as prime farmland, 18 soils are prime farmland if drained, five soils are prime farmland if irrigated, and 18 soils are classified as farmland of statewide importance. In Deuel County, 40 soils are listed as prime farmland, 11 soils are prime farmland if drained, three soils are prime farmland if irrigated, and seven soils are classified as farmland of statewide importance.

In the portion of the proposed Project area within Brookings County, 44 of the soils found in this area are listed as prime or statewide important farmland. In the portion of the proposed Project area within Deuel County, there are 39 soils classified as prime or statewide important farmland. These soils account for approximately 60 percent of the entire proposed Project area.

3.3 WATER RESOURCES

3.3.1 Surface Water

Most of the proposed Project facilities for White Site 1 or White Site 2 would be located within the Big Sioux River basin. However, the northern-most portions of the proposed natural gas pipeline routes are within the Minnesota River Basin. Surface waters located within and adjacent to the proposed Project facilities include Lac Qui Parle River, Deer Creek, Six Mile Creek, Lake Hendricks, Oak Lake, isolated

wetlands, and numerous unnamed intermittent and ephemeral stream tributaries. There are two waterways designated as Deer Creek in the proposed Project area, one flowing north to Lake Hendricks and one flowing southwest toward the Big Sioux River.

Lac Qui Parle River flows into Lake Hendricks, located just east of the White Site 1 Natural Gas Pipeline Route. Lac Qui Parle River then flows northeast into the Minnesota River. Other small streams in the northern portion of both pipeline routes are also tributaries to the Lac Qui Parle River. Deer Creek and its tributaries generally flow south along the proposed White Site 1 Natural Gas Pipeline Route and turn in a southwesterly direction south of White Substation. Six Mile Creek generally flows southwest and is located to the west of the proposed Project. Both Deer Creek and Six Mile Creek are tributaries to the Big Sioux River. Oak Lake is a very large prairie pothole, located southwest of the northern portion of the proposed White Site 1 Natural Gas Pipeline Route. It does not have a surface drainage outlet.

All drainages within the proposed Project area are on privately owned lands. These lands have been impacted by agricultural use, including grazing, haying, and tilling.

As required under section 303(d) of the Federal CWA, the SDDENR has identified and created a list of impaired water bodies that require the development of Total Maximum Daily Limits (TMDLs). A TMDL is the amount of pollution a water body can receive and still maintain water quality standards established by the U.S. EPA. The main causes of impairment within the Big Sioux River basin are fecal coliform, mostly from livestock operations and municipal sewage, and total suspended solids, mostly from cropland and streambank erosion. Lakes within the Big Sioux Basin are eutrophic due to algae, nutrient enrichment, and siltation. Most prairie pothole lakes and wetlands are undergoing a natural process of gradually turning into marshes and eventually into dry land, as vegetation production and natural inputs of dust and sediment eventually displace the water features. Lakes in the Big Sioux Basin which are impaired include School Lake in Deuel County and West Oakwood Lake in Brookings County. Streams in the Big Sioux Basin that are listed as impaired include North Deer Creek, located to the west of I-29; and Spring Creek, located in southeastern Brookings County. Six Mile Creek, Deer Creek, and Medary Creek, which drain the proposed Project area, are unassessed.

The pipelines proposed to serve the alternative plant sites also enter the Minnesota River drainage. Lake Hendricks, located east of the White Site 1 Natural Gas Pipeline Route, is on the 303(d) list because it had

a Trophic Scale Index (TSI) value that was higher than the assigned numeric standard for a warm water, semi-permanent fishery. TSI values quantify productivity based on algal biomass (SDDENR 2008b).

Water quality in Lake Hendricks has deteriorated due to nutrient and sediment loading. The Brookings County Conservation District works with landowners to install field windbreaks, shelterbelts, filter strips, cattle rock crossings, and riparian buffers. In addition, cattle access to Lake Hendricks has been reduced by fencing (BCD 2002).

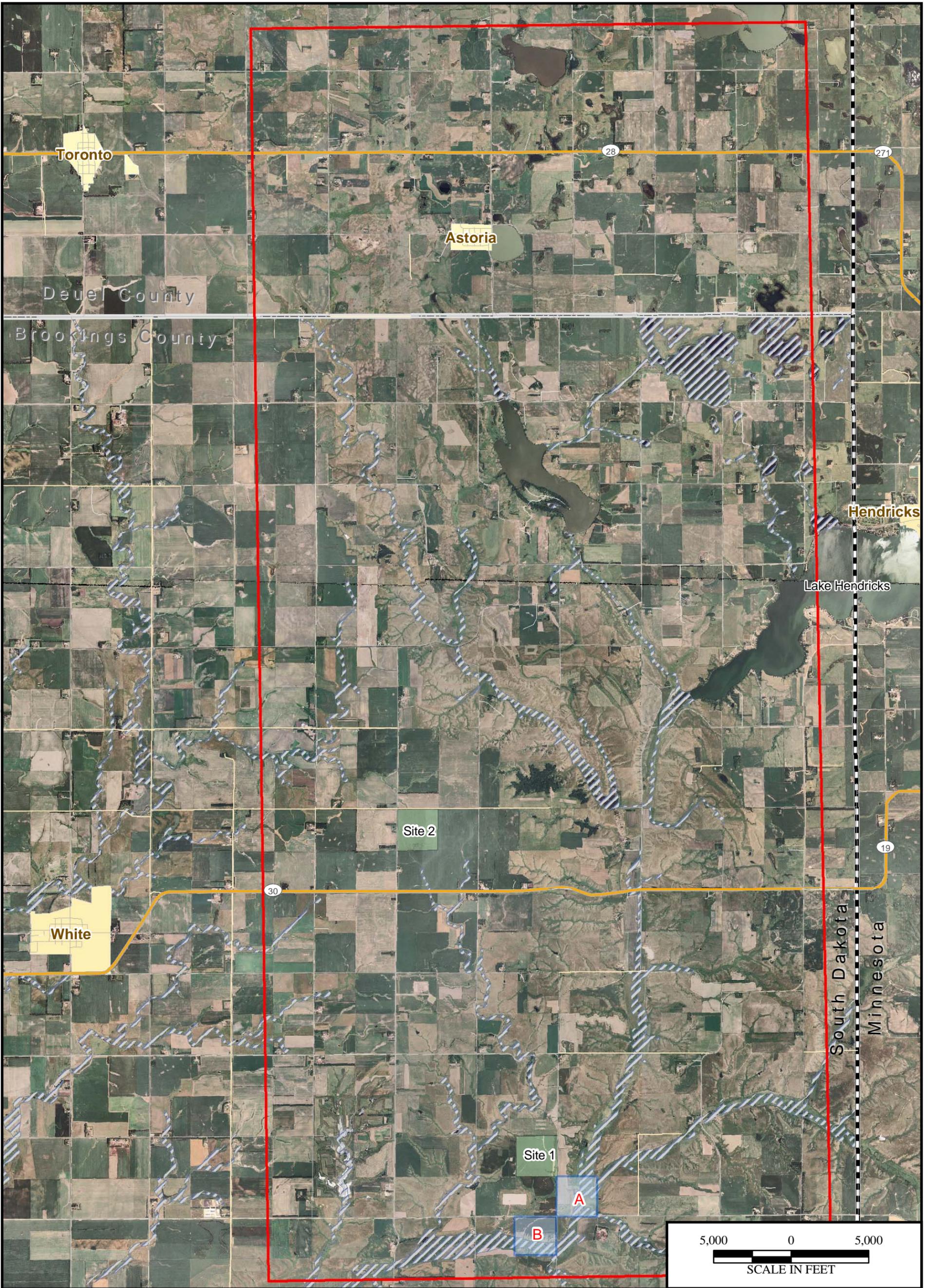
3.3.2 Floodplains

Both Brookings and Deuel Counties participate in the Federal Emergency Management Agency's (FEMA) National Flood Insurance Program, which allows residents to purchase special insurance at subsidized rates, although only Brookings County enforces the Flood Damage Prevention Ordinance. This ordinance puts specific restrictions on construction in floodplains. There are no designated 100-year flood plains in the rural areas of Deuel County. Within the proposed Project area in Brookings County, designated floodplains are along Deer Creek and Six Mile Creek (tributaries to Big Sioux River) and along the other stream designated as Deer Creek that flows into Lake Hendricks and the Lac Qui Parle River). These streams have wide floodplains due to the lack of time to develop meanders, as the streams are relatively younger than the streams they flow into, e.g. the Big Sioux River, and have overall less stream flow. The floodplains of Deer Creek and Six Mile Creek are generally hundreds of feet in width. The water well supply sites are located within the Deer Creek floodplain. The designated floodplains in the vicinity of White Site 1 and White Site 2 are delineated on figure 3-2.

3.3.3 Groundwater

The main source of groundwater occurring in Brookings County is that of the Big Sioux Aquifer. Most of the public water supply in this area comes from the Big Sioux Aquifer (BCPC 2000). Sediments and soils that overlie the Big Sioux aquifer are thin and very permeable, which means that the aquifer is susceptible to contamination from the land surface. In some locations, the groundwater from this aquifer is not suitable for human use because of high nitrate concentrations due to human or agricultural sewage. Other chemical substances present at levels considered high for drinking water are iron, manganese, and sulfate. However, the water is usually good in quality for other uses. The best water quality in the aquifer occurs where it is thickest and the potential to dilute pollutants is greatest, including in Brookings County (Liebbrand 1985).

\\espsrv\data\projects\Basin\Basin51236_EIS\GIS\DataFiles\ArcDocs\Revised_Figures_11_19_09\Figure 3-2_11_19_09.mxd Revised: 11/19/2009



LEGEND

- Water Well Sites A and B
- White Sites 1 and 2
- Study Area
- Floodplain

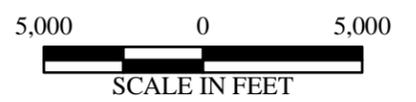


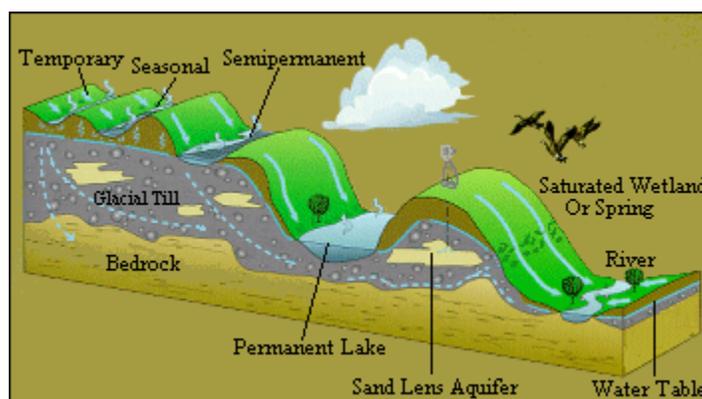
Figure 3-2

Floodplains in the Vicinity of
White Site 1 and White Site 2
Deer Creek Station EIS

Source: USDA NAIP County Mosaic, Brookings and Deuel counties, North Dakota; FEMA; ESRI; Basin Electric Power Cooperative

Other groundwater can be found within the proposed Project area below streams and bodies of water, such as Lac Qui Parle River, Deer Creek, Six Mile Creek, Lake Hendricks, and Oak Lake. The water from these sources seeps down into the underlying sediment, which are glacial drift formations and deposits of outwash composed of sand and gravel. The groundwater in these aquifers is generally shallow at less than fifty feet from the surface (DCPC 2004a). The aquifers are complex, consisting of many small aquifers that are hydrologically associated with several large aquifers and the Big Sioux River. Yields in some areas are not reliable. For most uses, the water in these aquifers is of acceptable quality. However, in some locations, there are high nitrate concentrations due to livestock waste seepage into the water table (Amundson and Koch 1985; Leibbrand 1985). The complex pattern of hydrology in the prairie pothole region is illustrated in figure 3-3.

Figure 3-3: Hydrology of the Prairie Pothole Region



(Source: Johnson et al. 1997)

Eleven counties in eastern South Dakota, including Brookings and Deuel Counties, have delineated Well Head Protection Areas. Such protection involves protecting ground water supplies by eliminating and controlling pollution sources that may affect surface and sub-surface areas surrounding water wells or well fields. South Dakota has divided levels of protection into three different zones. Zone A is the area most immediate to wells and requires the highest degree of protection from potential contaminants. Zone B is an intermediate zone and requires less protection than Zone A; this generally includes shallow aquifer boundaries. Zone C includes the outermost portion of a wellhead protection area. Shallow aquifer boundaries, and thus Zone B areas, exist throughout the proposed Project area, generally underlying surface waters where groundwater recharge occurs. There are Zone A Well Head Protection Areas in and around the town of Astoria in Deuel County in the north-central part of the proposed Project area (DCPC 2004b).

3.3.4 Wetlands

Wetlands are scattered throughout much of eastern South Dakota. The types of wetlands found in this area range from large lakes to small temporary wetlands, such as prairie potholes. Wetlands are characterized by hydrological indicators, hydric soils, and hydrophytic vegetation. Examples of hydrophytic vegetation commonly found in eastern South Dakota include reed canarygrass (*Phalaris arundinacea*), prairie cordgrass (*Spartina pectinata*), cattails (*Typha* spp.), numerous sedge species, coyote willow (*Salix exigua*), peach-leaved willow (*Salix amygdaloides*), and plains cottonwood (*Populus deltoides*) (EDAW 2009a). Wetlands provide wildlife habitat, nutrient storage, water quality protection, flood control, and groundwater recharge. Wetlands in the proposed Project area of both alternative sites and associated facilities are indicated in appendix B.

The proposed Project area for both alternative sites and associated facilities contains a high density of small wetlands (Tiner 1999; SDDENR 2008b). These “prairie potholes” are an essential habitat for many migrating birds. Because the Upper Midwest region has a wide range of rainfall patterns, the boundaries of prairie potholes are difficult to identify during dry years because the drier portions of these wetlands are often cultivated and tilled (Tiner 1999).

The USFWS created Waterfowl Production Areas (WPAs) to protect and preserve wetland resources in South Dakota. An estimated 700 WPAs covering approximately 183,000 acres of wetlands and uplands were purchased by 1994. In addition, the FWS obtained easements on an estimated 613,000 wetland acres in South Dakota through 1994 (SDDENR 2008b). In the area of the proposed Project, WPAs are located to the east and west of the White Site 1 Natural Gas Pipeline route along the Deuel-Brookings county line. These WPAs are administered by the Madison Wetland Management District. In adjacent areas of Minnesota, WPAs in Lincoln County are administered by the Big Stone Wetland Management District.

The NRCS oversees the Wetlands Reserve Program (WRP), which is a voluntary program that provides financial incentives to landowners to protect, restore, and enhance wetlands on their property.

Landowners either sell a conservation easement or enter into a cost-share restoration agreement with the USDA to protect and restore wetlands (USDA NRCS 2007).

As part of the look at the wetlands existing in the area, National Wetland Inventory (NWI) maps were reviewed in relation to the proposed Project facilities associated with the two alternative sites. This data allowed a comparison of the existing conditions for both proposed sites without conducting a detailed wetland delineation. This process was used as a screening tool to provide information about wetlands

present for both sites and associated facilities. The more detailed wetland delineation used as part of the analysis to determine impacts to wetlands for the Applicant's preferred site is presented in section 4.4.2.

3.3.4.1 Facility Sites

White Site 1

NWI wetlands of 1.60 acres are indicated on maps for White Site 1. Wetlands at White Site 1 are associated with an intermittent drainage probably inundated during the wettest periods of the growing season. These are palustrine emergent (PEM) wetlands. Deer Creek is a tributary to the Big Sioux River, which is classified by the USACE as a traditional navigable water. Because the PEM wetlands are associated with an unnamed drainage which empties downstream into Deer Creek, these wetlands are likely jurisdictional waters. The jurisdictional status of the waters will be confirmed during section 404 permitting.

White Site 2

Based on available NWI maps and observations from public access roads, many of the small, isolated prairie pothole wetlands have been converted from hydrophytic vegetation to agricultural crops. However, some of the pothole wetlands are still intact. Many of the potholes have wetland hydrology and likely have hydric soils. NWI wetlands on White Site 2 total 1.69 acres. There are an additional 0.05 acres of NWI wetlands on the rural water pipeline extension.

3.3.4.2 Water Well Supply Site B and Water Pipeline

Water Well Supply Site B contains 5.18 acres of NWI wetlands. Most are associated with Deer Creek and adjacent topographic depressions on the southern half of the site. Deer Creek flows from east to west through the center of Site B. Hydrophytic vegetation associated with these wetlands includes reed canarygrass, barnyardgrass (*Echinochloa* spp.), bog yellow cress (*Rorippa palustris*), and creeping foxtail (*Alopecurus arundinaceus*). There are no NWI wetlands associated with the water pipeline to the facility site.

3.3.4.3 Natural Gas Pipeline Corridors

White Site 1 Natural Gas Pipeline Route

Approximately 1.75 acres of wetlands are indicated on NWI maps. Wetland features are associated with swales, topographic depressions, and perennial and intermittent drainages. The northern portion of the proposed corridor has several uncultivated prairie potholes and depressional wetlands. Most surface waters within the corridor contain wetland vegetation. The proposed corridor crosses nine drainages,

including four tributaries to Deer Creek near the central and southern portions of the corridor and three tributaries to Oak Lake. Wetlands associated with the Deer Creek tributaries are likely classified as jurisdictional. The wetlands associated with isolated topographic depressions are likely non-jurisdictional, but are protected under EO 11990, Protection of Wetlands.

White Site 2 Natural Gas Pipeline Route

Upon the review of existing NWI maps and observations from public access roads, PEM, PSS, PFO wetlands totaling 0.61 acres are located within the White Site 2 Natural Gas Pipeline corridor. Wetland features are associated with swales, topographic depressions, and intermittent and perennial drainages. The northern portion of the alternative corridor contains numerous uncultivated prairie potholes and depressional wetlands that contain hydrophytic vegetation. This corridor crosses an estimated 17 drainages, including one tributary to Oak Lake, five tributaries to Deer Creek, and three intermittent tributaries to Six Mile Creek. Given the extensive involvement with streams, the alternative pipeline corridor would contain more area of wetlands than the preferred corridor.

3.3.4.4 Transmission Corridors

White Site 1 Transmission Line

No NWI wetlands are indicated in the White Site 1 Transmission Line corridor.

White Site 2 Transmission Line

Based upon observations from public access roads and the review of NWI wetland data, wetlands within the White Site 2 Transmission Line corridor include PEM, PSS, and PFO wetlands. Based on NWI maps, there are 1.7 acres of wetlands within the White Site 2 Transmission Line corridor. Wetland features are associated with swales, intermittent and perennial drainages, and topographic depressions. All perennial drainages appear to be south-flowing tributaries to Deer Creek. Wetland vegetation is similar to that found in the White Site 1 Transmission Line corridor.

3.4 BIOLOGICAL RESOURCES

3.4.1 Vegetation

The majority of the proposed Project area assessed for both sites and associated facilities is within the Big Sioux Basin, which has a well-developed drainage network. The ecoregion is in South Dakota and extends into southwestern Minnesota. The gentle topography and small number of wetlands in this ecoregion allow for more tilled land than adjacent ecoregions. Natural vegetation in the Big Sioux Basin ecoregion is primarily tall grass prairie plants, which includes big bluestem (*Andropogon gerardii*), little

bluestem (*Schizachyrium scoparium*), switchgrass (*Panicum virgatum*), Indiangrass (*Sorghastrum nutans*), sideoats grama (*Bouteloua curtipendula*), and lead plant (*Amorpha canescens*). Other natural vegetation in this ecosystem includes hardwood trees, such as ash species (*Fraxinus* spp.), bur oak (*Quercus macrocarpa*), Osage orange (*Maclura pomifera*), as well as riparian plants, including willows (*Salix* spp.) and cord grasses (*Spartina* spp.). Cultivated crops include small grains, corn, sunflowers, and soybeans (Bryce et al. 1998).

A portion of the northeastern corner of the proposed Project area assessed for both sites is located in the Prairie Coteau ecoregion. The eastern arm of this ecoregion extends through parts of Minnesota and South Dakota. There is a poorly developed drainage pattern, as the landscape formed from glacial ice melting under a layer of sediment. The Prairie Coteau contains numerous wetlands and natural lakes. Natural vegetation in the Prairie Coteau ecoregion is also primarily tall grass prairie plants, including big and little bluestem, switchgrass, Indiangrass, and blue grama (*Bouteloua gracilis*). Land use includes pastureland in rolling areas and cultivated crops of small grains, corn, and soybeans in flat areas (Bryce et al. 1998).

Prior to field visits, aerial photography and National Land Cover Data (NLCD) were used in order to identify vegetation communities within the proposed Project area. During the field visits, Global Positioning System (GPS) units were used to record the density of noxious weeds and vegetation communities in the pipeline corridors. Although a complete inventory was not conducted during these field visits, a list of all observed vegetation species was created (EDAW 2009a). The vegetative composition of the proposed Project area is primarily cultivated crops and grassland (table 3-1).

Table 3-1: Vegetative Composition of the Proposed Project Area

Vegetation Type	Acres	Percent of Project Area
Open Water	2,119.20	2.71%
Developed, Open Space	2,628.00	3.36%
Barren Land (Rock/Sand/Clay)	12.01	0.02%
Deciduous Forest	463.69	0.59%
Grassland/Herbaceous	29,263.38	37.42%
Planted Pasture/Hay	6,632.93	8.48%
Cultivated Crops	34,366.45	43.95%
Woody Wetlands	23.57	0.03%
Emergent Herbaceous Wetlands	2,601.57	3.33%

The largest vegetation category, comprising about 44 percent of the proposed Project area, is cultivated annual crops. The areas under this classification also include lands being actively tilled. Agricultural

crops in the proposed Project area include, in order of dominance, corn, hay, soybeans, and winter wheat (EDAW 2009a). The second largest vegetation type is grasslands, which account for more than 37 percent of the proposed Project area. These areas may be used for livestock grazing. The most common plants found in upland pasture areas are creeping bentgrass (*Agrostis stolonifera*), smooth brome (*Bromus inermis*), western wheatgrass (*Pascopyrum smithii*), Kentucky bluegrass (*Poa pratensis*), and tall dropseed (*Sporobolus asper*); bentgrass and brome are introduced species (EDAW 2009a). Smaller percentages of the area are in planted pasture and hay, developed lands, and wetlands.

3.4.2 Noxious Weeds

According to South Dakota statute FS 525, “Noxious Weed Control”, landowners are required to control noxious weeds on their land. This is enforced by the South Dakota Department of Agriculture (SDDA). Federal agencies are also directed to prevent the introduction of invasive species and ensure that its actions are not likely to cause or promote the introduction or spread of invasive species (EO 13112). Noxious weeds are a problem for a number of reasons. They threaten wildlife by replacing natural vegetation and nesting habitat, threaten native plant species, and reduce crop productivity and increase soil erosion, contributing to sedimentation in water bodies, which in turn affects fish habitat (SDDOA DAS 2009).

South Dakota has two designations of noxious weeds, State and local. Table 3-2 and table 3-3 provide the State and locally listed noxious weeds and the acreage that each species affects in Brookings and Deuel Counties, as reported by the SDDA (2007). Noxious weeds identified during field surveys include Canada thistle (*Cirsium arvense*), musk thistle (*Carduus nutans*), and absinth wormwood (*Artemisia absinthium*).

Table 3-2: South Dakota State-Listed Noxious Weeds in Brookings and Deuel Counties

Scientific Name	Common Name	Infested Acres in Brookings County	Infested Acres in Deuel County
<i>Cirsium arvense</i>	Canada Thistle	>50,001	>50,001
<i>Euphorbia esula</i>	Leafy Spurge	1,001 - 5,000	>10,001
<i>Lythrum salicaria</i>	Purple Loosestrife	None Reported	<100
<i>Sonchus arvensis</i>	Perennial Sow Thistle	1,001 - 5,000	1,001 - 5,000

Source: South Dakota Department of Agriculture (2007), Retrieved February 4, 2009
<http://www.state.sd.us/doa/das/noxious.htm>

Table 3-3: South Dakota Locally Listed Noxious Weeds in Brookings and Deuel Counties

Scientific Name	Common Name	Infested Acres in Brookings County	Infested Acres in Deuel County
<i>Artemisia absinthium</i>	Absinth Wormwood	201 - 1,000	5,001 - 10,000
<i>Carduus acanthoides</i>	Plumeless Thistle	501 - 1,000	>10,000
<i>Carduus nutans</i>	Musk Thistle	501 - 1,000	>10,000

Source: South Dakota Department of Agriculture (2007), Retrieved February 4, 2009
<http://www.state.sd.us/doa/das/noxious.htm>

3.4.3 Wildlife

The Prairie Pothole Region, of which the Big Sioux and Prairie Coteau ecoregions are a small portion, is the most important waterfowl-producing region on the North American continent. Thousands of wildlife species likely occur within the State of South Dakota. There are more than 414 species of birds that occur within the State, including both resident and migratory species (Baker 2005). Appendix C lists some of the birds, mammals, reptiles, and amphibians that may occur near or within the proposed Project area. Appendix D lists fish species that may occur near or within the proposed Project area. The primary habitat types that occur within the proposed Project area are agricultural lands (pastureland and cropland), tall and mixed-grass prairie, woodlands (shelterbelts), wetlands, and riparian communities. The majority of the land within the proposed Project area is used for agricultural purposes. This section discusses common wildlife and habitats that may occur in the proposed Project area (EDAW 2009a).

The two species of big game that may occur within the proposed Project area are mule deer (*Odocoileus hemionus*) and white-tailed deer (*Odocoileus virginianus*). White-tailed deer are found throughout South Dakota and prefer wooded vegetation and river drainages on the prairie (Rice 1994). SDGFP harvest numbers indicate white-tailed deer are adapting and moving into agricultural landscapes and foraging in croplands. Wetlands, riparian areas, and shelterbelts are crucial for white-tailed deer cover during winter months and throughout the year. Mule deer are uncommon in the area, although their range within South Dakota does include the proposed Project area.

Coyote (*Canis latrans*), red fox (*Vulpes vulpes*), American badger (*Taxidea taxus*), raccoon (*Procyon lotor*), porcupine (*Erethizon dorsatum*), and striped skunk (*Mephitis mephitis*) are some of the larger mammals found within the proposed Project area, and these mammals use a variety of habitats including mixed-grass prairie, pastureland, forested areas, and drainages. Six species of bats are known to occur or have suitable habitat occurring within the proposed Project area (appendix C). Bats utilize tree cavities,

crevices, caves, and overhangs as roosting sites, and are often found in proximity to surface water. The majority of other small mammals in eastern South Dakota are adapted to prairie and woodland habitats and associated drainages. These species include, but are not limited to, the least weasel (*Mustela nivalis*), thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*), northern grasshopper mouse (*Onychomys leucogaster*), and prairie vole (*Microtus ochrogaster*).

Migrant and resident bird species in prairie habitat that may occur near the proposed Project include the brown-headed cowbird (*Molothrus ater*), eastern meadowlark (*Sturnella magna*), western meadowlark (*Sturnella neglecta*), red-winged blackbird (*Agelaius phoeniceus*), eastern bluebird (*Sialia sialis*), eastern kingbird (*Tyrannus tyrannus*), great blue heron (*Ardea herodias*), northern harrier (*Circus cyaneus*), killdeer (*Charadrius vociferus*), field sparrow (*Spizella pusilla*), northern flicker (*Colaptes auratus*), belted kingfisher (*Ceryle alcyon*), common nighthawk (*Chordeiles minor*), tree swallow (*Tachycineta bicolor*), turkey vulture (*Cathartes aura*), as well as numerous species of migrant shorebirds. Wild turkey (*Meleagris gallopavo*), mourning dove (*Zenaida macroura*), Canada goose (*Branta canadensis*), mallard (*Anas platyrhynchos*), as well as numerous other waterfowl species, are game bird species that may be found surrounding the proposed Project

Some common reptile and amphibian species that may occur near or within the proposed Project area include American toad (*Anaxyrus americanus*), bullfrog (*Lithobates catesbeiana*), tiger salamander (*Ambystoma tigrinum*), snapping turtle (*Chelydra serpentina*), ring-necked snake (*Diadophis punctatus*), and common garter snake (*Thamnophis sirtalis*). Amphibian species are most likely to be encountered around semi-permanent or permanent wetland areas, but are also found around man-made wetlands and riverine wetland areas (Fischer et al. 1999).

There are approximately 52 fish species that may occur near or within the proposed Project area. Water bodies located in and around the proposed Project range from small, unnamed tributaries to larger rivers and streams such as Deer Creek, as well as farm ponds and medium-sized lakes such as Lake Hendricks and Oak Lake. Common game fish species that may occur within the proposed Project area include channel catfish (*Ictalurus punctatus*), white crappie (*Pomoxis annularis*), smallmouth bass (*Micropterus dolomieu*), walleye (*Stizostedion vitreum*), and bluegill (*Lepomis macrochirus*). Nongame fish species such as creek chub (*Semotilus atromaculatus*), fathead minnow (*Pimephales promelas*), and banded killifish (*Fundulus diaphanous*) are likely to be found within the proposed Project area as well.

3.4.4 Special Status Species

County lists from the USFWS were used in determining which endangered species have the potential to occur in the proposed Project area. A recent EIS prepared for the White Wind Farm located adjacent to the proposed Project was also used to assist in the evaluation of impacts to endangered, threatened, proposed, and candidate species. In addition, an April 7, 2009, letter received from the USFWS contained lists of species and discussed other wildlife issues. The area of the proposed Project potentially contains habitat for two federally-listed endangered species, the Topeka shiner (*Notropis topeka*) and the American burying beetle (*Nicrophorus americanus*); one federally-listed threatened species, the western prairie fringed orchid (*Platanthera praeclara*); and one candidate species, the Dakota skipper (*Hesperia dacotae*). The list of plant and animal species considered threatened or endangered by the State of South Dakota was also reviewed (SDNHP 2008). Protected species with the potential to occur in the area of the proposed Project are listed in table 3-4.

Table 3-4: Threatened, Endangered, and Candidate Species

Name	Scientific Name	Federal Status	State Status
Invertebrates			
American burying beetle	<i>Nicrophorus americanus</i>	Endangered	
Dakota skipper	<i>Hesperia dacotae</i>	Candidate	Threatened
Fish			
Northern redbelly dace	<i>Phoxinus eos</i>		Threatened
Topeka shiner	<i>Notropis topeka</i>	Endangered	
Banded killifish	<i>Fundulus diaphanus</i>		Endangered
Blacknose shiner	<i>Notropis herolepis</i>		Endangered
Sturgeon chub	<i>Macrhybopsis gelida</i>		Threatened
Birds			
Bald eagle	<i>Haliaeetus leucocephalus</i>	*	Threatened
Osprey	<i>Pandion haliaetus</i>		Threatened
Whooping crane	<i>Grus americana</i>	Endangered	Endangered
Amphibians and Reptiles			
Eastern hognose snake	<i>Heterodon platirhinos</i>		Threatened
Lined snake	<i>Tropidoclonion lineatum</i>		Endangered
Northern red-bellied snake	<i>Storeria occipitomaculata</i>		Special Concern
Plants			
Western prairie fringed orchid	<i>Platanthera praeclara</i>	Threatened	

*Federally protected by the Bald and Golden Eagle Protection Act

Based on review of habitat information, state-listed species with the potential to occur in the proposed Project area are Dakota skipper, northern redbelly dace, banded killifish, blacknose shiner, and northern redbellied snake. Habitat descriptions for these protected species are found in Appendix E.

3.5 SOCIOECONOMIC RESOURCES

Various socioeconomic issues have been taken into consideration in analyzing the impacts of the proposed Project. Socioeconomic characteristics within the proposed Project area are discussed below and include population growth, racial and ethnic characteristics, housing trends, economic indicators, and employment.

3.5.1 Population Growth

Astoria, with a population of 150 persons in 2000, is one mile west of the proposed White Site 1 Natural Gas Pipeline Route and two miles east of the White Site 2 Natural Gas Pipeline Route (figure 2-1). White is six miles northwest of White Site 1 and four miles southwest of White Site 2, and has a 2000 population of 530. Astoria and White have remained relatively stable in population in recent years. The City of Brookings is located about 14 miles to the southwest of White Site 1 and 16 miles to the southwest of White Site 2. The population of Brookings grew from 16,270 in 1990 to 18,504 in 2000, a growth rate of 13.7 percent (U.S. Census Bureau 1990 and 2000). Brookings County grew by 12 percent from 1990 to 2000, while Deuel County lost 0.5 percent of its population (table 3-5). Adjacent Lincoln County, Minnesota also lost population.

Table 3-5: Population Change

	Population		% Change
	1990	2000	1990 to 2000
Counties			
Brookings County	25,207	28,220	12.0%
Deuel County	4,522	4,498	-0.5%
City/Town			
Astoria	155	150	-3.2%
Brandt	123	113	-8.1%
Brookings	16,270	18,504	13.7%
Bushnell	81	75	-7.4%
Toronto	201	202	0.5%
White	536	530	-1.1%

Source: US Census Bureau, 1990 and 2000 Census

The Brookings County comprehensive plan estimates that by 2015, the county will have a population of 28,228 persons, and the Deuel County comprehensive plan estimates that the county will experience a

decrease in population by 2020 with 3,915 persons. The Lincoln County, Minnesota comprehensive plan estimates that by 2030 the population of the county will be between 4,500 and 6,500 persons.

3.5.2 Racial and Ethnic Characteristics

In order to characterize the racial and ethnic characteristics of the population in the area of the proposed Project, census data is analyzed at the county, city, and census block group levels.

The majority of the population of Brookings and Deuel counties is white (table 3-6). The racial composition of the Block Groups covering the proposed Project area is similar to that of Brookings and Deuel counties. There are three census block groups that extend through the proposed Project area. The racial composition of the population in these census block groups is displayed with the county and city data in table 3-6, Population by Race. As compared to the population of Brookings County and the proposed Project area as a whole, the percent of the population that is American Indian/Alaskan and Hispanic is higher in Block Group 2 of Census Tract 9586. In this Block Group, 2.1 percent of the population is American Indian/Alaskan and 2.3 percent of the population is Hispanic. This Block Group also has the lowest percentage of white residents, with 95.6 percent. Overall, there is very little variation in the racial and ethnic breakdown between the Block Groups, or between the Block Groups and the counties.

Table 3-6: Population by Race

	Total Pop.	White	Black or African American	American Indian/Alaskan	Asian	Hawaiian/Pacific Islander	Some other race	Two or more races	Hispanic*
Counties									
Brookings County	28,220	96.36%	0.31%	0.90%	1.34%	0.04%	0.30%	0.75%	0.88%
Deuel County	4,498	98.51%	0.09%	0.29%	0.18%	0.02%	0.24%	0.67%	0.76%
Lincoln County	6,429	98.82%	0.05%	0.28%	0.20%	0.00%	0.42%	0.23%	0.86%
Block Groups									
CT 9536, BG 3 (Deuel County)*	827	98.43%	0.24%	0.12%	0.24%	0.00%	0.36%	0.60%	0.48%
CT 9586, BG 1 (Brookings County)	1,306	98.62%	0.08%	0.54%	0.00%	0.00%	0.00%	0.77%	1.15%
CT 9586, BG 2 (Brookings County)	614	95.60%	0.00%	2.12%	0.81%	0.00%	0.81%	0.65%	2.28%

Source: US Census Bureau, 2000 Census

*CT (Census Tract), BG (Census Block Group)

3.5.3 Housing Trends

Single-family housing accounts for 58.4 percent of the housing in Brookings County, 84.3 percent of the housing in Deuel County, and 88.3 percent in Lincoln County (LCESO 2009). By comparison, all three census block groups within the proposed Project area have a higher percentage of single-family housing

units as compared to both counties, with Block Group 1 of Census Tract 9586 having the highest at 87.9 percent. Block Group 3 of Census Tract 9536 has the lowest percentage with 86 percent (table 3-7).

In Brookings County, multi-family housing varies in the number of units per structure including structures with 50 or more units. Deuel and Lincoln counties have less variety in housing types than Brookings County, with no residential structures containing more than 10 to 19 units. Mobile homes comprise 11.8 percent of total housing in Brookings County, 6.8 percent of total housing in Deuel County, and 3.2 percent in Lincoln County. The block groups in the proposed Project area vary little in the percentage of mobile homes with 5.2 to 7.4 percent.

Table 3-7: Comparison of Housing Units by Type

	Housing Units	Single Family	Multi-Family (Number of Units in Structure)						Mobile Home
			2	3 or 4	5 to 9	10 to 19	20 to 49	50+	
Counties									
Brookings County	11,576	58.38%	2.51%	3.32%	6.82%	7.50%	8.42%	1.21%	11.80%
Deuel County	2,172	84.25%	0.97%	2.99%	2.99%	1.89%	0.00%	0.00%	6.81%
City/Town									
Astoria	77	76.62%	0.00%	10.39%	6.49%	0.00%	0.00%	0.00%	6.49%
Brandt	57	91.23%	0.00%	7.02%	0.00%	0.00%	0.00%	0.00%	1.75%
Brookings	7,371	47.23%	3.38%	4.40%	9.29%	11.19%	13.08%	1.90%	9.54%
Bushnell	28	75.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	25.00%
Toronto	109	79.82%	1.83%	13.76%	0.00%	0.00%	0.00%	0.00%	4.59%
White	220	80.45%	0.00%	0.00%	10.45%	0.91%	0.00%	0.00%	8.18%
Block Groups									
CT 9536, BG 3 (Deuel County)*	406	85.96%	0.49%	6.65%	1.72%	0.00%	0.00%	0.00%	5.17%
CT 9586, BG 1 (Brookings County)	555	87.93%	0.00%	0.00%	4.32%	0.36%	0.00%	0.00%	7.39%
CT 9586, BG 2 (Brookings County)	246	86.59%	2.85%	1.22%	2.44%	0.00%	0.00%	0.00%	6.91%

Source: US Census Bureau, 2000 Census

*CT (Census Tract), BG (Census Block Group)

Based on 2000 Census data, there is a 58.2 percent homeownership rate in Brookings County, a 80 percent homeownership rate in Deuel County, and an 80.3 percent homeownership rate in Lincoln County. Of the census block groups in the proposed Project area, homeownership rates vary only slightly. The vacancy rate for Brookings County is 7.9 percent, and the vacancy rate for Deuel County is 15.1 percent.

The median year built for residential structures is 1972 in Brookings County and 1952 in Deuel County. By comparison, all of the block groups have an older housing stock when compared to the county they are in. In 2000, the median home value was \$88,500 in Brookings County, \$44,400 in Deuel County, and \$43,700 in Lincoln County. In 2000, the median rent for renter-occupied housing was \$396 in Brookings County, \$303 in Deuel County, and \$326 in Lincoln County. Rents in the census block groups varied; the

lowest was Block Group 3 of Census Tract 9536 with \$296 and the highest, with \$355, was Block Group 1 of Census Tract 9586 (table 3-8).

Table 3-8: Housing Characteristics

	Total Occupied Housing Units	Home-ownership Rate	Vacancy Rate	Median Year Structure Built	Median Value Owner-Occupied**	Median Rent Renter-Occupied**
Counties						
Brookings County	10,665	58.2%	7.9%	1972	\$88,500	\$396
Deuel County	1,843	80.0%	15.1%	1952	\$44,400	\$303
City/Town						
Astoria	73	79.5%	5.2%	1944	\$17,800	\$221
Brandt	43	88.4%	24.6%	1939	\$10,000	\$392
Brookings	6,963	46.2%	5.5%	1974	\$93,900	\$393
Bushnell	27	66.7%	3.6%	1956	\$60,000	\$575
Toronto	93	79.6%	14.7%	1939	\$34,100	\$338
White	205	76.6%	6.8%	1939	\$53,000	\$338
Block Groups						
CT 9536, BG 3 (Deuel County)**	348	84.8%	14.3%	1939	\$26,000	\$296
CT 9586, BG 1 (Brookings County)	479	83.3%	13.7%	1941	\$60,000	\$355
CT 9586, BG 2 (Brookings County)	231	78.4%	6.1%	1968	\$60,600	\$363

Source: US Census Bureau, 2000 Census

*CT (Census Tract), BG (Census Block Group)

**In 2000

3.5.4 Economic Indicators

In 2000, 4.9 percent of the 17,207 Brookings County residents in the civilian labor force were unemployed, and 1.3 percent of the 2,253 Deuel County residents in civilian labor force were unemployed (table 3-9). Lincoln County, Minnesota was similar, with a 2.2 percent unemployment rate.

Table 3-9: Economic Indicators

	Total Population	Civilian Labor Force	Unemployment Rate	Median Household Income, 1999	% Population Below Poverty in 1999
Counties					
Brookings County	28,220	17,207	4.9%	\$35,438	12.6%
Deuel County	4,498	2,253	1.3%	\$31,788	10.3%
City/Town					
Astoria	150	85	0.0%	\$24,375	20.7%
Brandt	113	39	15.4%	\$30,417	15.9%
Brookings	18,504	11,628	6.3%	\$31,266	15.8%
Bushnell	75	43	7.0%	\$45,625	8.0%
Toronto	202	86	1.2%	\$23,750	8.9%
White	530	257	1.2%	\$31,528	6.2%
Block Groups					
CT 9536, BG 3 (Deuel County)**	827	398	2.3%	\$28,889	12.9%
CT 9586, BG 1 (Brookings County)	1,306	662	1.2%	\$36,445	8.1%
CT 9586, BG 2 (Brookings County)	614	377	2.4%	\$43,594	8.5%

Source: US Census Bureau, 2000 Census

*CT (Census Tract), BG (Census Block Group)

The median household income in 1999 was \$35,438 in Brookings County, \$31,788 in Deuel County, and \$31,607 in Lincoln County. Median household incomes in the proposed Project area census block groups ranged from a low of \$28,889 in Block Group 3 of Census Tract 9536 to a high of \$43,594 in Block Group 2 of Census Tract 9586. The 1999 poverty rate for Brookings County was 12.6 percent, the rate for Deuel County was 10.3 percent, and the rate for Lincoln County was 9.7 percent. The proposed Project area census block group with the lowest poverty rate was Block Group 1 of Census Tract 9586, with an 8.1 percent rate. Block Group 3 of Census Tract 9536 had the highest poverty rate, or 12.9 percent.

3.5.5 Employment

In Brookings County, the industries with the highest percentage of employment included educational, health and social services (27.1 percent), followed by manufacturing (20.8 percent), and then retail trade (10 percent). The top three industries for Deuel County were educational, health and social services (21.1 percent), manufacturing (19.7 percent), and agriculture, natural resources, and mining (17.1 percent). The top three industries for Lincoln County were education, health and social services (25.6 percent), agriculture, natural resources and mining (16.7 percent), and manufacturing (12.5 percent).

In all of the census block groups in the proposed Project area, educational, health and social services had the highest percentage of employment. The percent employed in educational, health and social services for these block groups ranged from 20.6 percent in Block Group 3 of Census Tract 9536 to 25.8 percent in Block Group 2 of Census Tract 9586. Manufacturing was in the top three in all census block groups, ranging from 18.5 percent in Block Group 3 of Census Tract 9536 to 21.5 percent in Block Group 2 of Census Tract 9586. Agriculture, natural resources, and mining were also in the top three in all of the census block groups. The percent employed in this sector ranged from 13.9 percent in Block Group 1 of Census Tract 9586 to 18 percent in Block Group 3 of Census Tract 9536 (table 3-10).

3.6 ENVIRONMENTAL JUSTICE

Environmental justice concerns may arise from human health or environmental effects of a project on either minority or low-income populations. The need to identify environmental justice issues is stated in EO 12898, entitled “Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations.” The EO states “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.” A Presidential Memorandum accompanying the EO directed agencies to incorporate environmental justice concerns in their NEPA processes and practices.

Table 3-10: Employment by Industry

Employment by Industry	Counties		City / Town						Block Groups		
	Brookings County	Deuel County	Astoria	Brandt	Brookings	Bushnell	Toronto	White	CT 9536, BG 3 (Deuel County)**	CT 9586, BG 1 (Brookings County)	CT 9586, BG 2 (Brookings County)
Total Employed Civilian Labor Force	16,369	2223	85	33	10900	40	85	254	389	654	368
Agriculture, nat. resource, mining	5.9%	17.14%	5.88%	0.00%	3.85%	0.00%	8.24%	3.94%	18.0%	13.91%	17.7%
Construction	4.0%	6.03%	14.12%	12.12%	3.20%	5.00%	3.53%	6.30%	8.2%	6.27%	6.5%
Manufacturing	20.8%	19.66%	14.12%	24.24%	19.72%	45.00%	34.12%	24.41%	18.5%	21.10%	21.5%
Wholesale trade	1.6%	2.02%	3.53%	3.03%	1.24%	0.00%	0.00%	3.54%	2.8%	2.14%	0.8%
Retail trade	10.0%	8.01%	4.71%	6.06%	11.02%	12.50%	15.29%	10.63%	7.2%	9.63%	4.3%
Transportation and utilities	3.3%	6.21%	9.41%	6.06%	2.46%	7.50%	9.41%	5.91%	5.7%	5.81%	4.1%
Information	2.0%	2.11%	0.00%	0.00%	2.00%	0.00%	2.35%	2.76%	0.8%	1.07%	0.5%
Financial	4.2%	4.00%	10.59%	0.00%	4.09%	0.00%	0.00%	3.15%	6.9%	2.45%	4.1%
Professional and business	4.7%	2.11%	0.00%	6.06%	5.42%	15.00%	0.00%	3.54%	1.0%	4.74%	4.9%
Educ., health and social services	27.1%	21.14%	21.18%	21.21%	28.94%	5.00%	20.00%	27.56%	20.6%	25.08%	25.8%
Leisure, hospitality, food	9.9%	3.42%	3.53%	6.06%	12.12%	5.00%	0.00%	5.12%	1.5%	3.67%	2.2%
Other services	3.5%	4.95%	12.94%	15.15%	2.97%	0.00%	3.53%	1.57%	6.7%	2.75%	3.8%
Public administration	3.0%	3.19%	0.00%	0.00%	2.96%	5.00%	3.53%	1.57%	2.1%	1.38%	3.8%

Source: US Census Bureau, 2000 Census
 *CT (Census Tract), BG (Census Block Group)

(THIS PAGE INTENTIONALLY LEFT BLANK)

Environmental justice issues are identified by determining whether minority or low-income populations in the proposed Project area are meaningfully greater than for Brookings and Deuel counties as a whole. If so, disproportionate effects on these populations will be considered. For the purposes of analyzing the proposed Project, minority populations are identified by comparing the percent minority residents for those census blocks within the vicinity to the percent for Brookings and Deuel counties as a whole. CEQ guidance (CEQ 1997) states that minority populations should be identified when the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population. Census blocks with minority populations that exceed the city level by more than ten percent are considered to be “meaningfully greater” for the purposes of this analysis.

Of the 149 census blocks in the proposed Project area, four census blocks have a minority population that is ten percent or more greater than the county as a whole. These four blocks are in Census Tract 9586 in Brookings County. Twenty-five percent of Census Block 1081 and 20 percent of Census Block 1149 identified themselves as American Indian or Alaskan in 2000. Eleven percent of Census Block 2002 and 21.4 percent of Census Block 1075 identified themselves as Hispanic or Latino. Low-income populations are identified by comparing the percent of the population with incomes below established poverty levels for those census block groups within the proposed Project area to the percent below poverty for Brookings and Deuel counties as a whole. Census block groups with low-income populations that exceed the county level by more than ten percent are considered to be areas of environmental justice concern. None of the block groups in the proposed Project area exceed the county levels by 10 percent or more.

3.7 LAND USE

3.7.1 Comprehensive Plans

The Comprehensive Land Use Plan for Brookings County, adopted July 25, 2000, serves as a general policy guide for directing future land use within the unincorporated portions of the county (BCPC 2000). The plan includes general land development goals as well as a future land use map. The portion of the proposed Project area within Brookings County is classified as an Area of Development Stability on the future land use map. The goal for this land use category is the preservation of agricultural land by preventing the encroachment of urban land uses. The focus of these areas is agricultural, although there may be occasional residences or commercial/industrial (CI) developments.

The Comprehensive Land Use Plan for Deuel County, adopted May 5, 2004, guides the future land development of the unincorporated portions of the county (DCPC 2004a). The plan includes general land development goals and a future land use map. The portion of the proposed Project within Deuel County is primarily classified as an Area of Development Stability on the future land use map. The focus of this land use category is agriculture. The town of Astoria, which lies within the proposed Project area, is classified as an Area of Development Advantage on the future land use map. The goal for this land use category is to encourage growth within or immediately adjacent to municipalities in order to discourage the premature development of agricultural lands.

3.7.2 Zoning

Land use and development in unincorporated Brookings County is regulated by the Brookings County Zoning Regulation (BCPC 2007). The regulations establish four zoning districts, which include Agricultural (A), CI, Lake Park (LP), and Natural Resources (NR). The portion of the proposed Project area that is in Brookings County is primarily zoned Agricultural. The purpose of the district is “to maintain and promote farming and related activities within an environment which is generally free of other land use activities. Residential development will be discouraged to minimize conflicts with farming activities and reduce the demand for expanded public services and facilities” (p. 11.00-1). Within the proposed Project area, there are a few LP and NR zoned districts; they are primarily adjacent to Oak Lake, Lake Hendricks, and Black Slough. The LP district is established to regulate residential development along the lakeshores. The NR district provides protection for sensitive natural environments to preserve natural vegetation and protect wildlife habitat. The zoning regulations also establish two overlay districts, which include the Flood Plain Overlay District and the Aquifer Protection Overlay District. Floodplain and aquifer protection are discussed further in section 3.3.

The Deuel County Zoning Ordinance regulates land use and development in the unincorporated portions of the county (DCPC 2004b). The ordinance establishes five zoning districts and one overlay district, which include A, CI, LP, NR, Town (TD), and Aquifer Protection Overlay (AP). The portion of the proposed Project area that is in Deuel County is primarily zoned Agricultural. Permitted land uses in the A zone generally include agricultural related uses. There is a small area in the northern portion of the proposed Project area zoned CI. The CI District is “intended for commercial and industrial uses which due to their size and nature require highway access.” There is also an area zoned NR near the town of Astoria. The NR District provides protection for sensitive natural resources and wildlife habitat and includes areas such as floodplains, abandoned quarries, wetlands, natural prairies, and historical sites.

3.7.3 Existing Land Use

The majority of land in Brookings County is unincorporated agricultural land. There are nine incorporated municipalities in the county, the largest of which is the City of Brookings with a population of 18,504 (U.S. Census Bureau 2000). The other municipalities (Arlington, Aurora, Bruce, Bushnell, Elkton, Sinai, Volga, and White) are small towns with populations of less than 1,500 (U.S. Census Bureau 2000). Within the unincorporated portions of Brookings County, there is very little development, consisting primarily of scattered farm and non-farm residences and occasional commercial or industrial establishments (BCPC 2000). A number of unoccupied, abandoned home sites also exist in the proposed Project area.

Deuel County also contains primarily unincorporated agricultural land. There are seven incorporated municipalities in the county (Altamont, Astoria, Brandt, Clear Lake, Gary, Goodwin and Toronto), one unincorporated community (Bemis), and one lakefront development (Lake Cochrane). Of the incorporated communities, Clear Lake is the largest, with a population of 1,335 (U.S. Census Bureau, 2000). The other municipalities have populations of less than 250 (U.S. Census Bureau 2000). The unincorporated portions of Deuel County are primarily agricultural land, with scattered farm and non-farm residences and occasional commercial and industrial establishments (DCPC 2004a). There are also approximately 71 construction aggregate mining sites in the county, which include both active and State permitted, non-active sites.

The proposed Project area extends through the townships of Lake Hendricks, Oaklake, Richland and Sherman in Brookings County and Scandinavia Township in Deuel County. Almost all of the proposed Project area is unincorporated agricultural land, except for the town of Astoria, which is located in the northern portion of the proposed Project area. Other land uses within the proposed Project area include scattered rural residences, livestock operations, the White substation, and transmission lines. A portion of Lake Hendricks lies within the proposed Project area, and there is a concentration of residential development along the lakeshore.

Based on NLCD, only 3.5 percent of the proposed Project area is developed (USDA SCA 2009). The majority of the land is cultivated crops (44 percent) and grassland (37.4 percent). The remaining is 8.5 percent pasture, 0.6 percent forest, 3.3 percent wetlands, and 2.7 percent open water.

3.7.4 Agriculture

Based on the 2007 Census of Agriculture, 90 percent (43,666,403 acres) of the total land area in the State of South Dakota is farmland, with an average farm size of 1,401 acres (USDA 2009). South Dakota ranked 17th in the U.S. in total value of agricultural products sold (\$6.6 billion), with crop sales accounting for 51 percent and livestock sales accounting for 49 percent. The top crops in terms of acreage in the State include corn (4,455,368 acres), wheat (3,341,778 acres), hay (3,239,947 acres), and soybeans (3,222,872 acres). Land enrolled in the CRP, including the WRP, Farmable Wetlands Program (FWP) and Conservation Reserve Enhancement Program (CREP), in South Dakota totaled 1,599,477 acres in 2007, or 3.7 percent of farmland in the State.

In Brookings County, 91.2 percent (462,579 acres) of the total land area is farmland (USDA 2009). The average farm size in Brookings County (469 acres) is smaller in comparison to the State. The county ranked sixth of 66 counties in South Dakota for total value of agricultural products sold (\$186,725,000), 47 percent of which was crop sales and 53 percent of which was livestock sales. The top crops in terms of acreage in Brookings County include corn (134,821 acres), soybeans (102,360 acres), hay (33,044 acres), and wheat (14,118 acres). There were 389 farms enrolled in CRP in 2007 in the county, totaling 41,381 acres (8.9 percent of all the farmland in the county).

In Deuel County, farmland accounts for 79.6 percent (317,164 acres) of the total land area in the county (USDA 2009). The average farm size in Deuel County is 544 acres. The county ranked 29th in the State for total value of agricultural products sold (\$105,092,000). Crop sales accounted for 40 percent of this production value, and livestock sales accounted for 60 percent. The top crops in the county include corn (61,521 acres), soybeans (45,391 acres), hay (26,047 acres), and wheat (15,849 acres). In 2007, there were 315 farms enrolled in CRP in Deuel County, totaling 42,586 acres (13.4 percent of all farmland in the county).

The majority of land within the proposed Project area is farmland, and based on USDA-NASS Cropland Data, the top crops in terms of land area include corn (15,470 acres), soybeans (7,704 acres), and wheat (1,103 acres) (USDA SCA 2009). Based on correspondence with the FSA, there are not any sites within the proposed Project area that are enrolled in CRP or that have FSA mortgages. According to the NRCS, there are no easements administered by the agency within the proposed Project area.

There are four types of USFWS administered easements that occur within the proposed Project area, including conservation, grassland, WPA, and wetland. There are three conservation easements within the proposed Project area, totaling 550 acres. There are also three grassland easements (795 acres total), five

WPA easements (885 acres total), and seven wetland easements (709 acres total). None of these easements would be affected by the proposed Project.

3.8 TRANSPORTATION

The region of impact with respect to transportation includes the State and county highway network that would be used to deliver construction equipment, access for employees and deliveries during construction and operation of the proposed Project. White Site 1 is located near the intersection of 207th Street and 484th Avenue, roughly six miles southeast of the City of White. White Site 1 is approximately four miles south of SD 30 and four miles north of US 14. White Site 2 is located close to the intersection of 202nd Street and 482nd Avenue, about four miles east of the City of White and one mile north of SD 30.

Highways 14, 30, and 28 connect to Interstate 29, west of the site alternatives, at exits 132, 140, and 150, respectively. All highways are paved, two-lane roads maintained by the State Department of Transportation (DOT). The posted speed limits of the highways and interstate are 65 and 75 miles per hour (mph), respectively. Traffic volume data (average daily traffic, or ADT) on I-29 to the west ranges from 3,565 to 4,355, ADT values for US 14 range from 4,055 to 4,635, and ADT values for SD 30 range from 555 to 801. On other roads, values are much less and the majority of motor vehicle traffic is limited to local commuters and farm equipment.

A network of gravel or unimproved dirt roads provides access to the interior portions of the proposed Project area (table 3-11). The local roads follow section survey lines and are spaced one mile apart on north-south or east-west orientations.

Table 3-11: Road Network

North - South Roads	
Interstate 29	Concrete
478 Ave, 482 Ave (gravel north of 209 St), 486 Ave	Pave Asphalt
473 Ave, 474 Ave, 475 Ave, 476 Ave, 477 Ave, 479 Ave, 480 Ave, 481 Ave, 483 Ave, 484 Ave, 485 Ave (paved north of SD 30), 487 Ave	Gravel or Crushed Rock
East - West Roads	
US 14	Concrete
SD 28, SD 30	Pave Asphalt
195 St, 196 St, 197 St (paved asphalt from 478-SD/MN Border), 199 St (paved asphalt from 483B Ave - 487 Ave), 200 St (paved asphalt from 478 Ave - 483B Ave), 201 St, (paved asphalt from I-29 to 478 Ave), 202 St, 203 St, 204 St, 205 St, 206 St, 207 St, 208 St, 209 St (paved asphalt from I-29 to 476 Ave), 210 St, 211 St, 212 St, 213 St, 214 St, 216 St	Gravel or Crushed Rock

No regional or municipal airports are in the vicinity of the proposed Project area. The closest airport is in Brookings, approximately 14 miles southwest of White Site 1 and roughly 16 miles from White Site 2.

3.9 VISUAL RESOURCES

The Big Sioux Basin ecoregion has less topographic relief than the Prairie Coteau ecoregion, which has a more rolling, hilly appearance. The Prairie Coteau is also dotted with large and small lakes, which provide scenic diversity. The upper Deer Creek Valley, which cuts into the Prairie Coteau and extends all the way to Lake Hendricks, provides relatively greater topographic relief. Both the Big Sioux Basin and Prairie Coteau are rural, primarily cropland with a few scattered cattle operations. Occasional stands of trees are planted as windbreaks along the edges of fields or around the farmhouses. This flat to gently rolling area is punctuated by occasional farmsteads and barns and other agricultural outbuildings. Two substations, numerous transmission and distribution lines, and wind farms to the east and south now dominate the area. The nearest towns include White and Astoria.

3.10 NOISE

Sound is caused by vibration of air molecules and is measured on a logarithmic scale with units of decibels (dB). Sound is composed of various frequencies. Frequency is measured in Hertz (Hz), which is the number of cycles per second. The typical human ear can hear frequencies ranging from approximately 20 Hz to 20,000 Hz. Typically, the human ear is most sensitive to sounds in the middle frequencies (1,000 to 8,000 Hz) and is less sensitive to sounds in the low and high frequencies. As such, the A-weighting scale was developed to simulate the frequency response of the human ear to sounds at typical environmental levels. The A-weighting scale emphasizes sounds in the middle frequencies and de-emphasizes sounds in the low and high frequencies. Any sound level to which the A-weighting scale has been applied is expressed in A-weighted decibels, (dBA). For reference, the A-weighted sound pressure level and subjective loudness associated with some common noise sources are listed in table 3-12.

Table 3-12: Typical Sound Pressure Levels Associated with Common Noise Sources

Sound Pressure Level (dBA)	Subjective Evaluation	Environment	
		Outdoor	Indoor
140	Deafening	Jet aircraft at 75 ft	
130	Threshold of pain	Jet aircraft during takeoff at a distance of 300 ft	
120	Threshold of feeling	Elevated train	Hard rock band
110		Jet flyover at 1000 ft	Inside propeller plane
100	Very loud	Power mower, motorcycle at 25 ft, auto horn at 10 ft, crowd noise at football game	
90		Propeller plane flyover at 1000 ft, noisy urban street	Full symphony or band, food blender, noisy factory
80	Moderately loud	Diesel truck (40 mph) at 50 ft	Inside auto at high speed, garbage disposal, dishwasher
70	Loud	B-757 cabin during flight	Close conversation, vacuum cleaner, electric typewriter
60	Moderate	Air-conditioner condenser at 15 ft, near highway traffic	General office
50	Quiet		Private office
40		Farm field with light breeze, birdcalls	Soft stereo music in residence
30	Very quiet	Quiet residential neighborhood	Bedroom, average residence (without TV and stereo)
20		Rustling leaves	Quiet theater, whisper
10	Just audible		Human breathing
0	Threshold of hearing		

Source: Adapted from Egan 1988 and Ramsey and Sleeper 1994

It has been found that the A-scale weighting best approximates the frequency response of the human ear. The human ear responds to noises in the audible frequencies in a similar manner in most individuals. Most humans perceive the change in a noise level as follows:

- 3 dBA – Barely perceptible change
- 6 dBA – Readily perceptible change
- 10 dBA – Doubling (or halving) of the apparent loudness

There are also objective factors to consider when determining the noise and how people may be affected by the noise. Noise in the environment is constantly fluctuating, such as when a car drives by, a dog

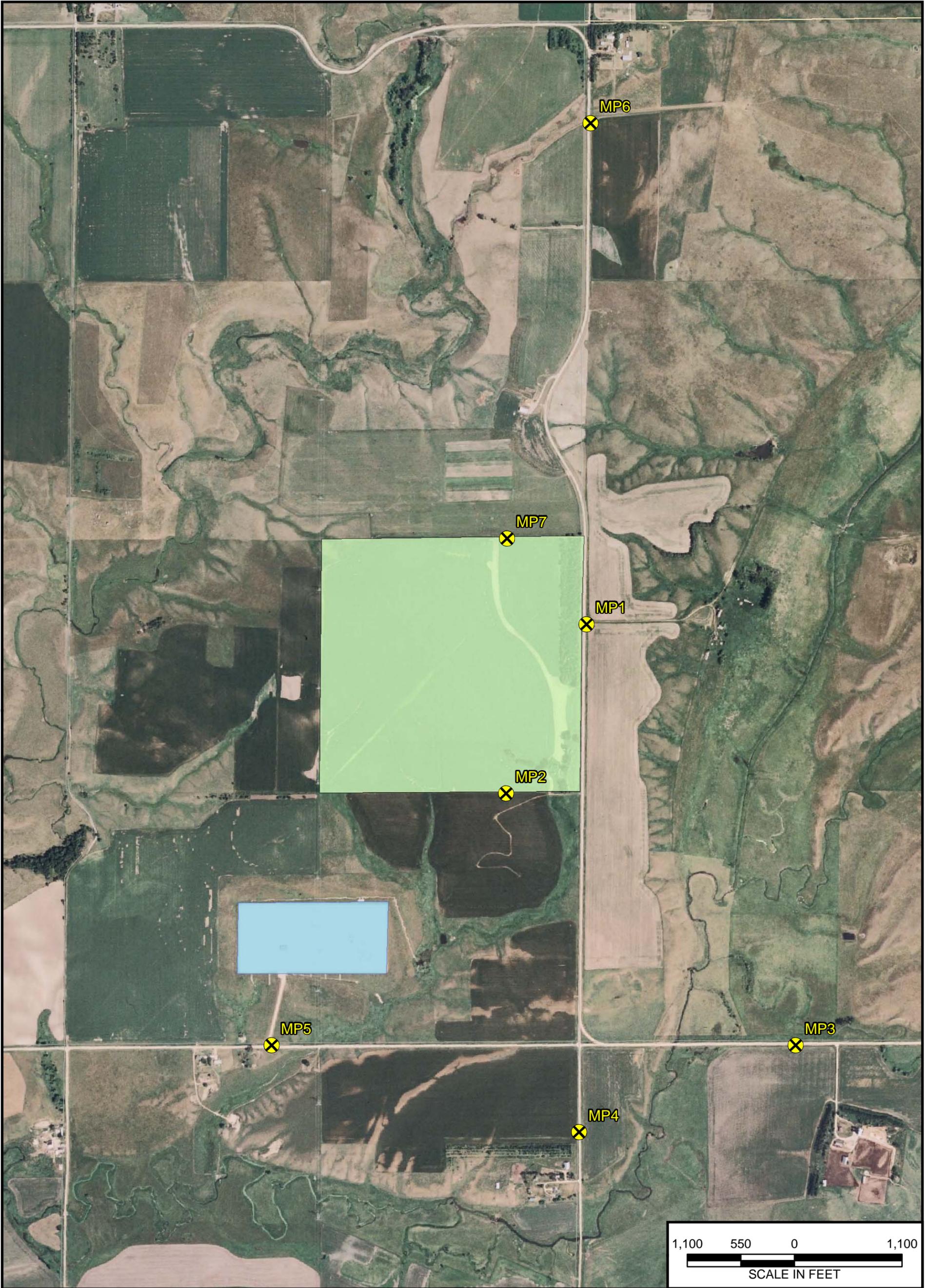
barks, or a plane passes overhead. Therefore, noise metrics have been developed to quantify fluctuating environmental noise levels. These metrics include the exceedance sound level (L_X). The L_X is the sound level exceeded “X” percent of the sampling period and is referred to as a statistical sound level. The most common L_X values are L_{eq} , L_{90} , L_{50} , and L_{10} . L_{eq} is the level of a constant sound over a specific time period that has the same sound energy as the actual sound over the same period. For this noise study, the most logical metric for noise measurements is L_{eq} .

The land in the vicinity of the proposed Project is generally used for agricultural and residential purposes. There are minimal noise sources in the area, with vehicular traffic, farming equipment, wind, and birds being the primary sources of existing sounds in the surrounding area. Accordingly, the background levels vary by time of day.

There are two substations located to the south of the proposed White Site 1 which would contribute to ambient noise levels at residences located close to the substations, primarily to the south of the proposed Project. Additionally, an existing wind farm is located approximately three miles east of the proposed Project and a proposed wind farm may be constructed to the west in the future. Because of the distance of the wind farms to the proposed Project, noise associated with the wind farms is not expected to contribute to ambient noise near the proposed Project.

An ambient noise survey was conducted for the community surrounding White Site 1. Background sound level measurements were taken during several time periods on May 19, 2009, and May 20, 2009, to capture the ambient sound levels near the proposed Project. Strong winds were present during each of the survey periods. High wind speeds generate higher noise levels as winds interact with vegetation and other nearby objects. These strong wind speeds are not uncommon in the proposed Project area. Sound level measurements were made at seven locations (figure 3-4). Each measurement was 5 minutes in duration. Noise measurements were not captured at three measurement points (MP2, MP3, and MP7) during three survey periods due to very high winds that were blowing dust into the microphone and meter. Because wind speeds were high during most measurements, when the wind was not blowing or was low, instantaneous noise levels were also recorded. This was done to determine noise levels during lighter wind conditions. Table 3-13 displays the L_{eq} noise level and minimum noise level that were captured during each measurement. Typical background noise levels for the project area range from 50 to 70 decibels.

\\espsrv\data\projects\Basin\Basin\51236_EIS\GIS\DataFiles\ArcDocs\Revised_Figures_11_19_09\Figure 3-4_11_19_09.mxd Revised: 11/19/2009



- LEGEND**
- White Site 1 Project
 - White Substation
 - X Noise Measurement Point



Figure 3-4
Ambient Noise Measurement Point Locations
Deer Creek Station EIS

Table 3-13: Background Noise Levels

Measurement Point	Time Period	Measured L_{eq} (dBA) ¹	Minimum Measured Noise Level (dBA)	Extraneous Noises
MP1	6PM to 7PM	54	44	wind rustling trees and grass, birds
MP2	6PM to 7PM	--	--	
MP3	6PM to 7PM	--	--	
MP4	6PM to 7PM	57	44	wind rustling trees and grass, birds
MP5	6PM to 7PM	66	52	wind rustling trees and grass, birds, pole hitting fence
MP6	6PM to 7PM	59	43	Paper blowing, grass rustling, gate clanging, birds
MP7	6PM to 7PM	--	--	
MP1	11PM to 1AM	51	43	wind rustling trees and grass, creaking gate, slight insect noise
MP2	11PM to 1AM	55	48	wind rustling trees and grass, faint substations, frogs
MP3	11PM to 1AM	64	52	wind rustling grass
MP4	11PM to 1AM	56	42	wind rustling grass, frogs
MP5	11PM to 1AM	61	49	wind rustling trees and grass, frogs, pipe against gate
MP6	11PM to 1AM	49	39	wind rustling trees, wind howling through power lines
MP7	11PM to 1AM	52	42	wind rustling grass
MP1	6AM to 7AM	53	44	wind rustling trees and grass, gate clanging
MP2	6AM to 7AM	--	--	
MP3	6AM to 7AM	--	--	
MP4	6AM to 7AM	58	46	wind rustling trees and grass, birds
MP5	6AM to 7AM	61	49	wind rustling trees and grass, birds
MP6	6AM to 7AM	54	43	wind rustling trees and grass, birds
MP7	6AM to 7AM	--	--	
MP1	9AM to 11AM	53	47	wind rustling trees and grass, gate clanging, faint substation, faint birds
MP2	9AM to 11AM	--	--	
MP3	9AM to 11AM	--	--	
MP4	9AM to 11AM	65	50	wind rustling trees and grass, faint birds
MP5	9AM to 11AM	70	53	wind rustling grass, birds
MP6	9AM to 11AM	61	45	wind rustling trees and grass, gate clanging, faint birds
MP7	9AM to 11AM	--	--	

¹Some measurements were not possible due to high winds blowing dust into the microphone.

3.11 PUBLIC HEALTH AND SAFETY

Public health and safety within and around both alternative sites depends on potential for hazards and risk. Occupational hazards include risks associated with construction and construction equipment, installation of equipment, heavy equipment transportation, and contact with electric lines. Potential public hazards include increased traffic volume due to construction vehicles in the area, and large construction vehicles and equipment using local roadways designed for lighter traffic.

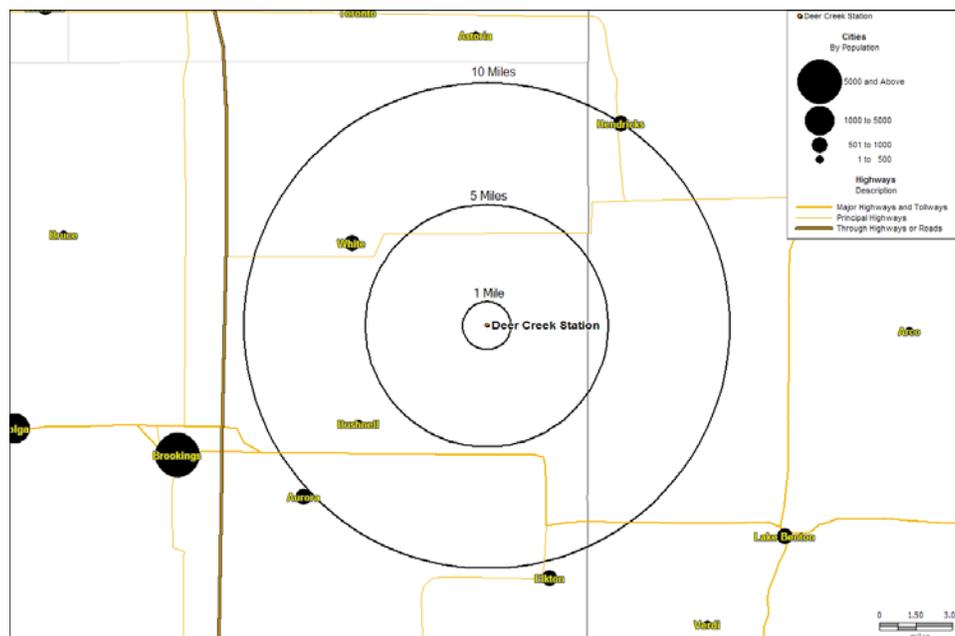
Both proposed Project sites are located in a rural, agricultural area with low population density. Predominant activities are farm-related and include row crop production, livestock production, and haying. Access to private lands is restricted by landowners. Public safety is provided by local law enforcement or emergency response agencies. Fire services within the proposed Project area are provided by the White Volunteer Fire Department in White, South Dakota.

Although farming-related activities may use or produce hazardous materials within the proposed Project area of both sites (i.e. petroleum products used in farm machinery, herbicides/pesticides, and manure from large-scale cattle feeding operations), no specific occurrences or incidents regarding these hazards are known (EDAW 2009a). There is nothing to indicate that there are any existing unusual hazards to the environment within the proposed Project area.

3.12 INTENTIONAL DESTRUCTION

This section describes concentrated communities and resources within close proximity to the proposed Project. Population concentration and local resources are important considerations when evaluating the potential for intentional acts of destruction.

The proposed Project sites are located in eastern Brookings County, South Dakota. Two communities are between 5 and 10 miles from the proposed Project. The town of White has a population of less than 1,000 and the town of Bushnell has a population of less than 500. The towns of Hendricks, Aurora, and Elkton are approximately 10 miles from the proposed Project sites and have populations of less than 1,000. The city of Brookings is located approximately 14 miles from the proposed Project sites and has a population of approximately 20,000 (figure 3-5).

Figure 3-5: Proposed Site Proximity to Population Concentrations

The White Substation provides a connection between local power distribution lines and a Western 345-kV transmission line, which runs north and south. One local distribution line delivers power from the White Substation to the city of Brookings (southwest of the proposed site). Another local distribution line delivers power from the White Substation to communities directly east. The Western 345-kV transmission line provides power to Sioux Falls and surrounding communities, approximately 60 miles south of the proposed site.

The Northern Border Pipeline Co. interstate natural gas pipeline (42-in.) runs south and east and is located just north of Hendricks, MN. At its closest point, this pipeline is greater than 10 miles from the proposed site.

Brookings County relies exclusively on ground water from underground aquifers for safe drinking water and irrigation. In this area, there are shallow aquifers.

3.13 CULTURAL RESOURCES

3.13.1 Cultural History

Culturally the earliest occupation of this area is defined by archaeologists as the Early Prehistoric Period (10,000-3,000 B.C.), followed by the Middle Prehistoric Period (3000 B.C. to A.D. 900) and the Late Prehistoric (A.D. 900-1650) with subdivisions in each period. The period from A.D. 1650 to about 1800

is considered the protohistoric period by archaeologists. The historic period for the area is from A.D. 1800 to 1959.

Many Early Prehistoric sites are bison kill sites. Surface finds have been documented throughout the Region. The Middle Prehistoric Period exhibits a trend toward increased sedentism, intensified horticultural activity, expanding regional exchange networks, and elaboration of ceremonial activities and mortuary practices. Technological changes include the adoption of the bow and arrow and widespread use of ceramic vessels. In all cases, bison hunting remains the most important subsistence practice. Many of the sites appear to be short term seasonal occupations until the later part of the period when more and more groups experimented with plant domestication. The Late Prehistoric Period (A.D. 900-1650) sees major changes in ceramic, subsistence and settlement patterns, and differences in cultural orientations. This period shows influences from the Mississippian and Plains Village cultures. Most of the traditions identified for this period come from excavations along the Missouri River and the salvage work conducted during the 1950s before dams were constructed.

During the historic period, a number of peoples were known to pass through or trade in the area. These include the Cheyenne, Eastern or Santee Sioux (Mdewankanton, Wahpekute, Wahpeton, and Sisseton), the Middle or Wicheyela Sioux (Yankton and Yanktonai), the Western or Teton Sioux (Hunkpapa, Miniconjou, Blackfoot, Two-Kettle, Sansarc, Brule and Oglala), Arikara, Omaha, and Ponca.

Villages of the Omaha and Ponca were reported from the Big Sioux River to the south of the proposed Project. To the east, area residents would have found pipestone at the quarries in southwestern Minnesota and wood poles from the forest for lodge poles and other needs. When the French began trading with the people in the Dakotas it is known that the Teton Sioux would often travel to the James River to trade. The Arikara are Caddoan speakers and were documented as living on the Missouri River near the present day border of Nebraska and South Dakota in earth lodges. They continued to move upriver during the historic period mostly because of outbreaks of smallpox. It is likely they hunted in or passed through the proposed Project area.

Several locations near the proposed Project are associated with Sioux activities. The Oakwood Lakes, 22 miles to the west, were known by a Sioux name for the congregation of large herds of bison. Lake Benton, 16 miles to the east, was a location for collecting acorns. Deer Creek valley, adjacent to the Proposed Project, was known as *He Hdoka Sunkaku*, translated as Hole in the Mountain's Brother. This was a reference to a similarity between Deer Creek valley and one near Lake Benton. These areas were not identified during scoping as having cultural or religious significance to the tribes.

The Euro-Americans first explored the area as early as the 1630s. The early explorers of the Missouri River basin include Bourmont, the Mallet Brothers, and Truteau. The French occupied the territory on a limited basis into the eighteenth century. After the purchase of the area by the United States it was renamed the Louisiana Territory and later became the Missouri Territory after Louisiana became a State in 1812. The first official exploration of the territory was by Lewis and Clark.

Two major fur trading companies, the Hudson Bay Company and the North West Company, competed for trade throughout the territory. By the 1820s, the American Fur Company was coming into prominence in the Dakota Territory and several fortified posts were established along the Missouri River. One such post, Fort au Cedar or Old Fort George, was established along the Missouri River near the proposed Project at the mouth of Medicine Knoll Creek.

The military history of the area is generally associated with conflicts between the U.S. Government and the Native American or Indian population. One of the conflicts was close to the proposed Project. The Sioux Uprising of 1862 claimed the lives of between 450 and 800 whites and between 70 and 100 Sioux. Major battles were fought at New Ulm, Birch Coulee, and Wood Lake. The final battle was the Battle of Wood Lake; this was a decisive victory for the U. S. Army. The U.S. Army, militia, Yankton, and the raiding bands of Sioux, primarily Inkpaduta's band, repeatedly crossed through western Minnesota and eastern South Dakota. All of the Native Americans were eventually placed on reservations.

Much of eastern South Dakota was opened to Euro-American settlement in 1851 with the treaty of Traverse de Sioux. This early settlement was directly influenced by the railroads. The Great Dakota Boom in the 1880s led settlers from Norway, Germany, Russia, and other Midwesterners to establish homesteads in the eastern two-thirds of the Dakotas. Most of these settlers believed the climate was wet and humid due to unusual rains that occurred during this period. Many of these immigrants did not stay when the climate reverted to its normal dry cycle.

The opening of the settlement and establishment of towns in South Dakota is directly linked to railroad construction. Between 1878 and 1889, 285 towns were platted in South Dakota, of which 80 percent were found along rail lines. The remaining 20 percent were referred to as "inland towns" because they were not readily accessible. A section of the Chicago and Northwestern rail line that is close to or in the proposed Project area was constructed during 1879 and 1880 from Tracy, Minnesota to Pierre, South Dakota. Typical towns along the rail line were plotted in a T-shape with the rail line creating the crossbar of the T.

South Dakota is much the same today with the majority of towns and cities near the original rail lines. Agriculture and ranching are the primary subsistence. The outlying areas are sparsely populated but it is possible that early settlements may be found and dugouts and log structures may be found in or near the proposed Project.

3.13.2 Historic Properties in the Proposed Project Area

A historic property is any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the NRHP. An inventory of historic properties, including archaeological sites and historic structures was completed for those areas where construction and operational activities are proposed. Fifty-three total sites are included in the inventory; twelve of the sites have not been evaluated for listing in the NRHP, and five sites were determined eligible for listing in the NRHP. All of the recommended eligible sites are prehistoric in time period. None of the recommended eligible sites are near any potential construction or operational areas. One unevaluated site is located near the gas pipeline route, approximately one mile west of White Site 2. Tribal representatives of the following tribes were contacted by Western during scoping:

- Flandreau Santee Sioux
- Lower Sioux Indian Community of Minnesota
- Prairie Island Indian Community of Minnesota
- Santee Sioux Tribe of Nebraska
- Sisseton-Wahpeton Oyate
- Spirit Lake Tribe
- Upper Sioux Indian Community of Minnesota
- Yankton Sioux Tribe

No sites of cultural or religious significance were identified.

The White Site 1 Natural Gas Pipeline Route, White Site 1, and Water Well Supply Site B were further evaluated for cultural resources in detail. Sites investigated were abandoned farmsteads and prehistoric artifact scatters. None were determined eligible for inclusion in the NRHP. The archaeologists were accompanied by a tribal representative from the Sisseton-Wahpeton Reservation.

3.14 RECREATION

The proposed Project area for both sites consists of rolling prairies, agricultural lands, “prairie pothole” wetlands, lakes, ponds, and streams. There are many outdoor recreational opportunities in the region, with hunting, fishing, boating, and camping being the preferred activities for locals and tourists.

Numerous lakes and streams are found throughout the region. Lake Hendricks and Oak Lake are the largest lakes near to the alternative project sites, but there are other small lakes and ponds scattered throughout. Boating is popular on the larger lakes, and fishing opportunities are available on most lakes and streams. There is one South Dakota State park (Oakwood Lakes, 15 miles west of White), two State recreation areas (Lake Poinsett, 25 miles west of White; and Lake Cochrane, 10 miles north of Astoria), and one state natural area (Mound Springs Prairie, 15 miles north of Astoria) in the general vicinity. The parks and recreation areas offer boating, fishing, camping, and hiking opportunities (SDGFP 2009a). Mound Springs Prairie near Gary contains domed seepage wetlands, known as calcareous seepage fens. It is the largest remaining prairie complex in the Prairie Coteau. A city park with picnicking, swimming, and boating is located on Lake Hendricks. Oak Lake is a field station of South Dakota State University and is also used for recreation.

Hunting is a popular recreational activity in South Dakota, within the area of the proposed Project sites and in surrounding areas. Big game hunting for whitetail deer is popular, as well as upland game-bird hunting and waterfowl hunting. Much of the land within and surrounding the proposed Project areas is privately owned. However, there are Federal and State-managed public recreation areas in and around the proposed Project sites. WPAs are public hunting areas operated by the USFWS and exist to provide waterfowl hunters public access to enhanced waterfowl habitat. Areas within Brookings and Deuel counties are assigned to the Madison Wetland Management District. Game Production Areas (GPAs) are State-owned public hunting areas operated by the SDGFP and are managed for game production and public hunting access (SDGFP 2009b).

In addition to WPAs and GPAs, which are State and Federally owned properties, SDGFP provides Walk-In Areas (WIAs) for public hunting. WIA’s are privately owned parcels of land that are leased by the State to provide public hunting opportunities on WIA-enrolled parcels. Landowners are paid a yearly fee to enroll their property in the WIA program. A majority of land in the WIA program is enrolled in the CRP and provides quality habitat for pheasants, which is a popular quarry for hunters in South Dakota and within the proposed Project area (SDGFP 2009b). There are numerous WIAs in Brookings and Deuel counties, and several WIAs are located near the proposed Project sites.

Other recreational opportunities exist in and around the proposed Project. The City of Brookings, located approximately 14 miles to the southwest, provides many recreational and cultural opportunities such as golfing, theater, museums, shopping, and dining. In addition, there are numerous city parks located in Brookings and in neighboring communities surrounding the proposed Project (Brookings SD 2009).

No designated Wild and Scenic Rivers are located within the proposed Project area. However, the lower Big Sioux River 40 miles downstream is on the Nationwide Rivers Inventory of the National Park Service.

3.15 OTHER ACTIONS WITH POTENTIAL CUMULATIVE EFFECTS

Other actions are taking place in the Big Sioux River Basin and Prairie Coteau that affect the same resources impacted by the proposed Deer Creek Station. The following is a partial list of actions, and the resources potentially affected.

- White Wind Farm, Brookings County, water quality, wildlife
- Wind farm to south of plant, Brookings County, water quality, wildlife
- Yankee Substation to Brookings County Substation 115-kV transmission line project, water quality, wildlife
- Cropland erosion, all counties, Big Sioux and Lac Qui Parle watersheds
- Agricultural nutrients, Big Sioux and Lac Qui Parle watersheds
- Grassland conversion to agriculture, Big Sioux and Lac Qui Parle watersheds
- Sand and gravel mining, Brookings County, water quality in Deer Creek

* * * * *