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XCEL ENERGY, INC.

Mustang Substation to Shell CO2 Substation 115-kV Transmission Line Proposed Project

Environmental Assessment and Route Analysis,
Yoakum and Gaines Counties, Texas

Docket No. 47585

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139766
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MUSTANG SUBSTATION TO SHELL CO2 SUBSTATION 115-kV TRANSMISSION LINE PROPOSED PROJECT

PREPARED FOR: *XCEL ENERGY, INC.*

PREPARED BY: *POWER ENGINEERS, INC.*

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ACRONYMS AND ABBREVIATIONS

AFS	Aggregate Facility Study Report
AM radio	amplitude modulation radio
amsl	above mean sea level
ANWR	Aransas National Wildlife Refuge
BEG	Bureau of Economic Geology
BGEPA	Bald and Golden Eagle Protection Act
BMPs	Best Management Practices
CCN	Certificate of Convenience and Necessity
CFR	Code of Federal Regulations
CLF	civilian labor force
CR	County Road
CWA	Clean Water Act
DoD	Department of Defense
EA	Environmental Assessment and Route Analysis
ESA	Endangered Species Act
Esri	Environmental Systems Research Institute
ESSS	Ecologically Significant Stream Segments
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FIRMs	Flood Insurance Rate Maps
FM	Farm-to-Market Road
FM radio	frequency modulation radio
GIS	Geographic Information System
GLO	Texas General Land Office
GSEC	Golden Spread Electric Cooperative, Inc.
HPAs	High Probability Areas
HTCs	Historic Texas Cemeteries
IH	Interstate Highway
IPAC	Information for Planning and Conservation
ISD	Independent School District
kV	kilovolt
MBTA	Migratory Bird Treaty Act
NAIP	National Aerial Imagery Program
NCED	National Conservation Easement Database
NEPA	National Environmental Policy Act
NESC	National Electrical Safety Code
NFHL	National Flood Hazard Layer
NHD	National Hydrology Database
NHPA	National Historic Preservation Act
NOI	Notice of Intent
NOT	Notice of Termination
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetland Inventory
NWP	Nationwide Permit
NWSRS	National Wild and Scenic River System
OTHM	Official Texas Historical Marker

Oxy	Occidental Permian Ltd.
PEM	palustrine emergent
Pf	palustrine farmed
POWER	POWER Engineers, Inc.
Proposed Project	A new single-circuit 115-kilovolt (kV) transmission line in Yoakum County, Texas
PSF	Permanent School Fund
PSS	palustrine scrub/shrub
PU	palustrine open water ponds with unconsolidated bottoms
PUC	Public Utility Commission of Texas
PURA	Public Utility Regulatory Act
RM	Ranch-to-Market Road
ROW	right-of-way
RRC	Railroad Commission of Texas
SH	State Highway
SHPO	State Historic Preservation Office
spp.	Species (plural)
SPS	Southwestern Public Service Company
SWPPP	Stormwater Pollution Prevention Plan
TAC	Texas Administrative Code
TARL	Texas Archeological Research Laboratory
TASA	Texas Archeological Sites Atlas
TCEQ	Texas Commission on Environmental Quality
TEA	Texas Education Agency
THC	Texas Historical Commission
TLTC	Texas Land Trust Council
TPWC	Texas Parks and Wildlife Code
TPWD	Texas Parks and Wildlife Department
TSS	Texas Speleological Society
TWDB	Texas Water Development Board
TxDOT	Texas Department of Transportation
TXNDD	Texas Natural Diversity Database
U.S.	United States
USACE	United States Army Corps of Engineers
USBOC	United States Bureau of the Census
U.S.C.	United States Code
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
U.S. Hwy	United States Highway
Xcel Energy	Xcel Energy, Inc.

1.0 DESCRIPTION OF THE PROPOSED PROJECT

1.1 Scope of the Proposed Project

Southwestern Public Service Company (SPS), a subsidiary Xcel Energy, Inc. (Xcel Energy) proposes to construct a new single-circuit 115-kilovolt (kV) electric transmission line in Yoakum County, Texas (Proposed Project). The Proposed Project will be constructed starting at the existing Mustang Substation located in Yoakum County, approximately five miles east of Denver City, Texas and about half a mile north of County Road (CR) 390 to the existing Shell CO2 Substation. The Shell CO2 Substation is located 0.28 mile north-northeast of the intersection of FM 1939 and State Highway 214. The new transmission line will be approximately nine miles in length and constructed primarily on monopole structures in a right-of-way (ROW) that is approximately 70 feet wide. The study area and approximate location of the existing facilities are shown on Figure 1-1.

SPS retained POWER Engineers, Inc. (POWER) to prepare this Environmental Assessment and Route Analysis (EA). This EA will support SPS's application to the Public Utility Commission of Texas (PUC) to amend its PUC Certificate of Convenience and Necessity (CCN) to include the Proposed Project. This EA may also be used to support any additional federal, state, or local permitting activities that may be required prior to construction of the Proposed Project.

To assist POWER in its evaluation of the Proposed Project, SPS provided POWER with the Proposed Project endpoints as designated in the Notification to Construct (NTC) issued by the Southwest Power Pool (SPP), a preliminary route, and information regarding the purpose and need for the Proposed Project, proposed construction practices, preliminary transmission line design, clearing methods, ROW requirements and maintenance procedures for the Proposed Project.

1.2 Purpose and Need

SPS is a member of, and its entire transmission system is located within, the SPP. The SPP is an organization that meets the requirements of the Texas Public Utility Regulatory Act (PURA) § 39.151 as an independent system operator. SPS does not operate in the Electric Reliability Council of Texas (ERCOT) region, and ERCOT takes no position on SPS's transmission projects.

The proposed transmission line was identified as a reliability project by the SPP's Aggregate Facility Study Report (AFS) SPP-2011-AG3-AFS-11 dated December 18, 2013. This AFS report studied a total of 745 MW of long-term transmission service requests and, in particular identified potential system problems and potential modifications necessary to facilitate these transmission service requests while maintaining or improving system reliability. Of the 745 MW of long term service requests, 175 MW was requested by GSEC for transmission service from their Mustang Plant. The Proposed Project was identified as needed for reliability to address the overload issues of the Denver City-Mustang Substation 115-kV Circuit #1 transmission line, which could occur during the outage of the Denver City-Mustang Substation 115-kV line Circuit #2 transmission line.

Based on the results of the AFS report, SPP issued an NTC letter to SPS. The SPP NTC letter sent to SPS under Proposed Project ID 30510 and Network Upgrade ID number 50637, directs SPS to build a 115-kV transmission line from the Mustang Substation to the Shell CO2 Substation, and install necessary terminal equipment at both Mustang Substation and Shell CO2 Substation in Yoakum County, Texas.

FIGURE 1-1 PROJECT AREA LOCATION MAP

1.3 Description of Proposed Design and Construction

1.3.1 Design Criteria

SPS proposes to construct the 115-kV transmission line using single-circuit, self-supporting steel monopole structures within new ROW areas. SPS proposes to use direct embedment for tangent structures, and proposes drilled pier foundations for structures at dead-end and high angle locations. The typical height of the steel pole structures is between 80 and 140 feet (see Figures 1-2 through Figure 1-6). SPS also proposes to use structures that are double circuit capable for the first 3,300 feet of the line that originates at the Mustang Substation. All design criteria will comply with applicable statutes and codes, including the appropriate edition of the National Electrical Safety Code (NESC) and SPS's standard design practices.

1.4 Construction Considerations

Projects of this type require surveying, ROW clearing, foundation installation, structure assembly and erection, conductor and shield wire installation, and cleanup when construction is completed. The following information regarding these activities was provided to POWER by SPS.

1.4.1 Clearing

Removal of woody vegetation within the ROW would be limited to establishing the required conductor to ground clearances and facilitating construction and future maintenance operations. Mowing and/or shredding of herbaceous vegetation may be required within grasslands or pasturelands. Major grading activities are not anticipated within the ROW due to the relatively flat terrain within the study area. Grading activities will be limited to the minimum required to facilitate construction activities and future maintenance access. Future ROW maintenance activities may include periodic mowing and/or herbicide applications to maintain an herbaceous vegetation layer within the ROW.

ROW clearing activities would be completed while minimizing the impacts to existing groundcover vegetation when practical. Where at all possible, SPS plans to span all surface waters and playa lake wetlands. Ingress and egress to the ROW would be afforded from adjacent public roads, or where necessary, through additional temporary easements across private property.

1.4.2 Construction

After each pole location has been surveyed and the ROW cleared, a single hole will be augured into the ground at each monopole location. The depth of each hole will be determined by the geotechnical profile, terrain, and structure height for each location. Each steel pole will be assembled on the ground near its designated location and then lifted by crane and aligned with structure arms oriented perpendicular to the transmission line centerline. For angle structures, towers will be set with structure arms oriented on the angle bisector. The steel poles will be backfilled with natural soil to provide stability. Excavated material will be spread onsite or disposed offsite in accordance with any federal, state, and local regulations.

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FIGURE 1-2 TYPICAL 115-KV SINGLE CIRCUIT DELTA TANGENT STRUCTURE

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FIGURE 1-3 TYPICAL 115-KV DOUBLE CIRCUIT TANGENT STRUCTURE

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FIGURE 1-4 TYPICAL 115-KV SINGLE CIRCUIT DELTA RUNNING ANGLE STRUCTURE

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FIGURE 1-5 TYPICAL 115-KV SINGLE CIRCUIT DELTA RUNNING ANGLE STRUCTURE

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FIGURE 1-6 TYPICAL 115-KV SINGLE CIRCUIT VERTICAL DEADEND STRUCTURE

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Concrete anchor bolt foundations will be required at dead-ends and high angle monopole locations. After the hole is augured, a rebar reinforced concrete foundation will be poured. The monopoles will then be attached to the foundation. After the monopoles are erected, the insulators and hardware assemblies will then be attached. After a series of poles are constructed, the conductor and shield wire is strung and tensioned.

Guard structures are proposed during the line stringing phase where the transmission line crosses existing transmission and distribution lines, telephone lines, and roadways. Once the transmission line is permanently attached, the guards are removed.

1.4.3 Cleanup

ROW cleanup activities include restoration and will be conducted concurrently with the completion of each series of monopoles as ROW access requirements allow. All equipment, debris, culverts, and temporary environmental controls will be removed. ROW restoration will be completed and includes revegetation with native grass species, in consultation with landowners and in consideration of their preference and any necessity to stabilize the soil; and the construction of any necessary permanent environmental controls. The timeliness of these restoration activities is expected to prevent soil erosion.

1.5 Maintenance Considerations

Maintenance of the ROW is typically completed on an interval of two to four years depending on the rate of vegetation regrowth. Maintenance activities include mowing the entire ROW and the application of herbicides to stumps. The application of herbicides will be conducted within federal, state, and local guidelines.

1.6 Agency Actions

Numerous federal, state, and local regulatory agencies and organizations have developed rules and regulations regarding the routing and potential impacts associated with the construction of the Proposed Project. This section describes the major regulatory agencies and additional issues that are involved in project planning and permitting of transmission lines in Texas. POWER solicited comments from various regulatory entities during the development of this document. Records of correspondence and additional discussions with these agencies and organizations are provided in Section 3.0 and Appendix A.

1.6.1 Public Utility Commission of Texas

The PUC regulates the routing of transmission lines in Texas under PURA Chapter 37, with specific consideration for the criteria set forth in § 37.056(c). The PUC regulatory guidelines for routing transmission lines in Texas include:

- 16 Texas Administrative Code (TAC) § 25.101(b)(3)(B), including the policy of prudent avoidance;
- 16 TAC § 22.52(a)(4); and
- CCN application requirements.

This EA has been prepared by POWER in support of SPS's CCN application for PUC approval of the Proposed Project.

1.6.2 United States Army Corps of Engineers

Under Section 10 of the Rivers and Harbors Act of 1899, 33 United States Code (U.S.C.) § 403, the United States Army Corps of Engineers (USACE) regulates all work or structures in or affecting the course, condition, or capacity of navigable Waters of the United States (U.S.). Under Section 404 of the Clean Water Act (CWA), 33 U.S.C. § 1344, the USACE regulates the discharge of dredged and fill material into all Waters of the U.S., including associated wetlands.

The Proposed Project is located within the jurisdiction of the USACE – Fort Worth District. No navigable waters were identified within the study area that, if crossed, would necessitate a Section 10 Permit for the Proposed Project. If construction of the Proposed Project impacts waters of the U.S., or associated jurisdictional wetlands as defined in Section 404 of the CWA, then the Proposed Project will likely meet the criteria of the Nationwide Permit (NWP) No. 12 - Utility Line Activities, which applies to activities associated with any cable, line, or wire for the transmission of electrical energy.

1.6.3 United States Fish and Wildlife Service

The United States Fish and Wildlife Service (USFWS) enforces federal wildlife laws and provides comments on proposed construction projects with a federal nexus under the National Environmental Policy Act (NEPA) and within the framework of several federal laws including the Endangered Species Act (ESA), Migratory Bird Treaty Act (MBTA), and Bald and Golden Eagle Protection Act (BGEPA).

POWER reviewed the current county listings in the USFWS Information for Planning and Conservation (IPAC) (Reference No. 02ETAR00-2016-SLI-0961) and Texas Natural Diversity Database (TXNDD) records of federal and state listed species occurrences and/or designated critical habitats and considered these during the route development process. The absence of recorded occurrences for individual listed species is not an indication that the species or potential suitable habitat for the species is not present along the approved route. Upon PUC approval of the route and prior to construction, pedestrian surveys will be completed to identify any suitable habitat for federally listed species as necessary. If suitable habitat is noted, then informal consultation with the USFWS – Arlington Ecological Services Field Office may be completed to determine the need for any required species-specific surveys and/or permitting under Section 7 of the ESA.

1.6.4 Federal Aviation Administration

According to Federal Aviation Administration (FAA) regulations, Title 14 Code of Federal Regulations (CFR) Part 77.9 the construction of a transmission line requires FAA notification if a transmission tower structure height will exceed 200 feet or the height of an imaginary surface extending outward and upward at one of the following slopes:

- A 100:1 slope for a horizontal distance of 20,000 feet from the nearest point of the nearest runway of each airport described in paragraph (d) of 14 CFR Part 77.9 having at least one runway longer than 3,200 feet, excluding heliports;
- A 50:1 slope for a horizontal distance of 10,000 feet from the nearest runway of a public or military airport described in paragraph (d) of 14 CFR Part 77.9 where its longest runway is no

longer than 3,200 feet in length, excluding heliports; or

- A 25:1 slope for a horizontal distance of 5,000 feet for a heliport described in paragraph (d) of 14 CFR Part 77.9.

Paragraph (d) of 14 CFR Part 77.9 includes public-use airports listed in the Airport/Facility Directory (currently the Chart Supplement), public-use or military airports under construction, airports operated by a federal agency or Department of Defense (DoD), or an airport or heliport with at least one FAA-approved instrument approach procedure.

Notification is not required by structures that will be shielded by existing structures of a permanent and substantial nature or by natural terrain or topographic features of equal or greater height, and will be located in a congested area of a city, town, or settlement where the shielded structure will not adversely affect safety in air navigation.

The PUC CCN application also requires listing private airports within 10,000 feet of any primary route centerline. Following PUC approval of the route for the proposed transmission line, SPS will make a final determination of the need for FAA notification, based on specific structure locations and design. If any of the FAA notification criteria are met for the approved route, a Notice of Proposed Construction or Alteration, FAA Form 7460-1, will be completed and submitted to the FAA Southwest Regional Office in Fort Worth, Texas at least 30 days prior to construction. The result of this notification, and any subsequent coordination with the FAA could include changes in line design and/or potential requirements to mark and/or light the structures.

1.6.5 Texas Parks and Wildlife Department

The Texas Parks and Wildlife Department (TPWD) is the state agency with primary responsibility for protecting the state's fish and wildlife resources in accordance with Texas Parks and Wildlife Code (TPWC) § 12.0011(b). POWER solicited comments from TPWD during the scoping phase of the Proposed Project. POWER reviewed TPWD's comments and considered the recommendations during the route development of the proposed transmission line. A copy of this EA will be submitted to TPWD when the CCN application is filed with the PUC.

1.6.6 Floodplain Management

Flood Insurance Rate Maps (FIRMs), published by the Federal Emergency Management Agency (FEMA), were not available for review to determine the floodplain boundaries within the study area. The Proposed Project is not anticipated to create any significant permanent changes in the existing topographical grades and is not likely to significantly increase the stormwater runoff within the study area. Careful siting should minimize the possible impacts in any flood prone areas and the structures should not significantly affect flooding. Yoakum and Gaines Counties do not have a designated local floodplain administrator.

1.6.7 Texas Commission on Environmental Quality

The construction of the Proposed Project may require a Texas Pollution Discharge Elimination System General Construction Permit (TXR 150000) as implemented by the Texas Commission on Environmental Quality (TCEQ) under the provisions of Section 402 of the CWA and Chapter 26 of the Texas Water Code. The TCEQ has developed a three-tiered approach for implementing this permit that is dependent on the acreage of ground disturbance. No permitting is required for ground

disturbances of less than one acre (Tier I). If more than one acre, but less than five acres are disturbed, then a Stormwater Pollution Prevention Plan (SWPPP) must be developed and implemented during construction activities accompanied with posting a site notice and sending a notification to any Municipal Separate Sewer System Operator (Tier II) within the Proposed Project area. If more than five acres of land are disturbed, then the requirements mentioned above for Tier II are necessary and the submittal of a Notice of Intent (NOI) and Notice of Termination (NOT) to the TCEQ is also required (Tier III). Once the route is approved by the PUC, the proposed acreage of ground disturbance will be determined and the appropriate Tier and conditions of the TXR 150000 permit will be evaluated.

A Section 401 Water Quality Certificate from the TCEQ may also be required if the Proposed Project requires a USACE IP. States have the authority to review federally permitted or licensed activities that may result in a discharge of pollutants into the waters of the U.S. As previously discussed, a USACE IP is not anticipated for this Proposed Project.

1.6.8 Texas Historical Commission

Cultural resources are protected by federal and state laws if they have some level of significance under the criteria of the National Register of Historic Places (NRHP) (36 CFR Part 60) or under state guidance (13 TAC Part 2 § 26.7-8). The Texas Historical Commission (THC) was contacted by POWER to identify known cultural resource sites within the study area boundary. POWER also reviewed Texas Archeological Research Laboratory (TARL) records for known locations of cultural resource sites. Once the route is approved by the PUC, additional coordination with the THC may determine the need for archeological surveys or additional permitting requirements. Even if no additional surveys are required, SPS proposes to implement an unanticipated discovery procedure during construction activities. If artifacts are discovered during construction, activities in the area will cease and SPS will notify the State Historic Preservation Office (SHPO) for additional consultation.

1.6.9 Texas Department of Transportation

The Texas Department of Transportation (TxDOT) has been notified of the Proposed Project. If the route approved by the PUC crosses or occupies TxDOT ROW, it will be constructed in accordance with the rules, regulations, and policies of TxDOT. Best management practices (BMP) will be used, as required, to minimize erosion and sedimentation resulting from the construction. Revegetation will occur as required under the "Revegetation Special Provisions" contained in TxDOT form 1023 (Rev. 9-93). Traffic control measures will comply with applicable portions of the Texas Manual of Uniform Traffic Control Devices.

1.6.10 Texas General Land Office

The Texas General Land Office (GLO) requires a Miscellaneous Easement for ROW within any state owned riverbeds or navigable streams or tidally influenced waters. Coordination with the GLO will be completed after PUC approval of the route; however, no GLO easement is anticipated for this Proposed Project because no rivers or navigable streams are crossed by the primary route.

2.0 ROUTE STUDY METHODOLOGY AND DESCRIPTION OF THE STUDY AREA

2.1 Routing Study Methodology

The objective of this EA was to address the requirements of PURA § 37.056(c)(4)(A)-(D), 16 TAC § 22.52(a)(4), and 16 TAC § 25.101(b)(3)(B), including the PUC's policy of prudent avoidance. The study area approach utilized by POWER for this EA included study area delineation based on the Proposed Project endpoints; identification and characterization of existing land use and environmental constraints; and identification of areas of potential routing possibilities located within the study area. POWER identified potentially affected resources including the location of habitable structures and considered each resource during the route development process. Regulatory agency, local official, and landowner comments (if applicable) were also incorporated into the route evaluation process. The route was analyzed using evaluation criteria to determine potential impacts to existing land use and environmental resources. In addition, SPS considered engineering and construction constraints, reliability issues, and estimated costs to evaluate the route as it relates to the requirements of PURA and PUC Substantive Rules.

2.1.1 Study Area Boundary Delineation

The first step in the evaluation process was to delineate a study area. This area needs to encompass the Proposed Project endpoints and include a sufficiently large area within which feasible to adequately evaluate the proposed transmission line in support of SPS's application to amend its CCN. The study area, which set boundaries for the data collection process, is located in the southwest portion of the Texas Panhandle in the High Plains region. Major physiographic features, jurisdictional boundaries, sensitive land uses and existing utility corridors helped to define the study area boundaries (refer to Figure 2-1).

The study area encompasses portions of both Yoakum and Gaines Counties and the Mustang and Shell CO2 Substations are located in Yoakum County. The Mustang Substation is located in the eastern portion of the study area and is approximately five miles east of the Denver City, Texas. The Shell CO2 Substation is located in the northwestern portion of the study area and is approximately 2.5 miles north of Denver City, Texas. The width of the study area from north to south is approximately 5.6 miles, depending on the location of measurement, and the length of the study area from west to east is approximately 6.1 miles, encompassing a total area of approximately 33.6 square miles.

FIGURE 2-1 LOCATION OF THE STUDY AREA AND PROPOSED ROUTE

2.1.2 Data Collection and Constraints Mapping

After delineation of the study area, a constraint map was prepared and used to initially display resource data and constraints for the Proposed Project area. The constraint map provides a broad overview of various resource locations indicating obvious routing constraints and areas of potential routing opportunities.

Several methodologies were utilized to collect and review environmental and land use data including incorporation of readily available Geographic Information System (GIS) coverage with associated metadata; review of maps and published literature; and review of files and records from numerous federal, state, and local agencies. Data collected for each resource area was mapped within the study area utilizing GIS layers.

Maps and data layers reviewed include United States Geological Survey (USGS) 7.5 minute topographic maps (Environmental Systems Research Institute [Esri] 1973, 1974), National Wetland Inventory (NWI) maps, and TxDOT county highway maps. Appraisal district land parcel boundary data layers were provided by Xcel Energy and used to identify apparent property boundaries as paralleling possibilities. USGS 7.5 minute topographic maps and aerial photography (Esri 1973, 1974; National Aerial Imagery Program [NAIP] 2014) were used as the background for several of the Proposed Project maps, including the initial base map, field maps, and the environmental and land use constraints maps (see Appendix B).

Data typically displayed on the constraint map includes as applicable, but is not limited to:

- Major land jurisdictions and uses;
- Major roads including local roads, CR, Farm-to-Market roads (FM) roads, Ranch-to-Market (RM) roads, United States Highways (U.S. Hwy), SH, and Interstate Highways (IH);
- Existing transmission line and pipeline corridors;
- Airports, private airstrips, and communication facilities;
- Recreational areas;
- Major political subdivision boundaries;
- Lakes, reservoirs, rivers, streams, canals, and ponds;
- FEMA 100-year floodplains;
- NWI mapped wetlands;
- Mobile irrigation systems; and
- Wells (including water and oil and gas).

2.1.3 Route Development and Evaluation

It was apparent in the beginning of the routing phase of this project that the ability to route a transmission line between the two substations would be difficult due to: extensive oil and gas development in the study area and around the Shell CO2 Substation; SPS- and non-SPS-owned distribution facilities throughout the study area; numerous existing transmission lines; habitable structures; and the existing and planned facilities in and around the Mustang Substation.

POWER and SPS initially individually worked to identify numerous possible routing options, but after reviewing the constraints it was determined that SPS should work with the landowners to determine a single workable route. A preliminary route was then identified by the SPS project team based upon initial discussions with landowners along with analysis and study of the constraints. This preliminary route was reviewed by the POWER planning team by using the environmental and land

use constraints map while considering resource sensitivity. The preliminary route was reviewed in accordance with PURA § 37.056 (c)(4)(A)-(D), the PUC's standard CCN application, 16 TAC § 25.101, including the PUC's policy of prudent avoidance, and consistency with SPS's transmission line routing guidelines. The route was reviewed while considering such factors as community values, parks and recreational areas, historical and aesthetic values, environmental integrity, route length utilizing and parallel to existing compatible corridors or parallel to apparent property boundaries, and prudent avoidance.

SPS and POWER reviewed the preliminary route throughout the project development and the route was refined as more information became available, and as a result of additional discussions with landowners.

In evaluating the proposed route, a variety of environmental criteria were considered. The criteria were selected because of their relevance to public and regulatory environmental concerns associated with the construction of transmission lines. Many of the criteria are factors contained in PURA §37.056(c)(4)(A)-(D) and 16 TAC § 25.101 for the granting of a CCN, as well as relevant questions in the PUC's CCN application form. The environmental criteria evaluated for this report are presented in Table 2-1. The proposed route is shown in relation to environmental and other land use constraints on topographic base in Figure 3-2 and on aerial photographic base in Figure 5-1 in Appendix B. The analysis of the route involved inventorying and tabulating the number or quantity of each environmental criterion located along the route (e.g., number of habitable structures within 300 feet etc.). The number or amount of each factor was determined by POWER using GIS layers, maps, recent aerial photography, and field verification from publicly accessible areas where practical. Potential environmental impacts are addressed in Section 4.0 of this document.

TABLE 2-1 LAND USE AND ENVIRONMENTAL EVALUATION CRITERIA

LAND USE
Length of proposed route
Number of habitable structures[1] within 300 feet of the ROW centerline
Length of ROW using existing transmission line ROW
Length of ROW parallel to existing electric transmission line ROW
Length of ROW parallel to other compatible existing ROW (highways, public roadways, railways, etc. – excluding pipelines)
Length of ROW parallel to apparent property lines[2]
Length of ROW parallel to pipelines[3]
Percentage of ROW parallel to existing compatible corridors – and apparent property boundaries (excluding pipelines)
Length of ROW through parks/recreational areas[4]
Number of parks/recreational areas[4] crossed by ROW centerline
Number of additional parks/recreational areas[4] within 1,000 feet of ROW centerline
Length of ROW through cropland
Length of ROW through pasture/rangeland
Length of ROW through land irrigated by traveling systems (rolling or pivot type)
Length of ROW across borrow pits, gravel pits, or quarries
Number of transmission pipeline crossings
Number of transmission line crossings
Number of U.S. and State highway crossings
Number of farm-to-market and/or ranch-to-market road crossings
Number of cemeteries within 1,000 feet of the ROW centerline
Number of FAA registered airports[5] with at least one runway more than 3,200 feet in length located within 20,000 feet of the ROW centerline
Number of FAA registered airports[5] having no runway more than 3,200 feet in length located within 10,000 feet of the ROW centerline
Number of private airstrips within 10,000 feet of the ROW centerline
Number of heliports within 5,000 feet of the ROW centerline
Number of commercial AM radio transmitters within 10,000 feet of the ROW centerline
Number of FM radio transmitters, microwave towers, and other electronic installations within 2,000 feet of ROW centerline
Number of existing water wells within 200 feet of the ROW centerline
Number of existing oil and gas wells within 200 feet of the ROW centerline

AESTHETICS
Estimated length of ROW within the foreground visual zone[6] of U.S. and State highways
Estimated length of ROW within the foreground visual zone[6] of farm-to-market and/or ranch-to-market roads
Estimated length of ROW within the foreground visual zone[6] of parks and/or recreational areas[4]
ECOLOGY
Length of ROW through upland woodlands
Length of ROW through bottomland/riparian woodlands
Length of ROW across mapped NWI wetlands and playa lakes
Length of ROW across known habitat of federally listed endangered or threatened species
Length of ROW across open water (lakes, ponds)
Number of stream crossings
Number of river crossings
Length of ROW parallel (within 100 feet) to streams or rivers
Length of ROW across FEMA mapped 100-year floodplains[7]
CULTURAL RESOURCES
Number of recorded historic or prehistoric sites crossed by ROW
Number of additional archeological or historical sites within 1,000 feet of ROW centerline
Number of National Register of Historic Places listed properties crossed by ROW
Number of additional National Register of Historic Places listed properties within 1,000 feet of ROW centerline
Length of ROW across areas of high archeological site potential

[1] Single-family and multi-family dwellings, mobile homes, apartment buildings, commercial structures, industrial structures, business structures, churches, hospitals, nursing homes, and schools, or other structures normally inhabited by humans or intended to be inhabited by humans on a daily or regular basis within 300 feet of the centerline of a transmission project of 230 kV or less.
[2] Apparent property lines created by existing roads, highways, or railroad ROWs are not "double-counted" in the length of ROW parallel to property lines criteria.
[3] This data is for informational purposes only. Pipelines were not considered compatible ROW.
[4] Defined as parks and recreational areas owned by a governmental body or an organized group, club, or church.
[5] As listed in the Chart Supplement South Central U.S. (FAA 2016 formerly known as the Airport/Facility Directory South Central U.S.), FAA 2016.
[6] One-half mile, unobstructed.
[7] Floodplain data not available for Yoakum and Gaines Counties

2.1.4 Reconnaissance Surveys

Reconnaissance surveys of the study area were conducted from publicly accessible areas by POWER personnel to confirm the findings of the research and data collection activities, identify changes in land use occurring after the date of aerial photography, and identify potential unknown constraints that might not have been previously noted in the data. Reconnaissance surveys of the study area were conducted by POWER on December 8, 2015. Additional reconnaissance surveys were conducted by

SPS in 2016 on July 26th & 28th, August 11th, September 21st, and November 21st; and in 2017 on February 28th, May 26th, July 5th, August 25th and September 8th.

2.2 Community Values, Land Use and Socioeconomics

Under PURA § 37.056(c)(4)(A)-(D), "community values" is a factor for consideration in siting a transmission line route; however, the statute does not specifically define the term. The PUC's standard CCN application form requires information concerning the following items related to community values:

- Public open house meeting, if applicable.
- Approval or permits required from other governmental agencies.
- Brief description of the study area traversed.
- Habitable structures within 300 feet of the centerline for transmission lines of 230 kV or less.
- Amplitude modulation (AM) and frequency modulation (FM) radio, microwave, and other electronic installations in the study area.
- FAA-registered public use airstrips, private airstrips, and heliports located in the study area.
- Irrigated pasture or croplands utilizing center-pivot or other traveling irrigation systems in the study area.
- Parks and recreation areas in the study area.
- Historical and archeological sites in the study area.

In addition to evaluating these items, POWER also evaluated the Proposed Project for community values and resources that might not be specified by the PUC, but that might be of importance to a particular community as a whole. In several dockets the PUC and Staff have used the following as a working definition: the term "community values" is defined as "a shared appreciation of an area or other natural resource by a national, regional, or local community." Examples of a community resource could include a park or recreational area, historical and archeological sites, or a scenic vista (aesthetics). POWER mailed consultation letters to various local elected and appointed officials to identify and collect information regarding community values and community resources.

2.2.1 Land Jurisdiction

Jurisdiction does not necessarily represent ownership. Potential conflicts could arise from crossing jurisdictional boundaries, which were evaluated in this study area. The study area is located within the jurisdictional boundaries of Yoakum and Gaines Counties. There is one municipality within the study area that includes Denver City.

2.2.2 Land Use

Existing land uses within the study area were identified and placed into the following categories: urban/developed, planned land use, agriculture, oil and gas facilities, transportation/aviation/utility features, and communication towers. Parks and recreation areas are discussed in Section 2.3. Land use information was primarily obtained from interpretation of aerial photographs, USGS topographical maps, and vehicular reconnaissance surveys from accessible public viewpoints. Planned land use features were limited to known features obtained from governmental entities and mobility authorities.

2.2.2.1 Urban/Developed

The urban/developed category represents concentrations of surface-disturbing land uses, which include habitable structures and other developed areas characterized with low, medium and high intensities. The various levels of development include a mix of residential, institutional, commercial, and/or industrial land uses. Developed low-, medium- and high-intensity areas were identified using aerial photograph interpretation and reconnaissance surveys. These classifications are defined below:

- **Developed Low-Intensity** areas typically include rural settings with single-family housing units.
- **Developed Medium-Intensity** areas typically include single-family housing units that are grouped in residential subdivisions and might include peripheral commercial structures.
- **Developed High-Intensity** areas typically include highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses, and commercial/industrial parks. Areas with the highest concentration of development are typically located within or near the towns and communities in the study area.

The study area encompasses Yoakum and Gaines Counties. The study area predominantly consists of low-intensity development. However, the study area contains a medium-intensity developed area. The more developed area within the study area counties is located within Denver City. The areas outside of the cities are primarily rural, with a mixture of rangeland/pastureland, irrigated cropland, and where most of the habitable structures are associated with scattered rural properties consisting of single-family housing units.

Habitable structures were identified using aerial photographs and field reconnaissance surveys. The PUC definition of a habitable structure was used for this routing study. Commission Rule 16 TAC § 25.101(a)(3) defines habitable structures as "[s]tructures normally inhabited by humans or intended to be inhabited by humans on a daily or regular basis. Habitable structures include, but are not limited to, single-family and multi-family dwellings, mobile homes, apartment buildings, commercial structures, industrial structures, business structures, churches, hospitals, nursing homes, and schools." POWER minimized the Proposed Project's potential impact to sensitive resources, including habitable structures, to the extent practicable. The route evaluation process considered the proximity of habitable structures to the line and reasonable and cost-effective routing adjustments to avoid habitable structures.

The study area is located within Yoakum and Gaines Counties and within three Independent School Districts (ISDs), including Denver City ISD (one elementary school, one middle school, and one high school), Seagraves ISD, and Seminole ISD for a total of three schools identified within the study area (Texas Education Agency [TEA] 2015).

2.2.2.2 Planned Land Use

The planned land use category identifies objectives and/or policies regarding land use goals and plans, including conservation easements, managed lands, and planned developments. Cities and counties typically prepare comprehensive land use plans to provide strategic direction for the individual city or county. Yoakum and Gaines Counties websites were reviewed and correspondence was submitted to county officials to identify any planned land use conflicts.

Conservation Easements

A conservation easement is a restriction that property owners voluntarily place on specified uses of their property to protect natural, productive, or cultural features. The property owner retains legal title to the property and determines which types of uses to allow and which to restrict. The property can still be bought, sold and inherited, but the conservation easement is tied to the land and binds all present and future owners to its terms and restrictions. Conservation easement language will vary as to the individual property owners' allowances for additional developments on the land. The land trusts facilitate the easements and ensure compliance with the specified terms and conditions.

The Texas Land Trust Council (TLTC) identifies several non-governmental groups that are land trusts for conservation easements within the Panhandle Plains Region. Specifically, the Colorado River Land Trust, Nature Conservancy, Native Prairies Association of Texas, Texas Agricultural Land Trust, Texas Land Conservancy, and Texas Cave Management Association serve as land trusts within Yoakum and Gaines Counties (TLTC 2015). A review of these and other non-governmental land trust groups did not identify any mapped conservation easements within the study area.

A review of the National Conservation Easement Database (NCED) revealed no easements within the study area (NCED 2015).

2.2.2.3 Agriculture

Agriculture is a significant segment of the economy throughout Texas, and the study area has active agricultural sectors. Table 2-2 compares 2012 data from the United States Department of Agriculture's (USDA) National Agricultural Statistics Service's Census of Agriculture against 2007 data. Table 2-2 sets out the total market value of agricultural products sold, the distribution of products, and the number of farms in the study area for the two time periods.

TABLE 2-2 AGRICULTURE

COUNTY	TOTAL MARKET VALUE OF AGRICULTURAL PRODUCTS			DISTRIBUTION OF PRODUCTS (2012)		NUMBER OF FARMS		
	2007	2012	Change	Crop Sales	Livestock Sales	2007	2012	Change
Yoakum County	$90,130,000	$80,008,000	-11%	92%	8%	348	339	-3%
Gaines County	$193,195,000	$180,470,000	-7%	97%	3%	825	644	-22%

Source: USDA 2012.

2.2.2.4 Oil and Gas Facilities

The study area is located in an area with numerous oil and gas fields. Data was obtained from the Railroad Commission of Texas (RRC) (RRC 2015a) that provided a GIS layer for existing oil and gas wells, pipelines and supporting facilities within the study area. Data point categories were reviewed and included the following types: permitted locations; oil, gas, injection, disposal, core test, shut-in, brine mining, and water supply wells; observed oil wells; horizontal drain holes; and sidetrack well surface locations. The 2015 RRC dataset along with aerial photograph interpretation and field reconnaissance were used to identify and map existing oil and gas related facilities.

2.2.2.5 Transportation, Aviation, Utility Features

Transportation Features

Federal, state, and local roadways were identified using TxDOT county transportation maps, Texas Natural Resource Information System data, and field reconnaissance surveys. The roadway transportation system within the study area in Yoakum County includes the following major roadways: SH 214 and SH 83. The roadway transportation within the Yoakum County study area also includes the following farm-to-market roads: FM 1939 and 2055. The roadway transportation system within the study area in Gaines County includes the following major roadways: SH 214 and SH 83. The roadway transportation within the Gaines County study area also includes the following farm-to-market roads: FM 2055 and FM 2056. Numerous county and local roads (paved and unpaved) were also identified in both study area counties (TxDOT 2015a).

TxDOT's "Project Tracker," which contains detailed information by county for every project that is or could be scheduled for construction, was reviewed to identify any state roadway projects planned within the study area. In Yoakum County, one roadway repair project is funded for development within the study area: the repair of roadway SH 83 between the Texas/New Mexico State Line and SH 214 (approximately 14 miles in length) (TxDOT 2015b). In Gaines County, no roadway projects are funded for development within the study area (TxDOT 2015b).

Aviation Features

POWER reviewed the Albuquerque Sectional Aeronautical Chart (FAA 2015a) and the Chart Supplement for the South Central U.S. (formerly the Airport/Facility Directory) (FAA 2016) to identify FAA registered facilities within the study area subject to notification requirements listed in 14 CFR Part 77.9. Facilities subject to notification requirements listed in 14 CFR Part 77.9 include public-use airports listed in the Airport/Facility Directory (currently the Chart Supplement), public-use or military airports under construction, airports operated by a federal agency or DoD, or an airport or heliport with at least one FAA-approved instrument approach procedure.

The Chart Supplement for the South Central U.S. used in conjunction with the Albuquerque Sectional Aeronautical Chart, contains all public-use airports, seaplane bases and heliports, military facilities, and selected private-use facilities specifically requested by the DoD for which a DoD Instrument Approach Procedure has been published in the U.S. Terminal Procedures Publication.

POWER also received correspondence from TxDOT's Aviation Division which also lists public-use facilities within the study area (refer to Appendix A).

No public-use or military FAA registered airports were identified within the study area counties (FAA 2016).

Also, no public-use heliports or heliports with an instrument approach procedure are listed for the study area in the Chart Supplement for the South Central U.S. (FAA 2016).

In addition, POWER also reviewed the FAA database (FAA 2015b), the AirNav website (AirNav 2016), USGS topographic maps, recent aerial photography, and conducted field reconnaissance from publicly accessible areas to identify private-use airstrips and private-use heliports not subject to notification requirements listed in 14 CFR Part 77.9. There were no private-use airstrips or private-use heliports identified within the study area.

Utility Features

Data sources used to identify existing electrical transmission and distribution lines include utility company and regional system maps, data provided by SPS, aerial imagery, USGS topographic maps, additional available planning documents, and field reconnaissance surveys. Transmission lines identified in the study area include four 230-kV transmission line, ten 115-kV transmission lines, and six other transmission lines (69-kV or less). Distribution lines are prevalent throughout the developed portions of the study area; however, these features were not mapped or inventoried.

In addition, numerous water wells are located throughout the study area (TWDB 2015b).

2.2.2.6 Communication Towers

Review of the Federal Communications Commission (FCC) database indicated there are no AM radio transmitters located within the study area (FCC 2015).

The FCC also indicated that there are three other electronic installations within the study area (e.g. FM radio transmitters, microwave relay stations, and/or cell towers) (FCC 2015).

2.2.3 Socioeconomics

This section presents a summary of economic and demographic characteristics for each county and describes the socioeconomic environment of the study area. Literature sources reviewed include publications of the United States Bureau of the Census (USBOC) and the Texas Water Development Board (TWDB).

2.2.3.1 Population Trends

Yoakum County experienced a population growth of eight percent between 2000 and 2010. By comparison, population at the state level increased by nearly 21% between 2000 and 2010 (USBOC 2000 and 2010). According to TWDB projections, Yoakum County is projected to experience an overall population increase over the next 40 years. Between 2010 and 2020, 2020 and 2030, 2030 and 2040, 2040 and 2050, population changes in Yoakum County are projected to increase 13%, 13%, ten percent, and ten percent, respectively (TWDB 2015a).

Gaines County experienced a population growth of 21% between 2000 and 2010. A state level population increase of 21% was noted between 2000 and 2010 (USBOC 2000 and 2010). According to TWDB projections, Gaines County is projected to experience an overall population increase over the next 40 years. Between 2010 and 2020, 2020 and 2030, 2030 and 2040, 2040 and 2050, population changes in Gaines County are projected to increase by 22%, 21%, 20%, and 18%, respectively (TWDB 2015a).

By comparison, the population of Texas is expected to experience population increases of 17%, 14%, 12%, and 11%, respectively, over the next four decades (TWDB 2015a). Table 2-3 presents past population trends and projections for Yoakum and Gaines Counties and for the State of Texas.

TABLE 2-3 POPULATION TRENDS

STATE/COUNTY	PAST		PROJECTED			
	2000	2010	2020	2030	2040	2050
Texas	20,851,820	25,145,561	29,510,184	33,628,653	37,736,338	41,928,264
Yoakum County	7,322	7,879	8,920	10,089	11,128	12,232
Gaines County	14,467	17,526	21,316	25,746	30,997	36,654

Source: USBOC 2000 and 2010; TWDB 2015a.

2.2.3.2 Employment

The civilian labor force (CLF) in Yoakum County increased by 20% (640 people) between 2000 and 2013 and the CLF in Gaines County increased by 36% (2,072 people) between 2000 and 2013. By comparison, the CLF at the state level grew by 28% (2,758,614 people) from 2000 to 2013 (USBOC 2000 and 2013). Table 2-4 presents the CLF for the study area counties and the State of Texas for the years 2000 and 2013.

Between 2000 and 2013, Yoakum County experienced a slight decrease in the unemployment rate from 9.2% to 8.1%. Gaines County experienced a slight increase in the unemployment rate from 5.5% to 5.8%. By comparison, the State of Texas experienced a small increase in the unemployment rate between 2000 and 2013 from 6.1% to 8.1% (USBOC 2000 and 2013). Table 2-4 presents employment and unemployment data for the study area counties and the State of Texas for the years 2000 and 2013.

TABLE 2-4 CIVILIAN LABOR FORCE AND EMPLOYMENT

STATE/COUNTY	2000	2013
Texas		
Civilian Labor Force	9,830,559	12,589,173
Employment	9,234,372	11,569,041
Unemployment	596,187	1,020,132
Unemployment Rate	6.1%	8.1%
Yoakum County		
Civilian Labor Force	3,152	3,792
Employment	2,861	3,486
Unemployment	291	306
Unemployment Rate	9.2%	8.1%
Gaines County		
Civilian Labor Force	5,776	7,848
Employment	5,460	7,390
Unemployment	316	458
Unemployment Rate	5.5%	5.8%

Sources: USBOC 2000 and 2013.

2.2.3.3 Leading Economic Sectors

The major occupations in Yoakum County 2013 are in the category of natural resources, construction, and maintenance occupations, followed by management, business, science, and arts occupations. In Gaines County, the major occupations are in the category of natural resources, construction, and maintenance occupations, followed by management, business, science, and arts occupations (USBOC 2013). Table 2-5 presents the number of persons employed in each occupation category during 2013 in each study area county.

TABLE 2-5 OCCUPATIONS WITHIN THE STUDY AREA COUNTIES

OCCUPATION	TOTAL NUMBER OF PERSONS	
	Yoakum County	Gaines County
Management, business, science, and arts occupations	840	1,843
Service occupations	510	958
Sales and office occupations	531	1,368
Natural resources, construction, and maintenance occupations	1,060	2,043
Production, transportation, and material moving occupations	545	1,178

Source: USBOC 2013.

In 2000 and 2013, the industry group that employed the most people in Yoakum and Gaines Counties was that encompassing agriculture, forestry, fishing and hunting, and mining, followed by educational services. Table 2-6 presents the number of persons employed in each of the industries in the study area county for the years 2000 and 2013.

TABLE 2-6 INDUSTRIES IN THE COUNTIES WITHIN THE STUDY AREA

INDUSTRY GROUP	TOTAL NUMBER OF PERSONS			
	Yoakum County		Gaines County	
	2000	2013	2000	2013
Agriculture, forestry, fishing and hunting, and mining	999	1,190	1,365	1,601
Construction	95	167	396	1,133
Manufacturing	123	92	287	335
Wholesale trade	68	80	250	155
Retail trade	268	323	538	734
Transportation and warehousing, and utilities	116	225	404	618
Information	10	4	70	32
Finance and insurance, and real estate and rental and leasing	90	88	200	121
Professional, scientific and management, and administrative and waste management services	60	99	84	301
Educational services, and health care and social assistance	579	615	1,102	1,233
Arts, entertainment, and recreation, and accommodation and food services	169	181	255	402
Public administration	999	1,190	1,365	1,601

Source: USBOC 2000 and 2013.

2.3 Parks and Recreation Areas

The PUC recognizes parks and recreational areas as those owned by a governmental body or an organized group, club, or church. Federal and state databases searches and county/local maps were reviewed to identify any parks and/or recreational areas within the study area. Field reconnaissance surveys were also conducted to identify any additional park or recreational areas.

2.3.1 National/State/County/Local Parks

No national parks or state parks were identified within the study area counties (National Park Service [NPS] 2015a; TPWD 2015a). Also, there were no county parks identified within the study area. However, two city parks were identified in the study area in Denver City: Mustang Baseball Field and Stuffy Moorehead Park (Denver City 2015).

Additional recreational activities such as hunting and fishing might occur on private properties throughout the study area, but are not considered to be open to the general public.

2.3.2 Wildlife Viewing Trails

Review of the TPWD Panhandle Plains Wildlife Trail indicates that there are no wildlife viewing sites/driving loops located within the study area (TPWD 2015b).

2.4 Historical (Cultural Resource) Values

Section 37.056(c)(4)(A-D) of PURA incorporates historical and aesthetic values as a consideration when evaluating proposed electric transmission facilities. The PUC's Standard Application for a CCN further stipulates that known historical sites within 1,000 feet of a route will be listed, mapped, and their distance from the centerline of the route documented in the application filed for consideration. Archeological sites within 1,000 feet of the route will be listed and their distance from the centerline documented, but they need not be shown on maps for the protection of the site. Sources consulted to identify known sites (national, state, or local commission) shall also be listed.

The THC is the state agency responsible for historic preservation. The THC, working in conjunction with the TARL maintains records of previously recorded cultural resources (archeological, architectural, and cemeteries) as well as records of previous field investigations. Information from the THC's Restricted Access Texas Archeological Sites Atlas (TASA) was reviewed and GIS shapefiles were acquired from the TASA and TARL to identify and map locations of previously recorded cultural resource sites within the study area.

Together archeological and historical sites are often referred to as cultural resources. Under the NPS's standardized definitions, cultural resources include districts, sites, buildings, structures, or objects important to a culture, subculture, or community for scientific, traditional, religious, or other reasons. For this study, cultural resources have been divided into three major categories: archeological resources, architectural resources, and historic cemeteries. These three categories correlate to the organization of cultural resource records maintained by the THC and TARL.

- **Archeological resources** are locations on the ground surface or buried within the earth where human activity has measurably altered or left deposits of physical remains (e.g., burnt rock middens, stone tools, petroglyphs, house foundations, bottles). Archeological resources can date to either prehistoric times or the historic era.

- **Architectural Resources** typically include standing buildings (e.g., houses, barns, outbuildings), but can also include structures (dams, canals, bridges, roads, silos), and districts that are non-archeological in nature.

Cemeteries are places of intentional human interment and may include large public burial grounds with multiple burials, small family plots with only a few burials, or individual grave sites. In some

instances cemeteries may be designated as Historic Texas Cemeteries (HTCs) by the THC and may be recognized with an Official Texas Historical Marker (OTHM). Other cemeteries may also be documented as part of the THC's Record, Investigate, and Protect program.

2.4.1 Cultural Background

The study area is located in Yoakum and Gaines Counties, within the Plains Cultural Resource Planning Region as delineated by the THC (Mercado-Allinger et al. 1996) and shown in Figure 2-2. Geographically, the study area is located on the southern reaches of the Southern High Plains, along the southern edge of the Llano Estacado. This region is largely devoid of topographic relief, and what slight relief exists occurs primarily as small lake and playa basins, dunes, and dry valleys. The majority of *in situ* Native American archeological deposits have been recorded in association with these features. Archeologists have divided the prehistoric occupation of the region into three main periods: the Paleoindian, Archaic, and Late Prehistoric or Ceramic periods (Johnson and Holliday 2004).

2.4.1.1 Paleoindian (ca. 11,500 to ca. 8,600 years ago)

Evidence of human occupation in the Southern High Plains of northwestern Texas and eastern New Mexico spans the last 11,500 years (Johnson and Holliday 2004). The archaeological complexes of the Paleoindian period are represented by the Clovis and Folsom complexes, and Late Paleoindian period, each based on distinctive lithic technology.

The Clovis complex extended from approximately 11,500 years ago to 11,000 years ago during the terminal Late Pleistocene. Although Clovis occupation sites have been identified on the Llano Estacado, only three have *in situ* Clovis deposits; the Blackwater Draw #1 (Clovis type-site) in New Mexico, the Miami site northeast of Amarillo, and the Lubbock Lake occupation west of Lubbock (Johnson and Holliday 2004). Each of these sites contained Clovis-type spear points found in association with mammoth remains indicating the Clovis population was relying on the animals as an important food base. At the Lubbock Lake site, at least six species of extinct megafauna were found exhibiting evidence that the sites were used as butchering or primary kill sites (Johnson and Holliday 2004). Despite the popular misconception that these early populations were primarily hunters, evidence from the Gault Site in central Texas suggests that their diet was more generalized (Collins 2002). Clovis cultures hunted big game out of base camps for short periods of time, but were highly mobile and rarely stayed for long periods at any one location.

FIGURE 2-2 LOCATION OF STUDY AREA IN RELATION TO THE CULTURAL RESOURCE PLANNING REGIONS OF TEXAS

The transition from the Clovis to the Folsom complex was marked by a significant climatic and environmental change which continued into Late Paleoindian times (Johnson and Holliday 2004). Average summer temperatures warmed from the earlier period while the average winter temperatures dipped below those during the Clovis period with sustained periods of freezing temperatures. Perennial streams persisted in the lower reaches of most draws. Ponds and marshes surrounded by lush vegetation began to form in the upper end of the draws. Many of the large animals hunted by the Clovis populations died off as a result of the temperature fluctuation; however, large bison thrived and congregated around the ponds where food was plentiful. Folsom people took advantage of the localized food base and large bison became the mainstay of the Folsom diet (Johnson and Holliday 2004).

A consistent and plentiful food base led to an increased Folsom population, as suggested by a rise in the number of archeological sites dating to this period (ca. 10,800 to 10,300 years ago). It also appears from archeological assemblages at sites such as Lipscomb, Lake Theo, Lubbock Lake, and the Midland/Scharbauer site, that Folsom people were occupying camp sites for longer periods of time. Many of these campsites were in close proximity to the water sources frequented by bison (Johnson and Holliday 2004).

The Midland/Scharbauer site is an archeological site dating to the Folsom era located southwest of the study area along Monahans Draw south of Midland. In 1953, human bone and teeth were found eroding out of the dry channel of Monahans Draw. Subsequent archeological investigations in the draw and adjacent deflation basins from 1953 to 1955 uncovered numerous artifacts that dated to the Folsom period. Many projectile points recovered from the excavations closely resembled the traditional Folsom point, but without the characteristic fluting. This projectile point was named "Midland" after the site. Early dating methods determined the artifacts date to around 10,000 years ago. Skeletal remains of a woman unearthed at the site were initially thought to date up to 20,000 years before present. More recent investigations at the site have determined the age of skeletal remains is most likely closer to that of the artifacts –somewhere between 11,000 and 10,000 years ago (Holliday and Meltzer 1996).

The Late Paleoindian period (ca. 10,000 to 8,500 years ago) is characterized by a continued warming and drying trend that began during the Folsom period. Seasonal temperature changes were more pronounced and periodic droughts led to disappearing surface water. What water was available tended to collect in playa basins and salinas (Johnson and Holliday 2004). Despite the warming trend, subsistence strategies remained much as they were during the earlier Paleoindian periods. Big game animals still made up a large part of the diet; however, smaller mammals such as deer, rabbit, and gophers as well as fish and reptiles were also part of the diet. Archeological faunal remains dating to the Late Paleoindian vary by geography throughout Texas and represent locally available food resources (Bousman et al. 2004).

2.4.1.2 Archaic Period (ca. 8,500 to 2,000 years ago)

The Archaic Period in the southern plains spans the greatest length of time of any of the Native American occupational periods. This 6,500 year period is divided into Early, Middle, and Late sub-periods based on variations in the style of stone tools. Comparatively little is known about the Early Archaic (ca. 8,000 to 6,000 years ago). Only two sites with Early Archaic components have been excavated in the Llano Estacado region; Lubbock Lake and San Jon in New Mexico. Data from these sites suggest an increased reliance on plant foods and smaller game, although bison continued to be a major part of the diet (Johnson and Holliday 2004; Dillehay 1974).

In the Middle Archaic, environmental conditions were significantly drier and hotter than during the Early Archaic. Many of the ponds and marshes dried up and the range vegetation was deteriorating. Water wells discovered at three sites dating to the Middle Archaic (Blackwater Draw Locality #1, Mustang Springs, and Marks Beach) indicate that Middle Archaic populations were finding alternate means of procuring and storing water (Meltzer and Collins 1987). Despite the harsh conditions, archeological evidence suggests that Lubbock Lake had a relatively intensive occupation throughout the Middle Archaic. Multiple activity areas representing camping, bison kill/butchering locales, and ovens likely used for plant processing are found around the lake (Johnson and Holliday 2004).

Around 4,500 years ago the climate began to shift back to relatively cooler and wetter conditions, marking a transition to the Late Archaic period. Range conditions improved and mixed grass prairie replaced the desert plains grasslands. Localized marshlands returned and springs once again dotted the landscape. Playas and salinas held seasonal to year-round water. The more hospitable environment supported a growing population as evidenced by the thousands of archeological sites dating to this period, in sharp contrast to the few sites dating to the Early and Middle periods (Johnson and Holliday 2004; Hughes 1991). During the Late Archaic, the primary mode of subsistence was bison hunting, although there is evidence for smaller game and wild plants in the diet. Site types dating to the Late Archaic include campsites, rock shelters, and bison kill and butchering sites. Projectile points consisted primarily of barbed dart points which were significantly smaller than the large spear points used during the Paleoindian period (Hughes 1991).

2.4.1.3 Late Prehistoric or Ceramic Period (ca. 2,000 to 500 years ago)

The Late Prehistoric is marked by increased sedentism. Although hunting and gathering remained the primary mode of subsistence in the region, a hospitable environment and secure resource base allowed for a transition towards a village-gardener lifestyle. One of the hallmarks of the period was the introduction of Mogollon brownware and Woodland cord marked pottery around 1,800 years ago. The bow and arrow was also introduced during this period along with small barbed arrow points and later side-notched triangular arrow points. Pit houses were common on the southern edge of the Llano Estacado early in the period, followed by a transition to surface residential structures around 800 years ago. There is also some evidence for limited agriculture in the Woodland Period. Similar to the Late Archaic, active and abandoned stream channels continued to be preferred locations for campsites (Hughes 1991).

Four Late Prehistoric culture complexes have been recognized on the Llano Estacado: Lake Creek/Plains Woodland on the northern edge, Palo Duro on the eastern edge, Eastern Jornada on the southwest margins, and Blow Out Mountain on the southeastern edge. The study area falls between three of the complexes on a portion of the southern Llano Estacado for which little has been documented relating to the Late Prehistoric. During the Late Prehistoric the region was used as a north-south thoroughfare along southeasterly flowing drainages. Semi-permanent residential base camps were established at large playa and pluvial lakes along the thoroughfare. The only well-documented Late Prehistoric playa lake site in the southern Llano Estacado is the Salt Cedar site in the extreme southeastern corner of Andrews County. Based on pottery sherds found in the archeological assemblage, the Salt Cedar site has been categorized as belonging to the Eastern Jornada Mogollon culture complex (Boyd 2004).

By the second part of the Late Prehistoric (ca. 1,000 to 800 years ago), most of the Southern Plains were occupied by permanent semi-sedentary villages and a mixed economy based on hunting and gathering as well as horticulture (Drass 1998). Intermingling of Puebloan trade pottery and Plains lithic tool types during this time indicate that trade networks had been developed throughout the region. Sites were also exhibiting a much greater variety in the species of animal bones and number

of grinding implements, indicating a broadened resource base with a dependency on both wild and domesticated processed plant foods. Intentional human burials were also common by this time (Boyd 2004).

2.4.1.4 Historic Period (ca. 300 to 150 years ago)

Archeologically, the historic period on the Southern High Plains is subdivided into the aboriginal and Euro-American-historic eras. The historic period is marked by the arrival of the Spanish, as they conducted the earliest European explorations of the American Southwest, establishing the first European claim to Texas. The introduction of the horse by Spain changed the lifeways of many Native American cultures, as they were used as beasts of burden, food, and in war. Historic-period aboriginal animal processing sites are similar to those during the Late Prehistoric period; however, the sites are distinguished from the earlier period by the presence of European trade goods and remains of modern horses processed as a food source. Several historic rock art sites have been documented to the east of the study area in Garza County, and many Comanche sites with glass trade beads dating from the 1700s to the early to mid-1800s have been found throughout the Texas Panhandle (Johnson and Holliday 2004).

Early American scouts viewed much of the land as dry and arid; incapable of supporting life (Hämäläinen 2003). It was this misconception coupled with the large aboriginal populations that hindered settlement in the area. Euro-American occupation of the Southern High Plains did not begin until the middle to late 1800s. Among the first Europeans to arrive were the Pastores, or sheep men, typically of Hispanic descent from New Mexico. Numerous groups of Pastores moved onto the Llano Estacado and established small settlements consisting of local plazas surrounded by adobe houses. For several decades until the late 1800s, sheep production would dominate the industry in the area. The U.S. government dispatched professional buffalo hunters and military troops to the Plains states to exterminate the buffalo, a primary food source of the aboriginal population, and drive the Native Americans to reservations. Some of the buffalo hunters who moved into the region in the 1870s, stayed and established ranches after the bison were exterminated. Following the Red River War, a series of military engagements between the U.S. Army and Kiowa, Comanche, Southern Cheyenne, and Southern Arapaho tribes in the mid-1870s, the threat of aboriginal raids on Euro-American settlers diminished, and the region was opened to Spanish and Anglo settlement (Johnson and Holliday 2004). Cedar Lake, approximately 30 miles east of the study area, was the site of a skirmish between Indians and United States cavalrymen in 1875 (Perez 2015).

Despite the early success of the sheep industry, cattle ranching quickly became the primary agricultural pursuit, with large-scale corporate cattle ranching operations coming to dominate in the latter nineteenth century (Rathjen 2015). In 1900, the combined population of Yoakum and Gaines Counties was 71 people, and over 22,000 head of cattle were reported in the agricultural census (Hunt 2015; Leffler 2015). Cattle production was the only industry within the two counties until the early twentieth century. The sale of railroad land and the 1895 School Land Act, which offered settlers cheap agricultural and grassland acreage, encouraged farming and boosted the population (Hunt 2015; Leffler 2015). Thousands of acres of land were improved for agriculture by settlers. The Santa Fe Railroad reached Seagraves in 1917, opening the area up to distant markets. However, drought drove many settlers away from the area by 1920. Agriculture in the counties of Yoakum and Gaines has remained limited in comparison to their eastern county neighbors (Hunt 2015; Leffler 2015).

During the 1920s, cotton increased in importance to the economies of Yoakum and Gaines Counties. By 1930, over 10,000 acres in Yoakum County and over 20,000 acres in Gaines County were devoted to cotton in stark contrast to the 485 acres of cotton planted in Gaines County in 1920 (Hunt 2015; Leffler 2015). Sorghum and corn also became important regional crops during the 1920s. The Great

Depression and Dust Bowl reversed much of the regions and nations economic growth, affecting many of the local farmers differently. Some farmers were able to hold on by finding local jobs in the flourishing dairy industry of neighboring counties but many had to turn to tenant farming. Between 1929 and 1935, the number of farmers who fully owned their land dropped by almost 50% in Gaines County (Hunt 2015). The Depression's effects were felt nationwide but the environmental cost of the Dust Bowl in the region was just as great. Lowering prices, drought, and sand storms plagued the local economy (Hunt 2015; Worster 2004). Cropland dropped significantly, and topsoil was blown away, exposing unproductive clay in much of the region.

In the mid-1930s oil was discovered in the area, boosting the economy and attracting a once-again growing population. In 1936, drillers found the Seminole Pool, and in 1938, over 650,000 barrels of crude oil was taken from Gaines County wells (Hunt 2015). In the same year, twice as many barrels were taken from wells of the Wasson Oil Field in Yoakum County, in an oil boom centered on Denver City, founded in 1939 (Leffler 2015). Much of the economy today in the Southern High Plains region is still strongly tied to the oil and gas industry, although water wells, mobile irrigation and mechanization after World War II opened up thousands of acres to cultivation (Leffler 2015). Through these new technologies, the Southern High Plains was better able to diversify its crops; cotton, sorghum, wheat, hay, and corn now dominate (Hunt 2015; Colaizzi et al. 2008). The oil boom that had allowed Denver City to prosper in the thirties would subside before growing again, continuing a trend of ebb and flow over the latter half of the twentieth century (Bennett 2015). Today Denver City continues to serve as the headquarters for oil production on the Wasson Oil Field, which spans over 60,000 acres (THC 2015c).

2.4.2 Records Review

The THC, working in conjunction with TARL, maintains records of previously recorded cultural resources as well as records of previous field investigations. On September 10, 2015, correspondence with TARL concluded that no previously recorded archeological and historical resources are located within the study area. Information on archeological sites and previously conducted surveys was obtained from the Texas Archeological TASA on September 14, 2015. The locations of and information pertaining to State Antiquities Landmarks, NRHP properties, cemeteries, HTCs, and OTHMs within the study area were obtained from the THC's online Texas Historical Site Atlas and TASA in September 2015. TxDOT's historic bridges database was reviewed for bridges that are listed or determined eligible for listing on the NRHP within the study area. At the national level, the NRHP database (NPS 2015b) and NPS websites for National Historic Landmarks (NPS 2015c), and National Historic Trails (NPS 2015d) were reviewed as well.

No archeological sites, NRHP-listed properties, State Antiquities Landmarks, NRHP-listed or determined-eligible bridges, cemeteries, OTHMs or HTCs are recorded within the study area.
To further assess potential impacts to cultural resources, high probability areas (HPAs) for prehistoric archeological sites were defined using topographic and satellite maps, and areas of Holocene deposition within the study area were delineated using the Geologic Atlas Hobbs and Brownfield map sheets (Bureau of Economic Geology [BEG] 1974 and 1976). Within the study area, the prehistoric HPAs occur along McKenzie Draw, its tributaries, and near playa lakes.

Historic-age resources are also likely to be found near water sources. However, they will also be located in proximity to primary and secondary roads that provided access to the sites. Buildings and cemeteries are also more likely to be located within or near historic communities.

2.4.3 Previous Investigations

Based on a review of the TASA data, four cultural resource surveys have been undertaken in the study area. In 1987, a survey was undertaken in advance of Denver City Wastewater Treatment Facilities along and south of SH 83, south of Denver City. In 1991, portions of SH 83 west of Denver City were surveyed in advance of proposed TxDOT improvements west of Denver City. In 1997, approximately one acre was surveyed in advance of a Federal Energy Regulatory Commission project. In 1997, multiple transmission line projects east of Denver City were surveyed, including proposed substation locations. Very little of the study area has been surveyed for cultural resources, and the few surveys that have been undertaken did not record any cultural resources.

2.5 Aesthetic Values

Section 37.056(c)(4)(C) of PURA incorporates aesthetics as a consideration when evaluating proposed electric transmission facilities. There are currently no formal guidelines provided for managing visual resources on private, state, or county owned lands. For the purposes of this study, POWER defined the term "aesthetics" to accommodate the subjective perception of natural beauty in a landscape and to assess an area's scenic qualities. The visual analysis was conducted by describing the regional setting and assessing the viewer's sensitivities. Related literature, aerial photograph interpretation, and reconnaissance surveys were used to describe the regional setting and to determine the landscape character types for the area.

Consideration of the visual environment includes a determination of aesthetic values (where the major potential effect of a project on the resource is considered visual) and recreational values (where the location of a transmission line could potentially affect the scenic enjoyment of the area). POWER used the following aesthetic criteria to determine an area's aesthetic identity:

- Topographical variation (hills, valleys, etc.);
- Prominence of water in the landscape (rivers, lakes, etc.);
- Vegetation variety (woodland, meadows);
- Diversity of scenic elements;
- Degree of human development or alteration; and
- Overall uniqueness of the scenic environment compared with the larger region.

The study area is located in the southwest portion of the Texas Panhandle in Gaines and Yoakum Counties. It is characterized by a nearly level landscape with a rural setting comprising oil and gas fields, agricultural cropland with prominent pivot irrigation, extensive oil and gas developments and some residential and commercial/industrial developments. The majority of the study area has been impacted by activities associated with oil and gas exploration and agricultural operations. The more developed area within the study area counties is located within Denver City. No windfarms are located within the study area.

No known designated views or designated scenic roads or highways were identified within the study area. A review of the NPS website did not indicate any National Wild and Scenic Rivers System (NWSRS), or National Historic Landmarks, National Monuments, National Memorials, National Historic Sites, National Battlefields, or National Trails within the study area (NWSRS 2015; NPS 2015c, 2015d).

Based on these criteria, the study area exhibits a low degree of aesthetic quality for the region. The study area maintains the setting of a rural oil and gas community. In general, the aesthetic quality of the study area is not distinguishable from that of other adjacent areas within the region.

2.6 Environmental Integrity

Resource inventory data were collected for physiography, geology, soils, surface waters, wetlands, and ecological resources. This data was mapped within the study area utilizing GIS layers. Additional data collection activities consisted of file and record reviews conducted with the various state and federal regulatory agencies, a review of published literature, and review of various maps and aerial photographs. Maps and data layers reviewed include USGS 7.5 minute topographic maps, Google Earth aerial imagery, Geologic Atlas maps, NWI maps, National Hydrography Database (NHD) (USGS 2015a), Playa Lakes Joint Venture (2011), FEMA national flood hazard layer, USGS, Natural Resource Conservation Service (NRCS) soil survey data, TCEQ, USFWS/TPWD endangered species county lists, and TXNDD.

2.6.1 Physiography and Geology

As shown in Figure 2-3, the study area is located within the Southern High Plains Physiographic Province of Texas and New Mexico. This province is located west of the North-Central Plains Province and is bounded to the south by the Edwards Plateau and the Trans-PecosBasin and Range provinces (BEG 1996). This region is described as flat with playa lakes and local dune fields. Elevations within the Southern High Plains region range from 2,200 feet to 3,800 feet above mean sea level (amsl) (BEG 1996). Within the study area, elevations range between 3,480 and 3,600 feet amsl with elevations gradually increasing to the north and west (BEG 1974, 1976).

Geologic formations occurring within the study area include the Quaternary-aged sand sheets and Blackwater Draw formation (BEG 1974, 1976). Tertiary-aged formations include the Ogallala Formation (BEG 1974). Brief descriptions of the geologic formations within the study area are stated below.

Quaternary Formations

A majority of the study area is covered by sedimentary Quaternary-aged sand sheet deposit and Blackwater Draw formation. Sand sheet deposits occur throughout the Proposed Project area with the Blackwater Draw formations occurring along extant stream features and relict playa lakes. These formations typically consists of clay, silt, sand, and gravel eroded from sedimentary rock with organic material abundant locally (USGS 2015b).

Tertiary Formations

The Ogallala Formation is exposed along draws and streams. It is described as a fluviatile sand, silt, clay, and gravel capped by caliche. Sand is common and may be fine to coarse grained quartz, cemented locally. Silt and clay are minor with caliche nodules. Gravel is not present everywhere but may consist of pebbles and quartz with some chert, igneous/metamorphic rock, or limestone. Its maximum thickness is approximately 350 feet (BEG 1974).

FIGURE 2-3 LOCATION OF STUDY AREA IN RELATION TO THE PHYSIOGRAPHIC REGIONS OF TEXAS

2.6.1.1 Geological Hazards

Several potential geologic hazards that could affect the construction and operation of the transmission line were evaluated within the study area. Hazardous areas typically reviewed include potential karst areas, faults, coal mining locations, gravel quarries, and potential subsurface contamination.

No known caves were identified within the counties or within the study area (Texas Speleological Society [TSS] 1994). No known quaternary faults were identified within the study area (USGS 2015c). No current or historical coal mining activities were identified; however, several gravel quarries are located within the study area (RRC 2015b).

Review of the TCEQ State Superfund Site database (TCEQ 2015) and United States Environmental Protection Agency (USEPA) Superfund Site database (USEPA 2015) did not indicate any current or previous hazardous waste sites within the study area.

The RRC oil/gas database was reviewed for the study area and numerous oil and gas wells, pipelines, treatment facilities, and pipeline compressor stations were identified within the study area (RRC 2015c).

2.6.2 Soils

2.6.2.1 Soil Units

The NRCS Web Soil Survey data were used to identify and characterize mapped soil units that are within the study area, including hydric and important farmland soil series designations (NRCS 2015). Soil map units represent an area dominated by one or more major kinds of soil or miscellaneous areas. Table 2-7 summarizes each soil association within the study area and indicates if any mapped units of the soil series within the association are considered hydric and/or prime farmlands (NRCS 2015).

TABLE 2-7 MAPPED SOIL UNITS WITHIN THE STUDY AREA

SOIL ASSOCIATION	DESCRIPTION	SOIL SERIES	LANDFORM	PERCENT OF ASSOCIATION	HYDRIC SOIL	PRIME FARMLAND SOIL
Spur - Potter - Mansker (s7451)	Well drained; Calcareous, loamy alluvium and eolian deposits	Spur	Draws	35	N	N
		Potter	Draws/scarps	15	N	N
		Mansker	Plains/Draws	50	N	Y
Patricia - Amarillo (s7539)	Well drained; Loamy or sandy eolian deposits	Patricia	Plains	60	N	N
		Amarillo	Plains	35	N	Y
		Other	-	5	-	-

Source: NRCS 2015.

Upland soil units within the study area are dominated by Patricia – Amarillo soils. Soil units typically located in draws and drainage areas include Spur – Potter – Mansker soil associations.

2.6.2.2 Hydric Soils

The National Technical Committee for Hydric Soils defines hydric soils as soils that were formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part. These soils, under natural conditions, are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation (NRCS 2015).

Map units that are dominantly comprised of hydric soils might have small areas, or inclusions, of non-hydric soils in the higher positions on the landform, and map units dominantly made up of non-hydric soils might have inclusions of hydric soils in the lower positions on the landform (NRCS 2015).

According to the NRCS (2015) Web Soil Survey data for the study area, no major soil units are designated as hydric soils within the study area. Table 2-7 lists whether there are map unit components that are rated as hydric soils in the study area. Minor soils (Other) within each association were not evaluated for this criterion; however minor soil associations may be classified as hydric.

2.6.2.3 Prime Farmland Soils

The Secretary of Agriculture, within 7 U.S.C. § 4201(c)(1)(A), defines "prime farmlands" as lands that have the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. These areas have the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed, including water management, according to acceptable farming methods. Additional potential prime farmlands are those with soils that meet most of the requirements of prime farmland but fail because they lack the installation of water management facilities, or they lack sufficient natural moisture. These areas would be considered prime farmland if such practices were installed. Review of the Soil Survey Geographic database listed prime farmland soils within the study area to include the Amarillo and Mansker soil series; additional minor soils may also be classified as prime farmland soils (NRCS 2015).

This transmission line Proposed Project is not subject to the requirements of the NEPA or the Farmland Protection Policy Act because this Proposed Project will not be completed by and will not receive assistance from any Federal agency. The NRCS encourages the use of accepted erosion control methods during construction.

2.6.3 Water Resources

Water resources evaluated in this study include surface water and groundwater. Information on water resources within the study area was obtained from a variety of sources, including the TPWD (2015a), TCEQ (2015), FEMA (2015), TWDB (2015b, 2015c), USGS topographical maps (USGS 2011), NHD, and aerial photographs.

2.6.3.1 Surface Waters

The study area is located within the Colorado River Basin (USGS 2015a). The only tributary of the Colorado River within the study area is McKenzie Draw. This draw would typically only flow during heavy rain events. The draw flows during these events to the southeast ending near the headwaters of

the Colorado River, located approximately 60 miles southeast of the study area. Additional unnamed surface waters identified within the study area include numerous playa lakes, small ponds, lakes, and ephemeral streams/draws. No major reservoirs or rivers were identified within the study area. All surface waters and their associated wetlands located within the study area are subject to USACE regulations as "waters of the U.S." under Section 404 of the CWA.

Special Status Waters

Under 31 TAC § 357.8, TPWD has designated Ecologically Significant Stream Segments (ESSS) based on habitat value, threatened and endangered species, species diversity, and aesthetic value criteria. Review of the TPWD database for Water Planning Region O (Llano Estacado) did not indicate any designated ESSS within the study area (TPWD 2001).

In accordance with Section 303(d) and 304(a) of the Clean Water Act, the TCEQ identifies surface waters for which effluent limitations are not stringent enough to meet water quality standards and for which the associated pollutants are suitable for measurement by maximum daily load. Review of the TCEQ website and most recent TCEQ CWA § 303(d) lists (TCEQ 2014) did not indicate any surface waters within the study area that did not meet these water quality standards.

2.6.3.2 Groundwater

The study area is underlain by the Ogallala aquifer. The Ogallala is the largest aquifer in the U.S. and underlies much of the High Plains Region. It consists of sand, gravel, clay, and silt. In Texas, the salinity increases in areas south of the Canadian River. Well yields, from a depth of 200 feet, range from 500 to 1,000 gallons per minute. The aquifer provides significantly more water for users (irrigation) than any other major aquifer in the state (TWDB 2015b, 2015c).

The TWDB database was reviewed for public and private water wells within the study area. The database identified numerous irrigation well locations throughout the study area. Water well locations were mapped utilizing GIS data layers. No major or historical springs were identified within the study area (TWDB 1975; TPWD 2015c).

2.6.3.3 Floodplains

The FEMA mapped floodplains and FEMA National Flood Hazard Layer (NFHL) data were unavailable within the study area (FEMA 2015). In lieu of FEMA floodplain maps, it is reasonable to consider that floodplain areas are associated with the larger playa lake depressions and creeks/draws and their tributaries within the study area.

2.6.3.4 Future Surface Water Developments

The study area is located within Water Planning Region O (Llano Estacado). The TWDB State Water Plan and Regional Water Plans (TWDB 2015c) were reviewed for potential future water development projects within the study area. No planned water development projects were identified within the study area.

2.6.4 Ecological Resources

Data and information on ecological resources within the study area were obtained from a variety of sources, including aerial photograph interpretation, field reconnaissance surveys, correspondence with the USFWS, TPWD and published literature and technical reports.

2.6.4.1 Ecological Region

The study area is located within the High Plains Level III Ecoregion and the Llano Estacado and Shinnery Sands Level IV Ecoregions (Griffith et al. 2007). The High Plains Ecoregion consists of flat to rolling grassland plains with a high percentage of the area converted to cropland. Oil and gas production are also prominent in this area. Thousands of playa lakes are scattered within the High Plains area. These seasonal playa features are important habitats for a variety of wildlife and for aquifer recharge, although many of these playas have been converted into cropland.

The Llano Estacado Ecoregion is characterized by a level, treeless plain. Historically this area was a vast shortgrass prairie; with abundant herds of bison (*Bos bison*), prairie dog (*Cynomys ludovicianus)* colonies, and lesser-prairie chickens (*Tympanuchus pallidicinctus*). Today, approximately 80% of the Llano Estacado is tilled for agriculture, growing cotton, corn, and wheat, using dry land farming practices or irrigation pumped from the Ogallala Aquifer (Griffith et al. 2007). The Shinnery Sands Ecoregion is characterized by sand dunes, flats, and hills on the western edge of the High Plains. The area is named for the shrubby shin oak (*Quercus havardii*) that grows in the sand soils. The sand dunes act as a major recharge source for the Pecos River in some areas. Land use within the Shinnery Sands is primarily for grazing livestock, wildlife habitat, and croplands.

2.6.5 Vegetation Areas

2.6.5.1 Terrestrial Communities

The study area is located within the High Plains vegetation area (refer to Figure 2-4) as described by Gould et al. (1960). Vegetational types within the study area include Crops, Blue Grama – Buffalograss Grassland (*Bouteloua gracilis - Bouteloua dactyloides*), Mesquite Shrub Grassland (*Prosopis glandulosa*), Mesquite Brush, Harvard Shin Oak – Mesquite Brush (*Quercus havardii - Prosopis*), and Harvard Shin Oak Brush (Frye et al. 1984). The original vegetation of the High Plains region is described by Hatch et al. (1990) as predominantly mixed prairie and shortgrass prairie with tallgrass prairie occurring on deep, sandy soils. Typical native vegetation occurring on clay and clay loam sites include blue grama, buffalograss, and galleta (*Hillaria jamesii*), which are the principal plant species originally encountered in this region, prior to widespread agricultural development. Historically, sandy loam soils of the region supported little bluestem (*Schizachyrium scoparium*), western wheatgrass (*Elytrigia smithii*), sideoats grama (*Bouteloua curtipendula*), and sand dropseed (*Sporobolus cryptandrus*). While the High Plains area was characteristically treeless and brush free, today, sand sagebrush (*Artemisia filifolia*), honey mesquite, prickly pear (*Opuntia* spp.), and *Yucca* spp. have invaded many sandy and sandy loam sites (Hatch et al. 1990). Currently, most of the High Plains is in irrigated cropland. Major crops produced in the High Plains include cotton, corn, sorghum, wheat, vegetables, and sugar beets. Many of the historical playa lakes have also been converted to agricultural croplands (Hatch et al. 1990).

Vegetation within the Llano Estacado Ecoregion consists of mixed gramas (*Bouteloua* spp.) in short grass prairies and midgrasses that include sideoats grama, western wheatgrass, galleta, yellow indiangrass (*Sorghastrum nutans*), and tobosa (*Pleuraphis mutica*). Sandy soils may hold species

such as sand bluestem (*Andropogon hallii*) and sand dropseed. Common forbs may include *Dalea* spp., scarlet globemallow (*Sphaeralcea coccinea*), sunflower (*Helianthus* spp.), and stiffstem flax (*Linum rigidum*). Honey mesquite, *Yucca* spp., and juniper (*Juniperus* spp.*)* may be common invading woody species. Playa lake depressions may consist of a variety of short and mid-grasses, willow (*Salix* spp.), rushes (*Juncaceae*), and aquatic plants (Griffith et al. 2007).

Common woody vegetation within the Shinnery Sands Ecoregion may include Havard shin oak, fourwing saltbush (*Atriplex canescens*), sand sagebrush, and yucca. Grasses may include sand dropseed, sand bluestem, big sandreed (*Calamovilfa longifolia*), little bluestem, switchgrass (*Panicum virgatum*), sideoats grama, buffalograss, alkali sacaton (*Sporobolus airoides*), and black grama (*Bouteloua eriopoda*) (Griffith et al. 2007).

FIGURE 2-4 LOCATION OF STUDY AREA IN RELATION TO THE VEGETATIONAL AREAS OF TEXAS

2.6.5.2 Wetlands and Aquatic Communities

Mapped wetlands information was incorporated for the study area from the USFWS NWI mapper and the Playa Lakes Joint Venture (Playa Lakes Joint Venture 2011; USFWS 2015a). NWI maps are based on topography and interpretation of infrared satellite data and color aerial photographs and are classified under the Cowardin System (Cowardin et al. 1979). Mapped wetlands types identified within the study area include palustrine open water ponds with unconsolidated bottoms (PU), palustrine emergent (PEM), palustrine farmed (Pf), and palustrine shrub/scrub (PSS). The PU, PEM, Pf, and lacustrine wetlands are the dominant wetland types within the study area and are associated with McKenzie Draw and holding ponds.

Emergent wetlands are typically located along the edges and shallows of playa lakes, ponds and streams or other depressional areas and are comprised of such species as cattails (*Typha* spp.), rushes (*Scirpus* spp.), sedges (*Carex* spp.), flatsedges (*Cyperus* spp.), millet (*Setaria* spp.), spikerushes (*Eleocharis* spp.), smartweeds (*Polygonum* spp.), cocklebur (*Xanthium* sp.), ragweed (*Ambrosia* spp.) and occasionally woody species such as cottonwood (*Populus deltoides*) and willows. Shrub/scrub wetlands are likely to be comprised of similar woody species such as cottonwood and willow (Chadde 2012a, 2012b).

2.6.6 Wildlife and Fisheries

The study area is located within the Kansan Biotic Province (refer to Figure 2-5) as described by Blair (1950). The historical terrestrial wildlife community assemblage within this district was an interdependent web with dominant species including the bison, black-tailed prairie dog, black-footed ferret (*Mustela nigripes*), burrowing owl (*Athene cunicularia*), ferruginous hawk (*Buteo regalis*), coyote (*Canis latrans*), gray wolf (*Canis lupis*), swift fox (*Vulpes velox*), pronghorn antelope (*Antilocarpa americana*), deer (*Odocoileus* spp.) and mountain lion (*Puma concolor*) (Griffith et al. 2007). Many species are no longer common throughout the province due to overharvesting, eradication, loss or degradation of habitat due to conversion to croplands or grazing pastures, natural fire suppression, and barbed wire fences. Generalist species able to adapt to the conversion in habitat and land use conditions will be more commonly observed within the study area. Ephemeral playa lakes can be important seasonal habitats to various amphibians, mammals, and birds, especially migratory species such as waterfowl, wading birds, and shorebirds. According to Blair (1950), species diversity within the Kansan Biotic Province includes 14 frogs and toads, 31 snake species, 14 lizards, one land turtle, and 59 species of mammals.

Amphibians

Amphibian species (frogs, toads, salamanders, and newts) that might occur within the study area are listed in Table 2-8 (Tipton et al. 2012; Dixon 2013). Frogs and toads might occur in all vegetation types while salamanders and newts are typically restricted to moist or hydric habitats.

FIGURE 2-5 LOCATION OF STUDY AREA IN RELATION TO THE BIOTIC PROVINCES OF TEXAS

TABLE 2-8 POTENTIALLY OCCURRING AMPHIBIAN SPECIES WITHIN THE STUDY AREA

COMMON NAME	SCIENTIFIC NAME
Salamanders/Frogs/Toads	
Barred tiger salamander	*Ambystoma marortium*
Bullfrog	*Lithobates catesbeiana*
Couch's spadefoot	*Scaphiopus couchi*
Great plains toad	*Anaxyrus cognatus*
Green toad	*Anaxyrus debilis*
Mexican spadefoot	*Spea multiplicata*
Plains leopard frog	*Lithobates blairi*
Plains spadefoot	*Spea bombifrons*
Red-spotted toad	*Anaxyrus punctatus*
Woodhouse's toad	*Anaxyrus woodhousii*
Spotted chorus frog	*Pseudacris clarkii*
Texas toad	*Anaxyrus speciosus*

Source: Tipton et al. 2012, Dixon 2013.

Reptiles

Reptiles (turtles, lizards, and snakes) that might occur in the study area are listed in Table 2-9 (Dixon 2013). These include those species that are more commonly observed near water (e.g., aquatic turtles) and those that are more common in terrestrial habitats.

TABLE 2-9 POTENTIALLY OCCURRING REPTILIAN SPECIES WITHIN THE STUDY AREA

COMMON NAME	SCIENTIFIC NAME
Turtles	
Plains box turtle	*Terrapene ornata ornata*
Pond slider	*Trachemys scripta elegans*
Spiny softshell	*Apalone spinifera*
Yellow mud turtle	*Kinosternon flavescens*
Lizards	
Common side-blotched lizard	*Uta stansburiana*
Common spotted whiptail	*Aspidoscelis gularis*
Eastern collared lizard	*Crotaphytus collaris collaris*
Great plains skink	*Plestiodon obsoletus*
Great plains earless lizard	*Holbrookia maculata maculata*
Marbled whiptail	*Aspidoscelis marmoratus*
Northern many-lined skink	*Plestiodon multivirgatus multivirgatus*
Prairie racerunner	*Cnemidophorus sexlineatus viridis*
Prairie lizard	*Sceloporus consobrinus*
Round-tailed horned lizard	*Phryosoma modestum*
Southwestern fence lizard	*Sceloporus cowlesi*
Texas greater earless lizard	*Cophosaurus texanus texanus*
Texas horned lizard	*Phryosoma cornutum*
Snakes	
Bullsnake	*Pituophis catenifer sayi*
Checkered gartersnake	*Thamnophis marcianus*
Chihuahuan nightsnake	*Hypsiglena jani*
Central plains milksnake	*Lampropeltis triangulum gentilis*
Desert kingsnake	*Lampropeltis splendida*

COMMON NAME	SCIENTIFIC NAME
Great plains ratsnake	*Pantherophis emoryi*
Kansas glossy snake	*Arizona elegans elegans*
Long-nosed snake	*Rhinocheilus lecontei*
Massasauga	*Sistrurus catenatus*
Plain-bellied watersnake	*Nerodia erthrogaster*
Plains black-headed snake	*Tantilla nigriceps*
Plains hog-nosed snake	*Heterodon nasicus*
Prairie rattlesnake	*Crotalus viridis*
Ring-necked snake	*Diadophis punctatus*
Texas threadsnake	*Rena dulcis*
Western coachwhip	*Coluber flagellum testaceus*
Western diamond-backed rattlesnake	*Crotalus atrox*
Variable groundsnake	*Sonora semiannulata semiannulata*

Sources: Dixon 2013.

Birds

Numerous avian species may be present within the study area (Tables 2-10 through 2-12). These may include year-round residents or migratory species. Bird species may migrate within or through the study area in the spring and fall and/or use the area for nesting (spring/summer) or to overwinter (TPWD 2002; Lockwood and Freeman 2014). The likelihood for occurrence of each species will depend upon suitable habitat and the season. All migratory birds are protected under the MBTA.

TABLE 2-10 POTENTIALLY OCCURRING RESIDENT BIRD SPECIES WITHIN THE STUDY AREA

COMMON NAME	SCIENTIFIC NAME
American coot	*Fulica americana*
American kestrel	*Falco sparverius*
American robin	*Turdus migratorius*
Barn owl	*Tyto alba*
Belted kingfisher	*Megaceryle alcyon*
Bewick's wren	*Thryomanes bewickii*
Black-crowned night heron	*Nycticorax nycticorax*
Blue jay	*Cyanocitta cristata*
Brown-headed cowbird	*Molothrus ater*
Burrowing owl	*Athene cunicularia*
Cactus wren	*Campylorhynchus brunneicapillus*
Canyon towhee	*Melozone fuscus*
Chihuahuan raven	*Corvus cryptoleucus*
Common grackle	*Quiscalus quiscula*
Curve-billed thrasher	*Toxostoma curvirostre*
Eastern meadowlark	*Sturnella magna*
Eastern screech owl	*Megascops asio*
Eurasian collared-dove	*Streptopelia decaocto*
European starling	*Sturnus vulgaris*
Great blue heron	*Ardea herodias*
Great horned owl	*Bubo virginianus*
Greater roadrunner	*Geococcyx californianus*
Great-tailed grackle	*Quiscalus mexicanus*

COMMON NAME	SCIENTIFIC NAME
Harris hawk	*Parabuteo unicinctus*
Horned lark	*Eremophila alpestris*
House finch	*Haemorhous mexicanus*
House sparrow	*Passer domesticus*
Inca dove	*Columbina inca*
Killdeer	*Charadrius vociferus*
Ladder-backed woodpecker	*Picoides scalaris*
Loggerhead shrike	*Lanius ludovicianus*
Mallard	*Anas platyrhynchos*
Mourning dove	*Zenaida macroura*
Northern bobwhite	*Colinus virginianus*
Northern cardinal	*Cardinalis cardinalis*
Northern flicker	*Colaptes auratus*
Northern mockingbird	*Mimus polyglottos*
Pyrrhuloxia	*Cardinalis sinuatus*
Red-tailed hawk	*Buteo jamaicensis*
Red-winged blackbird	*Agelaius phoeniceus*
Ring-necked pheasant	*Phasianus colchicus*
Rock pigeon	*Columba livia*
Rock wren	*Salpinctes obsoletus*
Rufous-crowned sparrow	*Aimophila ruficeps*
Scaled quail	*Callipepla squamata*
Western meadowlark	*Sturnella neglecta*
White-winged dove	*Zenaida asiatica*

Source: Lockwood and Freeman 2014.

TABLE 2-11 POTENTIALLY OCCURRING WINTER MIGRANT BIRDS WITHIN THE STUDY AREA

COMMON NAME	SCIENTIFIC NAME
American crow	*Corvus brachyrhynchos*
American goldfinch	*Spinus tristis*
American pipit	*Anthus rubescens*
American white pelican	*Pelecanus erythrorhynchos*
American wigeon	*Anas americana*
Bald eagle	*Haliaeetus leucocephalus*
Brewer's blackbird	*Euphagus cyanocephalus*
Brown creeper	*Certhia americana*
Bufflehead	*Bucephala albeola*
Cackling goose	*Branta hutchinsii*
Canada goose	*Branta canadensis*
Canvasback	*Aythya valisineria*
Cedar waxwing	*Bombycilla cedrorum*
Chestnut-collared longspur	*Calcarius ornatus*
Chipping sparrow	*Spizella passerina*
Cinnamon teal	*Anas cyanoptera*
Clark's grebe	*Aechmophorus clarkii*
Common goldeneye	*Bucephala clangula*
Common loon	*Gavia immer*

COMMON NAME	SCIENTIFIC NAME
Common merganser	*Mergus merganser*
Common yellowthroat	*Geothlypis trichas*
Cooper's hawk	*Accipiter cooperii*
Dark-eyed junco	*Junco hyemalis*
Double-crested cormorant	*Phalacrocorax auritus*
Downy woodpecker	*Picoides pubescens*
Eared grebe	*Podiceps nigricollis*
Eastern bluebird	*Sialia sialis*
Ferruginous hawk	*Buteo regalis*
Field sparrow	*Spizella pusilla*
Gadwall	*Anas strepera*
Golden eagle	*Aquila chrysaetos*
Golden-crowned kinglet	*Regulus satrapa*
Greater scaup	*Aythya marila*
Greater white-fronted goose	*Ansera bifrons*
Green-tailed towhee	*Pipilo chlorurus*
Green-winged teal	*Anas crecca*
Hermit thrush	*Catharus guttatus*
Herring gull	*Larus argentatus*
Hooded merganser	*Lophodytes cucullatus*
House wren	*Troglodytes aedon*
Lapland larkspur	*Calcarius lapponicus*
Lark bunting	*Calamospiza melanocorys*
Least sandpiper	*Calidris minutilla*
Lesser scaup	*Aythya affinis*
Lincoln's sparrow	*Melospiza lincolnii*
Long-eared owl	*Asio otus*
Marsh wren	*Cistothorus palustris*
McCown’s longspur	*Rhynchophanes mccownii*
Merlin	*Falco columbarius*
Mountain bluebird	*Sialia currucoides*
Northern harrier	*Circus cyaneus*
Northern pintail	*Anas acuta*
Northern shoveler	*Pinas clypeata*
Orange-crowned warbler	*Oreothlypis celata*
Pied-billed grebe	*Podilymbus podiceps*
Prairie falcon	*Falco mexicanus*
Red-breasted nuthatch	*Sitta canadensis*
Red-naped sapsucker	*Sphyrapicus nuchalis*
Redhead	*Aythya americana*
Ring-billed gull	*Larus delawarensis*
Ring-necked duck	*Aythya collaris*
Ross Goose	*Chen rossii*
Rough-legged hawk	*Buteo lagopus*
Ruby-crowned kinglet	*Regulus calendula*
Ruddy duck	*Oxyura jamaicensis*
Sandhill crane	*Grus canadensis*

COMMON NAME	SCIENTIFIC NAME
Savannah sparrow	*Passerculus sandwichensis*
Sharp-shinned hawk	*Accipiter striatus*
Short-eared owl	*Asio flammeus*
Snow goose	*Chen caerulescens*
Song sparrow	*Melospiza melodia*
Sora	*Porzana carolina*
Spotted towhee	*Pipilo maculatus*
Swamp sparrow	*Melospiza georgiana*
Townsend's solitaire	*Myadestes townsendi*
Vesper sparrow	*Pooecetes gramineus*
Virginia rail	*Rallus limicola*
Western grebe	*Aechmophorus occidentalis*
White-breasted nuthatch	*Sitta carolinensis*
White-crowned sparrow	*Zonotrichia leucophrys*
White-throated sparrow	*Zonotrichia albicollis*
Wilson's snipe	*Gallinago delicata*
Wood duck	*Aix sponsa*
Yellow-bellied sapsucker	*Sphyrapicus varius*
Yellow-rumped warbler	*Setophaga coronata*

Source: Lockwood and Freeman 2014.

TABLE 2-12 POTENTIALLY OCCURRING SUMMER MIGRANT BIRD SPECIES WITHIN THE STUDY AREA

COMMON NAME	SCIENTIFIC NAME
American avocet	*Recurvirostra americana*
Ash-throated flycatcher	*Myiarchus cinerascens*
Barn swallow	*Hirundo rustica*
Black-chinned hummingbird	*Archilochus alexandri*
Black-necked stilt	*Himantopus mexicanus*
Blue grosbeak	*Passerina caerulea*
Blue-winged teal	*Anas discors*
Bronzed cowbird	*Molothrus aeneus*
Bullock's oriole	*Icterus bullockii*
Cassin's sparrow	*Peucaea cassinii*
Cattle egret	*Bubulcus ibis*
Cave swallow	*Petrochelidon fulva*
Chimney swift	*Chaetura pelagica*
Cliff swallow	*Petrochelidon pyrrhonota*
Common gallinule	*Gallinula galeata*
Common nighthawk	*Chordeiles minor*
Common poorwill	*Phalaenoptilus nuttallii*
Dickcissel	*Spiza americana*
Grasshopper sparrow	*Ammodramus savannarum*
Great egret	*Ardea alba*
Green heron	*Butorides virescens*
Lark sparrow	*Chondestes grammacus*
Lesser goldfinch	*Spinus psaltria*
Mississippi kite	*Ictinia mississippiensis*

COMMON NAME	SCIENTIFIC NAME
Northern rough-winged swallow	*Stelgidopteryx serripennis*
Orchard oriole	*Icterus spurius*
Painted bunting	*Passerina ciris*
Purple martin	*Progne subis*
Say's phoebe	*Sayornis saya*
Scissor-tailed flycatcher	*Tyrannus forficatus*
Snowy plover	*Charadrius nivosus*
Swainson's hawk	*Buteo swainsoni*
Turkey vulture	*Cathartes aura*
Western kingbird	*Tyrannus verticalis*
Yellow-billed cuckoo	*Coccyzus americanus*
Yellow-crowned night-heron	*Nyctanassa violacea*

Source: Lockwood and Freeman 2014.

Mammals

Mammals that might occur in the study area are listed in Table 2-13 (Schmidly 2004). The occurrence of each species within the study area is dependent on availability of suitable habitat.

TABLE 2-13 POTENTIALLY OCCURRING MAMMALIAN SPECIES WITHIN THE STUDY AREA

COMMON NAME	SCIENTIFIC NAME
American badger	*Taxidea taxus*
American perimyotis	*Perimyotis subflavus*
Banner-tailed kangaroo rat	*Dipodomys spectabilis*
Big brown bat	*Eptesicus fuscus*
Big free-tailed bat	*Nyctinomops macrotis*
Black-tailed jackrabbit	*Lepus californicus*
Black-tailed prairie dog	*Cynomys ludovicianus*
Bobcat	*Lynx rufus*
Brazilian free-tailed bat	*Tadarida brasiliensis*
Chihuahuan desert pocket mouse	*Chaetodipus eremicus*
Common gray fox	*Urocyon cinereoargenteus*
Coyote	*Canis latrans*
Desert cottontail rabbit	*Sylvilagus audubonii*
Desert shrew	*Notiosorex crawfordi*
Deer mouse	*Peromyscus maniculatus*
Eastern cottontail rabbit	*Sylvilagus floridanus*
Eastern fox squirrel	*Sciurus niger*
Eastern red bat	*Lasiurus borealis*
Eastern spotted skunk	*Spilogale putorius*
Eastern white-throated woodrat	*Neotoma leucodon*
Feral pig	*Sus scrofa*
Hispid cotton rat	*Sigmodon hispidus*
Hispid pocket mouse	*Chaetodipus hispidus*
Hog-nosed skunk	*Conepatus leuconotus*
Hoary bat	*Lasiurus cinereus*
House mouse	*Mus musculus*
Jones's pocket gopher	*Geomys knoxjonesi*
Least shrew	*Cryptotis parva*

COMMON NAME	SCIENTIFIC NAME
Long-tailed weasel	*Mustela frenata*
Merriam's kangaroo rat	*Dipodomys merriami*
Merriam's pocket mouse	*Perognathus merriami*
Mexican ground squirrel	*Spermophilus mexicanus*
Mountain lion	*Puma concolor*
Mule deer	*Odocoileus hemionus*
Nine-banded armadillo	*Dasypus novemcinctus*
Northern grasshopper mouse	*Onychomys leucogaster*
Northern pygmy mouse	*Baiomys taylori*
Norway rat	*Rattus norvegicus*
Ord's kangaroo rat	*Dipodomys ordii*
Pallid bat	*Antrozous pallidus*
Plains harvest mouse	*Reithrodontomys montanus*
Plains pocket gopher	*Geomys bursarius*
Plains pocket mouse	*Perognathus flavescens*
Porcupine	*Erethizon dorsatum*
Pronghorn	*Antilocarpa americana*
Raccoon	*Procyon lotor*
Red fox	*Vulpes vulpes*
Ringtail	*Bassariscus astutus*
Roof rat	*Rattus rattus*
Silver-haired bat	*Lasionycteris noctivagans*
Southern plains woodrat	*Neotoma micropus*
Spotted ground squirrel	*Spermophilus spilosoma*
Striped skunk	*Mephitis mephitis*
Swift fox	*Vulpes velox*
Texas antelope squirrel	*Ammospermophilus interpres*
Texas mouse	*Peromyscus attwateri*
Thirteen-lined ground squirrel	*Spermophilus tridecemlineatus*
Townsend's big-eared bat	*Plecotus townsendii*
Virginia opossum	*Didelphis virginiana*
Western harvest mouse	*Reithrodontomys megalotis*
Western spotted skunk	*Spilogale gracilis*
White-footed mouse	*Peromyscus leucopus*
White-tailed deer	*Odocoileus virginianus*
Yellow-faced pocket gopher	*Cratogeomys castanops*

Source: Schmidly 2004.

Aquatic Communities

Open water aquatic habitats within the study area are primarily associated with the draws and their tributaries. Emergent vegetation within the open water aquatic habitats is typically limited to the shallow areas along the shorelines with hydrophytic tree/shrub species growing near constant level water sources. Draws within the study area are anticipated to flow intermittently due to the high water use for irrigation and the lowered groundwater table (reduced springflows). The divisions of the biotic provinces were separated on the basis of terrestrial vertebrate distributions; however, the distribution of freshwater fishes generally corresponds with the terrestrial province boundaries (Hubbs et al. 2008).

Aquatic species supported by the ephemeral water regime are typically adapted to rapid dispersal and life cycle completion within pool habitats typically having fine-grained substrates. The intermittently flowing streams and seasonal and smaller ponds likely support aquatic species primarily adapted to ephemeral pool habitats. Because water is present seasonally, the aquatic species assemblage consists primarily of invertebrate species. Intermittent flowing surface waters may support populations of mosquitofish (*Gambusia affinis*), minnows (Cyprinids), killifish (*Fundulus* spp.), and sunfish (*Lepomis* spp.) (Thomas et al. 2007).

2.6.7 Threatened and Endangered Species

For this routing study, emphasis was placed on obtaining documented occurrences of special status species and/or their designated critical habitat within the study area. The documented occurrences of species of concern and/or other unique vegetative communities within the study area were also reviewed. Special status species include those listed by the USFWS as threatened, endangered, or candidate; and those species listed by TPWD as threatened or endangered (USFWS 2016). Species of concern include those listed as rare by TPWD. A GIS data layer of historical known occurrences for listed species and/or sensitive vegetative communities was obtained from the TXNDD (TXNDD 2015). For the purpose of this study, the TXNDD information is not used as a substitute for a presence/absence survey, but as an indication of previous occurrences within suitable habitat for the species.

The USFWS regulates activities affecting plants and animals designated as endangered or threatened under the ESA (16 U.S.C. § 1531 et seq.). The USFWS was consulted using IPAC (Consultation Code: 02ETAR00-2016-SLI-0961). By definition, an endangered species is in danger of extinction throughout all or a significant portion of its range. A threatened species is defined as likely to become endangered within the near foreseeable future throughout all or a significant portion of its range. Candidate species are those for which there is sufficient information on their biological vulnerability and threat(s) to support listing as threatened or endangered and that might be proposed for listing in the near foreseeable future. The ESA also provides for the conservation of "designated critical habitat," which is defined by the USFWS as the areas of land, water, and air space that an endangered species needs for survival. These areas include sites with food and water, breeding areas, cover or shelter sites, and sufficient habitat to provide for normal population growth and behavior for the species. USFWS data regarding designated critical habitat areas were reviewed; however, no areas were identified (USFWS 2015b). Species not designated as federally threatened or endangered are not afforded any regulatory protection under the ESA; however, other federal and state laws may provide additional regulatory protection.

The TPWD also regulates plants and animals designated as endangered or threatened (Chapters 67 and 68 of the TPWC and 31 TAC §§ 65.171 - 65.176; and Chapter 88 of the TPWC and 31 TAC §§ 69.01 - 69.9). Under Texas law, endangered animal species are those deemed to be "threatened with statewide extinction" and endangered plant means "a species of plant life that is in danger of extinction throughout all or a significant portion of its range." Threatened animal and plant species are those deemed to be likely to become endangered within the foreseeable future.

The USFWS and TPWD, maintain listings by county for all special status species pursuant to federal and state law (USFWS 2016; TPWD 2015d).

Plants

No plant species are listed for the study area counties by either the federal or state authorities as threatened or endangered (TPWD 2010; TPWD 2015d; USFWS 2016).

Animals

Threatened and endangered animal species lists from the USFWS and TPWD were reviewed for each study area county and these are summarized in Table 2-14 (TPWD 2015d; USFWS 2016). Species not designated as federally threatened or endangered are not afforded any regulatory protection under the ESA; however, other federal and state laws may provide additional regulatory protection.

TABLE 2-14 LISTED SPECIAL STATUS SPECIES WITHIN STUDY AREA

LISTED SPECIES		COUNTY LISTED		LEGAL STATUS	
COMMON NAME	**SCIENTIFIC NAME**	**YOAKUM**	**GAINES**	**USFWS[1]**	**TPWD[2]**
Birds					
Bald eagle	*Haliaeetus leucocephalus*	X	X	DL	T
Peregrine falcon *(2 sub-sp.)*	*Falco peregrinus*	X	X	DL	T
Whooping crane	*Grus americana*	X	X	E	E
Reptiles					
Texas horned lizard	*Phrynosoma cornutum*	X	X	-	T
Mammals					
Black-footed ferret	*Mustela nigripes*	X	X	E, EXT	EXT
Gray wolf	*Canis lupis*	X	X	E, EXT	E, EXT

Notes: Legal Status abbreviation: E - Endangered, T - Threatened, DL - Delisted, C - Candidate, EXT - Extirpated, X - Listed in the county.
Sources: [1] USFWS 2016; [2] TPWD 2015d.

2.6.7.1 USFWS Listed Species

Whooping crane

The study area is located outside of the primary central migratory corridor for the whooping crane (*Grus americana*). The primary migration path includes a 220-mile wide corridor that begins at their nesting site at Wood Buffalo National Park in Canada and continues south to their wintering grounds at the Aransas National Wildlife Refuge (ANWR) along the Texas coast. They begin their southern migration in September and arrive at their Texas wintering grounds at or near the ANWR between October and December. The whooping crane is the tallest bird in North America and uses a variety of habitat types along their migration, from croplands to large wetlands, to feed and roost. Cranes typically feed on insects, frogs, fish, rodents, small birds, berries, fruits, crabs, or clams. During migration, they typically fly at altitudes greater than 1,000 feet but will roost and feed in areas away from human disturbance during nightly stopovers. Stopover areas include large rivers, lakes and associated wetlands, playa lakes, pastureland, and cropland (USFWS 2009). The whooping crane is not anticipated to occur within the study area, except as a rare non-breeding migrant during the spring and fall where suitable stopover habitat is available (TPWD 2002).

2.6.7.2 Federal Extirpated Species

Gray Wolf

The gray wolf (*Canis lupis*) was formerly known throughout the western two-thirds of the state inhabiting forests, brushlands, and grasslands. The gray wolf preys on large herbivores such as deer and pronghorn antelope, but will also feed on rabbits, ground squirrels, and mice (Schmidly 2004). However, the species is now considered extirpated from the state of Texas and occurrence of a gray wolf within the study area is not anticipated.

Black-footed Ferret

The federally-listed endangered black-footed ferret *(Mustela nigripes*) is associated primarily with prairie dog towns and historically ranged in Texas throughout the northwestern portion of the state including the Panhandle, much of the Trans-Pecos, and a considerable part of the Rolling Plains. However, the black footed ferret is now considered extirpated from Texas with the last records from Dallam County in 1953 and Bailey County in 1963 (Schmidly 2004). Therefore, the occurrence of the black-footed ferret within the study area is not anticipated.

2.6.7.3 Federal Delisted Species

Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) was delisted in 2007 by the USFWS because the population had recovered beyond the ESA criteria for listing as either threatened or endangered. The status of the bald eagle population currently is monitored by USFWS and the species is still afforded federal protection under the BGEPA and MBTA. Bald eagles may nest and/or winter in Texas. The bald eagle is found primarily near rivers and large lakes and will build large nests in tree tops or on cliffs, usually near large bodies of water. The bald eagle primarily preys on fish, but will also eat birds, small mammals, and turtles and will often scavenge or steal carrion. The study area is located outside of the known bald eagle nesting and wintering range in Texas (Campbell 2003). Bald eagles are not expected to occur within the study area due to a lack of suitable habitat, except as an uncommon migrant (TPWD 2002).

Peregrine Falcon

The peregrine falcon (*Falco peregrinus*) state listing includes two subspecies: American peregrine falcon (*F. p. anatum*) and Arctic peregrine falcon (*F. p. tundrius*). Although only the American subspecies is listed as state threatened, both sub-species are listed together due to their similarity of appearance (TPWD 2015d). Both subspecies have been delisted from federal listings due to the recovery of population numbers. The American peregrine falcon inhabits nests in tall cliff eyries and occupies many kinds of habitats during migration, including urban. Stopover habitat during migration may include lake shores and coastlines; the falcon is also a resident breeder in west Texas (TPWD 2015d). Diet primarily consists of other birds such as ducks, shorebirds and seabirds (Alsop 2002). This species is not anticipated to occur in the study area, except as an uncommon migrant (TPWD 2002).

2.6.7.4 TPWD Listed Species

Texas Horned Lizard

The Texas horned lizard (*Phrynosoma cornutum*) population has recently decreased due to collection, land use conversions, habitat loss and affects from increased fire ant populations. The Texas horned lizard inhabits a variety of habitats including open desert, grasslands and shrubland in arid and semiarid habitats that contain bunch grasses, cacti and yucca on soils varying from pure sands and sandy loams to coarse gravels, conglomerates and desert pavements. Their primary prey item is the harvester ant (*Pogonomyrmex* spp.), but they may also consume grasshoppers, beetles and grubs. The Texas horned lizard thermo-regulates by basking or burrowing into the soil and is active (not hibernating) between early spring to late summer (Henke and Fair 1998). This species may occur within the study area if suitable habitat exists (Dixon 2013).

2.6.8 TPWD Species of Conservation Concern

TPWD (2015c) lists species of concern that may receive protection under other federal and/or state laws, such as the MBTA, TPWC 5:64-67 and 78, TAC 31:65 and 69. Species of concern are those within the state that are considered rare. TPWD generally recommends consideration for these species when routing linear utility corridors and promotes the conservation of these species and their habitats. TPWD (2015c) lists seven birds, five mammal species, and one reptile as species of concern as shown in Table 2-15.

Review of the TXNDD (2015) data identified the location of several black-tailed prairie dog (*Cynomys ludovicianus*) colonies near the study area. Western burrowing owls (*Athene cunicularia hypugaea)* are also associated with prairie dog towns.

TABLE 2-15 STATE LISTED SPECIES OF CONCERN WITHIN THE STUDY AREA

		COUNTY LISTED	
COMMON NAME	**SCIENTIFIC NAME**	**YOAKUM**	**GAINES**
Birds			
Baird's sparrow	*Ammodramus bairdii*	X	X
Ferruginous hawk	*Buteo regalis*	X	X
Mountain plover	*Charadrius montanus*	X	X
Prairie falcon	*Falco mexicanus*	X	X
Snowy plover	*Charadrius alexandrinus*	X	X
Western burrowing owl	*Athene cunicularia hypugaea*	X	X
Western snowy plover	*Charadrius alexandrinus nivosus*	X	X
Mammals			
Black-tailed prairie dog	*Cynomys ludovicianus*	X	X
Jones' pocket gopher	*Geomys knoxjonesi*	X	X
Pale Townsend's big-eared bat	*Corynorhinus townsendii pallescens*	X	X
Plains spotted skunk	*Spilogale putorius interrupta*	X	
Swift fox	*Vulpes velox*	X	X
Reptiles			
Dune sagebrush lizard	*Sceloporus arenicolus*	X	X

Source: TPWD 2015d
Notes: Legal Status abbreviation: X - Listed in the county.

Birds

Baird's Sparrow
Baird's sparrow (*Ammodramus bairdii*) is a migrant species and inhabits shortgrass prairie with scattered low bushes and matted vegetation. This species is generally migratory with about 60% of the breeding populations located in Canada. The non-breeding winter range may extend south to southwest Texas, Arizona, New Mexico, and Mexico. Habitat loss and degradation due to land conversion to agriculture, grazing, and drainage of wetlands have led to population declines in portions of its range. This species may occur within the study area as a rare non-breeding migrant (Lockwood and Freeman 2014).

Ferruginous Hawk

The ferruginous hawk (*Buteo regalis*) inhabits open prairie, plains, and badlands nesting in tall trees or structures. They are frequently observed near active prairie dog towns and primarily feed on rodents and rabbits. Historically, this species nested frequently in the panhandle, but due to poaching and prairie dog eradication, their numbers have steeply declined. This species may occur within the study area as a non-breeding winter migrant (Lockwood and Freeman 2014).

Mountain Plover

The mountain plover (*Charadrius montanus*), unlike many other plover species, is not typically found near water. Non-breeding habitat includes shrub steppe, shortgrass prairie, and bare ground landscapes, including plowed fields. This species nests on the ground in shallow depressions in high plains or shortgrass prairie habitats. The mountain plover is insectivorous and primarily forages on crickets, beetles and ants. On two separate occasions the mountain plover was ruled a proposed candidate under the ESA. But on both occasions the USFWS determined the species was not threatened or endangered throughout all and a significant portion of the species range. This species may occur within the study area as a potential migrant (Lockwood and Freeman 2014).

Prairie Falcon

The prairie falcon (*Falco mexicanus*) inhabits open plains, grasslands, deserts, and prairies, nesting on cliff faces. Wheat fields and other irrigated croplands also are used for foraging in winter. Winter roosts and nesting sites may be located far from foraging areas. These falcons generally prey on small mammals, birds and reptiles. The combination of many events and practices such as the eradication of prey species, pesticides, habitat loss, change in land use, and invasion of exotic species may have led to population declines in portions of its range. This species may occur within the study area as a non-breeding winter migrant (TPWD 2002; Lockwood and Freeman 2014).

Snowy Plover

The snowy plover (*Charadrius alexandrinus*) and the western snowy plover subspecies (*C. a. nivosus*) both favor alkaline flats and lake or river shoreline habitats. They feed on small insects, crustaceans, and other small invertebrates while probing sand or mud substrates. The western snowy plover is listed as federally threatened if within 50 miles of the Pacific coast. Populations are typically scattered and have declined due to habitat loss/degradation, disturbance of nesting sites, and impacts by non-native predators. These species may occur within the study area as a transient or casual summer migrant along major waterways (Lockwood and Freeman 2014).

Western Burrowing Owl

The western burrowing owl inhabits open grasslands, such as prairie, plains, and savanna, and sometimes in open areas, including vacant lots near human habitation or airports. This species nests and roosts in abandoned mammal burrows. They frequently use prairie dog burrows, but have also been observed utilizing other species such as canid (*Canidae*), mustelid (*Musteloidea*), and armadillo (*Dasypus novemcinctus*) burrows. This species was listed as an ESA candidate species from 1994 to 1996. They are listed as endangered in Canada and threatened in Mexico and still considered to be a Bird of Conservation Concern by USFWS. They are opportunistic feeders and primarily forage on arthropods, small mammals, amphibians, and reptiles (USFWS 2003).

Mammals

Black-tailed Prairie Dog

The black-tailed prairie dog lives in large colonies, creates numerous burrows and primarily feeds on plant material. Females may give birth to single litter of four or five young, per year, in March through April (Schmidly 2004). Historically, they inhabited the short-grass prairies and plains across west Texas and the Panhandle. Today, with the eradication and fragmentation of prairie dog towns

associated with the conversion of prairies to agriculture, population numbers for this species have decreased rapidly. It is estimated that 98% of the original Texas population has been eradicated. After a USFWS review in 2004, black-tailed prairie dog was removed as a candidate species. Recently, USFWS announced after a 12-month finding that no ESA protection of the species was warranted because potential impacts do not threaten the long-term persistence of the species (USFWS 2011). TXNDD (2015) data identified several prairie dog colonies within the study area. This species may occur within the study area, where suitable habitat is present.

Jones' Pocket Gopher
Jones' pocket gopher (*Geomys knoxjonesi*) inhabits the southwestern plains primarily utilizing deep sandy soils of Aeolian origins. Some hybridization of the species occurs where their range overlaps with the Plains pocket gopher (*Geomys bursarius*). The Jones' pocket gopher is sensitive to land use changes (TPWD 2015d). This species may occur within the study area, if suitable habitat is present.

Pale Townsend's Big-eared Bat
The Pale Townsend's big-eared bat (*Corynorhinus townsendii pallescens*) is an opportunistic insectivore that roosts in caves, mines, and occasionally old buildings. The species hibernates in groups during the winter, and during breeding season maternal colonies are formed. Females may give birth to a single offspring in late May to June. This species may occur in suitable habitats, but historic blasting of caves and mine tunnels potentially destroyed large numbers of these bats (Schmidly 2004). This species may occur within the study area, if suitable habitat is present.

Plains Spotted Skunk
The plains spotted skunk (*Spilogale putorius interrupta*) is one of three recognized sub-species of the eastern spotted skunk (*S. putorius*). The plains spotted skunk is a small slender skunk that lives in a variety of habitats but requires extensive vegetative cover. Habitats include, but are not limited to, wooded or brushy areas and tallgrass prairie, croplands, fence rows, farmyards, and forest edges. This skunk is omnivorous and primarily feeds on arthropods rabbits, voles, and rats (Schmidly 2004). This species may occur within the study area, if suitable habitat is present.

Swift Fox
The swift fox lives in dens on sparsely vegetated short-grass prairies, open desert, grasslands, and pastureland. Mating pairs are formed in the fall and litters of three to six young are born in March through April. They are largely nocturnal and prey on rabbits, rodents, small birds and insects. The swift fox is susceptible to trapping and historic efforts to eradicate other carnivore species have greatly reduced their numbers (Schmidly 2004). In 1995, the USFWS determined the swift fox was a candidate to be listed as threatened, but was not listed due to higher priority species. Due to conservation and management efforts, in 2001 USFWS decided not to list the fox and to remove it from candidate status. This species may occur within the study area, if suitable habitat is present.

Reptiles

Dune Sagebrush Lizard
The dune sagebrush lizard (*Sceloporus arenicolus*) is found only in active and semi-stable shinnery oak dunes of southeastern New Mexico and adjacent Texas (TPWD 2015d). This species may occur within the study area if suitable habitat exists is present.

Sensitive Plant Communities

Other information typically included in TXNDD report data, but not on county lists, includes natural plant communities. Review of the TXNDD (2015) data did not indicate any sensitive plant communities within the study area. The TXNDD data does not indicate the presence or absence of a species or suitable habitat within an area, but merely provides documentation of historical occurrences. No other rare natural plant communities were identified within the study area.

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3.0 AGENCY CORRESPONDENCE

A list of federal, state and local regulatory agencies, elected officials and organizations was developed to receive a consultation letter regarding the Proposed Project. The purpose of the letter was to inform the various agencies and officials of the Proposed Project and provide them with an opportunity to provide information regarding resources and potential issues within the study area. Various federal, state, and local agencies and officials that may have potential concerns and/or regulatory permitting requirements for the Proposed Project were contacted. POWER utilized websites and telephone confirmations to identify local officials. Copies of all correspondence with the various state/federal regulatory agencies and local/county officials and departments are included in Appendix A.

Federal, state, and local agencies/officials contacted include:

FEDERAL

- Federal Aviation Administration
- Federal Emergency Management Agency
- National Park Service
- Natural Resources Conservation Service
- U.S. Army Corps of Engineers
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service

STATE

- Railroad Commission of Texas
- Texas Commission on Environmental Quality
- Texas Department of Transportation (Environmental Affairs Division, Planning and Programming)
- Texas General Land Office
- Texas Historical Commission
- Texas Land Conservancy
- Texas Parks and Wildlife Department
- Texas Water Development Board

LOCAL and OTHER ORGANIZATIONS

- City Officials
- County Officials
- Ducks Unlimited - Texas
- Native Prairies Association of Texas
- South Plains Association of Governments
- Texas Agricultural Land Trust
- Texas Cave Management Association
- The Nature Conservancy
- The Nature Conservancy – North Texas
- Independent School Districts

In addition to letters sent to the agencies listed, POWER also requested and reviewed TXNDD Element Occurrence Records from TPWD (TXNDD 2015). POWER also requested and reviewed previously recorded archeological site information from TARL, and reviewed the THC's

Archeological Site Atlas (2015a and 2015b) for additional cultural resource information. As of the date of this document, written responses to letters sent in relation to the study area that were received are listed and summarized below.

- The USFWS responded via email on September 14, 2015 and requested POWER use the IPAC website. The email also stated there are five listed species for Gaines and Yoakum Counties and the Proposed Project will have "no effect" on federally threatened, proposed, candidate, or listed species.
- The USACE responded with a letter dated October 27, 2015. The USACE assigned a project number and a regulatory project manager for the request and will be evaluating the Proposed Project as expeditiously as possible. The letter enclosed a copy of NWP 12 permits and details regarding a permit for reference if needed for the Proposed Project.
- The NRCS responded with a letter dated September 10, 2015. The NRCS stated that the Proposed Project is exempt because transmission lines are not a conversion of important farmlands and the site can still be used after construction.
- The TPWD provided a response letter dated November 10, 2015. The TPWD provided a project number (35424) and provided several recommendations. In summary, TPWD recommended avoiding or minimizing impacts to undisturbed habitats, wetlands, nesting migratory birds, listed or rare species, and wetlands.
- The NPS responded via email on October 7, 2015 stating that they had no comments at this time.
- The TxDOT Aviation Division provided a letter dated September 16, 2015, and stated that the FAA would require notice of the Proposed Project if criterion of FAR 77.9a or FAR 77.9b is met. The letter acknowledged the Denver City Airport (E57) near the study area. The letter also acknowledged that there are no public use heliports in or near the study area.
- The GLO responded with a letter dated September 23, 2015, and stated that the GLO does not appear to have any land or water bodies impacted by the Proposed Project, but requested contact when a final route has been selected in order to determine if the Proposed Project crosses any streambeds or Permanent School Fund (PSF) land that would require an easement.
- The THC responded with an email dated September 10, 2015, and stated there are no previously recorded sites present within the study area.

3.1 Public and Landowner Involvement

Since this Proposed Project would directly affect fewer than 25 landowners, the requirement to hold a public meeting under 16 TAC § 22.52 was not triggered. Accordingly, a public meeting was not held. However, SPS's process for routing the proposed line included significant involvement of the landowners most affected by the line and the opportunity for other landowners to communicate with SPS concerning the routing of the line.

SPS directly communicated with and obtained the written agreement of all but one of the landowners who will receive direct notice of the proposed route. Only five landowners' properties are crossed by the proposed line. There are 14 habitable structures within 300 feet

of the proposed route on land that is not crossed by the proposed route. The landowner who did not agree to the routing of the Proposed Project owns one of the habitable structures that is within 300 feet of the proposed transmission line, but does not own property that will be crossed by the Proposed Project. The vast majority of the route is proposed to cross land owned by Occidental Permian Ltd. (Oxy). Golden Spread Electric Cooperative, Inc. (GSEC) owns the next largest amount of land on which the proposed route is located. SPS worked closely with both Oxy and GSEC to determine a mutually agreeable route in consideration of the constraints on their respective properties which included numerous oil and gas wells, oil and gas pipelines and existing transmission lines that made routing in this area extremely difficult. The remaining three landowners with property that the proposed line will cross collectively will receive 0.17 mile of the proposed line. SPS also communicated with those landowners and obtained their written consent.

Although no public meeting was required, the landowners who will be directly affected by this transmission line have had the opportunity to give input on the routing of the line, have had their preferences considered, and, with exception of one landowner, have given written consent for the routing of the line on their property or within 300 feet of their habitable structure.

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4.0 POTENTIAL IMPACTS OF THE PROPOSED ROUTE

This section discusses potential impacts of the Proposed Project's construction and operation. POWER evaluated the potential impacts of the proposed route by tabulating the data for the environmental evaluation criteria in Table 2-1 (relating to community values, parks and recreation areas, cultural resources, aesthetics, and environmental integrity). The results of the tabulation are presented in Table 4-1 for the route that SPS believes best addresses the requirements of PURA and PUC Substantive Rules from the perspective of ecology, community values, land use, and cultural resources.

TABLE 4-1 ENVIRONMENTAL DATA FOR ROUTE EVALUATION MUSTANG SUBSTATION TO SHELL CO2 115-KV TRANSMISSION LINE PROJECT

EVALUATION CRITERIA	ROUTE DATA
LAND USE	
Length of proposed route	8.98
Number of habitable structures[1] within 300 feet of the ROW centerline	15
Length of ROW utilizing existing transmission line ROW	0
Length of ROW parallel to existing electric transmission line ROW	2.47
Length of ROW parallel to other existing linear ROW (highway, public roadways, railway, etc. – excluding pipelines)	3.77
Length of ROW parallel to apparent property lines[2]	0
Length of ROW parallel to pipelines[3]	0
Percentage of ROW parallel to existing compatible corridors and apparent property boundaries (excluding pipelines)	69.5%
Length of ROW through parks/recreational areas[4]	0
Number of parks/recreational areas[4] crossed by ROW centerline	0
Number of additional parks/recreational areas[4] within 1,000 feet of ROW centerline	0
Length of ROW through cropland	3.95
Length of ROW through pasture/rangeland	3.73
Length of ROW through land irrigated by traveling systems (rolling or pivot type)	0
Number of transmission pipeline crossings	26
Number of transmission line crossings	9
Number of U.S. and State highway crossings	2
Number of farm-to-market and/or ranch-to-market road crossings	4
Number of cemeteries within 1,000 feet of the ROW centerline	0
Number of FAA registered airports[5] with at least one runway more than 3,200 feet in length located within 20,000 feet of the ROW centerline	1
Number of FAA registered airports[5] having no runway more than 3,200 feet in length located within 10,000 feet of the ROW centerline	0
Number of private airstrips within 10,000 feet of the ROW centerline	0

EVALUATION CRITERIA	ROUTE DATA
Number of heliports within 5,000 feet of the ROW centerline	0
Number of commercial AM radio transmitters within 10,000 feet of the ROW centerline	0
Number of FM radio transmitters, microwave towers, and other electronic installations within 2,000 feet of ROW centerline	4
Number of existing water wells within 200 feet of the ROW centerline	2
Number of existing oil and gas wells within 200 feet of the ROW centerline	10
AESTHETICS	
Estimated length of ROW within foreground visual zone[6] of U.S. and State highways	0.88
Estimated length of ROW within foreground visual zone[6] of farm-to-market roads	5.29
Estimated length of ROW within foreground visual zone[6] of parks and/or recreational areas[4]	0.33
ECOLOGY	
Length of ROW through upland woodlands	0.04
Length of ROW through bottomland/riparian woodlands	0
Length of ROW across mapped NWI wetlands and playa lakes	0
Length of ROW across known habitat of federally listed endangered or threatened species	0
Length of ROW across open water (lakes, ponds)	0
Number of stream crossings	1
Number of river crossings	0
Length of ROW parallel (within 100 feet) to streams or rivers	0
Length of ROW across FEMA mapped 100-year floodplains[7]	N/A
CULTURAL RESOURCES	
Number of recorded archeological or historical sites crossed by ROW	0
Number of additional archeological or historical sites within 1,000 feet of ROW centerline	0
Number of National Register of Historic Places listed properties crossed by ROW	0
Number of additional National Register of Historic Places listed properties within 1,000 feet of ROW centerline	0
Length of ROW across areas of high archeological site potential	2.06

[1] Single-family and multi-family dwellings, mobile homes, apartment buildings, commercial structures, industrial structures, business structures, churches, hospitals, nursing homes, and schools, or other structures normally inhabited by humans or intended to be inhabited by humans on a daily or regular basis within 300 feet of the centerline of a transmission project of 230-kV or less.
[2] Apparent property lines created by existing roads, highways, or railroad ROW are not "double-counted" in the length of ROW parallel to property lines criteria.
[3] This data is for informational purposes only. Pipelines were not considered compatible ROW.
[4] Defined as parks and recreational areas owned by a governmental body or an organized group, club, or church.
[5] As listed in the Chart Supplement South Central U.S. (FAA 2016 formerly known as the Airport/Facility Directory South Central U.S.), FAA 2016.
[6] One-half mile, unobstructed.
[7] Floodplain data are not available for Yoakum and Gaines Counties.
Note: All length measurements are shown in miles unless noted otherwise.

4.1 Impacts on Community Values

Adverse effects upon community values are defined as aspects of the Proposed Project that would significantly and negatively alter the use, enjoyment, or intrinsic value attached to an important area or resource by a community. This definition assumes that community concerns are applicable to this specific project's location and characteristics, and do not include objections to electric transmission lines in general.

Potential impacts to community resources can be classified into direct and indirect effects. Direct effects are those that would occur if the location and construction of a transmission line result in the removal or loss of public access to a valued resource. Indirect effects are those that would result from a loss in the enjoyment or use of a resource due to the characteristics (primarily aesthetic) of the proposed transmission line, tower structures, or ROW.

4.1.1 Impacts on Land Use

The magnitude of potential impacts to land use resulting from the construction of a transmission line is determined by the amount of land (land use type) temporarily or permanently displaced by the actual ROW and by the compatibility with adjacent land uses. During construction, temporary impacts to land uses within the ROW might occur due to the movement of workers, equipment, and materials through the area. Construction noise and dust, as well as temporary disruptions of traffic flow, might also temporarily affect local residents. Coordination between SPS, its contractors, and landowners regarding ROW access and construction scheduling should minimize these disruptions.

The evaluation criteria used to evaluate potential land use impacts include proximity to habitable structures, overall route length, route length parallel to existing transmission ROW, length parallel to other existing linear ROW, length paralleling property lines, and effects upon agriculture. An analysis of the existing land use within and adjacent to the proposed ROW is required to evaluate the potential impacts.

POWER determined the number of habitable structures located within 300 feet of the route centerline and their distance from the centerline through the use of GIS software, interpretation of aerial photography, and verification during a reconnaissance survey. 16 TAC § 25.101(a)(3) defines habitable structures as "structures normally inhabited by humans or intended to be inhabited by humans on a daily or regular basis. Habitable structures include, but are not limited to, single-family and multi-family dwellings and related structures, mobile homes, apartment buildings, commercial structures, industrial structures, business structures, churches, hospitals, nursing homes, and schools." The route has 15 habitable structures located within 300 feet of the centerline. Table 5-1 presents detailed information on habitable structures. All known habitable structure locations are shown on Figure 5-1 in Appendix B.

The overall length of a particular route can be an indicator of the relative level of land use impacts. That is, generally the shorter the route, the less land is crossed and the fewer potential impacts would result. The total length of the route is approximately 8.98 miles. The route length reflects the direct or indirect pathway of the route between the Proposed Project endpoints. The length of the route may also reflect the effort to minimize land use impacts by utilizing or paralleling existing transmission line ROWs, and other existing linear features including other compatible ROW and apparent property boundaries.

Commission Rule 16 TAC § 25.101(b)(3)(B) requires that the PUCT consider whether new transmission line routes are within existing compatible ROWs, including the use of vacant positions on existing multiple-circuit transmission lines; whether the routes parallel existing compatible ROWs; whether the routes parallel apparent property lines, or other natural or cultural features; and whether the routes conform with the policy of prudent avoidance. Criteria were used to evaluate the use of compatible ROW, length parallel to existing transmission line ROW, length of route parallel to other existing linear ROWs, and length of ROW paralleling apparent property lines, or other natural or cultural features. It should also be noted that if a route utilizes or parallels more than one existing linear corridor, only one linear corridor was tabulated (e.g., the route parallels both an apparent property line and a roadway, but it was only tabulated as paralleling the roadway).

Although the route does not utilize existing transmission line ROW, it does parallel existing transmission line ROW for approximately 2.47 miles.

Less impact to land use generally results from locating new lines parallel to other existing linear ROW (highway, public roadways, railway, etc. – excluding pipelines). The length of the route that parallels other existing linear ROW is approximately 3.77 miles.

Paralleling apparent property lines is also generally considered a positive routing criterion to minimize impacts to existing and planned property uses. While the route does not parallel any apparent property lines (including section lines) alone, it does parallel approximately 5.26 property lines that are also parallel and included in Table 4-1 under the categories parallel to existing electric transmission line ROW or parallel to other existing linear ROW (highway, public roadways, railway, etc. – excluding pipelines).

To evaluate the length of the route that utilizes or parallels existing compatible ROWs, and apparent property lines (including section lines) or other natural features relative to the overall length of the route, the percentage of the total route length utilizing or parallel to any of these features was estimated. This percentage can be calculated by adding up the total length utilizing or parallel to existing transmission lines, other existing ROW, and apparent property lines and then dividing the result by the total length of the route. The route parallels existing linear features for 69.5% of its length.

4.1.2 Impacts on Agriculture

Impacts to agricultural land can generally be ranked by the degree of potential impact, with the highest degree of potential impact occurring to cultivated cropland areas, including hayfield production. However, due to the relatively small area affected (beneath the structures), and the short duration of construction activities at any one location, such impacts should be both temporary and minor. The route length crossing cropland areas is approximately 3.95 miles.

Since the ROW for this Proposed Project would not be fenced or otherwise separated from adjacent lands, no long-term or significant displacement of grazing or managed wildlife activities would occur. Most existing grassland uses, including grazing on rangelands and pastures may be resumed following construction. The route length crossing pastureland or rangeland areas is approximately 3.73 miles.

The route does not cross agricultural lands with known irrigation systems (rolling or pivot).

4.1.3 Impacts on Transportation/Aviation

Potential impacts to transportation could include temporary disruption of traffic and conflicts with proposed roadway and/or utility improvements. Traffic disruptions would include those associated with the movement of construction equipment and materials to and from the ROW and increased traffic flow and/or periodic congestion during the construction phase of the Proposed Project. Such impacts are usually temporary and short-term.

The route has no U.S. and State highway crossings. However, the route does have four FM/RM road crossings. SPS would be required to obtain road-crossing permits from TxDOT for any crossing of state-maintained roadways.

Aviation

The Proposed transmission line is not anticipated to have any effect on aviation operations in the study area.

According to FAA regulations, Title 14 CFR Part 77.9, the construction of a transmission line requires FAA notification if a transmission tower structure height will exceed 200 feet or the height of an imaginary surface extending outward and upward at one of the following slopes:

- A 100:1 slope for a horizontal distance of 20,000 feet from the nearest point of the nearest runway of each airport described in paragraph (d) of 14 CFR Part 77.9 having at least one runway longer than 3,200 feet, excluding heliports;

- A 50:1 slope for a horizontal distance of 10,000 feet from the nearest runway of a public or military airport described in paragraph (d) of 14 CFR Part 77.9 where its longest runway is no longer than 3,200 feet in length, excluding heliports; or

- A 25:1 slope for a horizontal distance of 5,000 feet for a heliport described in paragraph (d) of 14 CFR Part 77.9.

Paragraph (d) of 14 CFR Part 77.9 includes public-use airports listed in the Airport/Facility Directory (currently the Chart Supplement), public-use or military airports under construction, airports operated by a federal agency or DOD, or an airport or heliport with at least one FAA-approved instrument approach procedure.

Notification is not required for structures that will be shielded by existing structures of a permanent and substantial nature or by natural terrain or topographic features of equal or greater height, and will be located in a congested area of a city, town, or settlement where the shielded structure will not adversely affect safety in air navigation.

One FAA registered public-use airport is identified within 20,000 feet of the route. Denver City Airport (E57) is registered in the Chart Supplement for the South Central U.S. (formerly known as the Airport/Facility Directory) (FAA 2016) and is therefore subject to 14 CFR Part 77.9 notification requirements (refer to Table 4-2). All known airport/airstrip locations are shown on Figure 3-2 and Figure 5-1 in Appendix B and Table 5-1 in Section 5.0.

TABLE 4-2 AIRSTRIP RUNWAY LOCATIONS

FIGURE 5-1 MAP ID	AIRSTRIP	ESTIMATED RUNWAY LENGTH (FEET)[1]	EXCEEDS SLOPE[1,2]
20	Denver City Airport	Runway 4/22: 5,780 Runway 8/26: 3,960	Yes No

[1] Sources: FAA 2016; POWER aerial photo and USGS interpretation.
[2] Sources: POWER aerial photo and USGS interpretation considering elevation information obtained from USGS topographic maps and a maximum allowable height of 100 feet.

The longest runway for the Denver City Airport (E57), Map ID 20, is 5,780 feet. Typical structure heights would vary between 80 and 140 feet for this Proposed Project. Based on estimated above ground structure heights, elevation, and relative distances between the route and airport, POWER estimates that the route (with an estimated distance of approximately 8,077 feet) may have structures that exceed the notification criteria and may require FAA notification. Following PUC approval of the proposed transmission line route, SPS will make a final determination of the need for FAA notification, based on specific structure locations and design. The results of notification, and any subsequent coordination with the FAA could include changes in structure design and/or potential requirements to mark and/or light the structures.

There are no public-use or private-use heliports located within 5,000 feet of the route.

No active private airstrips not subject to 14 CFR Part 77.9 notification requirements were identified within 10,000 feet of the route.

4.1.4 Impacts on Utility Features

Utility features, including existing electrical transmission lines, distribution lines, and pipelines are crossed by the route. Water wells are scattered throughout the study area and were mapped and avoided to the extent practicable. There are two water wells located within 200 feet of the route centerline. If any utility features not owned by SPS are crossed by, or are in close vicinity to, the route centerline, SPS will coordinate with the appropriate entities to obtain necessary permits or permission as required.

Several existing electric transmission lines were identified within the study area and the route has nine electric transmission lines crossing.

Several oil and gas wells and pipelines were identified within the study area based on shapefile data obtained from the RRC. There are ten oil and gas wells within 200 feet of the ROW centerline.

Pipelines that are crossed by the route will be indicated on engineering drawings and flagged prior to construction. SPS will coordinate with pipeline companies as necessary during transmission line surveys, construction, and operation. The route crosses 26 transmission pipelines. Several small gathering pipelines are located throughout the study area and are crossed by the proposed transmission line route; however, these were not counted or inventoried.

4.1.5 Impacts on Electronic Communication Facilities

The proposed transmission line is not anticipated to have any effect on communication operations in the area. There are no AM radio transmitters identified within 10,000 feet of the route. There are four FM radio transmitters, microwave towers, and other electronic installations located within 2,000 feet of the route. The distance of each electronic communication facility from the route was measured using GIS software and aerial photograph interpretation (see Table 4-3 and Table 5-1). All known radio and communication facility locations are shown on Figure 3-2 and Figure 5-1 in Appendix B.

TABLE 4-3 ELECTRONIC COMMUNICATION FACILITIES

MAP ID	TOWER TYPE	DIRECTION	DISTANCE FROM ROUTE (FEET)*
16	Other electronic installation	E	662
17	Other electronic installation	N	192
18	Other electronic installation	N	954
19	Other electronic installation	S	643

*POWER aerial photo and USGS interpretation; FCC 2015.

4.1.6 Impacts on Socioeconomics

Construction and operation of the proposed transmission line is not anticipated to result in a significant change in the population or employment rate within the study area. For this Proposed Project, some short-term employment would be generated. SPS normally uses contract labor supervised by SPS employees during the clearing and construction phase of transmission line projects. Construction workers for the Proposed Project would likely commute to the work site on a daily or weekly basis instead of permanently relocating to the area. The temporary workforce increase would likely result in an increase in local retail sales due to purchases of lodging, food, fuel, and other merchandise for the duration of construction activities. No additional staff would be required for line operations and maintenance. SPS is also required to pay sales tax on purchases and is subject to paying local property tax on land or improvements as applicable.

Potential long-term economic benefits to the community resulting from construction of this Proposed Project are based on the requirement that electric utilities provide an adequate and reliable level of power throughout their service areas. Economic growth and development rely heavily on adequate public utilities, including a reliable electrical power supply. Without this basic infrastructure, a community's potential for economic growth is limited.

4.2 Impacts on Parks and Recreation Areas

Potential impacts to recreational land uses include the disruption or preemption of recreational activities. As previously mentioned in Section 2.5, few parks or recreational areas were identified within the study area. The route does not cross (or abut) a park or recreational area. Also, the route is not located within 1,000 feet of any parks or recreational areas.

4.3 Impacts on Historical (Cultural Resource) Values

Methods for identifying, evaluating, and mitigating impacts to cultural resources have been established for federal projects or permitting actions, primarily for purposes of compliance with the National Historic Preservation Act (NHPA). Similar methods are often used when considering cultural resources affected by state-regulated undertakings. In either case, this process generally involves identification of significant (i.e., national or state-designated) cultural resources within a project area, determining the potential impacts of the project on those resources, and implementing measures to avoid, minimize, or mitigate those impacts.

Impacts associated with the construction, operation, and maintenance of transmission lines can affect cultural resources either directly or indirectly. Construction activities associated with any project can adversely impact cultural resources if those activities alter the integrity of key characteristics that contribute to a property's significance as defined by the standards of the NRHP or the State of Texas Antiquities Code. These characteristics might include location, design, setting, materials, workmanship, feeling, or association for architectural and engineering resources or archeological information potential for archeological resources.

4.3.1 Direct Impacts

Typically, direct impacts are caused by the actual construction of the line or through increased vehicular and pedestrian traffic during the construction phase. The construction of a transmission line might directly alter, damage, or destroy historic buildings, archeological sites, engineering structures, landscapes, or historic districts. Additionally, an increase in vehicular traffic might damage surficial or shallowly buried sites, while the increase in pedestrian traffic might result in vandalism of some sites. Direct impacts might also include isolation of a historic resource from or alteration of its surrounding environment.

4.3.2 Indirect Impacts

Indirect impacts to cultural resources include those effects caused by the project that are farther removed in distance or that occur later in time but are reasonably foreseeable. These indirect impacts might include introduction of visual or audible elements that are out of character with the resource or its setting. Indirect impacts might also occur as a result of alterations in the pattern of land use, changes in population density, accelerated growth rates, or increased pedestrian or vehicular traffic. Historic buildings, structures, landscapes, and districts are among the types of resources that might be adversely impacted by the indirect impact of the proposed transmission towers and lines.

4.3.3 Mitigation

The preferred form of mitigation for direct and indirect impacts to cultural resources is avoidance through project modifications. Additional mitigation measures for direct impacts may include implementing a program for data recovery excavations if an archeological site cannot be avoided. Indirect impacts on historical properties and landscapes can be lessened through careful design and landscaping considerations, such as using vegetation screens or berms where practicable. Additionally, relocation might be possible for some historic structures.

4.3.4 Summary of Cultural Resource Impacts

The distance of each recorded cultural resource located within 1,000 feet from the proposed route was measured using GIS software and aerial photography interpretation. No archeological sites are recorded within the ROW of the proposed route, and no archeological sites are recorded within 1,000 feet of the proposed route centerline. No NRHP properties, NRHP-listed or eligible bridges, or State Antiquities Landmark are recorded within the proposed route ROW, or within 1,000 feet of the proposed route centerline.

Because a cultural resource survey has not been conducted for the proposed route, additional cultural resources sites that have not yet been recorded or evaluated might exist within the corridor. Consequently, the potential of impacting undiscovered cultural resources exists along the route. To assess this potential, areas with HPAs were defined by a professional archeologist by reviewing aerial, soil, and topographic maps. The TASA was also reviewed to identify areas where prehistoric resources have been documented in the vicinity of the study area. HPAs identified within the study area for prehistoric sites were identified near McKenzie Draw, playa lakes, and playa dunes. Topography, availability of water and other natural resources were all taken into consideration to determine HPAs, as well as the effects of geologic processes on archeological deposits. Using these considerations, a total of 2.06 miles, or approximately 23% of the total length of the line, was determined to be HPAs as shown in Table 4-1.

4.4 Impacts on Aesthetic Values

Aesthetic impacts, or impacts to visual resources, exist when the ROW, lines and/or structures of a transmission line system create an intrusion into, or substantially alter, the character of the existing view. The significance of the impact is directly related to the quality of the view, in the case of natural scenic areas, or to the importance of the existing setting in the use and/or enjoyment of an area, in the case of valued community resources and recreational areas.

Construction of the project could have both temporary and permanent aesthetic effects. Temporary impacts would include views of the actual assembly and erection of the tower structures. If wooded areas are cleared, the brush and wood debris could have an additional negative temporary impact on the local visual environment. Permanent impacts from the project would involve the views of the cleared ROW, tower structures, and lines from public viewpoints including roadways and recreational areas.

No landscapes protected from most forms of development or legislation exist within the study area. Potential visibility impacts were evaluated by estimating the length of the route that would fall within the foreground visual zones (one-half mile with unobstructed views) of parks or recreational areas, major highways, and FM roads. The route length within the foreground visual zone of parks or recreational areas, U.S. and State highways, and FM roads were tabulated and are discussed below.

The route has approximately 0.88 mile of its ROW length located within the foreground visual zone of U.S. and State highways.

The route has approximately 5.29 miles of its length located within the foreground visual zone of FM and/or RM roads.

The route has approximately 0.33 mile of its ROW length located within the foreground visual zone of parks or recreational areas.

Overall, the character of the rural landscape within the study area includes agricultural land and oil and gas wells. The oil and gas developments throughout the study area, including existing transmission lines and distribution lines, have already impacted the aesthetic quality within the region from public viewpoints. The construction of the route is not anticipated to significantly impact the aesthetic quality of the landscape.

4.5 Impacts on Environmental Integrity

4.5.1 Impacts on Physiography and Geology

Construction of the proposed transmission line is not anticipated to have any significant adverse effects on the physiographic or geologic features and resources of the study area. Erection of the structures will require the excavation and/or minor disturbance of small quantities of near-surface materials, but should have no measurable impacts on the geologic resources or features along the route. No geologic hazards were identified in the study area, and none are anticipated to be created by the Proposed Project.

4.5.2 Impacts on Soils

Activities associated with the construction, operation, and maintenance of electrical transmission lines typically do not adversely impact soils when appropriate mitigation measures are implemented during the construction phase. Potential impacts to soils include erosion, compaction, and the conversion of prime farmland soils.

The highest risk for soil erosion and compaction is primarily associated with the construction phase of a project. In accordance with SPS's standard construction practices, ROW clearing of woody vegetation including trees, brush, and undergrowth will be conducted within the approved ROW area (approximately 70 feet). Areas where vegetation on slopes is removed, with disturbance to the root zone, will have the highest potential for soil erosion, and the repetitive use of heavy equipment on the cleared ROW creates the greatest potential for soil compaction. Prior to construction, SPS will develop a SWPPP to minimize potential impacts associated with soil erosion, compaction, and sedimentation off of the ROW. Implementation of this plan will incorporate temporary and permanent BMPs to minimize soil erosion on the ROW during significant rainfall events. The SWPPP will also establish the criteria for re-vegetation and mitigating soil compaction to ensure adequate soil stabilization during the construction and post-construction phases. The native herbaceous layer of vegetation will be maintained, during construction to the extent practicable. Areas with a high erosion potential, including steep slopes and areas with shallow topsoil, will require seeding and/or implementation of permanent BMPs (e.g., soil berms or interceptor slopes) to stabilize disturbed areas and minimize soil erosion potential during the post-construction phase. The ROW will be inspected prior to and during construction at SWPPP specified intervals to ensure that potential high-erosion areas are identified and appropriate BMPs are implemented and maintained to prevent erosion. The ROW will be inspected post-construction to identify the progress of any revegetated areas and identify where any additional erosion control measures will need to be in place to assist in soil stabilization.

As previously discussed, prime farmlands, as defined by the NRCS, are lands that are best suited for producing food, feed, forage, or fiber crops. All the alternative routes cross soils designated as prime farmland. However, the USDA-NRCS does not consider the limited area of direct impact associated with transmission line structures to be a significant conversion of these lands, as the majority of the

ROW would be available for agricultural use once construction of the transmission line is completed. No significant impacts to prime farmland soils are anticipated for the proposed route. Potential impacts to soils, primarily erosion and compaction, would be minimized with the development and implementation of a SWPPP.

4.5.3 Impacts on Surface Water

McKenzie Draw would be crossed by the Proposed Project route. SPS proposes to span this surface water if practical. Structure locations would be outside of the ordinary high water marks for spanned surface waters. Hand-cutting of woody vegetation within the ordinary high water marks may be implemented and limited to the removal of woody vegetation as necessary to meet conductor to ground clearances. The shorter understory and herbaceous layers of vegetation would remain, where allowable, and BMPs would be implemented in accordance with the SWPPP to reduce the potential for sedimentation within this feature. The Proposed Project route does not across any open waters or parallel any streams for any length.

Since McKenzie Draw is proposed to be spanned by the transmission line, and a SWPPP will be implemented during construction, no significant impacts are anticipated to surface water integrity or water quality.

4.5.4 Impacts on Ground Water

The construction, operation, and maintenance of the proposed transmission line are not anticipated to adversely affect groundwater resources within the study area, though potential fuel and/or chemical spills during the construction process could potentially impact both surface water and groundwater resources. Thus, standard operating procedures and spill response specifications relating to petroleum product storage, refueling, and maintenance activities of equipment are provided as a component of the SWPPP in order to avoid and minimize potential contamination to water resources. SPS will take all necessary and available precautions to avoid and minimize the occurrence of such spills, and any remedial and disposal activities associated with any accidental spills will be in accordance with state and federal regulations.

4.5.5 Impacts on Wetlands

Wetlands serve as habitat to a number of species and are often used as migration corridors for wildlife. Removal of vegetation within wetlands increases the potential for erosion and sedimentation, which can be detrimental to downstream plant communities and aquatic life. No mapped NWI wetlands or playa lakes are crossed by the Proposed Project alignment.

The temporary and/or permanent placement of fill material within jurisdictional surface waters and associated wetlands requires a permit from the USACE under Section 404 of the CWA. Streams and wetlands crossed by the Proposed Project are subject to regulation under Section 404 of the CWA Based on the information evaluated in this document, a Section 404 permit is not anticipated for the Proposed Project. Prior to construction, a field assessment of the PUC approved route would be completed to further determine USACE jurisdictional areas and evaluate potential impacts to these resources along with any permitting actions required, if any. If necessary, SPS will coordinate with the USACE prior to clearing and construction to ensure compliance with Section 404 of the CWA.

4.5.6 Impacts on Floodplains

No FEMA FIRMs were available for the study area. Likely, the 100-year floodplains may be associated with the McKenzie Draw. No construction activities are anticipated that would significantly impede the flow of water within watersheds. Engineering design should alleviate the potential of construction activities to adversely impact flood channels and proper structure placement would minimize any flow impedance during a major flood event. The construction of the transmission line is not likely to significantly impact the overall function of a floodplain, or adversely affect adjacent or downstream properties. SPS will coordinate with appropriate county officials as necessary.

4.5.7 Impacts on Vegetation

Potential impacts to vegetation would result from clearing the ROW of woody vegetation and/or herbaceous vegetation. These activities facilitate ROW access for structure construction, line stringing, and future maintenance activities of the proposed transmission line. Impacts to vegetation would be limited to the ROW. Woodland vegetation removal within the ROW would be required if present. ROW clearing activities would be completed while minimizing the impacts to existing groundcover vegetation when practical. Mowing and/or shredding of herbaceous vegetation may be required within grasslands/pasturelands. Future ROW maintenance activities may include periodic mowing and/or herbicide applications to maintain the herbaceous vegetation layer within the ROW.

The lengths of the route that may require clearing of woodlands/brushlands are provided in Table 4-1. The lengths of the route crossing upland mesquite brushlands and/or riparian woodlands/brushland woodlands were interpolated from aerial photography and route lengths were digitally measured for these tabulations. The route crosses approximately 0.04 miles of mesquite brushland vegetation and zero (0) mile of riparian woodlands/brushlands.

Clearing of trees, shrubs, or herbaceous cover may cause a degree of habitat fragmentation. The magnitude of habitat fragmentation is minimized by paralleling an existing linear feature such as a transmission line, roadway, or railway. During the route development process, consideration was given to maximize the length of the route parallel to existing linear corridors to minimize impact to or avoid woodland areas. Clearing would occur only where necessary to provide access, work space, and future maintenance access to the ROW.

4.5.8 Impacts on Wildlife and Fisheries

The primary impacts of construction activities on terrestrial wildlife species are typically associated with temporary disturbances from construction activities, and with the removal of vegetation (habitat modification/fragmentation). Increased noise and equipment movement during construction may temporarily displace mobile wildlife species from the immediate workspace area. These impacts are considered short-term and normal wildlife movements would be expected to resume after construction is completed. Potential long-term impacts include those resulting from habitat modifications and/or fragmentation. During the routing process, POWER attempted to minimize potential habitat fragmentation by paralleling existing linear features and avoiding paralleling streams to the extent feasible.

Construction activities may impact small, immobile, or fossorial (living underground) animal species. Impacts to these species may occur due to equipment or vehicular movement on the ROW by direct impact or due to the compaction of the soil if the species is fossorial. TXNDD (2015) did not indicate

the presence of any species within the study area. Potential impacts of this type are not typically considered significant and are not likely to have an adverse effect on any species population dynamics.

If ROW clearing occurs during bird nesting season, potential impacts could occur within the ROW area related to migratory bird eggs and/or nestlings. Increases in noise and equipment activity levels during construction could also potentially disturb breeding or other activities of bird species nesting in areas adjacent to the ROW. SPS proposes to complete all ROW clearing and construction activities in compliance with the MBTA to avoid or minimize potential impacts.

Transmission lines can also present additional hazards to birds due to a possibility of electrocutions and/or collisions. Measures can be implemented to minimize this risk with transmission line engineering designs. The electrocution risk to birds should not be significant since the engineering design distance between conductors, conductor to structure, or conductor to ground wire for the proposed transmission line is greater than the wingspan of any bird potentially within the area (i.e., greater than eight feet). While the conductors are typically thick enough to be seen and avoided by birds in flight, the shield wire is thinner and can present a risk for avian collision. This risk can be minimized by installing bird flight diverters or other marking devices on the line within potential high bird use areas.

Potential impacts to aquatic systems would include effects of erosion, siltation, and sedimentation. Clearing the ROW of vegetation might result in increased suspended solids in the surface waters traversed by the transmission line. Increases in suspended solids might adversely affect aquatic organisms that require relatively clear water for foraging and/or reproduction. Physical aquatic habitat loss or alteration could result wherever riparian vegetation is removed and also at temporary crossings required for access roads. Increased levels of siltation or sedimentation might also potentially impact downstream areas, primarily affecting filter feeding benthic and other aquatic invertebrates.

To avoid or minimize these impacts, SPS proposes to span all surface waters where practical. Additionally, the implementation of a SWPPP and BMPs will also minimize potential impacts. Therefore, no significant adverse impacts are anticipated to any aquatic habitats crossed or located adjacent to the ROW for the transmission line.

Construction of the proposed transmission line is not anticipated to have direct adverse impacts to wildlife and fisheries within the study area. Direct impacts would be associated with the loss or modification of habitat which is reflected in the vegetation analysis discussed above. Habitat fragmentation was minimized for the route within woodland areas by avoidance and/or paralleling existing linear features to the extent feasible. While highly mobile animals might be temporarily displaced from habitats near the ROW during the construction phase, normal movement patterns should return after Proposed Project construction is complete. Implementation of a SWPPP utilizing BMPs will minimize potential impacts to aquatic habitats.

4.5.9 Impacts on Threatened and Endangered Species

To determine potential impacts to threatened or endangered species, POWER reviewed several sources of information. Known element occurrence data for the study area was obtained from the TXNDD and comments were received from TPWD (see Appendix A). Current county listings for federal and state listed threatened and endangered species and USFWS designated critical habitat locations were included in the review. POWER also utilized several published sources to review life histories and habitat requirements of listed species as previously discussed in Section 2.8.7.

No federal or state listed plant species were listed for Yoakum or Gaines Counties. Construction of the route is not anticipated to impact any threatened or endangered plant species.

The route does not cross any known habitat or designated critical habitat for federally listed animal species. Review of the TXNDD database did not indicate any previous occurrences of any federally listed species or state listed species within the study area. Of the state and federally listed species for Yoakum and Gaines Counties, only the Texas horned lizard is anticipated to occur within the study area where suitable habitat exists. If present, the Texas horned lizard may be subject to minor temporary disturbance during construction activities. If this species is observed during construction activities, it will be allowed to leave the study area or be relocated by a permitted individual. The construction of a transmission line does not include activities associated with collecting, hooking, hunting, netting, shooting, or snaring by any means or device, and does not include an attempt to conduct such activities. Therefore, "take" of state-listed species as defined in Section 1.01(5) of the Texas Parks and Wildlife Code is not anticipated as a result this project.

The whooping crane, bald eagle, and peregrine falcon are not anticipated to occur within the study area except as uncommon migrants. Other listed species, such as the black-footed ferret and gray wolf, are not anticipated to occur within the study area because they are believed to be extirpated from Texas. Therefore, construction activities are not anticipated to have negative impacts on these listed species.

5.0 ROUTE EVALUATION

The initial purpose of this study was to delineate and evaluate potential alternative routes for SPS's proposed transmission line in Yoakum and Gaines Counties, Texas between the existing Mustang Substation and the existing Shell CO2 Substation. As discussed in Section 2.1.3, due to the large amount of number in the area in the short distance between the endpoints, it was ultimately determined that SPS and POWER should work with the landowners to determine a single workable route. Once this route was identified and refined, POWER completed an environmental analysis of the single primary route (Section 4.0), the results of which are shown in Table 4-1. Table 5-1 presents detailed information on habitable structures and other land use features in the vicinity of the primary route. The environmental evaluation was an analysis of the primary route strictly from an environmental and land use impact viewpoint (i.e., land use, aesthetics, ecology, and cultural resources) based upon measurement of the environmental criteria (Table 2-1). POWER used this information to evaluate the primary route to ensure the route balances the PURA and PUC routing criteria related to land use, aesthetics, ecology, and cultural resources. SPS and POWER believe this primary route addresses the requirements of PURA and PUC Substantive Rules. The Proposed Route:

- runs parallel to existing compatible corridors and apparent property boundaries (excluding pipelines) for 69.5% of its length;
- has no length of ROW through land irrigated by traveling systems (rolling or pivot type);
- crosses a U.S. or State Highway twice;
- has no cemeteries within 1,000 feet of the ROW centerline;
- has no private airstrips within 10,000 feet of the ROW centerline;
- has no heliports within 5,000 feet of the ROW centerline;
- has no commercial AM radio transmitters within 10,000 feet of the ROW centerline;
- has no length of ROW through bottomland/riparian woodlands;
- has no length of ROW across mapped National Wetlands Inventory wetlands and playa lakes;
- has no length of ROW across known habitat of federally listed endangered or threatened species;
- has no length of ROW across open water (lakes, ponds);
- crosses only one stream;
- crosses no parks/recreational areas;
- crosses no rivers;
- has no length of ROW parallel (within 100 feet) to streams or rivers;
- crosses no archeological or historical sites;
- has no archeological or historical sites within 1,000 feet of ROW centerline;
- crosses no National Register of Historic Places listed properties; and
- has no National Register of Historic Places listed properties within 1,000 feet of ROW centerline.

TABLE 5-1 HABITABLE STRUCTURES AND OTHER LAND USE FEATURES IN THE VICINITY OF ROUTE 1

Map Number	Structure or Feature	Approximate Distance from Centerline (ft)	Direction from Route Centerline
1	Single Family Residence - Trailer Home	292	S
2	Single Family Residence - Trailer Home	239	S
3	Single Family Residence - Trailer Home	292	S
4	Single Family Residence	235	S
5	Industrial - Oil Gas Related - Office	214	S
6	Single Family Residence	216	S
7	Single Family Residence - Trailer Home	270	S
8	Barn / Workshop	289	S
9	Single Family Residence	266	W
10	Single Family Residence	270	W
11	Workshop	162	W
12	Single Family Residence - Trailer Home	244	E
13	Single Family Residence	209	E
14	Single Family Residence	293	E
15	Industrial	272	E
16	Other electronic installation	662	E
17	Other electronic installation	192	N
18	Other electronic installation	954	N
19	Other electronic installation	643	S
20	Denver City Public Airport	8,077	SW

6.0 LIST OF PREPARERS

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APPENDIX A AGENCY CORRESPONDENCE

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APPENDIX B OVERSIZED MAPS

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FIGURE 3-2

ENVIRONMENTAL AND OTHER LAND USE FEATURES IN THE VICINITY OF THE PRIMARY ROUTE

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FIGURE 5-1

HABITABLE STRUCTURES AND OTHER LAND USE FEATURES IN THE VICINITY OF THE PRIMARY ROUTE

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