**FINAL
ENVIRONMENTAL ASSESSMENT**

SUMMIT-WATERTOWN TRANSMISSION LINE PROJECT - South Dakota

**U.S. DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
DOE/EA-0872**

1993

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MASTER

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EXECUTIVE SUMMARY

A. Purpose and Need

The Western Area Power Administration (Western) needs to rebuild the existing Summit-Watertown 115-kV transmission line, located in northeastern South Dakota. This line provides electrical service to northeastern South Dakota, southeastern North Dakota, and western Minnesota. Nearly 60 percent of the existing facility was replaced in 1965 after severe ice-loading broke structures and wires. Because of the extensive loss of the line, surplus poles had to be used to replace the damaged H-frame structures. These were of varying sizes, causing improper structure loading. Additionally, the conductors and overhead shield wires have been spliced in numerous places. This provides additional space on these wires for icing and wind resistance, which in turn create problems for reliability. Finally, a progressive fungal condition has weakened the poles and, along with the improper loading, has created an unsafe condition for maintenance personnel and the general public.

B. Alternatives Including the Proposed Action

The alternatives considered for meeting the above stated need were the following: 1) no action, 2) retire the existing line and build an alternative, 3) build a new 230-kV line energized at 115-kV, and 5) rebuild the existing 115-kV line.

No action. Under this alternative, deteriorated structures and fatigued hardware on the existing 115-kV line between Summit and Watertown would be repaired and/or replaced as necessary. Although the primary advantage of this alternative is that the investment required for rebuilding would be avoided, it has the potential to incur high operating and maintenance costs, as well as threaten the safety of maintenance personnel and the general public.

Retire the existing line and build an alternative. Under this alternative, a new 115-kV transmission line would be built in the nearby area to replace the existing Summit-Watertown line. Voltage and power flow simulations performed as part of a systems study did not show any significant benefits for this alternative.

Build a new 230-kV line energized at 115-kV. This alternative proposes that a new single-circuit 230-kV transmission line be constructed between Summit and Watertown, and initially energized at 115-kV. The lack of demand for a 230-kV line, coupled with higher construction costs associated with the higher voltage, makes this an undesirable alternative.

Rebuild the existing line. A new single-circuit 115-kV transmission line would be constructed in the existing right-of-way (ROW) using wood pole H-frame and single-shaft steel pole structures. This alternative is considered the most viable because it meets all of the project objectives at the lowest cost.

C. Structure Alternatives for the Proposed Action

Heavy ice loading on the Summit-Watertown transmission line stresses existing structures and results in excessive sagging of the line which must be accounted for in the design of the rebuild. Three alternative types of structures were considered in the planning process: 1) wood pole H-frame, 2) single-shaft steel pole, and 3) steel lattice.

Construction of the wood pole H-frame requires less labor and equipment than does the steel pole because of the reduced weight. Wood poles are relatively easy to acquire and can be installed using simple construction techniques. The existing ROW easement would accommodate wood pole H-frame structures. Single-shaft steel pole structures require approximately the same ROW width as wood pole H-frame structures but require much less frequent maintenance and repair than do wood pole H-frames. Construction of lattice steel structures is a lengthy process and more costly because of the special construction techniques involved and the necessity for concrete foundations. To accommodate heavy ice loading conditions while controlling costs, the entire 31 mile of line would be rebuilt using a modified wood pole H-frame tangent structure with steel "Y" single pole dead-end and turning structures.

D. Proposed Action

Western's proposed action is to rebuild the 31-mile Summit-Watertown 115-kV transmission line in the existing right-of-way. To accommodate heavy ice loading conditions, the entire 31 mile of line would be rebuilt using a modified wood pole H-frame tangent structure with steel "Y" single pole dead-end and turning structures.

Construction would begin in January of 1994 and continue through May of 1995, with an in-service date of June 1995. The proposed transmission line would be operated at 115-kV.

E. Affected Environment

1. Human Environment

The existing 31-mile long transmission line is located in Roberts, Grant, and Codington Counties in northeastern South Dakota. One-half mile south of the Summit Substation, the corridor traverses a small parcel of state land. No Indian tribal-trust or tribal-allotted lands are crossed by the transmission line.

Land use features are limited to the existing transmission line, rural residences, several gravel pits, cultivated cropland, pasture lands, and land that is set aside as part of the Conservation Reserve Program (CRP). The project area also includes portions of Interstate Highway 29 and a network of local secondary roads which provide access to individual farmsteads.

The only towns within the vicinity of the project corridor are the towns of Summit to the north and Watertown to the south. Residential development within the transmission line corridor is generally rural and dispersed.

No major public land use or recreational areas are associated with the project corridor. State Wildlife Refuge Areas exist adjacent to, but outside of, the study area corridor. Hunting and fishing are the primary recreational activities in the project area.

Interstate 29 is the major transportation route within the project area, connecting the towns of Summit and Watertown. The existing transmission line parallels Interstate 29 for its entire length and also crosses numerous improved and unimproved section line roads as well as two Burlington Northern rail lines.

Basin Electric's 345-kV transmission line crosses the Summit-Watertown line and parallels it for approximately 3 miles. Buried telephone lines are located throughout the area but are well marked and are usually located parallel to section roads.

Agriculture is the primary land use. Soils that have the least erosion potential are used for cultivated crops such as corn, soy beans, wheat, oats, alfalfa, and barley. Artificial irrigation is not currently employed along the study corridor. Rangeland makes up approximately 32 percent of the project area.

The existing facility crosses predominantly lowland areas. The landscape character has been modified by manmade features such as cultivated fields, roads, highways, and the existing transmission lines. Contours are nearly level to undulating. Existing rural residences, major transportation routes, and public use areas were all considered to be key locations from which the transmission line would be seen within the study area.

Project area population densities are low, averaging 8 persons per square mile (3 persons per square mile in rural sections). In the nearby town of Watertown (and to a very limited extent the town of Summit), available services include agricultural supplies, retail stores, service/repair establishments, and restaurants.

2. Cultural Environment

The literature and records search indicated that no prehistoric or Native American sites have been previously recorded within the project area. The transmission line crosses three railroad corridors, two still in use, that have been assigned Smithsonian site numbers. The intensive pedestrian survey of the transmission line corridor and access roads resulted in the location and documentation of the following resources in addition to the railroads: one historic trash dump site; two historic isolated finds; and four prehistoric isolated finds.

3. Natural Environment

The project area has a typical continental climate characterized by extremes in temperature. Average winter and summer temperatures are 15.8 and 70.4 °F respectively; average annual precipitation near the project site is 21 inches; and average annual snowfall is 36.2 inches. Heavy icing conditions typically occur during the winter months and three to four inches of ice buildup on the conductors and static wires is common for north-south lines.

Air quality is classified as good, and total suspended particulates concentrations (TSP) are well below the annual limits. There are no known sources of carbon monoxide, ozone, or lead.

The project area is located within a portion of the Central Lowlands physiographic province known as the Coteau des Prairies. It is a remnant of Pleistocene glacial deposits along the eastern edge of South Dakota. These till, outwash, and lake glacial deposits overlie a topographic high of Cretaceous sediments and Precambrian granite, and can exceed 500 feet in thickness. The first bedrock formation occurring below the glacial deposits is the Pierre Shale which does not outcrop in the study area. Soil units can be categorized into two major groups: 1) soils formed on glacial till on uplands and terraces, and 2) soils formed in outwash sediment on uplands and terraces. With the exception of sand and gravel deposits, no significant mineral resources are known to be present.

In general, the topography of the Coteau des Prairies is rolling and hummocky owing to the presence of a variety of glacial features. The headwaters of the Big Sioux River are located in the northern part of the Coteau des Prairies, and in the study area itself. Much of the area just east of the study corridor does not have well integrated drainage due to the low transmissive properties of the glacial till, and a low hydraulic gradient. This post-glacial land surface is characterized by low relief and is dotted with numerous shallow, lake-filled depressions. Primary sources of surface water include Lakes Kampeska and Pelican and numerous small lakes, potholes, and sloughs. The uppermost water table aquifer in the project area is a glacial outwash deposit known as the Big Sioux aquifer. Water from this aquifer is rated as suitable for irrigation although it is also used for municipal, industrial, domestic, and stock-watering purposes.

The land along approximately 65 percent of the transmission line is under cultivation and the remainder is in native pasture, wetlands, or riparian vegetation. The pre-settlement vegetation which occurred along the transmission line corridor consisted of mid and tall grasses on the rolling hills and slopes, stream terraces, and bottom lands. Trees, shrubs, grasses, sedges and rushes along creeks and small ponds still remain but have undergone compositional changes due to overgrazing and reseeding. This area is transitional between tallgrass prairie and mixed prairie. Tallgrass prairie remains only in small isolated patches.

Wildlife habitats identified for the study corridor are: 1) agricultural croplands, 2) wetlands and stream courses, 3) pasture, and 4) tree windbreaks.

Six federally listed threatened or endangered species could potentially occur along the study corridor: 1) bald eagle, 2) whooping crane, 3) peregrine falcon, 4) piping plover, 5) American burying beetle, and 6) western prairie fringed orchid.

Wetlands and floodplains in the project area provide flood and erosion control, as well as stability along rivers, streams, and smaller drainages. Of the 31 linear miles of transmission line, only 2.2 linear miles are designated as being within a 100-year floodplain (defined as an area subject to a one percent or greater flood probability in a given year). The project area is notably lacking in large lakes or reservoirs (lacustrine systems), and extensive or large wetlands.

F. Environmental Consequences

1. Impacts to the Human Environment

No significant long-term land use impacts are anticipated and impacts to existing agricultural practices would be reduced by siting structures in rangeland or in areas where agricultural practices already have been modified to accommodate them. Utilization of the existing 115-kV ROW would minimize the need for ROW clearing or provision of access and maintenance roads. Anticipated short-term land use impacts include: 1) temporary loss of cropland in construction staging areas; 2) reduced crop yields in construction areas due to soil compaction; 3) increased potential for introduction of noxious weeds into disturbed areas; and 4) potential conflicts with existing feedlots and rural residences during construction (e.g., dust production, noise, presence of construction equipment). Measures to mitigate these short-term impacts would be implemented through Western's Standard Construction Practices (Appendix B), resulting in minimal land use impacts owing to the proposed action.

Mitigation measures would reduce site-specific visual impacts to some degree. Structures would be placed to allow sensitive features to be avoided or spanned whenever possible. Remaining impacts would be minimal owing to the existing modified landscape character, and previously affected views from within and adjacent to the existing ROW.

Socioeconomic benefits of the project to local residents would include increased reliability of electric service delivery, and decreased costs associated with equipment failures (i.e., water pumps, residential heating, and electrical systems).

Impacts on the local economies of Summit and Watertown are considered positive. Construction workers would likely seek housing in the area, which is readily available in motels and apartments in Watertown. Although these effects are short-term and may last only through the construction period, revenues would be generated through sales of food, gasoline, lodging, retail goods, and entertainment.

Adverse impacts of the project on the economic and social structure of the study area would include impacts to individual landowners (i.e. loss of productivity). Offsetting such impacts would be Western's payments for easements and for damages to crops which may result from the proposed action. Negative economic impacts would be minimal for the proposed rebuild in the existing ROW.

2. Impacts to the Cultural Environment

Construction and maintenance activities associated with the proposed transmission line project would have no impact on significant prehistoric, Native American or historic cultural resources. The two abandoned sections of historic railroad corridors crossed by the transmission line lack integrity, and the existing railroads would not be impacted. The single newly recorded historic resource located within the transmission line corridor is recommended as Not Eligible for the National Register of Historic Places and therefore project activities would be considered to have no impact.

3. Impacts to the Natural Environment

Potential air quality impacts would be short-term, low in magnitude, and no threat to federal air quality standards.

There are no known geologic features that require avoidance by transmission line construction. Construction constraints include: 1) avoidance of steep slopes prone to soil erosion and slumping, and 2) appropriate engineering design for unconsolidated materials (glacial till) to avoid weak structure foundations. The presence of the existing facility demonstrates that the proposed action would result in no significant impact to geologic resources.

No significant long-term impacts to water supply quantity or quality would result from the proposed action. The ground water table in the Big Sioux aquifer would not be affected by construction, although specialized foundation construction may be required in areas where the water table is near the surface. Construction activity may increase the potential for erosion which could affect short-term surface water quality through an increase in sediment load.

Potential soil-related impacts include loss of vegetation resulting in increased runoff and soil erosion and compaction. Because of the gentle relief of the majority of the project area, soil loss potential due to erosion is considered low. Based on existing soil characteristics, revegetation of affected areas has good potential. Western's Standard Construction Practices require mitigation of construction-related impacts to soils. Impacts to soils from the proposed action would not be significant.

Potential impacts to vegetation include removal during tower base construction, damage by equipment or reduction in productivity from dust deposition. The majority of impacts would result during construction activities, and to a lesser extent during maintenance. The vegetation communities most sensitive to disturbance are the wetlands and riparian areas associated with bottomlands, ponds and creeks. Approximately 65 percent of the line is cropland which undergoes repeated plowing, thus impacts to agricultural lands are negligible. Pasture land may receive motor vehicle impacts by traffic along the right of way. Tower base construction in wetlands may result in vegetation removal but revegetation would mitigate this loss.

Potential adverse impacts to vegetation communities would be mitigated or avoided by using existing rights of way for vehicular traffic, existing lay-down areas for construction equipment and Western's Standard Construction Practices. This would result in no significant impacts.

Potential impacts to wildlife resources resulting from the transmission line rebuild are wildlife disturbance, habitat alteration or temporary destruction, and avian collisions.

Wildlife disturbance may occur during the breeding or nesting season. This would mainly impact small song birds and small mammals that nest or breed in open areas like wetland or pasture vegetation.

Habitat alteration would result if tower bases were cleared or enlarged beyond their present dimensions, or if new lay-down areas or service roads were constructed. Restricting construction activities to existing roads and lay-down areas would lessen or eliminate this

potential adverse impact. Although tree windbreaks exist near the transmission line corridor, they would not be disturbed.

Avian collisions with transmission lines occur. The potential for highest collision rates would take place during bird concentration periods (migrations, flock forming) or in bird concentration areas (ponds, waterways, agricultural fields). However, collisions would not exceed those which occur under present transmission line conditions.

Implementation of Western's Standard Construction Practices would reduce potential adverse impacts to wildlife caused by the proposed action. Land disturbance along the existing ROW or at tower base locations would not result in long term biological impacts.

Construction and operation of the proposed transmission line rebuild would not require instream construction or significant wetland/bottomland vegetation disturbance. Therefore, direct impacts to fish and other aquatic life should not occur under Western's Standard Construction Practices.

A search conducted by the Natural Heritage Program revealed that no federal or state special status species have been recorded within the transmission line corridor. It is expected that no impacts to special status species would result from construction during the transmission line rebuild.

Impacts on floodplains and wetlands would be reduced by siting and construction practices designed to avoid conflicts with wetlands and riparian areas. These include placing structures to avoid wetlands, spanning floodplains, and precluding vehicles from wetland and riparian areas. Potential impacts to floodplains or wetlands as a result of the proposed action would be minimal.

G. Electrical Effects

The electrical effects of the proposed project would be those resulting from corona and electric/magnetic fields. Effects of corona include audible noise, visible light, photochemical oxidants, and radio and television interference. However, adverse effects from audible noise, visible light, or photochemical oxidants are not anticipated. Impacts from radio and television interference, if they occur, would be mitigated by Western on a case by case basis.

Field effects from electrical and magnetic fields created by the proposed transmission line include induced currents and voltages. The induced short-circuit to the largest anticipated vehicle under the proposed line would be less than the National Electric Safety Code criterion of 5 milliamperes (mA).

Primary shocks from steady-state current would not be possible from the induced currents because of the relatively low field strengths and grounding practices of Western. Secondary shocks are not likely to occur; when they do, they would represent a nuisance rather than a hazard. Spark discharges from induced voltages could occur on objects inadequately grounded under the proposed line; however, shock of this type would be rare.

Whether long-term direct exposure to electric fields from transmission lines causes biological health effects in humans is controversial. Research results are contradictory and inconclusive. No adverse human health or biologic effects are anticipated from the proposed action.

Adverse electrical effects on agriculture are not anticipated because the electrical fields from the proposed transmission line would be below levels where most effects have been observed on honeybees or on crops.

Magnetically induced currents and voltages from the proposed transmission line would be minimized by grounding practices of Western and available mitigating techniques that would be applied. It is highly unlikely that exposures to magnetic fields from the proposed line would have adverse biological or health effects because of the low levels generated. The proposed line would not be located close to occupied residences.

H. Cumulative and Unavoidable Adverse Impacts

Since the proposed action is a rebuild of an existing line in the same right-of-way, the resulting cumulative impacts are not considered significant. There are no other known projects underway or contemplated in the project area or the immediate vicinity.

No unavoidable or irreversible adverse impacts would be expected as a result of removal of the existing transmission facility and construction, operation, and maintenance of the proposed rebuild of the Summit-Watertown 115-kV transmission line.

I. PURPOSE AND NEED

The Western Area Power Administration (Western) needs to rebuild the existing Summit-Watertown 115-kV transmission line, located in Roberts, Grant, and Coddington counties, South Dakota (Figure I-1). This line provides electrical service to northeastern South Dakota, southeastern North Dakota, and western Minnesota. Nearly 60 percent of the existing facility was replaced in 1965 after severe ice-loading broke structures and wires. Because of the extensive loss of the line, surplus poles had to be used to replace the damaged H-frame structures. These were of varying sizes, causing improper structure loading. Additionally, the conductors and overhead shield wires have been spliced in

FIGURE I-1. PROJECT LOCATION

numerous places. This provides additional space on these wires for icing and wind resistance, which in turn create problems for reliability. Finally, a progressive fungal condition has weakened the poles and, along with the improper loading, has created an unsafe condition for maintenance personnel and the general public.

II. ALTERNATIVES INCLUDING THE PROPOSED ACTION

A. No-Action Alternative

Under this alternative, deteriorated structures and fatigued hardware on the existing 115-kV line between Summit and Watertown would be repaired and/or replaced as necessary. The existing line is 40 years old. Maintenance requirements are extensive and would be more frequent in the future because of the shell-rotted poles.

Although the primary advantage of this alternative is that the initial investment required for rebuilding would be avoided, it has the potential to threaten the safety of maintenance personnel and the general public as well as incur high operating and maintenance costs. The existing poles and cross-arms are in poor condition and will eventually require maintenance with bucket trucks and lifting equipment because pole-climbing will be too hazardous. Pole structure replacement will become more frequent and the transmission line will become more unreliable. Moreover, the weakened structures will be less able to withstand the wind and ice loading conditions of northeastern South Dakota.

Given the presence of hazardous conditions, the probable high operating and maintenance costs, and the inevitability of a future need to reconstruct this line if it is to remain in operation, the no-action alternative is not considered viable.

B. Retire the Summit-Watertown 115-kV line and Build an Alternative 115-kV Transmission Line

Under this alternative, a new 115-kV transmission line would be built in the nearby area to replace the existing Summit-Watertown line. Locations considered for a new 115-kV transmission line were: 1) Summit to Graceville, 2) Summit to Morris, and 3) Summit to Big Stone.

Voltage and power flow simulations performed as part of a systems study to compare the above locations with the existing Summit-Watertown route did not show any significant benefits, would not cause less environmental impact and would result in a significantly larger economic investment. Therefore, this alternative is not justifiable.

C. Build a Summit-Watertown 230-kV line energized at a 115-kV level

This alternative proposes that a new single-circuit 230-kV transmission line be constructed between Summit and Watertown, and initially energized at 115-kV. The existing 115-kV line between the two substations would be removed and either the existing right-of-way (ROW) would be reused with an increased width, or a new ROW would be selected for all or a portion of the line.

Although this alternative meets all project objectives, system studies show that the existing 115-kV voltage level for the Summit-Watertown line meets the anticipated long-term load demand for the project area. The lack of demand for a 230-kV line, coupled with higher construction costs associated with the higher voltage, makes this an undesirable alternative.

D. Rebuild the Summit-Watertown 115-kV line

A new single-circuit 115-kV transmission line would be constructed between Summit and Watertown under this alternative. Overhead static wires would also be installed on the new line for system protection from lightning strikes.

A conductor sizing study for the proposed project was completed by the Division of System Studies in September 1991. Based on a present worth analysis of costs over the expected life of the line and structure considerations for a potential of 5 inches of hoarfrost accumulation, 795 MCM ACSR 30/19 conductor was found to be adequate for rebuilding the line. The results of the study show that the effect of various conductor sizes does not significantly affect costs to service the Summit area loads from now to the year 2000.

The Summit-Watertown 115-kV transmission line would be built with wood pole H-frame and single-shaft steel pole structures within Western's existing 75-foot ROW easement. The new line would be maintained by Western's Huron District Operation & Maintenance (O&M) personnel and operated from the Watertown Power System Operations Office. This alternative is considered the most viable because it meets all of the project needs at the lowest cost.

E. Structure Alternatives for the Proposed Action

Heavy ice loading on the Summit-Watertown transmission line stresses existing structures and results in excessive sagging of the line. The high ice loading which occurs in the project area would be accounted-for in the design of the rebuild. The overhead ground wire and the conductors would be positioned in such a way as to prevent ground wire from sagging on to a lower conductor and possibly faulting the line. Extra deadend structures would be positioned along the length of the line to prevent long sections from being lost in the event of a structure failure.

Based on the above design criteria, three alternative types of structures were considered in the planning process for the Summit-Watertown transmission line rebuild: 1) wood pole H-frame, 2) single-shaft steel pole, and 3) steel lattice.

1. Wood Pole H-Frame

The wood pole H-frame has proven to be a very successful structure type for use at the 115-kV voltage level. This design offers increased span lengths compared to a single wood pole structure, thereby decreasing the number of required structures. Construction of the wood pole H-frame requires less labor and equipment than does the steel pole because of the reduced weight. Wood poles are relatively easy to acquire and can be

installed using simple construction techniques. In emergency situations, wood structures can be modified much easier than steel, therefore minimizing the amount of outage time.

Wood structures have a 100-percent replacement factor over 45 years. Wood pole H-frame structures require a wider ROW than single wood pole structures because of the greater width of the two-pole design and increased horizontal phase spacing. However, the existing Summit-Watertown transmission line uses wood pole H-frame structures with a 75-foot ROW easement which would accommodate wood pole H-frames for the rebuild.

2. Single-Shaft Steel Pole

Single-shaft steel pole structures require approximately the same ROW width as wood pole H-frame structures. These structures require specialized construction techniques utilizing heavy construction equipment with large lift capacities. They may also require field welders and more elaborate construction equipment for emergency repair and maintenance; resulting in longer outages than might be expected with wood structures. Concrete foundations are frequently required. The replacement factor for steel pole structures is about 3 percent in 50 years -- considerably lower than for wood structures.

3. Steel Lattice

Steel lattice structures have the longest allowable span lengths of all structure types considered, but also require the greatest ROW width. Construction of lattice steel structures is a lengthy process and more costly because of the special construction techniques involved and the necessity for concrete foundations. Emergency repairs require special tools and skills, although material is normally easier to obtain than for single-shaft steel pole structures. Steel lattice structures have the same life expectancy as single-shaft steel pole structures.

F. The Proposed Action

Western's proposed action is to rebuild the 31-mile Summit-Watertown 115-kV transmission line in the existing right-of-way. This line terminates at the existing Summit and Watertown substations.

Construction would begin in January of 1994 and continue through May of 1995, with an in-service date of June 1995. The proposed transmission line would be operated at 115-kV.

1. Transmission Line Description

a. Design Characteristics.

(1) Electrical Design. Western designs, constructs, operates and maintains transmission lines to meet or exceed the requirements of the National Electrical Safety Code, U.S. Department of Labor Occupational Safety and Health Standards, and Western's Power System Safety Manual for maximum safety and protection of landowners and their property.

(2) Line Design. The entire line is located in an area of heavy ice loading with the northern two-thirds of the line in an area of especially heavy ice loading conditions. To accommodate these conditions, the entire 31 miles of line would be rebuilt using a modified wood pole H-frame tangent structure with steel "Y" single pole dead-end and turning structures (Figure II-1). Maximum ruling span would be about 700 feet. Spacing between poles for the wood pole would be 17 feet. Generally, structures would be placed in holes augered in the ground and backfilled.

FIGURE II-1. PROPOSED STRUCTURE TYPES

Electrical conductors provide the medium for the flow of electrical energy. The circuit configuration and conductor size are shown on Table II-1. The conductor would consist of strands of reinforced steel cable encased by aluminum strands. The steel cable provides the tensile strength to support the conductor; the aluminum carries the electrical current. The conductors would be supported by structures for the entire length of the line.

Insulators and hardware used on the line would be standard design, provide nearly corona-free operation, and reduce audible noise and radio interference. Three insulator strings would be hung from each structure. Each string would have 7 or 10 individual insulators. Two overhead galvanized steel ground-wires, approximately one-half inch diameter, would be installed at the top of the structures to provide protection to the conductor from direct lightning strikes.

TABLE II-1. PROJECT DESIGN CHARACTERISTICS

DESIGN ELEMENT	CHARACTERISTIC
Line Length (approximate)	31 miles
ROW Width	75 feet
Thermal Capacity	180 MVA
Voltage	115,000 volts (115-kV)
Circuit Configuration	Single circuit per structure Single conductor per phase Horizontal configuration
Conductor size	795 kcmil (1.140")
Conductor type	30/19 Aluminum conductor Steel reinforced (ACSR)
Overhead ground wire	1/2-inch high strength steel
Electric field at edge of ROW	1.7 kV/M
Magnetic field at edge of ROW	0.09 gauss
Electrostatic short-circuit current limit	5 mA
Structure type/spacing	Single-shaft steel poles (17 over 31 miles) Wood pole H-frame (7/mile)
Structure height	Under 60 feet
Span lengths	Maximum span 700 feet
Minimum conductor ground clearance	NESC clearance under 5 inches of hoarfrost on line
Structure base dimensions	2 feet x 19 feet (wood pole) 4 feet diameter (steel pole)
Land temporarily disturbed per site for conductor reel and pole storage yards	2-3 acres
Land required for each structure base	38 sq feet (wood pole) 13 sq feet (steel pole)

b. Construction

(1) Right-of-Way Acquisition. Land rights already exist for the transmission line on the basis of easements obtained by the United States in the late 1940's and early 1950's. Specific easement rights would also be acquired for roads necessary to gain access to the transmission line ROW. The existing 75-foot wide ROW easement for the route, encompasses 282 acres of permanent transmission line easement and 10 acres of new access road easements (which are generally 30 feet wide). All land rights for the new access easements would be acquired in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646) and other applicable laws and regulations governing Federal acquisition of property rights. Landowners would be paid just compensation for rights acquired to their property, and every effort would be made to acquire these rights by direct purchase. All easements acquired would provide

for payment of damages caused by the construction, operation, and maintenance of the line.

(2) Work Force. Construction of the proposed 115-kV transmission line would involve the approximate number of workers and type of equipment listed in Table II-2. Construction activity would occur within the right-of-way and access easements, and would consist of sequential activities performed by a series of small crews working along the length of the line, as shown in Figure II-2.

TABLE II-2. PERSONNEL AND EQUIPMENT TYPICALLY REQUIRED FOR TRANSMISSION LINE CONSTRUCTION

ACTIVITY	PERSONNEL	EQUIPMENT
Tree clearing	3-4 persons	Bucket truck, pickup truck
Gate installation	2-3 persons	1 1/2-ton truck
Material haulout	5 persons	Hydro-crane, 5th wheel tractor w/flatbed trailer
Framing	4-6 persons	Hydro-crane, 1 1/2-ton truck, pickup truck
Auger	4 persons	Two trailers w/auger, two pickup trucks
Erection	6-8 persons	Crane, air compressor, pickup trucks
Stringing	15-25 persons	Reel trailer, tensioner, puller pickup trucks, digger, hi-reach, caterpillar w/winch, winch truck
Cleanup	3 persons	1 1/2-ton truck

(3) Surveying. Initial line-survey work, consisting of survey control, route centerline location, profile surveys, and access surveys, would take place prior to the start of construction. These surveys would be conducted for planning purposes only, and are not considered to be construction activities.

(4) Access Trails. Access to and from nearby public road systems as well as within the transmission line ROW would be required for construction, operation, and maintenance of the proposed transmission line. Whenever possible, access to the ROW would be accomplished by travel on existing trails and roads. Trails are generally ungraded and unsurfaced two-tracks used by landowners, operators, hunters, etc. and are not maintained except by periodic travel. Roads are usually graded, surfaced and maintained. Approximately 10 acres of new access easements may be required for the proposed project.

It is anticipated that line construction would be accomplished through overland travel along the ROW. Therefore, a graded surface access road is not planned unless absolutely necessary. Existing roads would be widened with some cut and fill required. Also, where steep slopes (12 to 15 percent) restrict overland travel,

roads for construction access may be either graded or located outside the transmission line ROW on more gentle terrain.

FIGURE II-2. TYPICAL CONSTRUCTION ACTIVITIES

Trails would be located where possible, at right angles to streams and washes. Culverts would be installed where necessary. In addition, any required road construction would include dust-control measures in sensitive areas. All existing roads would be left in a condition equal to or better than their condition prior to the construction of the transmission line. Gates would be installed whenever fences cross the right-of-way. At the landowner's request, Western would install locks on the gates.

(5) Clearing Right-of-Way. The contractor's first activities would be the installation of gates, construction of access approaches, and clearing of the ROW. Gates to access trails not in use would be closed but not locked unless requested by landowners. Existing transmission line conductors, insulators, and hardware would be removed from the line and poles would then be pulled from the ground and disposed of in accordance with applicable regulations.

Although few trees are encountered within the existing ROW, those encountered would be cleared to the extent required to provide suitable access for construction equipment. To provide access within the limits of the ROW and to permit vehicular travel, some trees may be cut off at the ground surface. Stumps and root systems would remain in the traveled surface unless otherwise designated to be removed by Western. Danger trees would be removed to the extent required to provide 26 feet of vertical clearance under maximum conductor-sag conditions for a width of 28 feet on each side of the centerline.

(6) Structure-Site Clearing. Trees adjacent to any transmission line structure would be removed to permit vehicular access to the structure and/or to minimize the possibility of structure damage due to falling trees. Tree removal generally would not extend beyond a 20-foot radius from any transmission structure member, except for danger trees. Danger trees are trees within the limits of the right-of-way which, upon falling, would come within 10 feet of the conductor or any structure member, including guy wires.

(7) Foundation Installation. In general, wood pole structures would be set directly into augured holes to a depth of 10 percent of the pole's length, plus 2 feet. The holes would be backfilled, and excess excavation material would be spread evenly around or adjacent to the site. Steel structures would be set in holes up to 35 feet in depth and would be backfilled with concrete.

(8) Structure Assembly and Erection. Poles, "X" braces, crossarms, insulators, and hardware would be delivered to the structure sites followed by framing crews to assemble the structures. Auger crews and equipment would be followed by erection equipment and backfill crews. For some portions of the line, special structure settings may require clearing of 40' X 60' level pads in order to allow pole setting by crane.

(9) Conductor Installation. Large reels of conductor and overhead ground-wire would be delivered to pre-selected sites. The conductor pulling, sagging, and clipping operations would take place in rapid succession, as shown in Figure II-3. Tension-stringing methods would be utilized to install the conductors and overhead ground-wires. Steel-pulling cables would be pulled downline and placed in large pulleys hanging from insulator strings attached to structures.

The pulling cables are used to pull the conductor through the structures under tension for the entire length between the pre-selected cable delivery sites. Therefore, the pulling and tension equipment would not be set up at any intermediate locations. Approximately 10,000 to 16,000 feet of conductor would be installed for each pull, and two or three pulls would be completed each week.

(10) Cleanup and Removal. The final phase of construction would involve gate repair as required. All rubbish and waste material would be hauled away and disposed of at approved sites. On completion of construction, all construction areas would be restored as near as possible to their original condition.

(11) Use of Chemicals. The ROW would not be chemically treated unless necessary to comply with the approved weed control program.

FIGURE II-3. BASIC WIRE-HANDLING ACTIVITIES

(12) Safety Program. Western would require the contractor to prepare and conduct a safety program (subject to Western's approval) in compliance with all applicable federal, state, and local safety standards and requirements, and general practices and policies of Western. The safety program would include, but not be limited to, procedures for fire and accident prevention, use of protective equipment, and medical care of injured employees and the public. Western would also establish provisions for taking appropriate actions in the event the contractor fails to comply with the approved safety program.

c. Operation

(1) Operational Characteristics. The transmission line would be operated at 115-kV and would be designed to limit audible noise at the edge of the right-of-way to less than 33 dBA during fair weather and 57 dBA during foul weather. The transmission line-produced electric and magnetic fields and the induced current from a conductive object would be limited by the design.

(2) Operational Procedures. The day-to-day operation of the line is directed by system dispatchers in power control centers. These dispatchers utilize Western's facilities to operate circuit breakers, determine the amount of power required to serve the loads and configure the power system accordingly, schedule the proper amount of generation, and monitor the power system to insure reliable service to the customer. The circuit breakers also operate automatically to further insure safe operation of the transmission line.

(3) Use of the Right-of-Way. Many land use activities are permitted on the transmission line ROW as long as they do not interfere with operation and maintenance of the line. Normal farming activities are permitted if reasonable care is taken to prevent damage to transmission line structures.

d. Maintenance

(1) Scheduled Maintenance. Western's preventive maintenance program for transmission lines includes routine aerial and ground patrols. Aerial patrols are conducted approximately four times per year, particularly after wind, ice, or lightning storms that might damage conductors, insulators, or structures.

Ground patrols are usually conducted once a year to detect equipment needing repair or replacement. Whenever possible, ground patrols and subsequent repair activities are scheduled during times when they are likely to cause a minimum of crop or property damage. Each year, every fifth mile of wood pole line is inspected and hardware and bolts are tightened where necessary. On steel structure lines, every fifth structure is inspected and hardware and bolts are tightened annually. Trees that have grown enough to endanger operation of the line are trimmed or topped.

Herbicides may be used at structures on the transmission line ROW to prevent undesirable weed growth. Herbicides used by Western are those registered with the Environmental Protection Agency in compliance with the Federal Pesticide Control Act of 1972 and other federal pesticide acts. Application of appropriate EPA-approved herbicides or soil sterilants to prevent undesirable plant growth is the primary weed-control measure at Western facilities in South Dakota. Application would be made in accordance with label directions at three-year intervals during the summer months in coordination with the landowner. Vegetation may also be mowed to minimize the fire hazard and to enhance the appearance of the areas around power installations.

(2) Emergency Maintenance. Western's transmission lines are sometimes damaged by storms, floods, or accidents requiring immediate repair. Emergency maintenance would involve prompt movement of repair crews to repair any damage or replace any equipment. If damages result from the repair activities, Western representatives would meet with the owner/operator to arrange for compensation.

e. Abandonment

(1) Dismantling. At the end of the useful life of the proposed project, if the facility were no longer required, the transmission line structures, conductors, insulators, and hardware would be dismantled and removed from the right-of-way.

(2) Future Uses. When and if the line and associated ROW are abandoned at some future date, Western would relinquish its interest in the easement to the owners of the underlying title.

(3) Site Reclamation. Following abandonment and removal of the transmission line from the ROW, areas leveled for equipment required to dismantle the line would be restored as near to their original condition as possible.

2. Estimated Project Costs

The construction cost estimate developed for rebuilding of the Summit-Watertown 115-kV transmission line using a mix of wood pole H-frame and single steel pole structures is \$7,187,000.

3. Tentative Project Schedule

The construction and operation schedule for the proposed action would be:

- EnvironmentalOctober 1991 to September 1993
- Field DataOctober 1991 to July 1992
- Land and Rights April 1992 to September 1994
- Design and Specifications August 1992 to October 1993
- ConstructionJanuary 1994 to May 1995
- In-Service Date..... June 1995

III. THE AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter presents a description of the existing environment and potential impacts on the environment resulting from the construction, operation, maintenance, and abandonment of the proposed transmission line rebuild. The project area is located in northeastern South Dakota (Figure III-1) and includes portions of Roberts, Grant, and Codington counties. The project area is comprised of a 31-mile long, 1000-foot wide study corridor centered on the existing right-of-way for the Summit-Watertown 115-kV line (see the resource maps in Appendix A). For some purposes (e.g., the assessment of visual resource impacts) the project area also includes locations immediately adjacent to the study corridor. The transmission line (referred to herein as the facility, the line, or the transmission line) is oriented in a north-south direction, terminating at the Summit substation in the north and the Watertown substation in the south.

FIGURE III-1. REGIONAL CONTEXT MAP

Impacts to project area resources are addressed in each of their respective sections. An environmental impact is defined as a change in the status of the existing environment as brought about directly or indirectly by the proposed action. Impacts can be positive (beneficial) or negative (adverse) and can be permanent or long lasting (long-term) or temporary or of short duration (short-term). Short-term impacts are generally associated only with the construction phase of the project while long-term impacts remain for the life of the project and beyond. Measures which can be employed to mitigate impacts are discussed under each of the resources. Western's Standard Construction Practices, which are designed to minimize environmental impacts, are provided as Appendix B.

A. Land Use

1. Affected Environment

Information regarding land use within the study area corridor was obtained from USGS topographic maps, county land status maps, and aerial photographs. The above sources included information regarding land jurisdiction, land ownership, and existing and future land use. These data were field verified in September, 1992.

Land use maps are provided as Figures 1a, 1b, and 1c in Appendix A, and depict existing land jurisdiction and land use within the project area.

a. Land Jurisdiction and Ownership. The existing 31-mile long transmission line is located in Roberts, Grant, and Codington Counties. One-half mile south of the Summit Substation, the corridor traverses a small parcel of state land administered by the South Dakota Board of Transportation. Beginning at the Summit substation, the first two miles of the facility is located in Roberts County; the next 10.5 miles in Grant County; and the southern-most 18.5 miles, including the Watertown Substation, in Codington County.

Although the existing line crosses approximately 8 miles of the 1867-established Sisseton Indian Reservation, a U.S. Supreme Court decision in 1975 upheld the termination of the Reservation borders for non-Indian lands. Thus, the reservation currently exists without a defined boundary and the present ownership of the reservation is a mixture of private, and tribal-owned land. No tribal-trust or tribal-allotted lands are presently crossed by the transmission line.

b. Existing and Future Land Use. Land use features are limited to the existing transmission line, rural residences, several gravel pits, cultivated cropland, pasture lands, and land that is set aside as part of the Conservation Reserve Program (CRP). The project area also includes portions of Interstate Highway 29 and a network of local secondary roads which provide access to individual farmsteads.

The only towns within the vicinity of the project corridor are the towns of Summit to the north and Watertown to the south.

Residential development within the transmission line corridor is rural and dispersed (with the exception of a small subdivision comprised of 12 residences located 2 miles north of the Watertown substation). According to USGS topographic maps and aerial photos field checked in September, 1992, over 35 currently occupied farm residences exist within a quarter-mile of the transmission line.

Commercial development is concentrated in the towns of Summit and Watertown, and a small cafe and fuel stop in Roberts County, just off Interstate Highway 29 southeast of the Summit substation.

No major public land use or recreational areas are associated with the project corridor. Over nine State Refuge Areas exist within Roberts, Grant, and Codington Counties, however, all are outside the project area. They include waterfowl, big game, and upland game bird refuges, and are usually associated with lakes. Hunting and fishing are the primary recreational activities in the project area counties.

Interstate 29 is the major transportation route within the project area, connecting the towns of Summit and Watertown. From the Summit substation, the existing transmission line parallels Interstate 29 on the west side for approximately 6 miles, then crosses to the east side of the highway and parallels it for another 25 miles to Watertown. The line also crosses numerous improved and unimproved section line roads.

The existing transmission line crosses two Burlington Northern rail lines -- the northernmost track is approximately one mile south of the Summit Substation, and the southern track is about 11 miles north of the Watertown Substation.

Basin Electric's 345-kV transmission line, crosses the Summit-Watertown line and parallels it for approximately 3 miles in northern Codington County.

Buried telephone lines are located throughout the area but are well marked and are usually located parallel to section roads.

c. Agricultural Land Use. Agriculture is the predominant land use within the project area. The soils that have the least erosion potential are used for cultivated crops. About 65 percent of the land area has historically been used for crops such as corn, soy beans, wheat, oats, alfalfa, and barley. The soils that remain uncultivated are used as rangeland. Rangeland makes up approximately 32 percent of the project area, and is mostly steep, shallow, stony, wet, or for other reasons not well suited for crops.

Areas along the existing facility currently used for crop production and open rangeland are illustrated in Appendix A, Figures 1a through 1c. The majority of the cultivated areas are dry-farmed. Flood-irrigation is not used and artificial irrigation is limited to three sprinkler irrigation devices which were observed in a cultivated field ten miles north of the Watertown Substation, although they did not appear to be in current use during the site visit in September, 1992.

2. Environmental Consequences

In rural, agricultural settings such as the Summit-Watertown project area, land use features that are considered sensitive include rural residences, farm complexes, public recreation areas, cultivated fields, artificially irrigated lands, wildlife areas, and wetlands. The primary land use issue generally expressed by the public and interested agencies in any area such as this, is the potential impact on agricultural practices.

Land use impacts refer to physical or operational effects of the proposed transmission line project on existing and future land use. In the project area, these impacts primarily relate to agricultural practices, since other types of land use are avoided by rebuilding the transmission line within the existing utility ROW. Artificially irrigated lands are not of concern since the area is predominantly dry-farmed.

Agricultural impacts can be both short-term and long-term. Short-term impacts to agriculture include:

- Temporary loss of cropland in construction staging areas.
- Reduced crop yields due to soil compaction.
- Increased potential for introduction of noxious weeds.

Long-term impacts to agriculture include:

- Loss of cropland under and around structures.
- Reduced crop yields owing to introduction of weeds and soil compaction caused by farm equipment maneuvering around structures.
- Location restrictions on future sprinkler systems.
- Modification of farming operations near and around structures.
- Potential damage to equipment such as harvesters from accidents.
- Modification of aircraft applications of pesticides and herbicides.

By using the existing ROW, no additional long-term impacts are anticipated and impacts to existing agricultural practices would be reduced by siting structures in rangeland or in areas where agricultural practices already have been modified to accommodate them. The need for ROW clearing or provision of access and maintenance roads would also be minimized. Anticipated short-term land use impacts include: 1) temporary loss of cropland in construction staging areas; 2) reduced crop yields in construction areas due to soil compaction; 3) increased potential for introduction of noxious weeds into disturbed areas; and 4) potential conflicts with existing feedlots and rural residences during construction (e.g., dust production, noise, presence of construction equipment). Measures to mitigate these short-term impacts would be implemented through Western's Standard Construction Practices (Appendix B).

B. Visual Resources

1. Affected Environment

To evaluate the potential visual impacts associated with the proposed project, data were gathered describing the landscape character (natural and manmade landforms) and project visibility within and adjacent to the study corridor. Visual resource maps supporting this section are provided as Figures 2a, 2b, and 2c in Appendix A.

a. Landscape Character. The landscape character has been modified by manmade features such as cultivated fields, roads, highways, and the existing transmission and distribution lines. Contours are nearly level to undulating. The area includes riparian, wetland, native grassland, and cultivated areas within the Big Sioux River drainage system.

b. Project Visibility. Existing rural residences, major transportation routes, and public use areas were all considered to be key locations from which the transmission line would be seen within the study area. Only a near-foreground view of the line, within 1/4 mile, was considered to impact the visual quality of the landscape. These near-foreground views were mapped and are illustrated in Figures 2a, 2b, and 2c of Appendix A.

Interstate 29 is parallel with and immediately adjacent to the existing ROW throughout the entire 31-mile length of the transmission line. Approximately 6 miles south of the Summit substation, the line crosses the highway and continues to parallel it on the opposite side.

Thirty-five rural residences have near-foreground views of the existing facility. The town of Summit is located within one mile of the ROW, and the town of Watertown is 3 miles from the line.

2. Environmental Consequences

Visual resource impacts are described in terms of public viewing value and sensitivity of the landscape to changes. Examples of these would be: varied structure types, new structure design, and construction of new access trails.

The new structures would be 65 feet in height, and placed in approximately the same location as the existing line. Impacted views would include rural residences, and areas along Interstate 29.

To minimize impacts, structures would be placed to allow sensitive features to be avoided or spanned whenever possible. Remaining impacts would be minimal owing to the existing modified landscape character, and previously affected views from within and adjacent to the existing ROW. Correspondence with local landowners has not identified any concerns with regard to the potential for a decline in visual quality due to the proposed transmission line rebuild.

C. Socioeconomic Resources

1. Affected Resources

The purpose of this section is to identify and describe the potential impacts to socioeconomics within the project area. This assessment identifies locations of major population concentrations and describes their demographic and economic characteristics.

Due to the nature of transmission line projects in general, only certain socioeconomic categories are affected. This description of the baseline socioeconomics in the project area addresses economic and population characteristics in each county including labor force, unemployment rates, and average income.

a. Project Area. The project area is almost entirely within an agricultural setting. As a result, population densities are low, averaging 8 persons per square mile. In rural sections of the townships, population densities are reduced to 3 persons per square mile. With the exception of a small cafe and fuel stop in Roberts County, just off Interstate 29 southeast of the Summit substation, no public services exist within the project area. In the nearby town of Watertown (and to a very limited extent the town of Summit), available services include agricultural supplies, retail stores, service/repair establishments, restaurants, motels, and bars.

b. Roberts County. The portion of the transmission line within Roberts County represents less than 7 percent of the total length of the corridor, and includes the Summit township.

Agriculture is the largest employer in the county, accounting for 37 percent of the employed persons over the age of sixteen. Of the 52 residents and 22 households in the Summit

township, the median and mean income per household is \$12,231 and \$15,397 respectively. The unemployment rate for the county is currently 7.5 percent.

c. Grant County. Thirty-three percent of the transmission line corridor is located in two townships of Grant County - Farmington and Lura. The total population of both townships is 142, including 48 households. The median and mean income per household is \$12,286 and \$13,063 respectively.

As in Roberts County, agriculture is the largest employer in Grant County, and accounts for 41 percent of the employed persons over the age of sixteen. The unemployment rate is 3.7 percent.

d. Codington County. Sixty percent of the transmission line corridor is located in three townships of Codington County -- Germantown, Rauville, and Lake. The statistical information for Lake township is highly influenced by the nearby city of Watertown, which is also the county seat of Codington County. The total population of the three townships is 1,126, including 358 households. The median and mean income per household is \$12,220 and \$15,473 respectively.

Agriculture is the largest employer in Codington County, and accounts for 30 percent of all employed persons over the age of sixteen. The unemployment rate for the county is 5.8 percent.

2. Environmental Consequences

Benefits of the project to local residents would include increased reliability of electric service delivery, and decreased costs associated with equipment failures (i.e., water pumps, residential heating, and electrical systems).

Impacts on the local economies of Summit and Watertown are considered positive. Construction workers would likely seek housing in the area, which is readily available in motels and apartments in Watertown. Although these effects are short-term and would last only through the construction period, revenues would be generated through sales of food, gasoline, lodging, retail goods, and entertainment.

Adverse impacts of the project on the economic and social structure of the study area would include impacts to individual landowners (i.e. loss of productivity). Offsetting such impacts would be Western's payments for easements and for damages to crops which may result from the proposed action. Negative economic impacts would not be significant for the proposed rebuild in the existing ROW.

D. Cultural Resources

Cultural resources were assessed through a literature and records search and by conducting an intensive pedestrian survey of the transmission line corridor and proposed access roads. A separate cultural resources report will be submitted to the State Historic Preservation Officer (SHPO) as part of the consultation required in Section 106 of the National Historic Preservation Act.

1. Prehistoric Resources

a. Affected Environment. The project area is located in the region identified by the State as the Upper Big Sioux Region. To reflect the major accepted temporal/cultural periods in the state, a series of primary contexts and subcontexts have been defined (Winham and Hannus, 1990:7-1). The contexts include: PaleoIndian, Archaic (Early, Middle, and Late), Woodland, Plains Village, and Protohistoric/Historic.

Although recent investigations have suggested that humans may have entered the New World over 30,000 years ago, Clovis and Folsom remains, representing the PaleoIndian period (ca. pre-6000 B.C.), are the earliest conclusive evidence for human occupation in South Dakota (ibid.:11-1). These groups are characterized by the presence of distinctive lanceolate, fluted spearpoints, indicative of the PaleoIndian tradition of hunting late Pleistocene big game animals, such as the mammoth.

The Archaic period, ca. 6000 B.C. to A.D. 500, refers to the post-Pleistocene cultural period when the big game animals became extinct and subsistence strategies changed to broad spectrum foraging, i.e., a more varied pattern of hunting and gathering. As the period continued, the subsistence economy of Archaic peoples appears to have become more diverse and included vegetal food processing, as well as the hunting of game animals. Sites associated with the end of this period have been identified in a variety of environmental locations which reflect the exploitation of a broad range of plant and animal resources.

Woodland cultural influences appeared in the Upper Big Sioux Region ca. A.D. 1 and continued until ca. A.D. 800. Several important developments occurred, including use of the bow and arrow, production and use of pottery and the beginning of horticulture in the region to supplement the hunting and gathering subsistence strategy. This also led to the establishment of at least semi-permanent communities and associated burial mounds. By ca. A.D. 900, eastern Mississippian influences affected the people of eastern South Dakota, and the Plains Village cultures developed (Lass, 1981:8). Increased reliance and importance of horticulture and the development of large, permanent, fortified villages typified this period, which continued through contact with Euro-Americans, ca. 1675 (ibid.).

The literature and records search indicated that no prehistoric sites had been previously recorded within the study area, although resources associated with all prehistoric periods discussed above have been recorded in eastern South Dakota. Four prehistoric isolated finds, (by definition Not Eligible for the National Register of Historic Places [NRHP]), were recorded during the pedestrian survey.

b. Environmental Consequences. Construction and maintenance activities associated with the proposed transmission line project would have no impact on significant prehistoric cultural resources.

2. Historic Resources

a. Affected Environment. Explorations of the region and the fur trade began about 1750 and continued until Dakota Territory was created in 1861. Fur trading posts were established in the early 1800s in northeastern South Dakota along many river valleys, including the Big Sioux (Putz, 1989:12). Euro-American settlement of the area began in the late 1850s, and growth in rural areas greatly increased after the Sisseton Reservation

lands were opened to homesteading in 1892 (ibid.:20). The first railroad to enter Dakota Territory was the Dakota Southern in 1873, and in 1880 the Chicago, Milwaukee and St. Paul Railroad extended to the location of Milbank (Grant County Historical Society 1979:4). The homesteading era, ca. 1858-1893, is basically the beginning of permanent Euro-American settlement in South Dakota, and included significant numbers of European immigrants such as Danes, Dutch, Swedes, Norwegians, Germans, Poles, French and others (Putz, 1989:24-86).

The Protohistoric/Historic period, ca. 1700-1940, was a period of rapid change and upheaval for native populations in South Dakota. During this period, contact and trade with Euro-Americans provided Native Americans access to horses and guns, both of which contributed to substantial changes in lifestyles. Tribes from the north and east, including the Sioux, moved west onto the plains, in response to growing Euro-American populations (Putz, 1989:4). Traditional territories, relationships and lifestyles were contested; conflicts occurred between plains nomadic tribes and sedentary horticultural peoples. Conflicts increased as Euro-Americans expanded into the area, resolving finally with the creation of the Reservation period.

The Recession of 1893 was followed by economic upsurges and downswings, causing many fluctuations in the demographics of the area. After the Recession, advances in technology combined with efforts to rebuild resulted in many changes in settlement patterns; many small towns were abandoned during this time period, while some cities grew in population (ibid.:147). The financial crash of October 1929 ended the prosperity of the 1920s and a decade of economic depression began. The federal government began assistance through the Civilian Conservation Corps and the Works Progress Administration, yet the population of the area continued to decline. Many farms and businesses were abandoned during this period.

The literature and records search indicated that three historic railroad corridors in the study area had been previously assigned Smithsonian site numbers and are considered eligible for the NRHP. One newly recorded historic site, a trash dump, was recorded during the pedestrian survey. This resource is recommended as Not Eligible for the NRHP. Two historic isolated finds, by definition Not Eligible for the NRHP, were also recorded.

The transmission line crosses three railroad corridors, two of which are still in use. All railroads are considered Eligible for the NRHP in South Dakota. The abandoned corridor crossed by the proposed action is identified as the Minneapolis & St. Louis Railroad, 39CD2015. Within the project area, nothing remains of this site; the grade has apparently been removed by agricultural activities and no other associated artifacts or features were observed. The transmission line also crosses the Chicago, Milwaukee, St. Paul & Pacific, 39RO2007, still in use, (now part of the Burlington Northern). At some point, (prior to 1970), a small section of this line, approximately 2 miles long, was relocated 500 to 1000 feet south, to its present location. This abandoned section is shown on the USGS topographic map. The old grade can be seen outside of the project area, but was apparently removed within the current project area. No other associated artifacts or features were observed. No historic artifacts or features were observed at the other Burlington Northern corridor, (formerly the Great Northern, 39CD2013), also still in use.

b. Environmental Consequences. Construction and maintenance activities associated with the proposed action would have no adverse impact on significant historic cultural resources if the construction activities avoid the grade and track of 39CD2013 and

39RO2007. The two abandoned sections of historic railroad corridors crossed by the transmission line lack integrity, and the existing railroads would not be impacted.

3. Native American Resources

a. Affected Environment. Members of all three major groups of the Sioux Nation (Santee, Yankton and Teton) moved into what is now South Dakota about A.D. 1750. The project area was primarily occupied by the Sisseton-Wahpeton branch. By 1800, the northern Sissetons had moved into the old Teton area at the head of the Minnesota and Red Rivers from Lake Traverse to Ottertail Lake. The southern Sissetons settled southwest of the Minnesota River and the Wahpetons were located on both sides of the Minnesota River (Blackthunder et.al., 1972:10).

The first treaty with the Sioux, ceding nine square miles along the St. Croix, Minnesota and Mississippi Rivers, was negotiated by Pike in 1805 (ibid.). By 1858, a reservation including lands from the Yellow Medicine River west, to the south end of Lake Traverse on the north, to an indefinite line east of Fort Ridgely, was formalized. The upper agency, located at the mouth of the Yellowstone Medicine River, served the Sissetons and Wahpetons. By 1862, 175 families of Sisseton and Wahpeton were reportedly raising crops in this area. After the Minnesota Uprising, "The Great Treaty of 1867" was negotiated with the Sisseton and Wahpeton. This treaty designated two reservations including the wedge-shaped Sisseton Reservation in South Dakota. By 1874, there were 1,677 Sisseton-Wahpeton Dakota on the Sisseton Reservation (ibid.:13). According to the BIA Land Status Map, the United States Supreme Court ruled in 1975 that "the Act of March 3, 1891, c. 543, 26 Stat.1035, terminated the Lake Traverse Reservation as to non-Indian lands within the 1867 reservation borders", and the original boundary is therefore no longer formally recognized by the State of South Dakota. This is interpreted to mean that the reservation currently exists only within tribal trust or allotted lands. The project area does not include any tribal trust or allotted lands.

The literature and records search revealed no recorded Native American resources in the study area, and no specific areas of concern were identified by Native Americans contacted prior to the pedestrian survey. No resources identified as Native American were recorded during the pedestrian survey.

b. Environmental Consequences. Construction and maintenance activities associated with the proposed action would have no impact on significant Native American cultural resources.

E. Atmospheric Resources

1. Climate

a. Affected Environment. Because South Dakota is a considerable distance from any large body of water, it has a typical continental climate characterized by extremes in temperature. The daily, monthly, and yearly temperature variability is high; with temperatures lower than -20 °F in the winter and higher than 100 °F in the summer. Average winter and summer temperatures are 15.8 and 70.4 °F respectively.

The average annual precipitation in the town of Brookings, located in the Big Sioux Basin near the project site, is 21 inches; average annual snowfall for the area is 36.2 inches. Monthly precipitation data recorded by the USGS during the years 1978 through 1986 indicate that May, June, and August are the highest precipitation months of the year.

Thirty-year weather information from the South Dakota State Climatological Office indicates that the prevailing wind direction is northwest in the winter, and southeast in the summer. The mean wind speed is approximately 11 miles per hour; the highest observed wind speed was measured at 58 miles per hour in 1973. However, wind speeds may reach 100 miles per hour during intense storms.

Heavy icing conditions typically occur during the winter months. That portion of the line from the Summit substation to approximately 10 miles north of Watertown is most susceptible to icing. Many of the ice storms develop from the east. As a result, three to four inches of ice buildup on the conductors and static wires is common for north-south lines, especially during March, April, November, and December.

b. Environmental Consequences. The presence of the transmission line would have no impact on the climate in the area.

2. Air Quality

a. Affected Environment. According to the South Dakota Department of Environment and Natural Resources, air quality is classified as good, and total suspended particulates concentrations (TSP) are well below the annual limits based on two years of data collection in Watertown (personal communication with Tim Rogers, October, 1992). The State annual limit for TSP in South Dakota is 50 micrograms per cubic meter. Monitoring data from Watertown indicates a geometric mean for the years 1985 and 1986, of 37.2 and 33.9 micrograms per cubic meter respectively. The only known sources of TSP in the area originate from grain elevators, asphalt plants, crushers, and incinerators.

Concentrations of carbon monoxide, ozone, and lead contaminants are thought to be very low.

b. Environmental Consequences. Primary types of impacts on air quality are: increased total suspended particulates from vehicle movement and soil disturbance during construction activities, and emissions of nitrogen oxide, hydrocarbon, carbon monoxide, and sulfur dioxide from construction and maintenance vehicles. These impacts would be short-term, low in magnitude, and no threat to federal air quality standards.

F. Earth Resources

1. Geology

a. Affected Environment. The project area is located in the physiographic province referred to as the Central Lowlands, which extends eastward from the drainage basin of the James River (Figure III-2). The transmission line corridor lies within a portion of these lowlands known since the time of the early French fur traders as the Coteau des Prairies. The Coteau des Prairies is the largest single topographic feature in eastern South Dakota,

FIGURE III-2. PHYSIOGRAPHIC SETTING

occupying the region between the Minnesota River valley and the James River valley. It is a 200-mile-long remnant of Pleistocene glacial deposits along the eastern edge of South Dakota. These glacial deposits overlie a topographic high of Cretaceous sediments and Precambrian granite, and can exceed 500 feet in thickness. The glacial deposition is divided into three types:

1. Glacial Till. A heterogeneous mixture of silt, sand, and rock fragments within a matrix of calcareous clay.
2. Glacial Outwash. Cross-bedded gravel, sand, and silt ranging in thickness from a few feet to 200 feet. The outwash deposits are a major source of ground water in the basin due to their high porosity and permeability.
3. Glacial lake deposits. Fine-grained clay and silt that accumulated in glacial lakes or ponds located in till. These lake deposits are relatively impermeable and range from 4 to 10 feet in thickness.

In general, the topography of the Coteau des Prairies is rolling and hummocky owing to the presence of glacial moraines, stream valleys, and various other geomorphic features including prairie mounds, disintegration ridges, kames, kame terraces, plateaus, and collapsed features. The headwaters of the Big Sioux River are located in the northern part of the Coteau des Prairies, and in the study area itself.

The first bedrock formation encountered below the glacial deposits is the Pierre Shale. There are no outcrops of Pierre Shale in the study area. The Pierre consists of a blue-gray, calcareous shale which locally contains bentonite layers and marly zones. In this locality, the Pierre Formation attains a maximum thickness of nearly 400 feet and rests unconformably on the underlying Niobrara Formation.

A geology map of the study corridor from Summit to Watertown is illustrated in Figures 3a, 3b, and 3c of Appendix A.

b. Environmental Consequences. There are no known geologic features that require total avoidance by transmission line construction. Construction constraints include: 1) avoidance of steep slopes prone to soil erosion and slumping, and 2) appropriate engineering design for unconsolidated materials (glacial till) to avoid weak structure foundations. The presence of the existing facility demonstrates that the proposed action would have no impacts associated with geologic resources.

2. Mineral Resources

a. Affected Environment. Mining in the vicinity of the project area is limited to sand and gravel operations. No other significant mineral resources are known to be present. Sand and gravel is distributed widely over the state, is second only to gold in total value, and is produced in a larger volume than any other of the state's mineral resources. In the vicinity of the project area, sand and gravel are found extensively in glacial outwash deposits in the plains, valley trains, and terrace remnants. Secondary sources include end moraines, kames, kame terraces, eskers, and beaches of glacial lakes.

A field inspection and review of U.S. Geological Survey topographic maps, identified 5 gravel pits present within one-half mile of the transmission line corridor.

b. Environmental Consequences. Rebuilding of the line in the existing ROW would not impact existing mining operations or significantly constrain future access to mineral resources. Potential impacts to mineral resources as a result of the proposed action would be minimal.

3. Hydrology

a. Affected Environment.

(1) Surface Water. In terms of surface water drainage, the state of South Dakota can be divided into the glaciated section east of the Missouri River and the unglaciated section west of the Missouri River. The project area is in the glaciated section east of the Missouri, and is primarily drained by the Big Sioux River and its tributaries (Figure III-3). Much of the area just east of the study corridor does not have well integrated drainage due to the low transmissive properties of the glacial till, and a low hydraulic gradient. This post-glacial land surface is characterized by low relief and is dotted with numerous shallow, lake-filled depressions.

Primary sources of surface water include Lakes Kampeska and Pelican and numerous small lakes, potholes, and sloughs. Lakes Kampeska and Pelican are in hydraulic connection with a major aquifer in the area known as the Big Sioux aquifer, discussed below.

(2) Ground Water. Aquifers in the area consist of unconsolidated sand and gravel deposited by meltwaters from receding glaciers. Drilling has shown that the aquifers are overlain and underlain by till composed of grayish-blue clay with minor amounts of sand and silt. Low conductivities (approximately 10^{-5} ft/day) have been measured for the till (South Dakota State Geological Survey 1971).

Four major aquifers were delineated in the area immediately underlying the transmission line corridor:

- Big Sioux aquifer. The uppermost water table aquifer in the project area is a glacial outwash deposit known as the Big Sioux aquifer. This aquifer is approximately 10 feet below land surface, occurring in the flood plain of the Big Sioux River and its tributaries. It is composed of poorly to well-sorted medium sand to medium gravel outwash. Ground water flow direction is generally to the south and towards the Big Sioux River with a flow gradient of 6 to 10 feet per mile. The water is primarily used for irrigation, domestic, municipal, and stock watering wells.
- Prairie Coteau and Lonesome Lake aquifers. These aquifers occur at spatially varied locations underlying the project area at depths of approximately 380 feet. They are separated from the overlying Big Sioux aquifer by a silty, sandy till. Recharge is predominantly by leakage through the till. Both aquifers flow under artesian conditions throughout the area.
- Altamont aquifer. The Altamont aquifer is comprised of well rounded, medium to coarse grained sand. It is present at an average depth of 460 feet below land surface, with an average thickness of 40 feet. The direction of ground water movement is to the southwest at a gradient of about 5 feet per mile.

(3) Water Quality. Predominant chemical constituents in water from the uppermost Big Sioux aquifer are calcium and bicarbonate. Dissolved-solids concentrations average 580 milligrams per liter (mg/l). Hardness concentrations average 400 mg/l. Water from this aquifer is rated as suitable for irrigation although it is also used for municipal, industrial, domestic, and stock-watering purposes (Hansen 1990).

Analyses of 21 ground water samples taken from wells near the town of Watertown, indicated sodium concentrations ranging from 0 to 55 mg/l, with an average of 8 mg/l. Watertown's primary source of water is Lake Kampeska. Supplementary water is obtained from 8 shallow wells. With the exception of iron and manganese, nearly all the water analyzed for the city of Watertown meets the South Dakota Department of Health drinking water standards (South Dakota State Geological Survey 1964(a)).

b. Environmental Consequences. No significant long-term impacts to water supply quantity or quality would result from the proposed action. The ground water table in the Big Sioux aquifer would not be affected by construction, although specialized foundation construction may be required in areas where the water table is near the surface. Construction activity may increase the potential for erosion which could affect short-term surface water quality through an increase in sediment load. South Dakota's Best Management Practices (BMP) Guide would be incorporated into the planning, design, and

construction of the proposed action. Any required permits would be obtained prior to construction.

Valley bottoms and areas of internal drainage in western Codington County are flooded almost every year because of snowmelt and rainfall runoff (Hansen 1990). However, flooding potential in the study corridor would be considerably lower due to the more integrated drainage of the Big Sioux River and its tributaries.

4. Seismicity

a. Affected Environment. Regionally, the distribution of earthquakes is shown in Figure III-3. The seismic risk map for the United States classifies the project area as a Zone 1 region. A Zone 1 region is defined as "... an area of minor damage; distant

FIGURE III-3. EARTHQUAKE DISTRIBUTION

earthquakes may cause damage to structures corresponding to V and VI on the Modified Mercalli Intensity Scale".

b. Environmental Consequences. Western's standard design and construction practices combined with the low seismic activity of the project area indicates minimal seismic risk to the proposed transmission line rebuild.

5. Paleontological Resources

a. Affected Environment. The only geologic unit in the project area that contains known unique fossil types is the Pierre Shale. Because the Pierre Shale does not outcrop in the project area and can be up to 500 feet deep locally, the potential for transmission line construction to encounter paleontological resources is negligible. The surficial strata in

the study corridor are Pleistocene glacial sedimentary deposits. These types of deposits do not characteristically contain large numbers of fossils.

b. Environmental Consequences. Because there is little outcropping of fossil bearing strata, the potential for impacts to paleontological resources is minimal.

6. Soils

a. Affected Environment. Soils information was obtained from published soil surveys for Roberts, Grant, and Codington Counties (U.S. Soil Conservation Service 1977, 1979, and 1966). The soil units mapped along the study corridor were categorized into two major groups based on their topographic position and major constituents. A general description of each of the groups can be found on Figures 4a, 4b, and 4c of Appendix A.

(1) Soils Formed in Glacial Till on Uplands and Terraces. Vienna and Lismore soils are predominant in these locations. They are formed of silty material classified as silty loams, and occur on glacial till plains. Slopes are nearly level (0 to 2 percent) to moderately sloping in areas next to drainageways. They have a fine to coarse texture and a moderate infiltration rate, and are usually well drained.

(2) Soils Formed in Outwash Sediment on Uplands and Terraces. These soils are predominantly composed of Renshaw, Fordville, and Divide soils. They are formed on outwash plains and glacial moraines. Slopes are nearly level to gently undulating and sloping, but steeper on the sides of drainageways and moraines. They are classified as having a moderate infiltration rate when thoroughly wet.

b. Environmental Consequences. Potential soil-related impacts include loss of vegetation resulting in increased runoff and soil erosion and compaction. Because of the gentle relief of the majority of the project area, soil loss potential due to erosion is considered low. Based on existing soil characteristics, revegetation of affected areas has good potential. Western's Standard Construction Practices (Appendix B) require mitigation of construction-related impacts to soils. Impacts to soils from the proposed action would be minimal.

G. Biological Resources

1. Affected Environment

A biological survey of the project area was conducted in June and September, 1992 and included a drive along the entire length of the transmission line with frequent stops to investigate the corridor for biological resources. Additionally, published and unpublished literature was gathered, and contacts made with state and federal agency personnel.

Vegetation data were obtained from existing sources, including the South Dakota Game, Fish and Parks Department, the Natural Heritage Program and the Soil Conservation Service. Data on the occurrence and use by wildlife of the area was also obtained from the South Dakota Game, Fish and Parks Department, the Natural Heritage Program and from published information.

To assist in the identification of vegetation types and associated wildlife habitat, black and white aerial photographs were photo interpreted. The identified vegetation types were delineated and transferred to base maps made from 7.5 minute topographic sheets.

a. Vegetation. Approximately 65 percent of the transmission line ROW is under cultivation at the present time, and the remainder is in native pasture, wetlands or streamside and pond vegetation. However, the pre-settlement vegetation which occurred along the transmission line corridor consisted of mid and tall grasses on the rolling hills and slopes, stream terraces, and bottom lands. Trees, shrubs, grasses, sedges and rushes along creeks and small ponds still remain but have undergone compositional changes due to overgrazing and reseeding. This area is transitional between what was tallgrass prairie and mixed prairie, since tallgrass prairie remains only in small isolated patches.

On the nearly level to rolling terrain which is under cultivation, the vegetation consists of cultivated species such as corn, soy bean, alfalfa, small grains, etc.

Timothy, Kentucky bluegrass, orchard grass and a variety of forbs such as panicked aster, flowering spurge, white sweet clover, sunflower, and coneflower occur along road sides and cultivated fields.

During the 1930's a tree windbreak program was instituted for protecting farmsteads and soils from erosion. Most of the trees along the transmission line corridor occur in these windbreaks. Some species have been planted while others have established themselves within the windbreaks. The common species are American elm, green ash, hackberry, Caragana, chokecherry, boxelder, American plum and Russian olive.

On the steeper slopes, and soils of stream terraces, terrace escarpments and gravelly ridgetops, areas now in native pasture and heavily grazed are represented by needle-and-thread grass, western wheatgrass, hairy grama and blue grama. Typical weedy species are mullein, curly dock, ragweed, Kochia, common milkweed, some sedges, thistles and cacti.

The bottomlands along streams are sometimes poorly drained and water stands on the surface during parts of the growing season. Characteristic species include Kentucky bluegrass, saltgrass, western wheatgrass, rushes and smaller sedges. Many areas have been reseeded to reed canary grass. The ponds support cattail and Potamogeton. Common forbs include common milkweed, asters, thistles and chenopods, and an occasional scrubby wild rose or rabbitbrush. Shrub and trees species include pussy willow, black willow and eastern cottonwood. Hawthorn is less common along these water courses, but occur in isolated locations along with Russian olive.

b. Wildlife. A field reconnaissance was conducted along the transmission line corridor to identify and observe habitat conditions available for wildlife and introduced sport species. During this reconnaissance any chance wildlife observations were noted. Wildlife habitats identified for the transmission line corridor are discussed below.

(1) Agricultural/croplands - This habitat exists along approximately 65 percent of the transmission line corridor. Vegetation varies with seasonal crop production but is primarily represented by corn, soybean and small grain crops. Common upland game species and a variety of song birds use this habitat and it edges.

(2) Wetlands/Wetland Ponds/Stream Courses - This habitat exists along approximately 3 percent of the corridor and provides nesting and feeding for some species of waterfowl. Greater concentrations of waterfowl are to the west in prairie pothole country. However, species expected in this area include teal, mallard, pintail, gadwall and shoveler. Streams and ponds along the transmission line corridor support reptiles, amphibians and fish.

(3) Pasture - This habitat exists for approximately 32 percent of the transmission line. Weedy species and increasers are more abundant in this habitat than in the others. Most of the pastures are heavily grazed. This habitat supports small burrowing mammals and songbirds.

(4) Tree Windbreaks - Fifteen windbreaks occur within the transmission line corridor and along its edge in some places. These windbreaks are composed of tree, shrub and understory forbs and grasses that form a dense growth of vegetation and support a variety of small game and wildlife species.

c. Endangered and Threatened Species. Federal and State listed species and species of concern that could occur along the transmission line corridor are presented in Table III-1. A brief description of their distribution and expected occurrence is given below.

The bald eagle and peregrine falcon may occur as either spring or fall migrants, or in the case of the bald eagle, as a winter resident. Generally, winter resident bald eagles occur around large bodies of water or along rivers. This habitat is not available along the corridor. In 1992 three mating pairs of bald eagles attempted to nest in South Dakota, one pair at the Sand Lake National Wildlife Refuge in Brown County, and the others at the Karl Mundt National Wildlife Refuge in Gregory County. The peregrine falcon nested historically in Pennington and Harding Counties in South Dakota. None have nested in the state since 1960. No known occurrences of the bald eagle or peregrine falcon are known within one mile of the transmission line corridor (Natural Heritage Database 1993).

The whooping crane may occur as either a spring or winter migrant traveling with large flocks of sandhill cranes along the Missouri River drainage. However, sightings have been reported in Codington County. This species will use large meadows and wetlands with standing water as feeding and resting places along its migration route. They also use transmission line corridor exists along the pothole region to the west and south of the corridor. No whooping crane occurrences have been recorded within one mile of the corridor (Natural Heritage Database 1993).

The American burying beetle is thought to require virgin or primary forest as its preferred habitat. However, suitable habitat may also include agricultural fields, including pastures, mowed fields and second growth woods, or any soils with significant accumulation of humus or topsoil. No beetle occurrences have been recorded within one mile of the corridor (Natural Heritage Database 1993).

Historically, the western prairie fringed orchid occurred in wet meadows of the Big Sioux River Valley, and a collection is recorded for Brandon, Minnehaha County, in South Dakota. Its habitat is tallgrass calcareous silt loam prairie or sub-irrigated sand prairie. This habitat may occur along approximately 2 percent of the line. However, no occurrences of the western prairie fringed orchid have been recorded within one mile of the corridor (Natural Heritage Database 1993).

TABLE III-1. POTENTIAL THREATENED, ENDANGERED, AND STATE SPECIES OF CONCERN

SPECIES	STATUS
Bald Eagle (<i>Haliaeetus leucocephalus</i>)	LE/SE
Whooping Crane (<i>Grus americana</i>)	LE/SE
Peregrine Falcon (<i>Falco peregrinus</i>)	LE/SE
Piping Plover (<i>Charadrius melodus</i>)	LT/ST
American Burying Beetle (<i>Nicrophorus americanus</i>)	LE
Western Prairie Fringed Orchid (<i>Platanthera praeclara</i>)	LT
Ferruginous Hawk (<i>Buteo regalis</i>)	C2
Swainson's Hawk (<i>Buteo swainsoni</i>)	C3
Regal Fritillary (<i>Speyeria idalia</i>)	C2
Brook Stickleback (<i>Culaea inconstans</i>)	SSC
Powesheik Skipper (<i>Oarisma powesheik</i>)	SSC
Lake Sedge (<i>Carex lacustris</i>)	SSC

LE = Listed Endangered, US Fish & Wildlife Service

LT = Listed Threatened, US Fish & Wildlife Service

C2 = Candidate Category 2 Species, US Fish & Wildlife Service

C3 = Candidate Category 3 Species, US Fish & Wildlife Service

SE = Listed Endangered, State of South Dakota

ST = Listed Threatened, State of South Dakota

SSC= State Species of Concern, South Dakota

Non-listed federal and state species of concern include the ferruginous hawk (*Buteo regalis*) and regal fritillary (butterfly), both Federal Candidate Category 2 species; Swainson's hawk (*Buteo swainsoni*), a federal Candidate Category 3 species; and the brook stickleback (*Culaea inconstans*), powesheik skipper (*Speyeria idalia*) and lake sedge (*Carex lacustris*), South Dakota state species of concern. These species have not been recorded within one mile of the corridor (Natural Heritage Database 1993).

2. Environmental consequences

a. Vegetation. Potential impacts to vegetation include removal during tower base construction, damage by equipment or reduction in productivity from dust deposition. The majority of impacts would result during construction activities, and to a lesser extent during maintenance. The vegetation communities most sensitive to disturbance are the wetlands and riparian areas associated with bottomlands, ponds and creeks. Approximately 65 percent of the ROW is cropland. Pasture land may receive motor vehicle impacts by traffic along the right of way.

Potential adverse impacts to vegetation communities would be mitigated or avoided by using existing rights of way for vehicular traffic, existing lay-down areas for construction equipment and Western's Standard Construction Practices.

b. Wildlife. Potential impacts to wildlife resources resulting from the transmission line rebuild are wildlife disturbance, habitat alteration and avian collisions.

Wildlife disturbance may occur during the breeding or nesting season. This would mainly impact wildlife species that nest or breed in open areas like wetlands or pastures. Restricting construction activities to existing lay-down areas and rights of way would lessen any potential impacts to this wildlife group.

Potential habitat alteration would result if tower bases were cleared or enlarged beyond their present dimensions, or if new lay-down areas or service roads were constructed. Restricting construction activities to existing roads and lay-down areas would lessen or eliminate this potential adverse impact. Although tree windbreaks exist near the transmission line corridor, no adverse impacts are expected since this habitat would not be disturbed.

Avian collisions with transmission lines occur. The potential for highest collision rates would take place during bird concentration periods (migrations, flock forming) or in bird concentration areas (ponds, waterways, agricultural fields). Those species most susceptible to collisions in the project area are waterfowl and low fast flying song birds. However, collisions are not expected to exceed those which occur under present transmission line conditions.

Implementation of Western's Standard Construction Practices would reduce potential adverse impacts to wildlife caused by the proposed action. Additionally, portions of the new line would be marked with bird flight diverters to minimize the potential for collisions. The location of the markings will be coordinated with the South Dakota Game Fish and Parks and the U.S. Fish and Wildlife Service. The disturbance of pasture, wetland or cropland along existing rights of way or tower base locations would not result in long term biological impacts.

c. Fish. Construction and operation of the proposed transmission line rebuild would not require instream construction or wetland/bottomland vegetation disturbance. Therefore, impacts to fish and other aquatic life should not occur.

d. Threatened and Endangered Species. A search conducted by the Natural Heritage Program revealed that no federal or state special status species have been recorded within the transmission line corridor. It is expected that impacts to special status species would not result from construction during the transmission line rebuild.

H. Floodplains and Wetlands

1. Affected Environment

Executive Orders 11988 and 11990 mandate that Federal agencies provide for the protection and management of floodplains and wetlands. Potential effects of proposed actions must be evaluated in the context of preserving the natural and beneficial values of floodplains and wetlands, reducing flood loss, and minimizing the loss of wetlands. In implementing these Executive Orders, the agencies require identification of the floodplains and wetland types.

For purposes of this study, floodplains are defined as the lowland and flat areas adjoining drainages, including at a minimum, areas subject to a one percent or greater probability flood (100-year flood) in any given year. The Federal Emergency Management Agency has mapped floodplains for approximately 77 percent of the project area (approximately 24 miles of the existing line). The unmapped areas are the northern 7 miles of the existing line which lie within the former boundary of the Sisseton Indian Reservation. The existing line crosses approximately 2 miles of mapped floodplains and an estimated .2 miles of floodplains in the unmapped area for a total of 2.2 miles (see Figures 3a, 3b, and 3c in Appendix A).

Wetlands are defined as those areas that are inundated by surface or ground water with a frequency sufficient to support vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. The predominant wetland systems occurring within the area are riverine (as defined by Cowardin, et al., 1979). A few small palustrine wetlands are also present (see Figures 5a, 5b, and 5c in Appendix A). Riverine systems include all the wetlands and shallow water habitats contained within the river channels while palustrine systems are comprised of wetlands along the floodplains as well as ponds, depressions, marshes, and seepage zones outside of the river channels. Types of wetlands resulting from human activities are ponds for livestock and the seepage areas below ponds, irrigation canals, and collection ditches.

Wetlands and floodplains in the project area provide flood and erosion control, as well as stability along rivers, streams, and smaller drainages. Recreational and aesthetic uses of wetlands are important public resources. Wetlands and floodplains are also important as habitat for wildlife. The project area is notably lacking in large lakes or reservoirs (lacustrine systems) and extensive or large wetlands.

2. Environmental Consequences

Impacts on floodplains and wetlands are related to physical disturbance from structure and access construction, and maintenance of the line. Removal of vegetation or changes in drainages which affect the water regime would be direct impacts. Indirect impacts could be caused by erosion or siltation as a consequence of improper construction practices. The consequences of these impacts would be reduction in plant productivity and use of the habitat by wildlife species. However, wetlands in the study area are limited in extent and have been impacted by agriculture.

Impacts would be reduced by siting and construction practices designed to avoid conflicts with wetlands and riparian areas. These include placing structures to avoid wetlands, spanning floodplains, and precluding vehicles from wetland and riparian areas. Potential impacts to floodplains or wetlands as a result of the proposed action would be minimal.

I. Electrical Effects

1. Safety

The greatest hazard from a transmission line is direct electrical contact with the conductors. Therefore, extreme caution must be exercised when operating vehicles and equipment in proximity to the line for any purpose, including recreation.

In a high electric field, it is theoretically possible for a spark discharge from the induced voltage on a large vehicle to ignite gasoline vapor during refueling. However, the probability for exactly the right conditions to occur is extremely remote. For the proposed line, the maximum electric field is low enough that it is very doubtful the right conditions could ever be achieved.

Because of the hazards associated with fires, Western prohibits storage of flammables, construction of flammable structures, and other activities that have the potential to cause or provide fuel for fires on rights-of-way.

Transmission line structures, wires, and other tall objects are the most likely points to be hit by lightning during a thunderstorm. Therefore, the area near structures and other tall objects should be avoided during thunderstorms. The proposed line is designed with overhead ground-wires and well-grounded structures to protect the system from lightning.

2. Line Characteristics

Both current and voltage are required to transmit electrical energy over a transmission line. The current, which is a flow of electrical charge measured in amperes, is the source of a magnetic field. The voltage, which represents the potential for an electrical charge to do work expressed in units of volts (V) or kilovolts (kV), is the source of an electric field. The proposed transmission line is a 115-kV line. At maximum thermal capacity of the conductor approximately 900 amperes would flow in each of three phases.

The electrical effects of the proposed 115-kV transmission line can be characterized as "corona effects" and "field effects." Corona is the electrical breakdown of the air into charged particles caused by the electrical field at the surface of the conductors. Effects of corona are audible noise, visible light, radio and television interference, and photochemical oxidants. Field effects are induced currents and voltages in conducting objects near the line, and related effects that occur as a result of electric and magnetic fields at ground level.

a. Corona Effects. Corona can occur on the conductors, insulators, and hardware of an energized high-voltage transmission line. Corona on conductors occurs at locations where the field has been enhanced by protrusions, such as nicks, insects, or water drops. During fair weather the number of these sources is small and corona is insignificant. However, during wet weather, the number of these sources increases and corona effects are much greater.

(1) Audible Noise (AN). Corona-generated AN from transmission lines is generally characterized as a crackling, hissing noise. The noise is most noticeable during wet-conductor conditions such as rain, snow, or fog. Transmission-line AN is measured and predicted in decibels (A-weighted) or dBA. Some typical noise-levels are: library, 40 dBA; light automobile traffic at 100 feet, 50 dBA; an operating air conditioning unit at 20 feet, 60 dBA; and freeway traffic or freight train at 50 feet, 70 dBA. This last level represents the point at which a contribution to hearing impairment begins. The average noise-level during wet weather at the edge of the right-of-way for the proposed line is anticipated to be 40-dBA at 127-kV.

In most instances, the AN from the proposed line would be masked by naturally occurring sounds at locations beyond the edge of the right-of-way. The average

fair-weather noise at the edge of the right-of-way is predicted to be 15-dBA, which would probably be below ambient levels.

(2) Radio and Television Interference (RI and TVI). Corona-generated RI is most likely to affect the AM broadcast band; FM radio reception is rarely affected. Only AM radio receivers near transmission lines are affected by RI. An acceptable level of maximum fair-weather RI at the edge of a right-of-way is 40 to 45 dBuV/m (decibels above 1 microvolt per meter). Average levels during foul weather are, as a general rule, 16-to-22 dB higher than average fair-weather levels. The predicted fair-weather level for the proposed transmission line is 40 dBuV/m, below the acceptable limit, while the predicted average level for foul weather is 57 dBuV/m.

Television interference due to corona occurs during foul weather and is generally caused by transmission lines with voltage of 345-kV or above. The level of corona-operated TVI expected from the proposed rebuild is 17 dBuV/m at the edge of the right-of-way. This is a lower level than occurs on many previously built lines where TVI has not been a serious problem.

There are various mitigative techniques for eliminating adverse impacts to radio and television reception. Individual complaints about RI and TVI would be resolved by Western.

(3) Other Interference. Corona-generated interference can disrupt communication bands such as the citizen's (CB) and mobile bands. However, mobile-radio communications are not susceptible to transmission line interference because they are generally frequency-modulated (FM). In the unlikely event interference occurs with these or other communications, mitigation can be achieved with the same techniques utilized for TV and AM radio interference.

A recent study of interference to electronic monitoring equipment used in agriculture indicated a limited number of problems, the exact cause of which was not completely identified, but seemed to be related to abnormal operating conditions of the lines, i.e., dirty or leaky insulators which would be a strong source of RI. In the unlikely event that problems arise, mitigation can be accomplished by proper shielding.

(4) Visible Light. Corona is visible as a bluish glow or as bluish plumes. On the proposed line, corona levels would be so low that corona on the conductors would be observable only under the darkest conditions and probably only with the aid of binoculars. Without a period of adaptation for the eyes and without intentionally looking for the corona, it would probably not be noticeable.

(5) Photochemical Oxidants. When corona is present, the air surrounding the conductors is ionized and many chemical reactions take place producing small amounts of ozone and other oxidants. Approximately 90 percent of the oxidant is ozone, and the remainder is mainly nitrogen oxides.

The national primary ambient air-quality standard for photochemical oxidants, of which ozone is the principal component, is 235 ug/m³ (microgram/cubic meter) or 120 ppb (part per billion). The maximum incremental ozone-levels at ground level

calculated for the proposed line would be less than approximately 0.02 ppb for a 0.5 mph perpendicular wind and a 1.0 mm/hr rain.

b. Field Effects. The electric field created by a high voltage transmission line extends from the energized conductors to other conducting objects, such as the ground, structures, vegetation, buildings, vehicles, and persons. The electric field or voltage gradient is expressed in units of volts/meter (V/m) or kilovolts/meter (kV/m).

The maximum electric field at the minimum 28-foot clearance for the proposed line at 121 kV would be 2.46 kV/m. At the edge of the right-of-way, the field would be 1.74 kV/m. Typical 500-kV transmission lines have maximum electric field of 8 to 9 kV/m and edge of right-of-way values of 2.5 to 3.5 kV/m.

There are no federal standards for transmission line electric fields. Several states have established recommended field limits for maximum and edge of right-of-way. The field levels of the proposed line would be within the recommended limits of these states.

(1) Induced Currents. When a conducting object, such as a vehicle or person, is placed in an electric field, currents and voltages are induced in the object. The magnitude of the induced current depends on the electric-field strength and the size and shape of the object. If the object is grounded, then the induced current flows to earth and is called the short-circuit current of the object. In this case, the voltage on the object is effectively zero. If the object is insulated (not grounded), then it assumes some voltage relative to ground. These induced currents and voltages represent a potential source of nuisance shocks near a high voltage transmission line. Even under worst case conditions, the short-circuit current resulting from induced voltage of the proposed transmission line to the largest anticipated vehicle would be less than the National Electric Safety Code (NESC) criterion of 5 mA.

(2) Steady-State Current Shocks. Steady-state currents are those that flow continuously after a person contacts an object and provides a path to the ground for the induced current. Primary shocks are those that can result in direct physiological harm. The lowest category of primary shocks is "let go", which represents the steady-state current that cannot be released voluntarily. The 5 mA maximum induced-current criterion for vehicles closely approximates the estimated 4.5 mA let-go threshold for 0.5 percent of children (Keeseey and Letcher, 1969). Primary shocks would not be possible from the induced currents under the proposed line.

Potential steady-state-current shocks from vehicles under the proposed line are all at or below the secondary shock levels. Secondary shocks are defined as those that could cause an involuntary and potentially harmful movement, but cause no direct physiological harm. Steady-state-current shocks are not anticipated to occur very often, and when they do, would represent a nuisance rather than a hazard.

(3) Spark Discharge Shocks. Induced voltages appear on objects, such as vehicles, when there is an inadequate ground. If the voltage is sufficiently high, then a spark-discharge shock will occur as contact is made with the object. This type of shock could occur under the proposed line. However, the magnitude of the electric field would be low enough so that this type of shock would be rare and would occur only in a small area under the line near midspan.

Carrying or handling conducting objects, such as irrigation pipe, under the proposed line could also result in spark discharges that are a nuisance. The primary hazard with irrigation pipe, however, is direct contact with the conductors.

(4) Field Perception. When the electric field under a transmission line is sufficiently great, it can be perceived by hair erection on an upraised hand. It is very unlikely that the electric field under the proposed line would be perceivable by a person standing on the ground.

3. Grounding and Shielding

Induced currents are always present around transmission lines. However, the grounding policies of Western would eliminate the possibility of nuisance shocks due to these currents from stationary objects such as fences and buildings.

Mobile objects cannot be grounded permanently, but coupled currents to persons in contact with mobile objects can be limited through adherence to the NESC and the use of conductor grounds. Electric-field reduction and the accompanying reduction in induced effects, such as shocks, is also accomplished by conductive shielding. Persons inside a conducting vehicle cab or canopy will be shielded from the electric field. Similarly, a row of trees or a lower-voltage distribution line will reduce the field on the ground in their vicinity. Metal pipes, wiring, and other conductors in a residence or building will shield the interior from the electric field.

4. Long-Term Exposure to Electric and Magnetic Fields

The question of whether long-term direct exposure to the electric fields from transmission lines causes biological or health effects in humans is a controversial subject which has been raised primarily in hearings related to 500-kV and 765-kV transmission lines. The maximum electric fields under these extremely high voltage lines are more than twice as great as the maximum of 2.46 kV/m under the proposed line.

The maximum calculated 60 Hz magnetic field at 3.3 feet above ground for the proposed line is 0.09 gauss. This field is calculated for the maximum current and thermal capacity of approximately 180 MVA and the conductors at a height of 28 feet. For this condition, the calculated magnetic field at the edge of the right-of-way is 0.09 gauss. The maximum level is comparable with the maximum magnetic fields of other transmission lines and with levels of magnetic field measured near common household appliances. The actual level of magnetic field will vary as the current on the line varies. The DC magnetic field of the earth is 0.6 gauss.

5. Cardiac Pacemakers

Currents and voltages that are introduced internally to the body represent a possible source of interference to cardiac pacemakers. Internal currents can be caused by electric fields, by magnetic fields, or by direct contact.

The conclusion drawn from research and reviews of the literature is that the overall risk to pacemaker wearers from transmission lines is minimal. This is especially true of 115-kV lines like the proposed line, because of the relatively low electric fields when compared to 500-kV and 765-kV lines. The threshold for interference to the most sensitive pacemakers

is estimated to be 3.4 kV/m. Thus the maximum fields of the proposed line would almost never be at a level to cause interference with pacemakers. To date, no evidence has been found that a transmission line has caused a serious problem to the wearer of a pacemaker.

6. Environmental Consequences

There are two possible impacts associated with the magnetic fields from an A.C. transmission line: 1) induced voltages and currents in long conducting objects such as fences and pipelines, and 2) possible biological effects due to long-term exposure. Grounding practices and the availability of mitigation measures would minimize the magnetic induction effects of the line. No adverse impact is expected.

It appears highly unlikely that exposures to the electric and magnetic fields from the proposed line would have adverse effects on biological systems, based on the low levels of magnetic fields from the proposed line and the fact that the proposed line would not be located near occupied residences.

J. Cumulative Impacts

Cumulative impacts would result from impact of the proposed action added to other past, present, and reasonably foreseeable future actions occurring in the region. There are no new major surface-disturbing developments planned for the study area which could interact with the proposed action in a cumulative manner. Since the proposed action is a rebuild of an existing line in an existing ROW using designs and construction techniques very similar to the those of the existing line, the resulting cumulative impacts would not differ significantly from existing impacts.

K. Unavoidable Adverse Impacts

Impacts to physical resources would be short-term resulting from construction activities. Earth resources impacts would include soil disturbance and increased erosion potential. Short-term air quality impacts would be caused by fugitive dust and vehicle emissions. Implementation of Western's Standard Construction Practices (Appendix C), cessation of construction, and reclamation measures would all serve to limit the duration and extent of these impacts to less than significant levels. Impacts to water resources in the study area are not anticipated from the proposed action.

Avian collisions with the transmission line constitute an impact to wildlife resources. Collision potential is not expected to increase over current conditions.

Use of the existing ROW would minimize the need for additional clearing and limit impacts to vegetation.

The potential for impacts to existing land uses and agricultural practices would be reduced by siting structures in previously disturbed areas or in areas where agricultural practices have been modified along the existing ROW. No long-term impacts to land use are anticipated.

Visual impacts would be minor due to the existing modified landscape character and previously affected views from key observation points within the study corridor.

In summary, no unavoidable or irreversible adverse impacts would be expected as a result of removal of the existing transmission facility and construction, operation, and maintenance of the proposed rebuild of the Summit-Watertown 115-kV transmission line.

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APPENDIX A -RESOURCE MAPS

SUMMIT – WATERTOWN TRANSMISSION LINE STUDY EXISTING LAND USE

SYMBOL	DEFINITION	SYMBOL	DEFINITION	SYMBOL	DEFINITION
■	RESIDENCE/FARM COMPLEX	— · — · —	TRANSMISSION LINE		RANGE
□	UNOCCUPIED RESIDENCE	— + — + —	RAILROAD		CULTIVATED
●	COMMERCIAL	====	PRIMARY HIGHWAY		STATE
▲	FARM BUILDINGS	———	SECONDARY HIGHWAY		CONSERVATION
I	INACTIVE SPRINKLER IRRIGATION	XXX	WIND BREAKS

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ION

/PASTURE/OTHER

ATED CROPLAND

-OWNED LAND

RVATION RESERVE PROGRAM

NOTE: ALL FEATURES SHOWN OUTSIDE OF THE 1000' CORRIDOR FOR REFERENCE ONLY.

FIGURE 1a

SUMMIT – WATERTOWN TRANSMISSION LINE STUDY EXISTING LAND USE

SYMBOL	DEFINITION	SYMBOL	DEFINITION	SYMBOL	DEFINITION
■	RESIDENCE/FARM COMPLEX	— · — · —	TRANSMISSION LINE		RANGE
□	UNOCCUPIED RESIDENCE	— + — + —	RAILROAD		CULT.
●	COMMERCIAL	=====	PRIMARY HIGHWAY		STATE
▲	FARM BUILDINGS	—————	SECONDARY HIGHWAY		CONSERVATION
I	INACTIVE SPRINKLER IRRIGATION	XXX	WIND BREAKS

SUMMIT — WATERTOWN TRANSMISSION LINE STUDY EXISTING LAND USE

SYMBOL DEFINITION

■	RESIDENCE/FARM COMPLEX
□	UNOCCUPIED RESIDENCE
●	COMMERCIAL
▲	FARM BUILDINGS
I	INACTIVE SPRINKLER IRRIGATION

SYMBOL DEFINITION

— · — · —	TRANSMISSION LINE
— + + + —	RAILROAD
=====	PRIMARY HIGHWAY
=====	SECONDARY HIGHWAY
XXX	WIND BREAKS

SYMBOL DEFINITION

	RANGE
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SEGMENT 6

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SCALE: 1 inch = 2000 feet

NOTE: ALL FEATURES SHOWN OUTSIDE OF THE 1000' CORRIDOR FOR REFERENCE ONLY.

FIGURE 1c

SUMMIT - WATERTOWN TRANSMISSION LINE STUDY VISUAL RESOURCES

SYMBOL	DEFINITION	SYMBOL	DEFINITION	SYMBOL	PROJE
■	RESIDENCE/FARM COMPLEX	— · — · —	TRANSMISSION LINE	▧	NEAR
□	UNOCCUPIED RESIDENCE	— + — + —	RAILROAD	▨	NEAR
●	COMMERCIAL	=====	PRIMARY HIGHWAY		
▲	FARM BUILDINGS	—————	SECONDARY HIGHWAY		
I	INACTIVE SPRINKLER IRRIGATION	XXX	WIND BREAKS

SEGMENT 1

SEGMENT 2

DY

FIGURE 2a

SUMMIT – WATERTOWN TRANSMISSION LINE STUDY VISUAL RESOURCES

SYMBOL	DEFINITION	SYMBOL	DEFINITION	SYMBOL	PROJE
■	RESIDENCE/FARM COMPLEX	— · — · —	TRANSMISSION LINE		NEAR
□	UNOCCUPIED RESIDENCE	— + — + —	RAILROAD		NEAR
●	COMMERCIAL	=====	PRIMARY HIGHWAY		
▲	FARM BUILDINGS	—————	SECONDARY HIGHWAY		
I	INACTIVE SPRINKLER IRRIGATION	XXX	WIND BREAKS

SEGMENT 3

SEGMENT 4

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ST VISIBILITY

FOREGROUND (1/4 MILE)

FOREGROUND HIGHWAY (1/4 MILE)

SCALE: 1 inch = 2000 feet

NOTE: ALL FEATURES SHOWN OUTSIDE OF THE 1000' CORRIDOR FOR REFERENCE ONLY.

FIGURE 2b

SYMBOL		DEFINITION
■		RESIDENCE/FARM COMPLEX
□		UNOCCUPIED RESIDENCE
●		COMMERCIAL
▼		FARM BUILDINGS
I		INACTIVE SPRINKLER IRRIGATION
SYMBOL		DEFINITION
— · — · —		TRANSMISSION LINE
— + — + — + —		RAILROAD
=====		PRIMARY HIGHWAY
—————		SECONDARY HIGHWAY
XXX		WIND BREAKS
SYMBOL		DEFINITION
NEAR
NEAR

SEGMENT 5

SEGMENT 6

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NOT VISIBILITY

FOREGROUND (1/4 MILE)

FOREGROUND HIGHWAY (1/4 MILE)

SCALE: 1 inch = 2000 feet

FIGURE 2c

NOTE: ALL FEATURES SHOWN OUTSIDE OF THE 1000' CORRIDOR FOR REFERENCE ONLY.

SUMMIT - WATERTOWN TRANSMISSION LINE STUDY GEOLOGIC RESOURCES

SYMBOL	DEFINITION
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Oyo - Youngest Outwash - Glacio-fluvial outwash and alluvial deposits, chiefly silt, sand, and gravel. Includes some reddish gravels which may be older.
Ogm - Ground Moraine - Glacial till, chiefly yellow-brown clay containing numerous highly weathered clay boulders. Characterized by plateau-like accumulations of till consisting of olive-gray to olive-brown calcareous, friable to compact silt and clay; ranges up to 150-feet in thickness; level and well drained topography; calcareous loess cover up to 4-feet thick.
SECON - SECONDARY
PRIMAR - PRIMARY
RAILRO - RAILROAD
TRANS - TRANSMISSION LINE
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SEGMENT 1

SEGMENT 2

DY

ON

- TRANSMISSION LINE
- PROPOSED CORRIDOR
- STATE HIGHWAY
- LOCAL HIGHWAY
- RAILROADS
- INDUSTRIAL/FARM COMPLEX
- IMPROVED RESIDENCE
- COMMERCIAL BUILDINGS
- SPRINKLER IRRIGATION

RAIL FLOODPLAIN
(where approximated)

SCALE: 1 inch = 2000 feet

NOTE: ALL FEATURES SHOWN OUTSIDE OF THE CORRIDOR FOR REFERENCE ONLY.

FIGURE 3a

SUMMIT - WATERTOWN TRANSMISSION LINE STUDY GEOLOGIC RESOURCES

SYMBOL DEFINITION

Qyo - Youngest Outwash - Glacio-fluvial outwash and alluvial deposits, chiefly silt, sand, and gravel. Includes some reddish gravels which may be older.

Qgm - Ground Moraine - Glacial till, chiefly yellow-brown clay containing numerous highly weathered clay boulders. Characterized by plateau-like accumulations of till consisting of olive-gray to olive-brown calcareous, friable to compact silt and clay; ranges up to 150-feet in thickness; level and well drained topography; calcareous loess cover up to 4-feet thick.

SYMBOL DEFINITION

--- TRANSMISSION LINE
+ + + RAILROAD
=== PRIMARY ROAD
--- SECONDARY ROAD

XXX WIND BREAK
■ RESIDENTIAL
□ UNOCCUPIED
● COMMERCIAL
▲ FARM
I INACTIVE

100-YEAR FLOOD (dashed line)

SEGMENT 3

SEGMENT 4

ON

MISSION LINE

D

HIGHWAY
HAWY HIGHWAY
REAKS

ICE/FARM COMPLEX

PIED RESIDENCE

RCIAL

BUILDINGS

SPRINKLER IRRIGATION

AR FLOODPLAIN

(where approximated)

SCALE: 1 inch = 2000 feet

NOTE: ALL FEATURES SHOWN OUTSIDE OF THE CORRIDOR
FOR REFERENCE ONLY.

FIGURE 3b

SUMMIT — WATERTOWN TRANSMISSION LINE STUDY GEOLOGIC RESOURCES

SYMBOL DEFINITION

Qyo — Youngest Outwash — Glacio-fluvial outwash and alluvial deposits, chiefly silt, sand, and gravel. Includes some reddish gravels which may be older.

Qgm — Ground Moraine — Glacial till, chiefly yellow-brown clay containing numerous highly weathered clay boulders. Characterized by plateau-like accumulations of till consisting of olive-gray to olive-brown calcareous, friable to compact silt and clay, ranges up to 150-feet in thickness; level and well drained topography; calcareous loess cover up to 4-feet thick.

SYMBOL DEFINITION

TRANSMISSION LINE
RAILROAD
PRIMARY
SECONDARY

XXX
RESIDENTIAL
UNOCCUPIED
COMMERCIAL
FARM
INACTIVE
100-YEARS
(dashed)

SEGMENT 5

SEGMENT 6

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ON

MISSION LINE
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 / HIGHWAY
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 ICE/FARM COMPLEX
 IPIED RESIDENCE
 RCIAL
 UILDINGS
 : SPRINKLER IRRIGATION
 AR FLOODPLAIN
 where approximated)

SCALE: 1 inch = 2000 feet

NOTE: ALL FEATURES SHOWN OUTSIDE OF THE CORRIDOR FOR REFERENCE ONLY.

FIGURE 3c

SUMMIT - WATERTOWN TRANSMISSION LINE STL

SYMBOL	DEFINITION
	1. WELL DRAINED SOILS FORMED ON ALLUVIUM AND OUTWASH SEDIMENT (12% OF LINE) Renshaw - Fordville - Divide; Estaline - Fordville - Renshaw Association: Nearly level or gently sloping; medium textured and moderately coarse textured soils underlain by sand and gravel; formed on outwash sediments.
	2. WELL DRAINED SOILS FORMED IN LOESS AND GLACIAL TILL (85% OF LINE) Vienna; Vienna - Lamore; Brook - Krenzburg - Vienna Association: Nearly level to sloping; moderately fine textured soils formed in higher elevations where glacial moraine is capped with a thin mantle of silty material.
	3. POORLY DRAINED SOILS FORMED IN THE BOTTOM LANDS OF THE BIG SIOUX RIVER (2% OF LINE) Lamoure - Raville Association: Nearly level, moderately fine textured soils on flood plains.
	4. WELL DRAINED SOILS FORMED ON STEEP SIDES OF STREAM VALLEYS (1% OF LINE) Buse - Sioux Association: Rolling or steep, medium textured and moderately coarse textured soils formed in glacial drift.

SYMBOL	DEFINITION
TRANS	-----
RAILRC	-----+-----+-----+-----
PRIMA	=====
SECON	=====
WIND	XXX
RESIDI	■
UNOC	□
COMM	●
FARM	▼
INACT	I

SEGMENT 1

SEGMENT 2

DY

ION

MISSION LINE

AD

Y HIGHWAY

ARY HIGHWAY

REAKS

ICE/FARM COMPLEX

PIED RESIDENCE

ICIAL

UILDINGS

SPRINKLER IRRIGATION

2000' 1000' 0' 2000' 4000'

SCALE: 1 inch = 2000 feet

NOTE: ALL FEATURES SHOWN OUTSIDE OF THE 1000' CORRIDOR FOR REFERENCE ONLY.

FIGURE 4a

SUMMIT – WATERTOWN TRANSMISSION LINE STL SOIL RESOURCES

SYMBOL DEFINITION

- I. WELL DRAINED SOILS FORMED ON ALLUVIUM AND OUTWASH SEDIMENT (12% OF LINE)
Renshaw - Fordville; Renshaw - Fordville - Divide; Estelline - Fordville -
Renshaw Association: Nearly level or gently sloping; medium textured and moderately
coarse textured soils underlain by sand and gravel; formed on outwash sediments.

- II. WELL DRAINED SOILS FORMED IN LOESS AND GLACIAL TILL (85% OF LINE)
Vienna; Vienna - Llamore; Brookings - Kronzburg - Vienna Association: Nearly
level to sloping; moderately fine textured soils formed in higher elevations where glacial
moraine is capped with a thin mantle of silty material.

- III. POORLY DRAINED SOILS FORMED IN THE BOTTOM LANDS OF THE BIG SIOUX RIVER
(2% OF LINE)
Lamoure - Rouville Association: Nearly level, moderately fine textured soils on
flood plains.

- IV. WELL DRAINED SOILS FORMED ON STEEP SIDES OF STREAM VALLEYS (1% OF LINE)
Buse - Sioux Association: Rolling or steep, medium textured and moderately
coarse textured soils formed in glacial drift.

SYMBOL DEFINITION

--- -- -- TRANSMISSION

--- -- -- RAILROAD

===== PRIMARY HIGH

===== SECONDARY H

XXX WIND BREAKS

■ RESIDENCE/FA

□ UNOCCUPIED ;

● COMMERCIAL

▲ FARM BUILDING

I INACTIVE SPRING

SEGMENT 3

SEGMENT 4

DY

- LINE
- WAY
- SHWAY
- IM COMPLEX
- ESIDENCE
- S
- KLER IRRIGATION

NOTE: ALL FEATURES SHOWN OUTSIDE OF THE 1000' CORRIDOR FOR REFERENCE ONLY.

FIGURE 4b

SUMMIT — WATERTOWN TRANSMISSION LINE STUDY SOIL RESOURCES

SYMBOL DEFINITION

- I. WELL DRAINED SOILS FORMED ON ALLUVIUM AND OUTWASH SEDIMENT (12% OF LINE)
Renshaw - Fordville; Renshaw - Fordville - Divide; Eastelline - Fordville -
Renshaw Association: Nearly level or gently sloping; medium textured and moderately
coarse textured soils underlain by sand and gravel; formed on outwash sediments.

- II. WELL DRAINED SOILS FORMED IN LOESS AND GLACIAL TILL (85% OF LINE)
Vienna; Vienna - Lamore; Brooking - Kranzburg - Vienna Association: Nearly
level to sloping; moderately fine textured soils formed in higher elevations where glacial
moraine is capped with a thin mantle of silty material.

- III. POORLY DRAINED SOILS FORMED IN THE BOTTOM LANDS OF THE BIG SIOUX RIVER
(2% OF LINE)
Lamoure - Rauville Association: Nearly level, moderately fine textured soils on
flood plains.

- IV. WELL DRAINED SOILS FORMED ON STEEP SIDES OF STREAM VALLEYS (1% OF LINE)
Buse - Sioux Association: Rolling or steep, medium textured and moderately
coarse textured soils formed in glacial drift.

SYMBOL DEFINITION

--- TRANS

--- RAILRO

--- PRIMA

--- SECON

XXX WIND

■ RESID

□ UNOC

● COMM

▲ FARM

I INACT

SEGMENT 5

SEGMENT 6

DY

- ION
- MISSION LINE
- AD
- Y HIGHWAY
- ARY HIGHWAY
- REAKS
- ICE/FARM COMPLEX
- UPIED RESIDENCE
- RCIAL
- BUILDINGS
- SPRINKLER IRRIGATION

SCALE: 1 inch = 2000 feet

NOTE: ALL FEATURES SHOWN OUTSIDE OF THE 1000' CORRIDOR FOR REFERENCE ONLY.

FIGURE 4c

SUMMIT – WATERTOWN TRANSMISSION LINE STUDY BIOLOGICAL RESOURCES

SYMBOL VEGETATION COMMUNITY

	RANGE/PASTURE/OTHER
	CULTIVATED CROPLAND
	WETLANDS AND MEADOWS
	BEETLE TRAP
	FISH SAMPLE

SYMBOL DEFINITION

	TRANSMISSION LINE
	RAILROAD
	PRIMARY HIGHWAY
	SECONDARY HIGHWAY
XXX	WIND BREAKS
	RESIDENCE/FARM COMPLEX
	UNOCCUPIED RESIDENCE
	COMMERCIAL
	FARM BUILDINGS
I	INACTIVE SPRINKLER IRRIGATION

SEGMENT 1

SEGMENT 2

SCALE: 1 inch = 2000 feet

NOTE: ALL FEATURES SHOWN OUTSIDE OF THE 1000' CORRIDOR FOR REFERENCE ONLY.

FIGURE 5a

SUMMIT – WATERTOWN TRANSMISSION LINE STUDY BIOLOGICAL RESOURCES

SYMBOL VEGETATION COMMUNITY

- RANGE/PASTURE/OTHER
- CULTIVATED CROPLAND
- WETLANDS AND MEADOWS
- BEETLE TRAP
- FISH SAMPLE

SYMBOL DEFINITION

- TRANSMISSION LINE
- RAILROAD
- PRIMARY HIGHWAY
- SECONDARY HIGHWAY
- WIND BREAKS
- RESIDENCE/FARM COMPLEX
- UNOCCUPIED RESIDENCE
- COMMERCIAL
- FARM BUILDINGS
- INACTIVE SPRINKLER IRRIGATION

SEGMENT 3

SEGMENT 4

DY

SCALE: 1 inch = 2000 feet

NOTE: ALL FEATURES SHOWN OUTSIDE OF THE 1000' CORRIDOR FOR REFERENCE ONLY.

FIGURE 5b

SUMMIT – WATERTOWN TRANSMISSION LINE STUDY BIOLOGICAL RESOURCES

SYMBOL VEGETATION COMMUNITY

RANGE/PASTURE/OTHER
CULTIVATED CROPLAND
WETLANDS AND MEADOWS
BEETLE TRAP
FISH SAMPLE

SYMBOL DEFINITION

TRANSMISSION LINE
RAILROAD
PRIMARY HIGHWAY
SECONDARY HIGHWAY
WIND BREAKS
RESIDENCE/FARM COMPLEX
UNOCCUPIED RESIDENCE
COMMERCIAL
FARM BUILDINGS
INACTIVE SPRINKLER IRRIGATION

SEGMENT 5

SEGMENT 6

Y

NOTE: ALL FEATURES SHOWN OUTSIDE OF THE 1000' CORRIDOR FOR REFERENCE ONLY.

FIGURE 5c

APPENDIX B - WESTERN'S STANDARD CONSTRUCTION PRACTICES

1. The contractor shall limit the movement of his crews and equipment to the right-of-way (ROW), including access routes. The contractor shall limit movement on the ROW so as to minimize damage to grazing land, crops, orchards, and property, and shall avoid marring the lands.
2. When weather and ground conditions permit, the contractor shall obliterate all contractor-caused deep ruts that are hazardous to farming operations and to movement of equipment. Such ruts shall be leveled, filled and graded, or otherwise eliminated in an approved manner. In hay meadows, alfalfa fields, pastures, and cultivated productive lands, ruts, scars, and compacted soils shall have the soil loosened and leveled by scarifying, harrowing, disking, or other approved methods. Damage to ditches, tile drains, terraces, roads, and other features of the land shall be corrected. At the end of each construction season and before final acceptance of the work in these agricultural areas, all ruts shall be obliterated, and all trails and areas that are hard-packed as a result of contractor operations shall be loosened and leveled. The land and facilities shall be restored as nearly as practicable to their original condition.
3. Water turnoff bars or small terraces shall be constructed across all ROW access on hillsides to prevent water erosion and to facilitate natural revegetation on the trails.
4. The contractor shall comply with all federal, state, and local environmental laws, orders, and regulations. Prior to construction, all supervisory construction personnel will be instructed on the protection of cultural and ecological resources. To assist in this effort, the construction contract will address: (a) federal and state laws regarding antiquities and plants and wildlife, including collection and removal, and (b) the importance of these resources and the purpose and necessity of protecting them.
5. The contractor shall exercise care to preserve the natural landscape and shall conduct these construction operations so as to prevent any unnecessary destruction, scarring, or defacing of the natural surroundings in the vicinity of the work. Except where clearing is required for permanent works, approved construction roads, or excavation operations, vegetation shall be preserved and shall be protected from damage by the contractor's construction operations and equipment.
6. On completion of the work, all work areas except access trails shall be scarified or left in a condition which will facilitate natural revegetation, provide for proper drainage, and prevent erosion. All destruction, scarring, damage, or defacing of the landscape resulting from the contractor's operations shall be repaired by the contractor.
7. Construction roads not required for maintenance access shall be restored to the original contour and made impassable to vehicular traffic. The surfaces of such construction roads shall be scarified as needed to provide a condition which will facilitate natural revegetation, provide for proper drainage, and prevent erosion.
8. Construction staging areas shall be located and arranged in a manner to preserve trees and vegetation to the maximum practicable extent. On abandonment, all storage and construction materials and debris shall be removed from the site. The

area shall be regraded as required so that all surfaces drain naturally, blend with the natural terrain, and are left in a condition that will facilitate natural revegetation, provide for proper drainage, and prevent erosion.

9. Borrow pits shall be so excavated that water will not collect and stand therein. Before being abandoned, the sides of borrow pits shall be brought to stable slopes, with slope intersections shaped to carry the natural contour of adjacent undisturbed terrain into the pit or borrow area giving a natural appearance. Waste piles shall be shaped to provide a natural appearance.
10. Construction activities shall be performed by methods that will prevent entrance, or accidental spillage, of solid matter, contaminants, debris, and other objectionable pollutants and wastes into streams, flowing or dry watercourses, lakes, and underground water sources. Such pollutants and wastes include, but are not restricted to, refuse, garbage, cement, concrete, sanitary waste, industrial waste, radioactive substances, oil and other petroleum products, aggregate processing tailings, mineral salts, and thermal pollution.
11. Dewatering work for structure foundations or earthwork operations adjacent to, or encroaching on, streams or watercourses shall be conducted in a manner to prevent muddy water and eroded materials from entering the streams or watercourses by construction of intercepting ditches, bypass channels, barriers, or settling ponds, or by other approved means.
12. Excavated material or other construction materials shall not be stockpiled or deposited near or on stream banks, lake shorelines, or other watercourse perimeters where they can be washed away by high water or storm runoff or can in any way encroach upon the watercourse itself.
13. Waste waters from concrete batching or other construction operations shall not enter streams, watercourses, or other surface waters without the use of such turbidity control methods as settling ponds, gravel-filter entrapment dikes, approved flocculating processes that are not harmful to fish, recirculation systems for washing of aggregates, or other approved methods. Any such waste waters discharged into surface waters shall be essentially free of settleable materials. Settleable material is defined as the material which will settle from the water by gravity during a one-hour quiescent detention period.
14. The contractor shall utilize such practicable methods and devices as are reasonably available to control, prevent, and otherwise minimize atmospheric emissions or discharges of air contaminants.
15. The emission of dust into the atmosphere will not be permitted during the manufacture, handling, and storage of concrete aggregates, and the contractor shall use such methods and equipment as are necessary for the collection and disposal, or prevention, of dust during these operations. The contractor's methods of storing and handling cement and pozzolans shall also include means of eliminating atmospheric discharges of dust.

16. Equipment and vehicles that show excessive emissions of exhaust gases due to poor engine adjustments, or other inefficient operating conditions, shall not be operated until corrective repairs or adjustments are made.
17. Burning or burying of waste materials on the ROW or at the construction site will not be allowed. The contractor shall remove all waste materials from the construction area. All materials resulting from the contractor's clearing operations shall be removed from the ROW.
18. The contractor shall make all necessary provisions in conformance with safety requirements for maintaining the flow of public traffic and shall conduct his construction operations so as to offer the least possible obstruction and inconvenience to public traffic.
19. WESTERN will apply necessary mitigation to eliminate problems of induced currents and voltages onto conductive objects sharing a ROW, to the mutual satisfaction of the parties involved. WESTERN will install fence ground on all fences that cross or are parallel to the proposed line.
20. If evidence of prehistoric, historic, or paleontological sites is discovered during construction, all activities within a 50-foot radius would cease immediately, and appropriate personnel within WESTERN would be notified to assure proper

APPENDIX C - BIOLOGICAL SURVEY

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BIOLOGICAL SURVEY SUMMIT - WATERTOWN TRANSMISSION LINE SOUTH DAKOTA

A. INTRODUCTION

The Department of Energy, Western Area Power Administration (Western), is proposing to rebuild the 31 mile stretch of 115 kV transmission line running from the Watertown substation to the Summit substation in northeastern South Dakota. The project will consist of replacing deteriorating H-frame wood poles with new poles, hardware, and overhead ground wires more able to withstand heavy ice loading conditions which exist in the project area. The transmission line crosses agricultural lands, pastures, wetland areas and several creeks. There is good access to the transmission line through existing unpaved county roads.

Prior to site construction, and in accordance with Section 7(c) requirements of the Endangered Species Act of 1973, as amended, the U.S. Fish and Wildlife Service is responsible for providing consultation concerning possible environmental effects of the proposed action on threatened and endangered species and critical habitats. This Biological Survey was conducted to evaluate the presence and status of any Federal endangered, threatened or candidate species, and to analyze potential effects of transmission line construction and operation on these species.

Western's Billings, Montana Area Office made an inquiry of the Fish and Wildlife Service, Pierre, South Dakota Field Office, and received from them a list of species that may occur in the area. In addition a written request was submitted to the Natural Heritage Program for a list of all Federal and South Dakota special status species which may occur in the project area.

A list of special status species was prepared (Table 1-1) and existing information and literature were reviewed with respect to all species potentially occurring within one mile of the transmission line corridor. In addition, a field survey was conducted in the fall of 1992 to note existing conditions and identify potential habitat for special status species. This information was included in the draft Environmental Assessment.

Next, a meeting was held with the U.S. Fish and Wildlife Service and South Dakota Department of Game, Fish and Parks personnel in Pierre, South Dakota to discuss the information and need for further field work. At this meeting it was decided that the following surveys would be completed sometime during the June-July 1993 time frame:

- Baited pitfall trap surveys for the American Burying Beetle (Nicrophorus americanus),

TABLE 1-1. FEDERAL THREATENED, ENDANGERED, CANDIDATE AND STATE SPECIES OF CONCERN WHICH COULD OCCUR ALONG THE SUMMIT-WATERTOWN TRANSMISSION LINE CORRIDOR

SPECIES	STATUS
BIRDS	
Bald Eagle (<u>Haliaeetus leucocephalus</u>)	LE/SE
Whooping Crane (<u>Grus americana</u>)	LE/SE
Peregrine Falcon (<u>Falco peregrinus</u>)	LE/SE
Piping Plover (<u>Charadrius melodus</u>)	LT/ST
Ferruginous Hawk (<u>Buteo regalis</u>)	C2
Swainson's Hawk (<u>Buteo swainsoni</u>)	C3
FISH	
Brook Stickleback (<u>Culaea inconstans</u>)	SSC
INSECTS	
American Burying Beetle (<u>Nicrophorus americanus</u>)	LE
Regal Fritillary (<u>Speyeria idalia</u>)	C2
Powesheik Skipper (<u>Oarisma powesheik</u>)	SSC
PLANTS	
Western Prairie Fringed Orchid (<u>Platanthera praeclara</u>)	LT
Lake Sedge (<u>Carex lacustris</u>)	SSC

LE = Listed Endangered, US Fish & Wildlife Service

LT = Listed Threatened, US Fish & Wildlife Service

C2 = Candidate Category 2 Species, US Fish & Wildlife Service

C3 = Candidate Category 3 Species, US Fish & Wildlife Service

SE = Listed Endangered, State of South Dakota

- Seine fishing for the Brook Stickleback (Culaea inconstans), and
- On the ground survey in native prairie for the Western Prairie Fringed Orchid (Platanthera praeclara).

In addition, bird observations would also be conducted in areas with suitable habitat for the following species:

- Bald eagle
- Whooping crane
- Peregrine falcon
- Ferruginous hawk

- Swainson's hawk
- Piping plover

B. PROJECT DESCRIPTION

The proposed action is to rebuild the 31 mile 115 kV transmission line within the existing right of way. The purpose and need and a complete description of the proposed action is provided in the Environmental Assessment (Western, 1993). Construction is scheduled to begin in January 1994 and continue through May 1995, with an in-service date of June 1995.

C. METHODS

The Biological Survey was conducted in three steps: Step 1) literature searches of existing published information; Step 2) interviews with resource agency personnel or other researchers knowledgeable of the species; and Step 3) conduct of field surveys.

The scientific and agency literature pertaining to these species of concern was reviewed and knowledgeable persons interviewed to provide the background information. This information is provided in the list of references. The field surveys were conducted from June 29 - July 4, 1993 along the 31 mile transmission line corridor. Field work took place in the early morning, late afternoon and early evening hours.

1. American Burying Beetle

Twelve sampling locations were selected within the 31 mile ROW for placement of carrion baited pitfall traps (Figure 5a - 5c, Western, 1993). Each pitfall trap consisted of 2-16 oz white plastic cups, one within the other, placed at ground level. A baby bottle with aged cows liver served as the bait and was placed in the bottom of the 16 oz cup. A 12 inch x 12 inch plywood cover was placed over the trap to provide shade and protection from the sun during the day.

The traps were checked each morning and beetles and other miscellaneous invertebrates were removed. The cups were cleaned, and the bait and covers replaced. Carrion beetles were placed live in containers for later identification. The numbers and species of carrion beetles were recorded for each trapnight. At the end of the survey the pitfall traps were removed and the hole backfilled with soil and grass plug.

A female snapping turtle was found dead along the county road paralleling the transmission line ROW. Each morning it was checked for carrion beetles. The beetles were removed and placed live in containers for later identification.

2. Brook Stickleback

Five creek locations were selected for fish sampling by seining along the transmission line ROW (Figure 3-1). During the sampling trip rainy weather contributed significant run off to all drainages along the ROW and the creeks were running high. No water quality

parameters were measured but qualitative observations were made. A 15 foot minnow seine with 0.25 inch openings was used to capture fish.

Two observers, one at each end of the seine, worked the seine along a creek channel for approximately 50 feet. At the end of each pass the seine was beached and all fish caught in the net were placed in a bucket of water for later counting, sorting and identification. Three passes of the seine were made at each sampling location. A subsample of fish from each pass of the seine was preserved and sent to the South Dakota Department of Game, Fish and Parks, and the remainder were released alive.

3. Western Prairie Fringed Orchid

Prior to arriving in the field, aerial photos showing the transmission line corridor were interpreted to identify areas not under cultivation. These mainly consisted of native pasture, wetlands and riparian areas. In the field these land areas were systematically walked to note vegetation type and species. Plant species encountered were identified to describe the vegetation type. The areas were carefully traversed to check for the presence of the western prairie fringed orchid. Notes were taken in a field notebook for later reference.

4. General Observations

During the one week field survey there was ample opportunity to make observations of other plant and animal species. As appropriate photos were taken of vegetation, terrain features, animals captured and plants species observed. In addition, binoculars were used to observe bird species occurring in and around the transmission line right-of-way. The emphasis was on the special status species listed in Table 1-1.

D. SPECIES DISCUSSIONS

Since the Environmental Assessment (see Section 3.G.) contains a discussion of the occurrence, distribution and potential effects of the proposed action on special status species listed in Table 1-1, this discussion only treats the American Burying Beetle, Brook Stickleback and Western Prairie Fringed Orchid.

1. American Burying Beetle

The American Burying Beetle is Federally Endangered which means that it may be extinct or in danger of becoming extinct throughout all or significant portions of its range.

Historically, this species was distributed throughout the eastern temperate states, with Texas and Oklahoma at the western edge of its distribution. It has been recorded in 35 states (USFWS 1991). Presently, two separate populations are known to exist in Rhode Island and eastern Oklahoma. In addition, this species was collected during a survey conducted at the Valentine National Wildlife Refuge, Nebraska, in 1992. The American Burying Beetle has not been collected in South Dakota since 1945 (USFWS 1993a).

The American Burying Beetle belongs to the family Silphidae (carrion beetles). Adult beetles may feed on carrion, maggots, insects and rotting vegetation. Peak activity occurs

between May and September and mating occurs during June and July. This beetle may require soils with a high organic/loam content suitable for digging and burying carrion. Mating adults dig a chamber, bury the carrion and lay from 3 to 30 eggs in an escape tunnel. New adult beetles emerge from these chambers in 48 - 60 days (USFWS 1991).

The prevalent theory regarding population declines is that of habitat fragmentation. According to this theory fragmentation of natural habitat, which historically supported high densities of native species, now greatly reduced, may have affected the American Burying Beetle by changes in species composition and reduction of prey base required for optimum reproduction (USFWS 1991). In addition, it is theorized that with the creation of edge habitat, competitors for carrion have increased (crow, raven, fox, skunk), which has increased competition for limited resources required for successful reproduction (USFWS 1991).

The American Burying Beetle is easily distinguished from all other species in this genus by its bright red pronotum. All other species have a black pronotum.

The American Burying Beetle was not collected in baited pitfall traps during this field survey. However, seven other species of the genus Nicrophorus were collected (Table 4-1). These seven species appeared to be numerous and distributed throughout the length of the transmission line ROW.

2. Western Prairie Fringed Orchid

The western prairie fringed orchid is Federally Threatened. A threatened species is one likely to become endangered in the foreseeable future within all or significant portions of its range. Historically this species occurred in tall grass regions of North America including the Dakotas, Iowa, Kansas, Minnesota, Missouri, Nebraska, and Manitoba, Canada.

At present there are 37 separate populations remaining in seven states. It apparently has been extirpated in South Dakota. However, potential range includes the eastern portion of the state along the Minnesota border.

In South Dakota the western prairie fringed orchid occurred in wet meadows of the Big Sioux River Valley, and a collection is recorded for Brandon, Minnehaha County. Its habitat is tallgrass calcareous silt loam prairie or sub-irrigated sand prairie. This habitat may occur along approximately 2 percent of the line. Researchers are studying the relationship between grazing and the occurrence of the orchid. There is a question regarding the grazing pressure a population of the orchid can withstand. All native pastures within and along the ROW are heavily grazed.

TABLE 4-1. CARRION BEETLES (FAMILY SILPHIDAE) COLLECTED.

SPECIES COLLECTED
Genus <i>Nicrophorus</i>
<u><i>N. hybridus</i></u>
<u><i>N. investigator</i></u>
<u><i>N. marginatus</i></u>
<u><i>N. obscura</i></u>
<u><i>N. orbicollis</i></u>
<u><i>N. pustulatus</i></u>
<u><i>N. tomentosus</i></u>
Genus <i>Necrodes</i>
<u><i>N. surinamensis</i></u>
Genus <i>Thanatophilus</i>
<u><i>T. lapoponicus</i></u>

Note: Beetles were collected at baited pitfall traps at twelve sampling locations along the summit-watertown transmission line corridor July 2-4, 1993.

The western prairie fringed orchid vegetative shoots emerge in late May and flowering occurs from mid June to late July. Pollination occurs by the hawkmoth and seed are dispersed by the wind.

Prior to the field survey, no occurrences of the western prairie fringed orchid had been recorded within or around the transmission line ROW (Natural Heritage Database 1993).

The western prairie fringed orchid was not observed during the field survey. Based on life history data, it appears that orchid population declines have occurred because of habitat distruction (conversion of native prairie to cropland and pasture), heavy grazing pressure, herbicide use and the introduction of leafy spurge (USFWS, 1993b).

3. Brook Stickleback

The state of South Dakota lists the Brook Stickleback as a Species of Concern. It was last collected near the Summit-Watertown transmission line right-of-way in 1977.

The Brook Stickleback is distributed across the northern portion of the United States and within the Mississippi and Great Lakes drainage basins. It occurs in vegetated ponds and pools, and usually in cold and clear running creeks and small rivers (Page & Burr 1991). The male builds a nest of grass, detritus and filamentous algae and entices a female to enter where she lays her eggs. The male then forces the female out and enters the nest to fertilize the eggs. The male cares for the nest until the eggs hatch, after which he returns to deeper water. Breeding takes place from May through July (Thompson 1985).

During the field survey the Brook Stickleback was collected in all streams sampled. Recent rains had increased runoff and flow was high. The streams were muddy, turbulent, and in many places had overrun their banks. High waters made seining difficult, so all water crossings could not be sampled. The stickleback was most abundant in shallow bays created by the high waters. This species was not present in the one stock pond sampled.

Data from the seining suggest that the Brook Stickleback is well distributed and abundant along creeks crossing the transmission line right-of-way.

4. General Observations

During the seven day survey period no Federally endangered, threatened, or Category 2 or 3 bird species were observed.

E. CONCLUSIONS

1. American Burying Beetle

The American Burying Beetle has not been collected in South Dakota since 1945. Although some apparent suitable habitat still occurs along the transmission line corridor, this species was not collected during the survey. Other species of the genus Nicrophorus were collected. It is possible the species no longer occurs in the area.

Construction, maintenance and operation of the Summit - Watertown transmission line will not impact the American Burying Beetle.

2. Western Prairie Fringed Orchid

The Western Prairie Fringed Orchid was not observed during the seven day field survey. Although some native prairie still exists along the corridor, it has been degraded by overgrazing. It is unlikely that this species occurs in the area (Dr. Ted Van Bruggen, personal communication, 1992).

Construction, maintenance and operation of the Summit - Watertown transmission line will not impact the Western Prairie Fringed Orchid.

3. Brook Stickleback

The Brook Stickleback was collected at all creeks sampled along the transmission line ROW. It was abundant in shallower bays created by the rising waters. In most locations the Brook Stickleback was in breeding condition.

Construction, maintenance and operation of the Summit - Watertown transmission line will not impact populations of the Brook Stickleback.

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