4.0 ENVIRONMENTAL IMPACTS OF THE ALTERNATIVE ROUTES

4.1 IMPACTS ON PHYSIOGRAPHY/GEOLOGY/SOILS

Construction of the proposed transmission line will have no significant effect on geologic features or resources within the study area. The erection of the support structures will require the removal and/or disturbance of small amounts of near-surface materials, but will have no measurable impact on geologic resources or features along any of the alternative routes. Some economically valuable geologic resources, including limestone, sand, and gravel, occur in the study area. If the selected route traverses sites producing those resources, there could be minor short-term impacts to those resources; however, alternative routes were generally delineated to avoid any such areas.

4.1.1 Soils

The construction and operation of transmission lines normally creates very few long-term adverse impacts on soils. The primary potential impact upon soils from any transmission line construction will be erosion and soil compaction. The hazard of soil erosion is generally greatest during the initial clearing (where necessary) of the ROW. To provide adequate space for construction activities and to minimize corridor maintenance and operational problems, the removal of most woody vegetation within the ROW is necessary. In these areas, the movement of heavy equipment will disturb only the remaining leaf litter and a small amount of herbaceous vegetation. The most important factor in controlling soil erosion associated with construction activities is revegetating areas that have potential erosion problems immediately following construction. Revegetation of a majority of the ROW would occur through natural succession. Critical areas, such as steep slopes and areas with shallow topsoil, may require additional seeding. To maximize the protection of land and water resources, SPS will exercise special care when clearing near waterways. Vegetation on the stream banks will remain intact to the greatest extent possible. Revegetation of these areas (if necessary) will take priority over less-critical areas. SPS will inspect the ROW during and after construction to identify problem erosion areas, and will take special precautions to minimize vehicular traffic over areas with very shallow soils.

4.1.2 Prime Farmlands

The Secretary of Agriculture, in 7 USC 4201(c)(1)(A), defines prime farmland soils as those soils that have the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. The USDA recognizes the importance and vulnerability of prime farmlands throughout the nation and, therefore, encourages the wise use and conservation of these soils where possible.

Prime farmland soils are scattered throughout the study area and are of limited extent along the alternative route corridors.

Whenever feasible, the alignment of alternative routes follow existing roadways, property lines, fence lines, or other existing ROWs, so as to minimize potential impacts (including those to prime farmland). Other than construction-related erosion, the primary impact of the project on prime farmland soils will be the physical occupation of small areas by the base of the support structures, which may slightly reduce the potential of those areas for agricultural production.

The NRCS has stated that they do not normally consider the construction of electric transmission lines to constitute a major impact, or conversion of prime farmland, since the soils can still be used for farming following construction (see Appendix A).

4.2 IMPACTS ON WATER RESOURCES

4.2.1 Surface Water

Table 7-1 (in Section 7 of this document) presents the potential impacts on surface waters for each route, including the number of stream crossings and length of ROW across open water.

All of the proposed alternative routes cross surface water features, including named and unnamed streams, potential wetlands, and stock tanks; however, the construction of the proposed 230-kV transmission line should have little adverse impact on the surface water resources of the study area. The main potential impact on surface waters from any major construction project is siltation resulting from erosion and potential pollution from the accidental spillage of petroleum products (e.g., fuel, lubricants, solvents, etc.) or other chemicals. Vegetation removal could result in increased erosion potential of the affected areas, leading to the delivery of slightly higher-than-normal sediment yields to area streams during heavy rainfall events. However, these short-term effects should be minor because of the relatively small area to be disturbed at any particular time, the short duration of construction activities, the preservation of streamside vegetation where practicable, and SPS's efforts to control runoff from construction areas. In addition, the proposed project will require a SWPPP, including the filing of a NOI with the TCEQ.

All proposed alternative routes would cross multiple streams. Upon route selection, SPS will avoid or minimize the placement of supporting structures in the streambed of drainage features. If appreciable stream flow is present in any of the spanned streams, construction crews will transport machinery and equipment around these areas via existing roads to avoid direct crossings. This will eliminate the necessity of constructing temporary low-water crossings that may result in erosion, siltation, and disturbance of the stream and its biota. If a spanned stream is dry at the time of construction, some earthwork may be necessary to facilitate crossing; however, the area will undergo restoration to preconstruction contours following project completion. If clearing of vegetation is necessary at stream crossings, SPS will employ selective clearing (i.e., use of chainsaws instead of heavy machinery), to minimize erosion problems. Highly erodible areas adjacent to streams (stream banks) will not be cleared unless necessary.

Construction of the proposed transmission line could result in some temporary erosion or short-term disturbance resulting in siltation, but impacts will be minimal and localized because of the ephemeral or intermittent nature of existing streams within the study area. No long-term adverse effects are likely. SPS will make efforts during construction for proper control and handling of any petroleum or other chemical products. The most effective method for avoiding surface water impacts is the implementation of proper spill prevention and spill response plans.

4.2.2 Groundwater

The construction, operation, and maintenance of the proposed transmission line should not adversely affect groundwater resources in the study area or vicinity. The effect of the proposed transmission line on groundwater resources will be negligible because the line will be above ground rather than buried. The amount of recharge area disturbed by construction is insignificant compared to the total amount of recharge area available for the aquifer systems in the region. No measurable alteration of aquifer recharge capacity should occur and the likelihood of groundwater contamination is not significant.

The greatest potential for groundwater impacts related to construction activities would be associated with the possible contamination from the accidental spillage of chemicals (e.g., fuels, lubricants, solvents, petroleum products, etc.). The most effective method to avoid groundwater impacts is the implementation of proper spill response plans. It is unlikely that polluted surface water run-off will contaminate any groundwater supplies; however, such control measures will be in place as additional precautionary measures during the construction phase of the project. In addition, the proposed project will require a SWPPP, including the filing of a NOI with the TCEQ.

4.2.3 Floodplains

The FEMA designated 100-year floodplain data is unmapped for Hansford, Hutchinson, Moore, and Sherman counties.

Construction of the proposed project should not have significant impacts on the function of the floodplain, nor adversely affect adjacent or downstream properties. If structures are to be located within the floodplain, then SPS will coordinate with the appropriate floodplain administrators for Hansford, Hutchinson, Moore, and Sherman counties.

4.3 IMPACTS ON TERRESTRIAL ECOSYSTEMS

4.3.1 Vegetation

The main impact on vegetation within the study area will be the removal of herbaceous vegetation along the proposed transmission line ROW. The amount of vegetation cleared from the transmission line ROW is dependent upon the type of vegetation present. For example, the greatest amount of vegetation clearing would occur in wooded areas, whereas pasturelands would require little to no removal of vegetation.

Areas currently used as pastureland or cropland may be temporarily unavailable for grazing or commercial crop production for the duration of the transmission line construction, but can usually be returned to previous land uses upon completion of construction.

During the vegetation clearing process, SPS will make efforts to retain native ground cover where possible, and to minimize impacts to local vegetation. Clearing of woody vegetation will only occur where necessary to provide access and working space and to protect conductors. Soil conservation practices will benefit native vegetation and assist in successful restoration of disturbed areas. As soon as possible after the construction of the transmission line, SPS will reseed the ROW in herbaceous species or a cover of forage crop, if necessary, to facilitate erosion control.

The interpretation of 1 inch = 1,000 ft color aerial photography provided the basis for quantifying the approximate impacts to vegetation associated with the proposed alternative routes. Table 7-1 (in Section 7.0 of this document) presents the potential impacts on vegetation communities for each route, including the length of ROW crossing pastureland, length of ROW crossing rangeland, length of ROW crossing upland brushland, length of ROW crossing emergent wetlands and length of ROW crossing aquatic/hydric communities. Limited field reconnaissance of the study area revealed pastureland, rangeland, and land with irrigation systems to be crossed along all of the proposed routes.

4.3.2 Aquatic/Hydric

All of the alternative routes would cross multiple streams. Alternative Route 5 would cross the least amount of streams (7). Alternative Route 8 would cross the greatest amount of streams (28). Alternative Route 5 would parallel the least amount of streams within 100 ft (0) followed by Alternative Route 1 with 129 ft. Alternative Route 7 would parallel the greatest amount of streams (2,777 ft). Alternative Routes 1, 2 and 6 would cross the least amount of open water (0) followed by Alternative Route 8 with 168 ft. Alternative Route 3 would cross the greatest amount of open water with 3,824 ft.

Aquatic/hydric habitat potentially affected by the proposed transmission line would generally be minor in extent because of the ephemeral and intermittent nature of most surface water features in the region. The study area is known for its isolated wetlands that have no connection to streams or ponds. Most isolated wetlands within the study area are playa lakes and are not jurisdictional under the CWA unless hydrologic connectivity is proven. NWI maps indicate that potential wetland communities within the study area are generally palustrine (i.e., marsh) and lacustrine (i.e., lake) communities. According to NWI maps, all of the alternative routes would cross emergent wetlands. Alternative Route 6 would cross 428 ft of emergent wetlands while Alternative Route 4 would cross the greatest amount with 2,091 ft.

The NRCS has identified hydric soils within the study area (see Appendix A), and some of the soils are present along the proposed alternative routes. Therefore, there is the potential for wetlands to be impacted. Upon selection of a final route, a ground reconnaissance of the transmission line would be necessary to determine whether any jurisdictional wetlands exist within the proposed ROW. If any jurisdictional wetlands do occur within the proposed ROW, it is likely that the aerial transmission line will easily span those features.

The removal or disturbance of streamside vegetation can result in an increased potential for erosion and sedimentation. Placement of erosion control devices down gradient of areas disturbed by construction activities would help to minimize runoff into local streams. In close proximity to streams, the positioning of erosion control measures between the disturbed area and the waterway will prevent or minimize siltation of streams. Placement of dredged or fill material within waters of the U.S. (including wetlands) is subject to USACE regulations. The implementation of sedimentation controls (a SWPPP will be in place) during construction will help minimize erosion and sedimentation into area streams.

4.3.3 Endangered and Threatened Plant Species

The FWS and TPWD were consulted to determine the potential occurrence of federal or state-listed endangered or threatened plant species within the study area. County-level endangered and threatened species lists prepared by TPWD's NDD (2009a, 2009b) and FWS (2010) indicate there are no federal or state-listed endangered or threatened plant species.

4.3.4 Wildlife

The impacts of transmission lines on wildlife include short-term effects resulting from physical disturbance during construction, as well as long-term effects resulting from habitat modification. The net effect from transmission line construction on local wildlife is typically minor. The following section provides a general discussion of the effects of transmission line construction and operation on terrestrial wildlife, followed by a discussion of the possible impact of each proposed alternative route.

Any required clearing or other construction-related activities will directly and/or indirectly affect most animals that reside within or traverse the transmission line ROW. Heavy machinery may adversely affect smaller, low mobility species, particularly amphibians, reptiles, and small mammals.

If construction occurs during the breeding season (generally spring to fall), construction activities may have greater adverse affects on wildlife, particularly on some species of birds. Heavy machinery may cause soil compaction, which may adversely affect fossorial animals (i.e., those that live underground). Mobile species, such as birds and larger mammals, may avoid initial clearing and construction activities and move into adjacent areas outside the ROW. Construction activities may temporarily deprive some animals of cover, and therefore potentially subject them to increased natural predation. Wildlife in the immediate area may experience a slight loss of browse or forage material during construction; however, the prevalence of similar habitats in adjacent areas and vegetational succession in the ROW following construction will minimize the effects of these losses.

The increased noise and activity levels during construction could potentially disturb the daily activities (e.g., breeding, foraging, etc.) of species inhabiting the areas adjacent to the ROW. Dust and gaseous emissions should have a minimal affect on wildlife. Although construction activities may disrupt the normal behavior of many wildlife species, little permanent damage to these populations should result. Periodic clearing along the ROW, while producing temporary negative impacts to wildlife, can improve the habitat for ecotonal or edge species through the increased production of small shrubs, perennial forbs, and grasses.

Transmission line structures could benefit some bird species, particularly raptors, by providing resting and hunting perches, particularly in open, treeless arid habitats (Avian Power Line Interaction Committee [APLIC], 2006). Raptor species, particularly the red-tailed hawk, often use the support structures as nesting sites. Vultures and ravens commonly use the structures as roosting sites and the wires and structures often serve as hunting or resting perches for species such as American kestrel, mourning dove, loggerhead shrike, and meadowlarks (*Sturnella* spp.). As a result, transmission lines have significantly increased raptor populations in several areas of the U.S. (APLIC, 2006).

The transmission line (both structures and wires) could present a hazard to flying birds, particularly migrants. Collisions tend to increase in frequency during the fall and spring when migrating flocks are denser and flight altitudes are lower in association with cold air masses, fog, and/or inclement weather. The greatest danger of mortality exists during periods of low ceiling, poor visibility, and drizzle when birds are flying low, perhaps commencing or terminating a flight, and may have difficulty seeing obstructions (Electric Power Research Institute [EPRI], 1993). Most migrant species, including passerines, should experience minimal adverse effects during migration since their normal flying altitudes are greater than the heights of the proposed transmission structures (Willard, 1978; Gauthreaux, 1978). For year-round or seasonal resident birds, those most prone to collision are often the largest and most common in a given area (Rusz et al., 1986; APLIC, 2006). Resident birds, or those in an area for an extended period, learn the location of power lines and become less susceptible to wire strikes (Avery, 1978). Raptors, typically, are uncommon victims of transmission line collisions because of their great visual acuity (Thompson, 1978). In addition, many raptors only become active after sufficient thermal currents develop, which is usually late in the morning when poor light is not a factor (Avery, 1978).

Power lines within daily use areas are responsible for most bird collisions. Waterfowl species are vulnerable because of their low altitude flight and high speed. Species that travel in large flocks, such as blackbirds and many shorebirds, are also vulnerable, because dense flocking makes movement around obstacles more difficult for individuals in the flock (APLIC, 2006).

Utility companies can employ several means to minimize transmission line impacts on birds in flight. The initial placement of a transmission line is the most important consideration (Avery, 1978; APLIC, 2006). The proximity of a transmission line to areas of frequent bird use is crucial. This is especially true for daily use areas, such as feeding areas or other areas where birds may be taking off or landing regularly (APLIC, 2006). The position of the individual structures can also help reduce collisions. Faanes (1987), in an in-depth study in North Dakota, found that birds in flight tend to avoid the transmission line structures, presumably because such structures are visible from a distance. Instead, most appear to fly over the lines in the mid-span region. In areas where the transmission line passes between roosting and foraging areas, the structures can be placed in the center of the flyway (i.e., where the birds are more likely to fly) to increase their visibility, in addition to heavily marking the wires.

Other considerations during the initial transmission line routing include the height of the surrounding vegetation and the topography of the area (APLIC, 2006). The height of transmission lines relative to the surrounding vegetation can help reduce the probability of collisions. Lines built at the height of the surrounding trees seldom are a problem for forest-dwelling birds and large birds will avoid the tree line, thus avoiding the transmission line (Thompson, 1978; APLIC, 2006). Consideration of topographical features such as valleys, ridges, and mountain passes can help avoid important flight paths.

Faanes (1987) reported that 97% of birds observed colliding with a power line did so with the ground (static) wire, largely because of attempts to avoid the conductors. Beaulaurier (1981) found that removal of the ground wire at two study sites in Oregon resulted in a reduction in collisions of 35% and 69%. Increasing the visibility of the wires by using markers such as orange aviation balls, black-and-white ribbons, or spiral vibration dampers, particularly at mid-span, can reduce the number of collisions. Beaulaurier (1981) reviewed 17 studies involving marking ground wires or conductors and found an average reduction in collisions of 45% when compared to unmarked lines. However, since overhead static wires are installed on transmission lines for safety and reliability reasons, SPS feels that increasing the visibility of wires is a better alternative, when necessary.

Waterfowl are among the birds most susceptible to wire strikes (Faanes, 1987) and yet, despite these hazards, it has been estimated that wire strikes (including distribution lines) account for less than 0.1% of waterfowl non-hunting mortality, compared to 88% from diseases and poisoning and 7.4% because of weather (Stout and Cornwell, 1976). In some areas, hunting affects 20 to 30% of waterfowl populations (Thompson, 1978). Suitable habitat for waterfowl within the study area is limited to small isolated ponds and playa lakes, therefore significant impacts are unlikely.

When considering impacts on wildlife, the ranking of the alternative routes relates primarily to the degree of disturbance or loss of habitat. Other consideration include the length of ROW parallel to streams, impacts to wetlands, the number of stream crossings, and the length of line using existing transmission line ROW, or parallel to other compatible ROW.

Pastureland, rangeland, and land with irrigation systems are the predominant habitat types within the study area. All clearing of vegetation would be in the form of woody and herbaceous removal for the construction of the poles.

Alternative Route 2 would cross the least amount of pastureland (29,703 ft) followed by Alternative Route 1 with 61,837 ft. Alternative Routes 3 and 7 would cross the greatest amount (165,112 ft). Alternative Route 6 would cross the least amount of rangeland (128,366 ft) while Alternative Route 2 would cross the greatest amount (192,524 ft). Alternative Routes 3 and 7 would cross the least amount of irrigation systems (19,374 ft) while Alternative Route 1 would cross the greatest amount (85,561 ft).

Alternative Route 5 would cross the least amount of streams (7). Alternative Route 8 would cross the greatest amount of streams (28). Alternative Route 5 would parallel the least amount of streams within 100 ft (0). Alternative Route 7 would parallel the greatest amount of streams (2,777 ft). Alternative Routes 1, 2 and 6 would cross the least amount of open water (0). Alternative Route 4 would cross the greatest amount of open water with 3,824 ft. All of the alternative routes would cross emergent wetlands. Alternative Route 4 would cross the greatest amount of emergent wetlands with 2,091 ft.

From a wildlife standpoint, the route with the least amount of vegetation clearing (associated with upland brushland and wooded riparian only), the least amount of streams and wetlands to be crossed, and the least amount of threatened/endangered species habitat to be crossed would be best. Alternative Route 5 would be the preferred route from a wildlife standpoint, as it would impact the least amount of the aforementioned criteria. Alternative Route 1 and Alternative Route 6 would follow with each having the same amount of impact on wildlife.

4.3.5 Endangered and Threatened Wildlife

According to TPWD (2010) and FWS (2010), ten federal and/or state-listed endangered and threatened species potentially occur in Hansford, Hutchinson, Moore, and Sherman counties.

The western burrowing owl, ferruginous hawk, Arkansas River shiner, prairie vole, and swift fox have known occurrences in the study area (FWS, 2009), but only the Arkansas River shiner is listed as threatened at the state and federal levels. The other species with known occurrences in the study area are listed as rare by the TPWD (2009b). The other 23 species listed in Table 3-1 are likely to occur outside the study area. These species include numerous birds, such as the whooping crane, the American peregrine falcon, arctic peregrine falcon, bald eagle, mountain plover, and Baird's sparrow, all of which have a potential to occur within the study area as migrants or transients. The proposed transmission line project is unlikely to result in adverse impacts to these species.

Species known to occur in the general area and that are likely present in suitable habitat include the state-listed (threatened) Texas horned lizard. The Texas horned lizard occurs in Hansford, Hutchinson, Sherman, and Moore counties (Dixon, 2000) and is likely to be present throughout the study area in suitable habitat; however, the proposed transmission line project should not adversely affect the species.

According to TPWD (2009a), known locations of black-tailed prairie dogs in the form of prairie dog towns occur within and near the ROW of the proposed alternative routes. Impacts on the prairie dog towns would occur during the drilling and setting of a pole within their known location. Due to the nature of the construction, these prairie dog towns will be minimally impacted and should not adversely affect the species.

The western burrowing owl has a known occurrence in prairie dog towns in Moore and Hutchinson County. The ferruginous hawk has a known occurrence in prairie dog towns in Moore County. The prairie vole has a known occurrence near a tributary of Palo Duro Creek in Hutchinson and Hansford counties.

The Arkansas River shiner has a known occurrence in the Middle Canadian Spring watershed of Hutchinson County.

4.3.6 Critical Habitat

There is no FWS-designated critical habitat in the counties comprising the study area, thus impacts are not anticipated.

4.4 IMPACTS ON AQUATIC ECOSYSTEMS

Potential impacts on aquatic systems include the number of streams crossed and the amount of open water habitat crossed. Other considerations relevant to aquatic systems are associated with the amount of ROW that will require clearing, particularly through wetlands.

Impacts on aquatic ecosystems from transmission line construction are generally minor. Aquatic features within the study area, such as streams and ponds, are of limited extent. Those present are largely ephemeral and intermittent, and the proposed transmission line would likely span them. The implementation of sedimentation controls during construction will help minimize erosion and sedimentation into area streams.

When considering impacts to aquatic ecosystems, the ranking of the alternative routes relates to the number of streams crossed and the amount of open water and wetlands crossed. Alternative Route 5 would cross the least amount of streams and parallel the least amount of streams within 100 ft. Alternative Route 1 would cross the least amount of open water and Alternative Route 6 would cross the least amount of emergent wetlands. From an aquatic habitat standpoint, Alternative Route 7 would have the greatest amount of impacts because it parallels the greatest amount of streams and a very large amount of streams, open water and emergent wetlands.

4.5 SOCIOECONOMIC IMPACTS

4.5.1 Social and Economic Factors

Economic growth and development rely heavily on adequate public utilities, including a reliable electrical power supply. Construction and operation of the proposed transmission line would benefit the residents of the state by enabling SPS to provide adequate and reliable electric service to expanding communities. The proposed transmission line project would enhance the utility's ability to meet increasing demands for power, provide operational reliability to deliver power as needed throughout the state, and allow the utility to more efficiently transport power to loads.

For this project, minimal short-term local employment would be generated. SPS normally uses contract labor supervised by SPS employees during the clearing and construction phase of transmission line projects. A portion of the project wages would find their way into the local economy through purchases, such as fuel, food, lodging, and possibly construction materials. SPS is also required to pay sales tax on purchases and is subject to paying local property tax on land or improvements.

Economic growth and development rely heavily on adequate public utilities, including a reliable electrical power supply. Without this basic infrastructure the state's potential for economic growth would be constrained.

4.5.2 Community Values

For the purposes of evaluating the effects of the proposed transmission line, PBS&J has defined the term community values as a "shared appreciation of an area or other natural or human resource by a national, regional or local community." Adverse effects upon community values are defined as aspects of the proposed project which 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 identified with the location and specific characteristics of the proposed transmission line and do not include possible objections to electric transmission lines per se.

Impacts on community values can be classified into two areas: (1) direct effects, or those effects which would occur if the location and construction of a transmission line results in the removal or loss of public access to a valued resource; and (2) indirect effects, or those effects which would result from a loss in the enjoyment or use of a resource due to the characteristics (primarily aesthetic) of the proposed line, structures, or ROW. Impacts on community values, whether direct or indirect, can be more accurately gauged as they affect the visual environment of an area (aesthetics) or recreational areas or resources. Impacts in these areas are discussed in detail in sections 4.6.2 and 4.6.3 of this report, respectively.

4.6 LAND USE, AESTHETICS, RECREATION, AND TRANSPORTATION/AVIATION

4.6.1 Land Use

Land use impacts from transmission line construction are determined by the amount of land (of varying use) displaced by the actual ROW and by the compatibility of electric transmission line ROW with adjacent land uses. During construction, temporary impacts to land uses within the ROW could occur due to the movement of workers and materials through the area. Construction noise and dust, as well as temporary disruption of traffic flow, may also temporarily affect residents and businesses in the area immediately adjacent to the ROW. Coordination between SPS, contractors, and landowners regarding access to the ROW and construction scheduling should minimize these disruptions.

The primary criteria considered to measure potential land use impacts for this project included proximity to habitable structures (e.g., residences, businesses, schools, churches, hospitals, nursing homes, etc.), length of existing transmission line ROW paralleled or utilized, length parallel to other compatible ROW, length parallel to property lines, and the overall length of each route.

Generally, one of the most important measures of potential land-use impact is the number of habitable structures located within a specified distance of an alternative route centerline. Habitable structures are defined by the PUC as "... single-family and multifamily dwellings and related structures, mobile homes, apartment buildings, commercial structures, industrial structures, business structures, churches, hospitals, schools, or other structures normally inhabited by humans or intended to be inhabited by humans on a daily or regular basis." PBS&J staff determined the number and distance of habitable structures within 300 ft of each route by the interpretation of aerial photographs, backed up by field reconnaissance, where possible. Of the alternative routes being evaluated, Alternative Route 8 would have the least amount of habitable structures within 300 ft of the route centerline (5) and Alternative Routes 2 would have the least amount of newly affected habitable structures within 300 ft of the ROW centerline (0). Alternative Route 1 would have the greatest number of habitable structures (14). Alternative Routes 3 and 7 would have the greatest number of newly affected habitable structures (8).

The least impact on land use generally results from locating new lines either within or parallel to existing transmission line ROW. Existing transmission line ROW from the Hitchland Substation to the Moore County Substation provided an opportunity to parallel existing transmission line ROW. Several existing transmission line ROWs provided opportunities to parallel existing transmission line ROWs. Alternative Route 2 would parallel the greatest amount of existing transmission lines with 271,667 ft followed by Alternative Route 5 with 215,259 ft. Alternative Routes 3 and 8 would follow the least amount with 13,909 ft.

Paralleling other existing compatible ROW (roads, highways, pipelines, etc) is also generally considered to be a positive routing criterion, one that usually results in fewer impacts than establishing new ROW, and is included in the PUC's transmission line certification criteria. As such, Alternative Route 3 parallels the greatest amount of roadway/highway and pipeline ROW (229,431 ft or 69%) followed by Alternative Route 7 (215,386 ft or 67%).

Paralleling property lines, where existing compatible ROW is not available, is another positive routing criterion, and was also recognized in the PUC's recent amendment to its substantive rules regarding transmission certification. Alternative Route 4 would follow the greatest amount of apparent property boundaries.

Finally, the overall length of a particular alternative route can be an indicator of the relative level of land use impacts. Generally, all other things being approximately equal, the shorter the route, the less land is crossed, which would usually result in fewer potential impacts. In this regard, Alternative Route 2 is the shortest alternative (288,336 ft) while Alternative Route 4 is the longest route (332,502 ft).

Potential impacts on agricultural land uses include the disruption or preemption of farming activities.

areas determine the nature and degree of potential impacts to farming operations. Generally, single-pole structures impact agricultural land less than H-frame or lattice towers because they present a smaller obstacle and take up less actual acreage at the foundation. Structures (and routes) located along field edges (property lines, roads, drainage ditches, etc.) generally present fewer problems for farming operations than a route running across an open field.

Construction-related activities could slightly impact agricultural production, depending upon the timing of construction related to the local planting and harvesting schedule. 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. Since the ROW for this project will not be fenced or otherwise separated from adjacent lands, there will be no significant long-term displacement of grazing or farming activities. Most existing agricultural land uses may be resumed following construction.

Impacts on agricultural lands can generally be ranked by degree of potential impact, with the least potential impact occurring in areas where grazing is the primary use (pasture or rangeland), followed by cultivated cropland, with forested/wooded land (orchards, commercial timber, etc.) having the highest degree of potential impact.

Within the study area, the highest degree of impact would be associated with pastureland, rangeland, and land with irrigation systems (e.g., circle pivot irrigation). Alternative Route 2 would cross the least amount of pastureland (29,703 ft) followed by Alternative Route 1 with 61,837 ft. Alternative Routes 3 and 7 would cross the greatest amount (165,112 ft). Alternative Route 6 would cross the least amount of rangeland (128,366 ft) while Alternative Route 2 would cross the greatest amount (192,524 ft). Alternative Routes 3 and 7 would cross the least amount of irrigation systems (19,374 ft) while Alternative Route 1 would cross the greatest amount (85,561 ft).

4.6.2 Aesthetics

Aesthetic impacts, or impacts upon 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, an existing scenic 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.

In order to evaluate aesthetic impacts, field surveys were conducted to determine the general aesthetic character of the area and the degree to which the proposed transmission line would be visible from selected areas. These areas generally include those of potential community value; parks and recreational areas; particular scenic vistas that were encountered during the field survey; and U.S. and state highways that traverse the study area. Measurements were made to estimate the length of each alternative route that would fall within recreational, major highway, or church, school, or cemetery foreground visual zones (½ mile, unobstructed). The determination of the visibility of the transmission line from various points was calculated from USGS maps and aerial photographs.

- Gruver Municipal Airport within 20,000 ft of Link B – approximately 16,429 ft.
- Gruver Municipal Airport within 20,000 ft of Link M – approximately 18,068 ft.
- Sunray Airport within 20,000 ft of Link K – approximately 3,329 ft.
- Sunray Airport within 20,000 ft of Link T – approximately 10,450 ft.
- Sunray Airport within 20,000 ft of Link U – approximately 19,134 ft.
- Sunray Airport within 20,000 ft of Link W – approximately 16,119 ft.
- Sunray Airport within 20,000 ft of Link X – approximately 16,596 ft.

Alternative Routes 3 and 7 fall within 10,000 ft of a private airstrip. Approximate distances for each link within 10,000 ft of the private airstrip are as follows:

- Private airstrip within 10,000 ft of Link Q – approximately 5,579 ft.

4.6.5 Communication

The proposed transmission line project should have a minimal effect on communication operations in the study area. Each of the alternative routes would be within 2,000 ft of a communication tower. The approximate distance from Link X to the Xcel Energy communication tower is 771 ft. None of the alternative routes would come within 10,000 ft of an AM radio transmitter.

4.6.6 Urban/Residential

Generally, one of the most important measures of potential land use impacts is the number of habitable structures located in the vicinity of each alternative route. PBS&J staff determined the number and distance of habitable structures located within 300 ft of the centerline of each alternative route through the interpretation of aerial photography and verification during reconnaissance surveys, where possible. PBS&J, to the greatest extent reasonable, in the routing of the alternative routes, attempted to avoid habitable structures. Habitable structures within 300 ft of the alternative routes are documented in Tables 4-1through 4-8.

PUC Substantive Rule § 25.101(b)(3)(B) requires, among other things, that the PUC consider whether new transmission line routes parallel existing compatible ROWs, property lines, or other natural or cultural features. In general, all of the alternative routes parallel existing corridors (including apparent property boundaries) for a significant amount of their length.

Table 4-1
Historic Structures Within [illegible] 300 Ft [illegible] Alternative 1
[illegible] Moore [illegible]

Map Number	Structure	Approximate Distance from Centerline (ft)	Direction
6	House Trailer	240	North
7	[illegible]	174	North
35	House	147	East
36	House	286	East
49	Business	141	West
50	Business	126	West
51	Mobile Home	174	East
52	House	147	East
53	House	230	East
54	Barn	39	East
56	Barn	169	South
60	Barn	70	East
62	House	209	North
63	House	191	North

Table 4-2
Historic Structures Within [illegible] 00 Ft [illegible] Alternative 2
[illegible] Moore [illegible]

Map Number	Structure	Approximate Distance from Centerline (ft)	Direction
35	House	147	East
36	House	286	East
52	House	147	East
53	House	230	East
54	Barn	39	East
60	Barn	70	East

Table 4-3

[illegible] 00 Ft [illegible]

[illegible] [illegible] [illegible]

Map Number	Structure	Approximate Distance from Centerline (ft)	Direction
23	Mobile Home	234	East
25	House	243	West
26	House [illegible]	218	East
31	House	99	West
32	[illegible]	244	East
40	Mobile Home	190	East
44	[illegible] [illegible]	28	North
60	Barn	248	North
64	House	269	East

Table 4-4

[illegible] 00 Ft [illegible]

[illegible] [illegible] [illegible]

Map Number	Structure	Approximate Distance from Centerline (ft)	Direction
2	[illegible]	89	East
3	House	157	East
9	[illegible]	178	East
30	[illegible]	290	East
41	[illegible]	172	East
43	[illegible]	215	South
44	[illegible]	28	North
58	[illegible]	170	East
60	Barn	70	East

Table 4-5
Historic Structures Within 300 Ft of Alternative 5
[illegible] [illegible] [illegible]

Map Number	Structure	Approximate Distance from Centerline (ft)	Direction
2	House [illegible] Barn	89	East
3	H[illegible]Barn	157	East
9	H[illegible] Barn	178	East
35	House	147	East
36	House	286	East
41	[illegible]	172	East
52	House	147	East
53	House	230	East
54	Barn	39	East
58	H[illegible]	170	East
60	Barn	248	North

Table 4-6
Historic Structures Within 300 Ft of Alternative [illegible]
[illegible] [illegible] [illegible]

Map Number	Structure	Approximate Distance from Centerline (ft)	Direction
35	House	147	East
36	House	286	East
52	House	147	East
53	House	230	East
54	Barn	39	East
58	H[illegible]	170	East
60	Barn	70	East

Table 4-7

H[illegible] 300 Ft [illegible]

H[illegible] Mo[illegible] S[illegible]

Map Number	Structure	Approximate Distance from Centerline (ft)	Direction
23	Mobile Home	234	East
25	House	243	West
26	House & Shop	218	East
31	House	99	West
32	A[illegible] House	244	East
40	Mobile Home	190	East
44	A[illegible]	28	North
60	Barn	248	North
64	House	269	East

Table 4-8

H[illegible] 300 Ft [illegible]

H[illegible] Mo[illegible] S[illegible]

Map Number	Structure	Approximate Distance from Centerline (ft)	Direction
26	House & Shop	218	East
43	U[illegible]	215	South
44	A[illegible]	28	South
58	H[illegible]	170	East
60	Barn	248	North

4.7 CULTURAL RESOURCES IMPACTS

Any construction activity has the potential for adversely impacting cultural resource sites. Section 106 of the National Historic Preservation Act of 1966, as amended, provides useful standards for considering the severity of possible direct and indirect impacts. According to the Secretary of the Interior's Guidelines for protection of historical and archeological resources (36 CFR 800), adverse impacts may occur directly or indirectly when a project causes changes in archeological, architectural or cultural qualities that contribute to a resource's historical or archeological significance.

Adverse impact may occur under conditions that include, but are not limited to:

1) destruction or alteration of all or part of a property;
2) isolation from or alteration of the property's surrounding environment (setting); or

3) introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting.

4.7.1 Direct Impacts

Direct impacts to recorded or unrecorded cultural resources sites may occur during the construction phase of any proposed project. Typically, direct impacts are caused during the construction phase of the project or through increased vehicular and pedestrian traffic during the construction phase. The increase in vehicular traffic may damage surficial or shallowly buried sites, while the increase in pedestrian traffic may result in vandalism of some sites. Additionally, the integrity of the character of any unrecorded, significant historic structures could also be visually impacted by the construction of this proposed transmission line.

4.7.2 Indirect Impacts

Indirect impacts include those caused by the undertaking that occur later in time or are further removed in distance but are reasonably foreseeable. These indirect impacts may include alteration in the pattern of land use, changes in population density, accelerated growth rates, or increased pedestrian or vehicular traffic. All of which may have an adverse impact on properties of historical, architectural, archeological or cultural significance. Historical sites and landscapes might be adversely impacted by the visibility of the transmission towers and lines.

4.7.3 Summary of Cultural Resources Impacts

Because of the significant amount of areas with a high probability to contain cultural resources sites in the project area, the proposed transmission line construction does have the potential to impact previously unrecorded archeological and historical sites. One method utilized by archeologists to assess an area for the potential occurrence of cultural resources is to identify high probability areas (HPAs). A HPA is an area that is considered to have a potential for containing previously unrecorded archeological sites. The identification of HPA is usually done by examining USGS 7.5-minute topographic maps and sometimes aerial photography. When identifying HPAs, topography and the availability of raw material, water, and subsistence resources are all taken into consideration. Also examined are the geological processes in the immediate project area. These may be considered important because geologic events may protect the integrity of an archeological site by burying it within deep sediments, or alternately, destroying it by erosional processes. Locations that are usually identified as HPAs for the occurrence of prehistoric sites include water crossings, stream confluences, drainages, alluvial terraces, wide floodplains, upland knolls, and areas where lithic or other subsistence resources could be found. Historic sites would be expected adjacent to historic roadways and in areas with structural remains.

The designation of HPA and the evaluation of the proposed links for their potential to contain previously unrecorded archeological sites are usually based solely on topographic maps and aerial photography. PBS&J archeologists did not visit all of the routes within the study area therefore some of the designated

HPAs (as well as direct and indirect impacts) may change when field archeologists conduct a visual reconnaissance or survey. In addition, the plotting accuracy for the previously recorded archeological sites is not necessarily precise. Most of these sites were plotted by field archeologists based on topographic features and manual measurements, which were then submitted to TARL for inclusion in their maps.

During November and December 2009, at the request of the client, PBS&J archeologists conducted a cultural resources survey of approximately 57 miles along the right of way of Alternative Route 3 (Nash and Sherman, 2010). This survey resulted in the identification of two newly recorded sites, 41HF129 and 41MO264. Both of these sites are small, sparse prehistoric lithic scatters defined primarily based on surface expression. Site 41HF129 is a small surface lithic scatter crossed by Link Q and site 41MO264 is a shallow lithic scatter crossed by Link U and located within 1,000 ft of Link S which is utilized for Alternative Routes 3, 4, 7, and 8 and Link T, which is used for Alternative Route 4.

The portions of these sites that are located within the ROW were not considered to be eligible for listing on the NRHP or as a SAL by the Principle Investigator. An Interim report was submitted to the THC for their review and they have concurred with PBS&J's recommendation and determined that the portions of the sites within the ROW are not eligible for NRHP listing or SAL designation. No further archeological work is necessary and these sites are no longer a constraint.

The NRHP eligible OTHM identified during the file review is located within approximately 645 ft of Link P. The OTHM marks the location of a trading post founded in 1874 on the Jones & Plummer Trail on the way to Dodge City, Kansas. This historical marker is a gray granite 1936 Centennial Marker and therefore, considered to be NRHP-eligible.

Previously, three primary alternative routes were evaluated based on the number of previously recorded sites crossed or within 1,000 ft of the routes, as well as the amount of HPA delineated along each of the routes. Currently, eight alternative routes are being evaluated, including the previously archeologically surveyed Alternative Route 3. Alternative Route 1 (21.6 mi of HPA) does not cross and is not within 1,000 ft of any previously recorded archeological sites. Alternative Route 2 has 20.42 mi of HPA and is within 1,000 ft of both site 41SH1 and the Site of Trading Post OTHM. Alternative Route 3 crosses 2 sites and contains approximately 28.18 miles of HPA. Alternative Route 4 (19.23 mi of HPA) is within 1,000 ft of one previously recorded archeological site (41MO264). Alternative Routes 5 and 6 (13.01 mi and 20.36 mi of HPA respectively) are within 1,000 ft of the Site of Trading Post OTHM. Finally, Alternative Route 7 with 28.68 miles of HPA crosses sites 41MO264 and 41HF129 and Alternative Route 8 crosses 1 previously recorded site (41MO264) and has 25.84 mi of HPA.

All eight routes were evaluated to determine the preferred route from a cultural resources perspective. Because sites 41HF129 and 41MO264 have been determined not eligible for NRHP listing or SAL designation by the THC, they are not considered a constraint when ranking the routes.

While Alternative Route 3 does not have the least amount of HPA with 28.18 miles, all but 5 miles have already been surveyed. This route does cross two previously recorded archeological sites (41MO264 and 41HF129) but, impacts to this route and its sites, excluding the portion where entry was not granted, have been mitigated by the archeological survey. Therefore, Alternative Route 3 is considered the preferred route from a cultural resources perspective. The primary criterion used for ranking the remainder of the routes was based on HPA and secondly, proximity to 41SH1. The remainder of the alternative routes are ranked as follows from least to greatest potential impact: Alternative Route 5, Alternative Route 4, Alternative Route 6, Alternative Route 1, Alternative Route 8, Alternative Route 7, and Alternative Route 2.

4.7.4 Mitigation

The preferred form of mitigation for cultural resources is avoidance. An alternative form of mitigation of direct impacts can be developed for archeological and historical sites with the implementation of a program of detailed data retrieval. Additionally, relocation may be possible for some historic structures. Indirect impacts on historical properties and landscapes can be lessened through careful design considerations and landscaping.

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5.0 PUBLIC INVOLVEMENT ACTIVITIES

5.1 CORRESPONDENCE WITH AGENCIES/OFFICIALS

PBS&J and SPS contacted the following local, state, and federal agencies and officials by letter in April 2008 to solicit comments, concerns, and information regarding potential environmental impacts, permits, or approvals for the construction of the proposed 230-kV transmission line in Hansford, Hutchinson, Sherman, and Moore Counties, Texas. A map of the study area was included with each letter. PBS&J and SPS contacted the same agencies and officials in May 2010 to solicit additional comments, concerns and information. A sample copy of each of the letters and responses received as of the publication of this report are included in Appendix A.

- Bureau of Land Management, Amarillo Field Office
- FEMA
- Gruver Independent School District (ISD)
- City of Gruver City Commissioners
- City of Gruver Director of Public Works
- City of Gruver Mayor
- City of Gruver City Manager
- City of Gruver Community Development Corporation President
- City of Gruver Chamber of Commerce
- Hansford County Commissioner Precinct 1
- Hansford County Commissioner Precinct 2
- Hansford County Commissioner Precinct 3
- Hansford County Commissioner Precinct 4
- County Historical Commission Hansford County
- County Farm Bureau Hansford County
- Stratford ISD
- City of Stratford Mayor
- City of Stratford City Manager
- City of Stratford City Engineer
- City of Stratford Director of Parks and Recreation
- Stratford Chamber of Commerce
- Texhoma ISD
- City of Texhoma Mayor

- City of Texhoma Water Superintendent
- Texhoma Public Works Authority
- Sherman County Judge
- Sherman County Commissioner Precinct 1
- Sherman County Commissioner Precinct 2
- Sherman County Commissioner Precinct 3
- Sherman County Commissioner Precinct 4
- Sherman County Development Committee
- Cluck Ranch Airport
- County Historical Commission Sherman County
- County Farm Bureau Sherman County
- Hutchinson County Judge
- Hutchinson County Commissioner Precinct 1
- Hutchinson County Commissioner Precinct 2
- Hutchinson County Commissioner Precinct 3
- Hutchinson County Commissioner Precinct 4
- County Historical Commission Hutchinson County
- County Farm Bureau Hutchinson County
- Sunray ISD
- City of Sunray Mayor
- City of Sunray City Manager
- Moore County Judge
- Moore County Commissioner Precinct 1
- Moore County Commissioner Precinct 2
- Moore County Commissioner Precinct 3
- Moore County Commissioner Precinct 4
- Moore County Road and Bridge Department Superintendent
- Moore County Soil and Water Conservation District
- Dumas/Moore County Chamber of Commerce President
- County Historical Commission Moore County
- County Farm Bureau Moore County
- Natural Resources Conservation Service (NRCS)

- Texas Airport Development Office (FAA)
- Texas General Land Office
- Texas Historical Commission (THC)
- Texas Parks and Wildlife Department (TPWD)
- Texas Water Development Board (TWDB)
- Texas Department of Transportation (TxDOT), Amarillo District
- TxDOT, Aviation Division
- TxDOT, Environmental Affairs Division
- U.S. Fish and Wildlife Service (FWS) - Amarillo
- U.S. Army Corps of Engineers (USACE), Tulsa District

5.2 PUBLIC MEETINGS

SPS and PBS&J held public open-house meetings in the study area on June 26, 2008, April 7, 2009, and April 21, 2009. The intent of the meetings was to solicit comments from citizens, landowners, and public officials concerning the proposed project. The meetings had the following objectives:

- Promote a better understanding of the proposed project including the purpose, need, and potential benefits and impacts,
- Inform and educate the public with regard to SPS's routing procedures, schedule, and decision process,
- Ensure that the decision-making process accurately identifies and considers the values and concerns of the public and community leaders.

Public involvement contributed both to the evaluation of issues and concerns by SPS and PBS&J, and to the selection of a preferred route for the project. Letters were sent inviting potentially affected landowners to the meeting. The letters stated the location, time, and purpose of the meetings. Sample copies of the letters and questionnaire are included in Appendix B.

Rather than a formal presentation in speaker-audience format, SPS and PBS&J staff utilized meeting space by setting up several information stations. Each information station was devoted to a particular aspect of the routing study and was staffed by SPS and/or PBS&J staff. Each station had maps, illustrations, photographs, and/or text explaining each particular topic. Interested citizens and property owners were encouraged to visit each station in order, so that the entire process could be explained in the general sequence of project development. The information station format is advantageous because it allows attendees to process information in a more relaxed manner and allows them to focus on their particular area of interest and ask specific questions. More importantly, the one-on-one discussions with SPS/PBS&J staff encouraged more interaction from those citizens who might be hesitant to participate in a speaker-audience format.

At the first station, PBS&J staff signed visitors in and handed out a questionnaire. The questionnaire solicited comments on citizen concerns as well as an evaluation of the information presented at the open house. Copies of the questionnaire are included in Appendix B. Completed questionnaires were received either at the meeting or later.

Originally designed as a 115 kV transmission line, the initial public meeting was held on June 26, 2008. Later, the project was changed to a 230 kV transmission line and another public meeting was held on April 7, 2009. A total of 33 people signed in as attending the public open-house meeting in Gruver, Texas, on June 26, 2008, a total of 13 people signed in as attending the April 7, 2009 meeting, while a total of 25 people signed in as attending the April 21, 2009 meeting.

Of those completing questionnaires, all of the respondents, except one, agreed the meeting and information provided was helpful to their understanding of the project.

The most important considerations for respondents who completed questionnaires were maintaining reliable electric service, minimizing the number of residences near the line, and minimizing the length of the route through cultivated fields. Most respondents preferred the proposed transmission line to be along roads/railroads, along section lines, and along fence lines away from roads. Placement of the proposed line along ½ section lines was considered unacceptable by 50% of the questionnaire respondents.

The questionnaires also provided space for respondents to include any general comments or remarks. The number of written comments was minimal. The written comments, remarks, and concerns documented by the meeting attendees in the questionnaire focused on how the project could affect the ability to include the transmission line tie-ons, the proximity to Oslo Lutheran Church, and the proximity of the proposed lines to residences and agriculture fields.