or in the Glass Mountains (TPWD, 2018b). Due to the relatively low elevation of the study area, it is unlikely for Wright's water-willow to be present.

Although not included on TPWD state county lists, the NDD database provides records for four other species, three of which are associated with montane or higher elevation habitats in geographically specific regions outside of the study area. None of these species are expected to occur within the study area. The other record includes the neglected sunflower (*Helianthus neglectus*) in Reeves and Ward counties, near the study area. This species inhabits sandy soils on rolling hills and is often associated with mesquite-sage woodlands (TPWD, 2018c). Four of five records were along IH 20 and SH 18, near Monahans, Texas, east of the study area. The other record in the NDD for the neglected sunflower was in Reeves County at the junction of US 285 and SH 302, north of the study area (TPWD, 2018b). This species is likely to occur wherever suitable habitat exists.

3.5.2 Fish and Wildlife

3.5.2.1 Terrestrial Wildlife

A wide variety of vertebrate species including amphibians, reptiles, mammals, and birds occur throughout the study area. These animals are addressed below in two groups: commonly occurring (i.e., "common") species; and species that are considered threatened, endangered, or rare by TPWD or USFWS. The information about common wildlife species presented in **Tables 3-4** through **3-11** is generally based on reference sources that provide species distribution information on a county-by-county basis. It was assumed that species known to occur within Pecos, Reeves, and/or Ward counties may be expected to occur within the study area, where suitable habitat is present.

Habitat types for the wildlife discussed below are grouped into seven general categories: woodland; desert; shrubland; open; water; cultivated; and urban. Woodland habitat is home to species that live on or in the ground within forested areas or are arboreal in nature; woodland areas include riparian forest areas found in stream floodplains and can overlap water habitats to some extent. Deserts are in arid regions, and may contain a mix of grassland, shrubland, or open habitat. Shrubland habitat is dominated by woody vegetation but is generally low-growing and lacks taller trees. Open habitat includes

grasslands or arid/semi-arid rocky areas. Cultivated areas consist of row crops, orchards, or grain fields; hay meadows would be considered grassland habitat. Water habitat is for all aquatic species, as well as those which live exclusively near water (e.g., frogs or wading birds). Urban habitats are favored by those animals, which thrive in man-made environments and succeed in disturbed areas.

Amphibians

According to Conant and Collins (1998) and the Center for North American Herpetology (CNAH, 2018), one caudate species (i.e., salamanders and newts) and 16 anuran species (i.e., frogs and toads) may be found in the study area (**Table 3-4**). Salamanders and newts are restricted to aquatic or moist habitats, but some frogs/toads inhabit more arid environments. All species require water during reproduction, either during the act of mating or for rearing young. Amphibians are ectothermic (i.e., "cold blooded," lacking the ability to internally regulate body temperature) and are particularly vulnerable to pollution, because they respire through their skin.

TABLE 3-4. AMPHIBIAN SPECIES WITHIN THE STUDY AREA.

Common Name	Scientific Name	Habitat Preference(s)
Order: Anura (frogs and toads)		
Barking frog	*Craugastor augusti*	Desert
Blanchard's cricket frog	*Acris blanchardi blanchardi*	Water
Canyon treefrog	*Hyla arenicolor*	Water – Woodland
Cliff chirping frog	*Eleutherodactylus marnockii*	Open
Couch's spadefoot toad	*Scaphiopus couchii*	Open
Great Plains narrowmouth toad	*Gastrophryne olivacea*	Open – Water
Great Plains toad	*Anaxyrus cognatus*	Open – Cultivated
Northern cricket frog	*Acris crepitans*	Water
Mexican spadefoot toad	*Spea multiplicata*	Water – Open
Plains spadefoot toad	*Spea bombifrons*	Open
Red-spotted toad	*Anaxyrus punctatus*	Open
Rio Grande leopard frog	*Lithobates berlandieri*	Water
Spotted chirping frog	*Eleutherodactylus guttilatus*	Water – Open
Texas toad	*Anaxyrus speciosus*	Open – Cultivated
Western green toad	*Anaxyrus debilis insidior*	Open – Desert
Woodhouse's toad	*Anaxyrus woodhousii*	Open– Desert – Water
Order: Caudata (salamanders and newts)		
Barred tiger salamander	*Ambystoma mavortium*	Water
Sources: Conant and Collins, 1998; CNAH, 2018; Dixon, 2013		

Reptiles

Reptile species native to west Texas include turtles, snakes, and lizards. Reptiles have thick, scaly skin to protect their bodies. Most lay soft, leathery eggs, although some bear live young. Reptiles, like amphibians, are ectothermic. **Table 3-5** presents the reptile species known to occur within one or more of the counties in the study area.

TABLE 3-5. REPTILE SPECIES WITHIN THE STUDY AREA.

Common Name	Scientific Name	Habitat Preference(s)
Order: Squamata (snakes and lizards)		
Baird's ratsnake	*Pantherophis bairdi*	Open – Woodland – Desert
Big Bend spotted whiptail	*Aspidoscelis scalaris septemvittata*	Open – Desert
Big Bend tree lizard	*Urosaurus ornatus schmidti*	Woodland – Open
Black-tailed rattlesnake	*Crotalus molossus*	Open
Blotched watersnake	*Nerodia erythrogaster transversa*	Water
Bullsnake	*Pituophis catenifer sayi*	Open – Desert
Central Plains milk snake	*Lampropeltis triangulum gentilis*	Open – Woodland
Checkered garter snake	*Thamnophis marcianus*	Open – Water
Chihuahuan greater earless lizard	*Cophosaurus texanus scitulus*	Open – Desert
Chihuahuan hook-nosed snake	*Gyalopion canum*	Desert
Chihuahuan night snake	*Hypsiglena jani*	Open
Chihuahuan spotted whiptail	*Aspidoscelis exsanguis*	Desert – Open – Woodland
Common checkered whiptail	*Aspidoscelis tesselata*	Desert – Open – Woodland
Common side-blotched lizard	*Uta stansburiana*	Open
Common spotted whiptail	*Aspidoscelis gularis*	Open – Desert
Crevice spiny lizard	*Sceloporus poinsettii*	Open – Woodland – Water
Desert kingsnake	*Lampropeltis getula splendida*	Water – Desert – Open
Desert massasauga	*Sistrurus catenatus edwardsii*	Desert
Desert spiny lizard	*Sceloporus magister*	Open – Desert
Diamond-backed watersnake	*Nerodia rhombifer*	Water
Dunes sagebrush lizard	*Sceloporus arenicolus*	Shrubland
Eastern collared lizard	*Crotaphytus collaris collaris*	Open
Eastern copperhead	*Agkistrodon contortrix*	Desert – Open
Four-lined skink	*Plestiodon tetragrammus*	Woodland – Open
Gray-banded kingsnake	*Lampropeltis alterna*	Desert
Great Plains lesser earless lizard	*Holbrookia maculata maculata*	Open
Great Plains ratsnake	*Elaphe emoryi emoryi*	Open
Great Plains skink	*Plestiodon obsoletus*	Open – Water
Kansas glossy snake	*Arizona elegans elegans*	Open
Little brown skink	*Scincella lateralis*	Woodland – Urban
Little striped whiptail	*Aspidoscelis inornata*	Desert – Open
Long-nosed leopard lizard	*Gambelia wislizenii*	Open
Long-nosed snake	*Rhinocheilus lecontei*	Open
Many-linked skink	*Plestiodon multivirgatus*	Desert – Woodland – Open
Marbled whiptail	*Aspidoscelis marmorata*	Desert – Open
Mediterranean house gecko	*Hemidactylus turcicus*	Urban
Mexican hog-nosed snake	*Heterodon kennerlyi*	Open
Mojave rattlesnake	*Crotalus scutulatus*	Open – Desert
Mountain patch-nosed snake	*Salvadora grahamiae grahamiae*	Desert
New Mexico threadsnake	*Leptotyphlops dissectus*	Desert – Open
Plains black-headed snake	*Tantilla nigriceps*	Open – Open
Prairie lizard	*Sceloporus undulatus*	Open – Shrubland
Prairie rattlesnake	*Crotalus viridis*	Open
Regal ringneck snake	*Diadophis punctatus regalis*	Water – Woodland
Rock rattlesnake	*Crotalus lepidus*	Open
Rough greensnake	*Opheodrys aestivus*	Shrubland – Water

TABLE 3-5. REPTILE SPECIES WITHIN THE STUDY AREA.

Common Name	Scientific Name	Habitat Preference(s)
Round-tailed horned lizard	*Phrynosoma modestum*	Desert – Open
Smith's black-headed snake	*Tantilla hobartsmithi*	Woodland – Open – Shrubland
Southwestern fence lizard	*Sceloporus cowlesi*	Woodland – Open
Spot-tailed earless lizard	*Holbrookia lacerata*	Desert
Striped whipsnake	*Masticophis taeniatus*	Shrubland – Open – Woodland
Texas banded gecko	*Coleonyx brevis*	Open
Texas coral snake	*Micrurus tener*	Open
Texas horned lizard	*Phrynosoma cornutum*	Open
Trans-Pecos ratsnake	*Bogertophis subocularis*	Desert
Twin-spotted spiny lizard	*Sceloporus bimaculosus*	Desert – Shrubland
Variable groundsnake	*Sonora semiannulata semiannulata*	Desert
Western black-necked gartersnake	*Thamnophis cyrtopsis cyrtopsis*	Water – Desert – Woodland
Western coachwhip	*Masticophis flagellum testaceus*	Open
Western diamondback rattlesnake	*Crotalus atrox*	Open
Western ribbonsnake	*Thamnophis proximus diabolicus*	Water
Western threadsnake	*Rena humilis*	Open – Desert
Order: Testudines (turtles)		
Eastern snapping turtle	*Chelydra serpentina*	Water
Ornate box turtle	*Terrapene ornata ornata*	Open
Pond slider	*Trachemys scripta*	Water
Rio Grande cooter	*Pseudemys gorzugi*	Water
Texas spiny softshell	*Apalone spinifera emoryi*	Water
Yellow mud turtle	*Kinosternon flavescens*	Water
Sources Conant and Collins, 1998; CNAH, 2018; Dixon, 2013.		

Birds

Birds differ from other animal groups in that feathers cover part or all of their bodies, and they lay hard, calcium-rich eggs. The four tables below present bird species, which could occur in the study area at various times throughout the year. They are divided into groups based on residency: permanent residents (**Table 3-6**); breeding (i.e., summer) residents (**Table 3-7**); winter residents (**Table 3-8**); and those which migrate through the area between their breeding and winter grounds (**Table 3-9**).

TABLE 3-6. BIRD SPECIES WHICH MAY PERMANENTLY RESIDE WITHIN THE STUDY AREA.

Common Name	Scientific Name	Order	Habitat Preference(s)
Golden eagle	*Aquila chrysaetos*	Accipitriformes	Open
Harris's hawk	*Parabuteo unicinctus*	Accipitriformes	Shrubland
Killdeer	*Charadrius vociferus*	Charadriiformes	Open
Eurasian-collared dove	*Streptopelia decaocto*	Columbiformes	Urban
Inca dove	*Columbina inca*	Columbiformes	Urban
Mourning dove	*Zenaida macroura*	Columbiformes	Woodland – Open – Urban
Rock dove	*Columba livia*	Columbiformes	Open – Urban
White-winged dove	*Zenaida asiatica*	Columbiformes	Woodland – Open
Greater roadrunner	*Geococcyx californianus*	Cuculiformes	Woodland – Open
American kestrel	*Falco sparverius*	Falconiformes	Open
Cooper's hawk	*Accipiter cooperii*	Falconiformes	Woodland

TABLE 3-6. BIRD SPECIES WHICH MAY PERMANENTLY RESIDE WITHIN THE STUDY AREA.

Common Name	Scientific Name	Order	Habitat Preference(s)
Prairie falcon	*Falco mexicanus*	Falconiformes	Open
Red-tailed hawk	*Buteo jamaicensis*	Falconiformes	Woodland – Open
Scaled quail	*Callipepla squamata*	Galliformes	Open
Wild turkey	*Meleagris gallopavo*	Galliformes	Open – Woodland
American coot	*Fulica americana*	Gruiformes	Water
Bewick's wren	*Thryomanes bewickii*	Passeriformes	Woodland
Black phoebe	*Sayornis nigricans*	Passeriformes	Woodland
Black-tailed gnatcatcher	*Polioptila melanura*	Passeriformes	Shrubland
Black-throated sparrow	*Amphispiza bilineata*	Passeriformes	Shrubland
Brown-headed cowbird	*Molothrus ater*	Passeriformes	Woodland – Open
Cactus wren	*Campylorhynchus brunneicapillus*	Passeriformes	Desert – Urban
Canyon towhee	*Melozone fusca*	Passeriformes	Shrubland
Canyon wren	*Catherpes mexicanus*	Passeriformes	Desert
Cassin's sparrow	*Peucaea cassinii*	Passeriformes	Open
Chihuahuan raven	*Corvus cryptoleucus*	Passeriformes	Shrubland
Common raven	*Corvus corax*	Passeriformes	Woodland
Crissal thrasher	*Toxostoma crissale*	Passeriformes	Shrubland
Curve-billed thrasher	*Toxostoma curvirostre*	Passeriformes	Shrubland
Eastern meadowlark	*Sturnella magna*	Passeriformes	Open
European starling	*Sturnus vulgaris*	Passeriformes	Woodland – Urban
Great-tailed grackle	*Quiscalus mexicanus*	Passeriformes	Open – Urban
Horned lark	*Eremophila alpestris*	Passeriformes	Open
House finch	*Haemorhous mexicanus*	Passeriformes	Woodland – Open – Urban
House sparrow	*Passer domesticus*	Passeriformes	Urban
Lark sparrow	*Chondestes grammacus*	Passeriformes	Open
Lesser goldfinch	*Spinus psaltria*	Passeriformes	Open – Woodland
Loggerhead shrike	*Lanius ludovicianus*	Passeriformes	Open
Northern cardinal	*Cardinalis cardinalis*	Passeriformes	Woodland
Northern mockingbird	*Mimus polyglottos*	Passeriformes	Woodland – Open
Pyrrhouloxia	*Cardinalis sinuatus*	Passeriformes	Shrubland
Red-winged blackbird	*Agelaius phoeniceus*	Passeriformes	Open – Water
Rock wren	*Salpinctes obsoletus*	Passeriformes	Rocky
Say's phoebe	*Sayornis saya*	Passeriformes	Open
Verdin	*Auriparus flaviceps*	Passeriformes	Shrubland
Western meadowlark	*Sturnella neglecta*	Passeriformes	Open
Woodhouse's scrub-jay	*Aphelocoma woodhouseii*	Passeriformes	Shrubland
Great blue heron	*Ardea herodias*	Pelecaniformes	Water
Acorn woodpecker	*Melanerpes formicivorus*	Piciformes	Woodland
Ladder-backed woodpecker	*Picoides scalaris*	Piciformes	Desert
Red-napped sapsucker	*Sphyrapicus nuchalis*	Piciformes	Woodland
Rufous-crowned sparrow	*Aimophila ruficeps*	Passeriformes	Shrubland – Open
Pied-billed grebe	*Podilymbus podiceps*	Podicipediformes	Water
Western grebe	*Aechmophorus occidentalis*	Podicipediformes	Water
Barn owl	*Tyto alba*	Strigiformes	Woodland – Urban
Burrowing owl	*Athene cunicularia*	Strigiformes	Open
Great horned owl	*Bubo virginianus*	Strigiformes	Woodland – Open – Urban
Western screech-owl	*Megascops kennicottii*	Strigiformes	Open – Woodland

Sources Cornell, 2017; eBird 2018; NatureServe Explorer, 2018; Sibley, 2003.

TABLE 3-7. BIRD SPECIES WHICH MAY BREED WITHIN THE STUDY AREA.

Common Name	Scientific Name	Order	Habitat Preference(s)
Swainson's hawk	*Buteo swainsoni*	Accipitriformes	Open
Zone-tailed hawk	*Buteo albonotatus*	Accipitriformes	Woodland – Shrubland
Black-chinned hummingbird	*Archilochus alexandri*	Caprimulgiformes	Open – Woodland
Broad-tailed hummingbird	*Selasphorus platycercus*	Caprimulgiformes	Open – Woodland
Common nighthawk	*Chordeiles minor*	Caprimulgiformes	Open
Common poorwill	*Phalaenoptilus nuttallii*	Caprimulgiformes	Shrubland
Lesser nighthawk	*Chordeiles acutipennis*	Caprimulgiformes	Open
Yellow-billed cuckoo	*Coccyzus americanus*	Cuculiformes	Woodland
Turkey vulture	*Cathartes aura*	Falconiformes	Woodland – Open – Urban
Ash-throated flycatcher	*Myiarchus cinerascens*	Passeriformes	Open – Woodland
Barn swallow	*Hirundo rustica*	Passeriformes	Open – Urban
Bell's vireo	*Vireo bellii*	Passeriformes	Woodland
Blue grosbeak	*Passerina caerulea*	Passeriformes	Woodland
Bullock's oriole	*Icterus bullockii*	Passeriformes	Open
Blue-gray gnatcatcher	*Polioptila caerulea*	Passeriformes	Woodland
Cassin's kingbird	*Tyrannus vociferans*	Passeriformes	Open – Shrubland
Cave swallow	*Petrochelidon fulva*	Passeriformes	Open
Cliff swallow	*Petrochelidon pyrrhonota*	Passeriformes	Open – Water
Cordilleran flycatcher	*Empidonax occidentalis*	Passeriformes	Woodland
Northern rough-winged swallow	*Stelgidopteryx serripennis*	Passeriformes	Open – Water
Orchard oriole	*Icterus spurius*	Passeriformes	Woodland
Painted bunting	*Passerina ciris*	Passeriformes	Shrubland
Scissor-tailed flycatcher	*Tyrannus forficatus*	Passeriformes	Open
Scott's oriole	*Icterus parisorum*	Passeriformes	Woodland – Open
Summer tanager	*Piranga rubra*	Passeriformes	Woodland
Varied bunting	*Passerina versicolor*	Passeriformes	Shrubland
Vermillion flycatcher	*Pyrocephalus rubinus*	Passeriformes	Desert – Water – Shrubland
Violet-green swallow	*Tachycineta thalassina*	Passeriformes	Woodland – Open
Western kingbird	*Tyrannus verticalis*	Passeriformes	Open
Yellow-breasted chat	*Icteria virens*	Passeriformes	Shrubland
Cattle egret	*Bubulcus ibis*	Pelecaniformes	Water
Elf owl	*Micrathene whitneyi*	Strigiformes	Open – Woodland
Sources: Cornell, 2017, eBird 2018; NatureServe Explorer, 2018; Sibley, 2003.			

TABLE 3-8. BIRD SPECIES WHICH MAY WINTER WITHIN THE STUDY AREA.

Common Name	Scientific Name	Order	Habitat Preference(s)
Bald eagle	*Haliaeetus leucocephalus*	Accipitriformes	Woodland
Ferruginous hawk	*Buteo regalis*	Accipitriformes	Open
Rough-legged hawk	*Buteo lagopus*	Accipitriformes	Open
Sharp-shinned hawk	*Accipiter striatus*	Accipitriformes	Woodland
American wigeon	*Anas americana*	Anseriformes	Water
Canada goose	*Branta canadensis*	Anseriformes	Water
Blue-winged teal	*Anas discors*	Anseriformes	Water
Bufflehead	*Bucephala albeola*	Anseriformes	Water
Canvasback	*Aythya valisineria*	Anseriformes	Water
Cinnamon teal	*Spatula cyanoptera*	Anseriformes	Water
Common goldeneye	*Bucephala clangula*	Anseriformes	Water
Common merganser	*Mergus merganser*	Anseriformes	Water
Gadwall	*Anas strepera*	Anseriformes	Water
Green-winged teal	*Anas crecca*	Anseriformes	Water

TABLE 3-8. BIRD SPECIES WHICH MAY WINTER WITHIN THE STUDY AREA.

Common Name	Scientific Name	Order	Habitat Preference(s)
Lesser scaup	*Aythya affinis*	Anseriformes	Water
Northern pintail	*Anas acuta*	Anseriformes	Water
Northern shoveler	*Anas clypeata*	Anseriformes	Water
Redhead	*Aythya americana*	Anseriformes	Water
Ring-necked duck	*Aythya collaris*	Anseriformes	Water
Ruddy duck	*Oxyura jamaicensis*	Anseriformes	Water
Calliope hummingbird	*Selasphorus calliope*	Caprimulgiformes	Open – Woodland
Greater yellowlegs	*Tringa melanoleuca*	Charadriiformes	Water
Least sandpiper	*Calidris minutilla*	Charadriiformes	Water
Long-billed dowitcher	*Limnodromus scolopaceus*	Charadriiformes	Water
Ring-billed gull	*Larus delawarensis*	Charadriiformes	Open – Water
Spotted sandpiper	*Actitis macularius*	Charadriiformes	Water
Wilson's snipe	*Gallinago delicata*	Charadriiformes	Water
Belted kingfisher	*Megaceryle alcyon*	Coraciiformes	Water
Merlin	*Falco columbarius*	Falconiformes	Open
Northern harrier	*Circus cyaneus*	Falconiformes	Open
Sora	*Porzana carolina*	Gruiformes	Water
Sandhill crane	*Antigone canadensis*	Gruiformes	Open – Water
American robin	*Turdus migratorius*	Passeriformes	Woodland
American goldfinch	*Carduelis tristis*	Passeriformes	Woodland – Open
American pipit	*Anthus rubescens*	Passeriformes	Open
Brewer's blackbird	*Euphagus cyanocephalus*	Passeriformes	Urban – Open
Brewer's sparrow	*Spizella breweri*	Passeriformes	Shrubland
Brown creeper	*Certhia americana*	Passeriformes	Woodland
Cedar waxwing	*Bombycilla cedrorum*	Passeriformes	Open – Woodland
Chestnut-collared longspur	*Calcarius ornatus*	Passeriformes	Open
Chipping sparrow	*Spizella passerina*	Passeriformes	Open – Woodland – Urban
Dark-eyed junco	*Junco hyemalis*	Passeriformes	Woodland – Shrubland
Eastern bluebird	*Sialia sialis*	Passeriformes	Woodland
Eastern phoebe	*Sayornis phoebe*	Passeriformes	Woodland – Urban
Field sparrow	*Spizella pusilla*	Passeriformes	Open
Fox sparrow	*Passerella iliaca*	Passeriformes	Woodland – Open
Golden-crowned kinglet	*Regulus satrapa*	Passeriformes	Woodland
Grasshopper sparrow	*Ammodramus savannarum*	Passeriformes	Open
Green-tailed towhee	*Pipilo chlorurus*	Passeriformes	Shrubland
Hermit thrush	*Catharus guttatus*	Passeriformes	Woodland
House wren	*Troglodytes aedon*	Passeriformes	Woodland
Lark bunting	*Calamospiza melanocorys*	Passeriformes	Open
Lincoln's sparrow	*Melospiza lincolnii*	Passeriformes	Woodland – Open
Marsh wren	*Cistothorus palustris*	Passeriformes	Water
McCown's longspur	*Rhynchophanes mccownii*	Passeriformes	Open
Mountain bluebird	*Sialia currucoides*	Passeriformes	Open – Woodland
Olive-sided flycatcher	*Contopus cooperi*	Passeriformes	Open -- Woodland
Pine siskin	*Spinus pinus*	Passeriformes	Woodland
Red-breasted nuthatch	*Sitta canadensis*	Passeriformes	Woodland
Ruby-crowned kinglet	*Regulus calendula*	Passeriformes	Woodland
Sage sparrow	*Artemisiospiza nevadensis*	Passeriformes	Shrubland
Sage thrasher	*Oreoscoptes montanus*	Passeriformes	Shrubland
Savannah sparrow	*Passerculus sandwichensis*	Passeriformes	Open
Song sparrow	*Melospiza melodia*	Passeriformes	Woodland
Sprague's pipit	*Anthus spragueii*	Passeriformes	Open
Spotted towhee	*Pipilo maculatus*	Passeriformes	Shrubland
Swamp sparrow	*Melospiza georgiana*	Passeriformes	Open – Water
Townsend's solitaire	*Myadestes townsendi*	Passeriformes	Open – Woodland
Vesper sparrow	*Pooecetes gramineus*	Passeriformes	Open

TABLE 3-8. BIRD SPECIES WHICH MAY WINTER WITHIN THE STUDY AREA.

Common Name	Scientific Name	Order	Habitat Preference(s)
Western bluebird	*Sialia mexicana*	Passeriformes	Woodland – Open – Urban
White-crowned sparrow	*Zonotrichia leucophrys*	Passeriformes	Woodland – Open
White-throated sparrow	*Zonotrichia albicollis*	Passeriformes	Woodland
Yellow-rumped warbler	*Dendroica coronata*	Passeriformes	Woodland
Northern flicker	*Colaptes auratus*	Piciformes	Woodland
Yellow-bellied sapsucker	*Sphyrapicus varius*	Piciformes	Woodland
American bittern	*Botaurus lentiginosus*	Pelecaniformes	Water
Black-crowned night-heron	*Nycticorax nycticorax*	Pelecaniformes	Water
Great egret	*Ardea alba*	Pelecaniformes	Water
Green heron	*Butorides virescens*	Pelecaniformes	Water
Eared grebe	*Podiceps nigricollis*	Podicipediformes	Water
Double-crested cormorant	*Phalacrocorax auritus*	Suliformes	Water
Long-eared owl	*Asio otus*	Strigiformes	Woodland
Short-eared owl	*Asio flammeus*	Strigiformes	Open
Sources: Cornell, 2017; eBird 2018, NatureServe Explorer, 2018; Sibley, 2003.			

TABLE 3-9. BIRD SPECIES WHICH MAY MIGRATE THROUGH THE STUDY AREA.

Common Name	Scientific Name	Order	Habitat Preference(s)
Osprey	*Pandion haliaetus*	Accipitriformes	Water
Snow goose	*Anser caerulescens*	Anseriformes	Water
Rufous hummingbird	*Selasphorus rufus*	Caprimulgiformes	Open – Woodland
American avocet	*Recurvirostra americana*	Charadriiformes	Water
American golden-plover	*Pluvialis dominica*	Charadriiformes	Open
Baird's sandpiper	*Calidris bairdii*	Charadriiformes	Water
Black-bellied plover	*Pluvialis squatarola*	Charadriiformes	Water
Black tern	*Chlidonias niger*	Charadriiformes	Water
Black-necked stilt	*Himantopus mexicanus*	Charadriiformes	Water
Bonaparte's Gull	*Chroicocephalus philadelphia*	Charadriiformes	Water
Forster's tern	*Sterna forsteri*	Charadriiformes	Water
Franklin's gull	*Leucophaeus pipixcan*	Charadriiformes	Water
Herring gull	*Larus argentatus*	Charadriiformes	Water
Lesser yellowlegs	*Tringa flavipes*	Charadriiformes	Water
Long-billed curlew	*Numenius americanus*	Charadriiformes	Open – Water
Marbled godwit	*Limosa fedoa*	Charadriiformes	Water
Pectoral sandpiper	*Calidris melanotos*	Charadriiformes	Water
Red-necked phalarope	*Phalaropus lobatus*	Charadriiformes	Water
Semipalmated plover	*Charadrius semipalmatus*	Charadriiformes	Open
Semipalmated sandpiper	*Calidris pusilla*	Charadriiformes	Water
Solitary sandpiper	*Tringa solitaria*	Charadriiformes	Water
Stilt sandpiper	*Calidris himantopus*	Charadriiformes	Water
Snowy plover	*Charadrius nivosus*	Charadriiformes	Water
Upland sandpiper	*Bartramia longicauda*	Charadriiformes	Open
Western sandpiper	*Calidris mauri*	Charadriiformes	Water
White-rumped sandpiper	*Calidris fuscicollis*	Charadriiformes	Water
Willet	*Tringa semipalmata*	Charadriiformes	Water
Wilson's phalarope	*Phalaropus tricolor*	Charadriiformes	Water
Peregrine falcon	*Falco peregrinus*	Falconiformes	Water
Virginia rail	*Rallus limicola*	Gruiformes	Water
American redstart	*Setophaga ruticilla*	Passeriformes	Woodland
Bank swallow	*Riparia riparia*	Passeriformes	Open – Water
Black-and-white warbler	*Mniotilta varia*	Passeriformes	Woodland
Black-headed grosbeak	*Pheucticus melanocephalus*	Passeriformes	Water

TABLE 3-9. BIRD SPECIES WHICH MAY MIGRATE THROUGH THE STUDY AREA.

Common Name	Scientific Name	Order	Habitat Preference(s)
Black-throated gray warbler	*Setophaga nigrescens*	Passeriformes	Woodland
Clay-colored sparrow	*Spizella pallida*	Passeriformes	Shrubland
Common yellowthroat	*Geothlypis trichas*	Passeriformes	Shrubland
Dusky flycatcher	*Empidonax oberholseri*	Passeriformes	Woodland
Dickcissel	*Spiza americana*	Passeriformes	Open
Eastern kingbird	*Tyrannus tyrannus*	Passeriformes	Open
Gray flycatcher	*Empidonax wrightii*	Passeriformes	Woodland
Hammond's flycatcher	*Empidonax hammondii*	Passeriformes	Woodland
Hooded Oriole	*Icterus cucullatus*	Passeriformes	Woodland – Shrubland
Indigo bunting	*Passerina cyanea*	Passeriformes	Woodland
Lazuli bunting	*Passerina amoena*	Passeriformes	Open
Least flycatcher	*Empidonax minimus*	Passeriformes	Woodland
MacGillivray's Warbler	*Geothlypis tolmiei*	Passeriformes	Woodland – Open
Nashville warbler	*Oreothlypis ruficapilla*	Passeriformes	Woodland
Northern waterthrush	*Parkesia noveboracensis*	Passeriformes	Woodland – Water
Orange-crowned warbler	*Oreothlypis celata*	Passeriformes	Woodland
Plumbeous vireo	*Vireo plumbeus*	Passeriformes	Woodland
Purple martin	*Progne subis*	Passeriformes	Water – Urban
Swainson's thrush	*Catharus ustulatus*	Passeriformes	Woodland
Tree swallow	*Tachycineta bicolor*	Passeriformes	Woodland
Townsend's warbler	*Setophaga townsendi*	Passeriformes	Woodland
Warbling vireo	*Vireo gilvus*	Passeriformes	Woodland
Western tanager	*Piranga ludoviciana*	Passeriformes	Woodland
Western wood-pewee	*Contopus sordidulus*	Passeriformes	Woodland
Willow flycatcher	*Empidonax traillii*	Passeriformes	Open
Wilson's warbler	*Cardellina pusilla*	Passeriformes	Woodland
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*	Passeriformes	Open
Yellow warbler	*Setophaga petechia*	Passeriformes	Woodland
American white pelican	*Pelecanus erythrorhynchos*	Pelecaniformes	Water
Snowy egret	*Egretta thula*	Pelecaniformes	Water
White-faced ibis	*Plegadis chihi*	Pelecaniformes	Water
Western grebe	*Aechmophorus occidentalis*	Podicipediformes	Water
Sources: Cornell, 2017, eBird 2018; NatureServe Explorer, 2018, and Sibley, 2003			

Mammals

According to Davis and Schmidly (1997), 181 species of mammals reside in Texas. Mammals are distinct from other groups in that their bodies are covered with hair, and they feed milk to their young. Nearly all mammals in Texas bear live young using a placenta (i.e., Eutherian or "placental" mammals). A notable exception is the opossum, which is a pouch-rearing mammal (i.e., marsupial). **Table 3-10** presents the mammals that are expected to occur within suitable habitat in the study area.

TABLE 3-10. MAMMAL SPECIES WITHIN THE STUDY AREA.

Common Name	Scientific Name	Habitat Preference(s)
Order: Artiodactyla (even-toed ungulates)		
Collared peccary	*Tayassu tajacu*	Shrubland – Desert
Mule deer	*Odocoileus hemionus*	Open – Desert
Pronghorn	*Antilocapra americana*	Open
White-tailed deer	*Odocoileus virginianus*	Woodland
Order: Carnivora (carnivores)		
American badger	*Taxidea taxus*	Open
Bobcat	*Lynx rufus*	Woodland
Common gray fox	*Urocyon cinereoargenteus*	Woodland
Common hog-nosed skunk	*Conepatus leuconotus*	Woodland – Shrubland – Open
Common raccoon	*Procyon lotor*	Woodland – Water
Coyote	*Canis latrans*	Open
Hooded skunk	*Mephitis macroura*	Water
Long-tailed weasel	*Mustela frenata*	Open
Mountain lion	*Felis concolor*	Shrubland – Desert
Red fox	*Vulpes vulpes*	Woodland – Open
Ringtail	*Bassariscus astutus*	Woodland – Open
Striped skunk	*Mephitis mephitis*	Woodland – Open
Swift (Kit) fox	*Vulpes velox*	Desert – Open – Cultivated
Western spotted skunk	*Spilogale gracilis*	Desert – Shrubland – Urban
Order: Chiroptera (bats)		
Big free-tailed bat	*Nyctinomops macrotis*	Desert – Grassland – Urban
Big brown bat	*Eptesicus fuscus*	Woodland – Urban
Brazilian free-tailed bat	*Tadarida brasiliensis*	Woodland – Urban
Cave myotis	*Myotis velifer*	Desert – Urban – Shrubland
Eastern red bat	*Lasiurus borealis*	Woodland
Hoary bat	*Lasiurus cinereus*	Woodland
Pallid bat	*Antrozous pallidus*	Open – Urban – Desert
Silver-haired bat	*Lasionycteris noctivagans*	Woodland – Urban
Townsend's big-eared bat	*Plecotus townsendii*	Desert – Open -- Urban
Western pipistrelle	*Pipistrellus hesperus*	Desert -- Open
Yuma myotis	*Myotis yumanensis*	Water
Order: Insectivora (insect-eating mammals)		
Desert shrew	*Notiosorex crawfordi*	Open – Shrubland
Order: Lagomorpha (hares, rabbits, and picas)		
Black-tailed jackrabbit	*Lepus californicus*	Open
Desert cottontail	*Sylvvilagus audubonii*	Grassland – Shrubland – Desert
Eastern cottontail	*Sylvilagus floridanus*	Open
Order: Didelphimorphia (opossums and allies)		
Virginia opossum	*Didelphis virginiana*	Woodland – Open – Urban
Order: Rodentia (rodents)		
Banner-tailed kangaroo rat	*Dipodomys spectabilis*	Open – Shrubland
Botta's pocket gopher	*Thomomys bottae*	Desert – Open
Black-tailed prairie dog	*Cynomys ludovicianus*	Open
Brush mouse	*Peromyscus boylii*	Water – Open – Woodland
Cactus mouse	*Peromyscus eremicus*	Desert
Common muskrat	*Ondatra zibethicus*	Water
Deer mouse	*Peromyscus maniculatus*	Woodland – Open
Desert pocket mouse	*Chaetodipus penicillatus*	Open – Desert
Fulvous harvest mouse	*Reithrodontomys fulvescens*	Open
Hispid cotton rat	*Sigmodon hispidus*	Open – Urban
Hispid pocket mouse	*Chaetodipus hispidus*	Open
House mouse	*Mus musculus*	Open – Urban
Jones' pocket gopher	*Geomys knoxjonesi*	Open
Mearn's grasshopper mouse	*Onychomys arenicola*	Desert
Merriam's kangaroo rat	*Dipodomys merriami*	Open – Desert

TABLE 3-10. MAMMAL SPECIES WITHIN THE STUDY AREA.

Common Name	Scientific Name	Habitat Preference(s)
Merriam's pocket mouse	*Perognathus merriami*	Open – Desert
Mexican ground squirrel	*Spermophilus mexicanus*	Shrubland – Open
Nelson's pocket mouse	*Chaetodipus nelsoni*	Desert – Open
Northern grasshopper mouse	*Onychomys leucogaster*	Open – Shrubland
Norway rat	*Rattus norvegicus*	Open – Urban
Ord's kangaroo rat	*Dipodomys ordii*	Open – Desert
Plains harvest mouse	*Reithrodontomys montanus*	Open
Plains pocket mouse	*Perognathus flavescens*	Open
Porcupine	*Erethizon dorsatum*	Woodland – Open – Shrubland
Rock pocket mouse	*Chaetodipus intermedius*	Open – Desert
Rock squirrel	*Spermophilus variegatus*	Woodland – Shrubland – Desert
Roof rat	*Rattus rattus*	Urban
Silky pocket mouse	*Perognathus flavus*	Open – Shrubland
Southern Plains woodrat	*Neotoma micropus*	Shrubland – Desert
Spotted ground squirrel	*Spermophilus spilosoma*	Woodland – Open – Desert
Texas antelope squirrel	*Ammospermophilus interpres*	Desert
Texas kangaroo rat	*Dipodomys elator*	Open – Shrubland
Texas mouse	*Peromyscus attwateri*	Open – Woodland
Western harvest mouse	*Reithrodontomys megalotis*	Open – Water
White-ankled mouse	*Peromyscus pectoralis*	Desert – Shrubland – Woodland
White-footed mouse	*Peromyscus leucopus*	Woodland
White-throated woodrat	*Neotoma albigula*	Shrubland – Desert
Yellow-faced pocket gopher	*Cratogeomys castanops*	Open – Shrubland – Desert
Order: Xenarthra (other placental mammals)		
Nine-banded armadillo	*Dasypus novemcinctus*	Open – Woodland
Source: Davis and Schmidly, 1997; NatureServe Explorer, 2018.		

3.5.2.2 Fish and Aquatic Wildlife

All streams in the study area are likely to experience wide variations in flow discharge during the course of a year. The smallest streams in the study area are shallow ephemeral streams with very limited floodplains that do not support substantial aquatic life, such as fish, crayfish, or mollusks. These streams flow only during and shortly after rainfall events and receive no groundwater inflow. Water flow in larger streams may be intermittent, receiving seasonal contribution from groundwater but leaving segments of the streambed dry for much of the year. Ponds do not experience the extreme variations in flow relative to streams, and ponds are nearly always exposed to full sunlight. As a result, the organisms which inhabit ponds are adapted to the different environments found in both streams and ponds. Ponds and smaller reservoirs are more likely to experience higher water temperatures and lower dissolved oxygen compared to streams and larger reservoirs. Algae and phytoplankton, which thrive on sunlight, fare better in slower moving systems such as ponds. Larger species, including many types of fish, fare better in streams, rivers, and large lakes. **Table 3-11** presents some of the common fish species expected within the study area, the majority of which would be found in the Pecos River and Toyah Creek.

TABLE 3-11. FISH SPECIES WITHIN THE STUDY AREA.

Common Name	Scientific Name	Common Name	Scientific Name
Blue catfish	*Ictalurus furcatus*	Mexican tetra	*Astyanax mexicanus*
Bluegill sunfish	*Lepomis macrochirus*	Manantial roundnose minnow	*Dionda argentosa*
Bullhead minnow	*Pimephales vigilax*	Pecos gambusia	*Gambusia nobilis*
Central stoneroller	*Campostoma anomalum*	Pecos pupfish	*Cyprinodon pecosensis*
Channel catfish	*Ictalurus punctatus*	Plains killifish	*Fundulus zebrinus*
Comanche Springs pupfish	*Cyprinodon elegans*	Proserpine shiner	*Cyprinella proserpina*
Common carp	*Cyprinus carpio*	Rainwater killifish	*Lucania parva*
Fathead minnow	*Pimephales promelas*	Red shiner	*Cyprinella lutrensis*
Gizzard shad	*Dorosoma cepedianum*	Redbreast sunfish	*Lepomis auritus*
Gray redhorse	*Moxostoma congestum*	Rio Grande cichlid	*Lepomis megalotis*
Green sunfish	*Lepomis cyanellus*	Rio Grande cutthroat trout	*Oncorhynchus clarkii virginalis*
Gulf killifish	*Fundulus grandis*	Roundnose minnow	*Dionda episcopa*
Headwater catfish	*Ictalurus lupus*	Sand shiner	*Notropis stramineus*
Inland silverside	*Menidia beryllina*	Sheepshead minnow	*Cyprinodon variegatus*
Ironcolor shiner	*Notropis chalybaeus*	Smallmouth buffalo	*Ictiobus bubalus*
Largemouth bass	*Micropterus salmoides*	Speckled chub	*Macrhybopsis aestivalis*
Largespring gambusia	*Gambusia geiseri*	Tamaulipas shiner	*Notropis braytoni*
Leon Springs pupfish	*Cyprinodon bovinus*	Western mosquitofish	*Gambusia affinis*
Longear sunfish	*Lepomis megalotis*	White bass	*Morone chrysops*
Longnose gar	*Lepisosteus osseus*		
Sources: Hendrickson and Cohen, 2015; NatureServe Explorer, 2018.			

Ephemeral creek channels rarely contain water to offer habitat to larger fish species. Headwater segments that feed into perennial and intermittent streams may provide habitat to mosquitofish, topminnows (*Fundulus* spp.), darters (*Etheostoma* spp.) and younger members of larger species, such as sunfish.

3.5.2.3 Commercially or Recreationally Important Fish and Wildlife Species

Wildlife Resources

Wildlife within the study area provides human benefits resulting from both consumptive (involving removal of wildlife) and non-consumptive uses. Bird watching is a popular non-consumptive use. Local Audubon Society chapter members play a valuable role in assisting local fish and wildlife agencies with field updates of rare or endangered species sightings (Audubon Texas, 2018). Diverse wildlife populations in the study area provide observing and photographing opportunities, which may be limited in the more remote portions of the study area.

According to the USFWS, more than one million people engage in recreational hunting within the state of Texas each year (USFWS, 2014). Hunting adds over two billion dollars to the state's economy each year through fees to hunt on public land, private leases, or for travel-related expenses. These numbers include hunters that are residents of Texas, as well as those that travel to the state to hunt. Within the study area, established hunting seasons exist for the species listed in **Table 3-12**.

TABLE 3-12. GAME SPECIES WITHIN THE STUDY AREA.

Common Name	Scientific Name
Dove	*Zenaida asiatica; Zenaida macroura*
Duck, coot, and teal	Numerous species
Javelina	*Tayassu tajacu*
Light and dark geese	Numerous species
Mule deer	*Odocoileus hemionus*
Pronghorn	*Antilocapra americana*
Quail	*Callipepla squamata*
Rails, gallinules, and moorhens	Numerous species
Sandhill crane	*Grus canadensis*
Turkey	*Meleagris gallopavo*
White-tailed deer	*Odocoileus virginianus*
Snipe and woodcock	*Gallinago delicata; Scolopax* spp.
Source: TPWD, 2018d	

Fisheries/Aquatic Resources

Recreational fishing opportunities in the study area are limited. The Pecos River is the main perennial water body within the study area. Numerous small ponds and streams are also found in the study area, but many are only temporarily or intermittently flooded. No commercial harvesting of aquatic species is known to occur within the study area (TPWD, 2018e). Game fishing species expected to be found in the study area are shown in **Table 3-13**.

TABLE 3-13. GAME FISHING SPECIES WITHIN THE STUDY AREA.

Common Name	Scientific Name	Habitat
Blue catfish	*Ictalurus furcatus*	Deep areas of main channels and backwaters of medium to large rivers.
Bluegill sunfish	*Lepomis macrochirus*	Shallow lakes and ponds and slow-flowing streams and rivers, often in association with vegetation, including submerged trees of shallow backwaters, or silty/gravel bottoms
Channel catfish	*Ictalurus punctatus*	Streams, rivers, lakes, eddies, ponds, and shallow waters
Largemouth bass	*Micropterus salmoides*	Moderately clear to turbid, quiet warm waters; streams, rivers, lakes, ponds; utilize vegetation/underwater structures.
Smallmouth buffalo	*Ictiobus ictiobus bubalus*	Most large streams, rivers, and reservoirs. Primarily bottom feeding.
White bass	*Morone chrysops*	Large streams, rivers, and lakes; adults found in open water.
Sources: TPWD, 2018e; and NatureServe Explorer, 2018		

3.5.2.4 Endangered and Threatened Fish and Wildlife Species

The USFWS has authority under the ESA to list and monitor the status of species whose populations are considered imperiled. USFWS regulations that implement the ESA are codified and regularly updated in 50 Code of Federal Regulations (CFR) Part 17. The federal process identifies potential candidates based upon the species' biological vulnerability. The vulnerability decision is based upon many factors affecting the species within its range and is linked to the best scientific data available to the USFWS at the time. Species listed as threatened or endangered by the USFWS are provided full protection under the ESA including a prohibition of indirect take, such as destruction of known critical habitat (i.e., areas formally designated by USFWS in the Federal Register).

Texas endangered species legislation in 1973 and subsequent amendments have established a state regulatory program for the management and protection of endangered species (i.e., species in danger of extinction) and threatened species (i.e., likely to become endangered within the foreseeable future) (Texas Legislature Online, 2018). Chapters 67 and 68 of the Texas Parks and Wildlife Code authorize the TPWD to formulate lists of threatened and endangered fish and wildlife species and to regulate the taking or possession of the species. Under this statutory authority, the TPWD regulates the taking, possession, transport, export, processing, selling or offering for sale, or shipping of threatened or endangered species of fish and wildlife.

Table 3-14 lists wildlife species that are considered endangered or threatened by the USFWS and/or TPWD, or are designated a SGCN by TPWD, and whose geographic range includes any portion of Pecos, Reeves, and Ward counties. It should be noted that inclusion in the table does not imply that a species is known to occur in the study area but only acknowledges the potential for occurrence. The estimate of likelihood of a species to occur within the study area is based on an analysis of habitat available and the known habitat preferences for each species. There is no USFWS-designated critical habitat within the study area for any of the federally-protected species in **Table 3-14**. A discussion of each species' habitat follows **Table 3-14**, grouped first by state or federal listed threatened or endangered species, and followed by the SGCN.

TABLE 3-14. ENDANGERED, THREATENED, OR RARE WILDLIFE POTENTIALLY IN THE STUDY AREA.

Common Name	Scientific Name	Listing Status[1]		Species Likely to Occur within Study Area?
		Federal	State	
BIRDS				
American peregrine falcon	*Falco peregrinus anatum*	DM	T	Yes [2]
Arctic peregrine falcon	*Falco peregrinus tundrius*	DM	SGCN	Yes [2]
Baird's sparrow	*Ammodramus bairdii*	--	SGCN	Yes [2]
Bald eagle	*Haliaeetus leucocephalus*	DM	T	Yes
Black-capped vireo	*Vireo atricapilla*	DM	E	No
Ferruginous hawk	*Buteo regalis*	--	SGCN	Yes
Interior least tern[3]	*Sterna antillarum athalassos*	LE	E	Yes [2]
Mexican spotted owl	*Strix occidentalis lucida*	LT	--	No
Montezuma quail	*Cyrtonyx montezumae*	--	SGCN	No
Mountain plover	*Charadrius montanus*	--	SGCN	Yes [2]
Northern aplomado falcon	*Falco femoralis septentrionalis*	LE	E	No
Peregrine falcon	*Falco peregrinus*	DM	T	Yes [2]
Piping plover[3]	*Charadrius melodus*	LT	SGCN	Yes [2]
Prairie falcon	*Falco mexicanus*	--	SGCN	Yes
Reddish egret	*Egretta rufescens*	--	T	Yes [2]
Red knot[3]	*Calidris canutus rufa*	LT	SGCN	Yes [2]
Snowy plover	*Charadrius alexandrinus*	--	SGCN	Yes [2]
Sprague's pipit	*Anthus spragueii*	--	SGCN	Yes [2]
Western burrowing owl	*Athene cunicularia hypugaea*	--	SGCN	Yes
Western snowy plover	*Charadrius alexandrinus nivosus*	--	SGCN	Yes [2]
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	LT	SGCN	Yes
Zone-tailed hawk	*Buteo albonotatus*	--	T	Yes
CRUSTACEANS				
Diminutive amphipod	*Gammarus hyalelloides*	LE	--	No
Pecos amphipod	*Gammarus pecos*	LE[4]	SGCN	No
FISHES				
Comanche Springs pupfish	*Cyprinodon elegans*	LE	E	No
Headwater catfish	*Ictalurus lupus*	--	SGCN	Yes
Leon Springs pupfish	*Cyprinodon bovinus*	LE	E	No
Pecos gambusia	*Gambusia nobilis*	LE	E	Yes
Pecos pupfish	*Cyprinodon pecosensis*	--	T	Yes
Proserpine shiner	*Cyprinella proserpina*	--	T	Yes
INSECTS				
A tiger beetle	*Cicindela hornii*	--	SGCN	Yes
Arroyo darner	*Aeshna dugesi*	--	SGCN	Yes
Balmorhea saddle-case caddisfly	*Protoptila balmorhea*	--	SGCN	No
Bleached skimmer	*Libellula composita*	--	SGCN	Yes
Poling's hairstreak	*Fixsenia polingi*	--	SGCN	No
MAMMALS				
Big free-tailed bat	*Nyctinomops macrotis*	--	SGCN	Yes
Black bear	*Ursus americanus*	--	T	No
Black-footed ferret	*Mustela nigripes*	LE	SGCN	No
Black-tailed prairie dog	*Cynomys ludovicianus*	--	SGCN	Yes
Cave myotis bat	*Myotis velifer*	--	SGCN	Yes
Davis Mountains cottontail	*Sylvilagus floridanus robustus*	--	SGCN	No
Gray wolf	*Canis lupus*	LE	E	No
Pale Townsend's big-eared bat	*Corynorhinus townsendii pallescens*	--	SGCN	Yes
Pecos River muskrat	*Ondatra zibethicus ripensis*	--	SGCN	Yes
Pocketed free-tailed bat	*Nyctinomops femorosaccus*	--	SGCN	Yes

TABLE 3-14. ENDANGERED, THREATENED, OR RARE WILDLIFE POTENTIALLY IN THE STUDY AREA.

Common Name	Scientific Name	Listing Status[1]		Species Likely to Occur within Study Area?
		Federal	State	
MOLLUSKS				
Brune's tryonia	*Tryonia brunei*	--	SGCN	No
Diamond tryonia	*Pseudotryonia adamantina*	LE	SGCN	No
Gonzales tryonia	*Tryonia circumstriata*	LE	SGCN	No
Pecos assiminea snail	*Assiminea pecos*	LE[4]	E	No
Phantom springsnail	*Pyrgulopsis texana*	LE[4]	SGCN	No
Phantom tryonia	*Tryonia cheatumi*	LE[4]	SGCN	No
Stockton Plateau threeband	*Humboldtiana texana*	--	SGCN	No
Texas hornshell	*Popenaias popeii*	C	T	Yes
REPTILES				
Dunes sagebrush lizard	*Sceloporus arenicolus*	--	SGCN	Yes
Spot-tailed earless lizard	*Holbrookia lacerata*	--	SGCN	Yes
Texas horned lizard	*Phrynosoma cornutum*	--	T	Yes
Trans-Pecos black-headed snake	*Tantilla cucullate*	--	T	Yes

Sources. Campbell, 2003; TPWD, 2018b; TPWD, 2018c; USFWS, 2018a; USFWS, 2018b.
Notes:
[1] **USFWS listing codes**: DM = Recovered, delisted, and being monitored, C = Candidate Species;
LE = Federally Listed Endangered Species (i.e , in danger of extinction); LT = Federally Listed Threatened Species (i.e., severely depleted population that may become endangered); blank = no federal status. **TPWD listing codes**
E = State Listed Endangered Species; T = State Listed Threatened Species;
SGCN = Species of Greatest Conservation Need (i.e , rare species with no regulatory listing status);
blank = no state status
[2] Assumed to be a transient species, potentially migrating through the study area, and using suitable habitat for stopovers.
[3] According to USFWS Information for Planning and Conservation database, the assessment of these species in the study area is only necessary for wind energy projects.
[4] The USFWS list supersedes information provided for federal status in TPWD Annotated County List of Rare Species, in the case of a discrepancy The species is listed by USFWS for the county but is not expected to occur within the study area

Listed Threatened or Endangered Species

The discussion that follows describes habitat preferences and other characteristics for the state and federal threatened or endangered species shown in **Table 3-14**. Unless otherwise noted, the information below is drawn primarily from TPWD (2018b; 2018c) and USFWS (2018a; 2018b) online data and publications. Many of the listed threatened or endangered species that may be found in the study area are migratory birds. These species utilize the area primarily as a travel corridor, where suitable habitats are used for resting and feeding stops. Some of the more important migratory habitats within the study area include riparian zones, grasslands, wetlands, and upland woods/brush.

The peregrine falcon (*Falco peregrinus)* nests on cliffs and in cliff-like areas near wetlands and water bodies. The American subspecies (*Falco peregrinus anatum*) breeds throughout the western U.S., Canada, Mexico, and in the Trans-Pecos region of Texas.

This subspecies is not easily distinguished at a distance from the Arctic subspecies (*Falco peregrinus tundrius*), which breeds within the tundra regions of Alaska, Canada, and Greenland. Both subspecies migrate through Texas and can be found seasonally along the Texas Gulf Coast. Species decline has been attributed to human disturbance, habitat loss, illegal shooting/collecting, and, most notably, past use of the pesticide dichloro-diphenyl-trichloroethane. The Arctic subspecies is no longer listed in Texas. However, because the subspecies are difficult to distinguish from one another, references are generally made at the species level. Although preferred habitat for these subspecies is very limited within the study area, there exists the potential for the area to be used for stopover during migration (Cornell, 2017; eBird, 2018; NatureServe Explorer, 2018; Sibley, 2003).

Breeding habitat for the bald eagle is most commonly located within 2 to 3 miles of a major water source, which can be used for fishing. Primary food sources include fish and waterfowl, most often associated with rivers, lakes, bays, and coastal areas. Bald eagles roost and nest in large trees and often return to the same nest year after year. In Texas, bald eagle nesting typically occurs from October to July. Past threats to the species included reproductive failure due to pesticides, unrestricted taking by humans, and loss of habitat. Recovery efforts have been successful, and the bald eagle populations are currently being monitored (Cornell, 2017; NatureServe Explorer, 2018; Sibley, 2003). Consistent sightings of bald eagles have been reported during winter at Balmorhea Lake, just 4 miles southwest of the study area boundary (eBird, 2018). Although preferred habitat for the bald eagle is limited within the study area, there is a likelihood for the area to be used for stopover during migration or wintering months.

Habitat preference for the black-capped vireo includes oak-juniper woodlands with a two-layered aspect of patchy shrubs and trees intermixed with open grassy areas. Nesting environments requires shrubby vegetation to reach the ground to build a nest. Nesting season runs from March to late summer. Year after year, the black-capped vireo will return to the same nesting location or utilize a spot nearby. Foraging for the black-capped vireo includes deciduous and broad-leaved shrubs and trees with ample habitat for insects (Cornell, 2017; eBird, 2018; NatureServe Explorer, 2018; TPWD, 2018c; Sibley, 2003). The NDD database includes one record of the black-capped vireo in eastern Pecos County in a mountain range south of the study area (TPWD, 2018b). Due to the lack of

oak-juniper savannas available in the study area, it is unlikely for the black-capped vireo to be present.

Preferred habitat for the interior least tern includes salt flats, broad sandbars, and barren shores along reservoirs and wide, shallow rivers. Nesting sites are chosen based on a lack of vegetation and proximity to fishing grounds. This species will, as needed, use non-traditional locations, such as gravel-mined areas and gravel rooftops, for nesting sites. The tern is a colonial species and creates a shallow depression in the sand/gravel to create its nest. The nest is susceptible to inundation, predation, and pollution, all of which threaten the terns and their offspring. The Pecos River could provide marginal stopover habitat during migration for the interior least tern within the study area (Cornell, 2017; eBird, 2018; NatureServe Explorer, 2018; Sibley, 2003).

The Mexican spotted owl is a medium-sized owl with large dark eyes and no ear tufts. It occurs in varied habitat, consisting of mature montane forest and woodland, shady wooded canyons, and steep canyons. In forested habitat, uneven-aged stands with high canopy closure, high tree density, and sloped terrain appear to be key habitat components. They can also be found in mixed conifer and pine-oak vegetation types (USFWS, 2008). The study area lacks forest, woodland, and canyonland habitat, so it is unlikely that the Mexican spotted owl would occur in the study area (Cornell, 2017; eBird, 2018; NatureServe Explorer, 2018; Sibley, 2003).

The northern aplomado falcon is a medium-sized falcon known from open rangeland and savanna, semi-arid grasslands with scattered trees and shrubs. It is also known from coastal prairies along sand ridges, in woodlands along desert streams, and in desert grasslands with scattered mesquite and yucca. This bird was once found from southern Texas to southern Arizona. It disappeared from this area by the early 20th century; vagrants seen in New Mexico and west Texas are probably from a small extant population in northern Chihuahua, Mexico. Due to its rarity, the northern aplomado falcon is unlikely to occur in the study area (Cornell, 2017; eBird, 2018; NatureServe Explorer, 2018; Sibley, 2003).

The piping plover is a compact ground bird that breeds in the Northern Plains. In Texas, it is a migrant that winters along the Gulf Coast at beaches and bayside mud or salt flats.

This species is considered migratory through the study area. The use of the study area by the piping plover should be considered incidental relative to the large area considered as part of the migration corridor (Cornell, 2017; eBird, 2018; NatureServe Explorer, 2018; Sibley, 2003).

The reddish egret is resident along the Texas Gulf Coast. This bird inhabits brackish marshes, shallow salt ponds, and tidal flats. It is casual inland to the Midwest. The reddish egret nests on the ground or in trees and bushes, on dry coastal islands in brushy thickets of yucca and prickly pear. The occurrence of the reddish egret in the study area should be considered incidental relative to the large area considered as part of the migratory range (Cornell, 2017; eBird, 2018; NatureServe Explorer, 2018; Sibley, 2003).

The red knot is a small plump-bodied, short-necked shorebird that in breeding plumage, typically held from May through August, is a distinctive and unique pottery orange color. Red knots migrate long distances in flocks northward through the contiguous U.S. mainly April through June and southward from July to October. In Texas, this bird winters along the Gulf Coast. The red knot prefers the shoreline of coast and bays and uses mudflats during rare inland encounters. Habitat consists primarily of seacoasts on tidal flats and beaches, herbaceous wetland, and tidal flat/shore. This species is considered migratory through the study area. The use of the study area by the red knot should be considered incidental relative to the large area considered as part of the migration corridor (Cornell, 2017; eBird, 2018; NatureServe Explorer, 2018; TPWD, 2018c; Sibley, 2003).

The western yellow-billed cuckoo breeds in riparian habitat and associated drainages. This bird inhabits areas near springs, developed wells, and earthen ponds supporting mesic vegetation, deciduous woodlands with cottonwoods and willows. Dense understory foliage is important for nest site selection. This cuckoo species nests in willow, mesquite, cottonwood, and hackberry. This bird forages in similar riparian woodlands. Breeding season occurs from mid-May to late September. The federally-threatened listing status applies only to the western population beyond the Pecos River drainage, west of the study area. The riparian brush vegetation along the Pecos River and its tributaries could provide habitat for the western yellow-billed cuckoo (Cornell, 2017; eBird, 2018; NatureServe Explorer, 2018; TPWD, 2018c; Sibley, 2003).

The zone-tailed hawk inhabits arid, open country, including open deciduous or pine-oak woodland, mesa, or mountain country. It is often found near watercourses, wooded canyons, and tree-lined rivers along middle-slopes of desert mountains. This hawk nests in various habitats and sites, ranging from small trees in the lower desert, giant cottonwoods in riparian areas, to mature conifers in high mountain regions. The presence of riparian zones and arid habitat within the study area provides means that the zone-tailed hawk may be present (Cornell, 2017; eBird, 2018; NatureServe Explorer, 2018; TPWD, 2018c; Sibley, 2003).

The diminutive amphipod is a shrimp-like aquatic animal that occurs in only four springs in Jeff Davis and Reeves counties. The most significant threats are habitat destruction by humans (e.g., groundwater pumping for agriculture) and loss of spring habitat (e.g., flowing water) due to decline of groundwater levels of the supporting aquifer. Since these springs are not located within the study area, the diminutive amphipod is not expected to occur within the study area (USFWS, 2018a; NatureServe Explorer, 2018; TPWD, 2018c).

The Pecos amphipod is an endemic aquatic amphipod. This amphipod is omnivorous, active mostly at night, and spends daylight hours hiding under vegetation and other cover. The Pecos amphipod is vulnerable to reduction of spring flow resulting from declining levels of groundwater. Since the Pecos amphipod's range is believed to be restricted to two springs, and these springs are not located within the study area, the Pecos amphipod is not expected to occur within the study area (USFWS, 2018a; NatureServe Explorer, 2018; TPWD, 2018c).

The Comanche Springs pupfish was originally found in Comanche Springs, San Solomon Springs, and Phantom Cave in Reeves County. Presently, this species is restricted to a series of spring-fed waters near Balmorhea and limited to the Toyah watershed. This fish is found in constantly discharging springs and in swift-flowing water of canals and earthen ditches. This species is vulnerable to hybridization with sheepshead minnow (*Cyprinodon variegatus*) and groundwater pumping activities. These springs are believed to be south of the study area, and thereby the Comanche Springs pupfish is not expected to occur within the study area (NatureServe Explorer, 2018; TPWD, 2018c).

The Leon Springs pupfish is endemic to the Leon Creek watershed of the Pecos River system. This species is found in the margins of spring-fed marsh pools, typically away from vegetation (NatureServe Explorer, 2018; TPWD, 2018c). The NDD database includes several records of the Leon Springs pupfish in a stream system approximately 14 miles east of the study area in Pecos County (TPWD, 2018b). As this species is considered endemic to a specific watershed outside of the study area, it is not likely for the Leon Springs pupfish to be found within the study area.

The Pecos gambusia is a small fish that inhabits the Pecos River and its tributaries. This fish inhabits shallow margins of clear, vegetated spring waters high in calcium carbonate, as well as in sinkhole habitats (NatureServe Explorer, 2018; TPWD, 2018c). The NDD database includes multiple records of the Pecos gambusia found in nearby areas outside of the study area (TPWD, 2018b). Due to the extent of the Pecos River within the study area, there is potential that the Pecos gambusia could occur within the study area.

The Pecos pupfish originally occurred within the entire Pecos River basin. Presently this fish is restricted to the upper basin only. The Pecos pupfish inhabits shallow margins of clear, vegetated spring waters high in calcium carbonate, as well as in sinkhole habitats. Other habitat includes saline springs, gypsum sinkholes, and desert streams. Sometimes this species occurs in low salinity waters, but it is most typical and abundant in highly saline habitats that support relatively few species (NatureServe Explorer, 2018; TPWD, 2018c). This species is documented in NDD records in the Pecos River within the study area, north, and east of the study area. The range of observations extends from 1972 to 1980 (TPWD, 2018b). Habitat for this observation consists of gravel and bedrock substrate and the presence of spring-fed tributaries. There is potential for the Pecos pupfish to be found within the study area wherever suitable habitat exists.

The Proserpine shiner inhabits the Rio Grande and Pecos River basins in rocky runs and pools of creeks and small rivers (NatureServe Explorer, 2018; TPWD, 2018c). The NDD database includes records of the Proserpine shiner in the Pecos River in the far eastern reach of Pecos County (TPWD, 2018b). With the presence of the Pecos River and other creeks, the Proserpine shiner may be found wherever suitable habitat exists.

In Texas, the black bear is typically found in bottomland hardwoods and large tracts of inaccessible forested areas. In the Trans-Pecos area, bears are restricted to remote mountainous areas or nearly impenetrable thickets along watercourses (Davis and Schmidly, 1997; NatureServe Explorer, 2018). Due to the lack of remote mountainous terrain, it is unlikely that the black bear would occur within the study area.

The black-footed ferret formerly inhabited prairie dog towns in the general area. It is considered extirpated in Texas (Davis and Schmidly, 1997; NatureServe Explorer, 2018). Therefore, the black-footed ferret is not expected to occur within the study area.

The gray wolf was formerly known throughout the western two-thirds of Texas in forests, brushlands, and grasslands (Davis and Schmidly, 1997; NatureServe Explorer, 2018). The gray wolf is considered extirpated in Texas; therefore, it is not expected to occur within the study area.

Both the Diamond tryonia and the Gonzales tryonia are aquatic snails, endemic to a spring system and its associated outflows in Pecos County. This stream system is estimated to be 16 miles east of the study area, according to the NDD records (TPWD, 2018c). These snail species are found in mud substrates on the margins of small springs, seeps, and marshes in flowing water associated with sedges and cattails. They are presumed to be fine particle feeders of detritus and periphyton within the substrate. As this spring system is outside the bounds of the study area, neither the Diamond tryonia nor the Gonzales tryonia are likely to occur within the study area (NatureServe Explorer, 2018; TPWD, 2018c).

The Pecos assiminea snail is a member of the marine snail family but represents the most inland snail of the genus. This semiaquatic snail is usually found on moist ground or beneath emergent plants within a few centimeters of flowing water. The only known remaining Texas population is near Fort Stockton, east of the study area, in Pecos County. Due to the reduced range of this species, it is unlikely that the Pecos assiminea snail would be found in the study area (NatureServe Explorer, 2018; TPWD, 2018c).

Phantom springsnail is an endemic aquatic snail. This snail is known only from three spring systems and associated outflows in Jeff Davis and Reeves counties. This snail is

vulnerable to reduction of springflow resulting from declining levels of groundwater. Since these spring systems are not located within the study area, the Phantom springsnail is not expected to occur within the study area (NatureServe Explorer, 2018; TPWD, 2018c).

The Phantom tryonia is an endemic aquatic snail. This snail is known only from three spring systems and associated outflows in Jeff Davis and Reeves counties. This snail is vulnerable to reduction of springflow resulting from declining levels of groundwater. Since these spring systems are not located within the study area, the Phantom tryonia is not expected to occur within the study area (NatureServe Explorer, 2018; TPWD, 2018c).

The Texas hornshell is a mussel that inhabits both ends of narrow, shallow runs over bedrock. It inhabits areas of the stream where small-grained materials collect in crevices, along river banks, and at the base of boulders. This mussel is not known from impoundments. The range for the Texas hornshell consists of the Rio Grande basin and several rivers in Mexico. While it may be extirpated in this part of the state, the study area is within the historic range of the Texas hornshell; therefore, there is potential that this mussel could occur within the Pecos River (NatureServe Explorer, 2018; TPWD, 2018c).

The historical range of the Texas horned lizard included the entire state of Texas in arid and semiarid areas of flat, open terrain with scattered vegetation and sandy or loamy soils. Population declines have been linked to loss of habitat, insecticides, over-collection, and the accidental introduction of the imported fire ant (*Solenopsis invicta*). Despite declines in east and central Texas, the Texas horned lizard is still common in portions of the Rio Grande Plains of south Texas, the Rolling and High Plains of northwest Texas, and the Trans Pecos of far west Texas. It remains possible that the Texas horned lizard could occur in the study area wherever suitable habitat exits (CNAH, 2018; Conant and Collins, 1998; NatureServe Explorer, 2018; TPWD, 2018c).

The Trans-Pecos black-headed snake is a small snake with uniform body color and a small, dark head. This secretive species is fossorial and mostly nocturnal. It inhabits predominantly mesquite-creosotebush and pinyon-juniper-oak habitats. The Trans-Pecos black-headed snake lays its eggs from June to August. It eats insects, spiders, and other small invertebrates (NatureServe Explorer, 2018; TPWD, 2018c). The NDD database includes a record for the Trans-Pecos black-headed snake in central Pecos County. There

is potential that the Trans-Pecos black-headed snake may be present within the study area wherever suitable habitat exists.

Species of Greatest Conservation Need

Baird's sparrow inhabits shortgrass prairie with scattered low bushes and matted vegetation. This bird is mostly migratory in the western half of the state, although it winters in Mexico and just across the Rio Grande into Texas from Brewster through Hudspeth counties. This species is considered migratory through the study area. The use of the study area by Baird's sparrow should be considered incidental relative to the large area considered as part of the migration corridor (Cornell, 2017; eBird, 2018; NatureServe Explorer, 2018; Sibley, 2003; TPWD, 2018c).

The ferruginous hawk inhabits open country, primarily prairies, plains, and badlands. This hawk nests in tall trees along streams or on steep slopes, cliff ledges, river cut-banks, hillsides, and power line towers. The ferruginous hawk is a year-round resident in the northwestern high plains, and winters elsewhere throughout the western two-thirds of Texas. Within the study area, prairie and plains areas could provide habitat for this species during the winter (Cornell, 2017; eBird, 2018; NatureServe Explorer, 2018; Sibley, 2003; TPWD, 2018c).

The Montezuma quail inhabits open pine-oak or juniper-oak woodlands with ground cover of bunch grass on flats and slopes of semi-desert mountains and hills. The Montezuma quail travels in pairs or small groups. Their diet consists of succulents, acorns, nuts, and weed seeds, as well as various invertebrates. Due to the lack of pine-oak and juniper-oak woodlands, it is unlikely that the Montezuma quail would occur within the study area (Cornell, 2017; eBird, 2018; NatureServe Explorer, 2018; Sibley, 2003; TPWD, 2018c).

The mountain plover is a compact ground bird that nests on high plains or shortgrass prairie. Nests are constructed on the ground in a shallow depression. Non-breeding habitat includes shortgrass plains and bare, dirt (plowed) fields. This species is considered migratory through the study area. The use of the study area by the mountain plover should be considered incidental relative to the large area considered as part of the migration corridor (Cornell, 2017; eBird, 2018; NatureServe Explorer, 2018; Sibley, 2003; TPWD, 2018c).

The prairie falcon inhabits open, mountainous areas, plains, and prairie. This species nests on cliffs. The prairie falcon is more sensitive to direct human disturbance than to development overall, particularly just before laying season. This species is considered a permanent resident within the study area, with several documented observations recorded. The presence of plains and prairie could provide habitat for the prairie falcon within the study area (Cornell, 2017; eBird, 2018; NatureServe Explorer, 2018; Sibley, 2003; TPWD, 2018c).

The snowy plover was formerly an uncommon breeder in the Texas Panhandle, and winters along coastal areas. The study area lies within the migratory route used by the snowy plover and they could potentially use locations with suitable habitat as stopover sites. However, their potential use of the study area should be considered incidental relative to the large area regarded as their migration corridor (Cornell, 2017; eBird, 2018; NatureServe Explorer, 2018; Sibley, 2003; TPWD, 2018c).

The Sprague's pipit only occurs in Texas during migration and winter (from mid-September to early April). Migration distance is short to medium, and the birds are diurnal migrants. The Sprague's pipit is strongly tied to native upland prairie and can be locally common in coastal grasslands. During migration and winter, habitat consists of pastures and weedy fields. This bird is sensitive to patch size and avoids edges. The study area lies within the migratory route used by these rare birds and they could potentially use locations with suitable habitat as stopover sites. However, their potential use of the study area should be considered incidental relative to the large area regarded as their migration corridor (Cornell, 2017; eBird, 2018; NatureServe Explorer, 2018; Sibley, 2003; TPWD, 2018c).

The western burrowing owl occurs in the western half of North America. Nesting takes place in warmer temperate and sub-tropical regions from southern California to west Texas and south into Mexico. Typical habitat consists of open grasslands, especially prairie, plains, and savanna. Sometimes the burrowing owl is found in open areas, such as vacant lots near human habitation or airports. Preferred habitat is typified by shorter vegetation accompanied by abandoned small mammal burrows, which the owl modifies for its own use. This species rarely creates its own burrows and is, thus, associated with known habitat for prairie dog, ground squirrel, fox, and similar ground-dwelling mammals. Species decline is primarily due to habitat loss and fragmentation. Due to the presence

of prairie and plains, the western burrowing owl could occur within the study area (Cornell, 2017; eBird, 2018; NatureServe Explorer, 2018; Sibley, 2003; TPWD, 2018c).

The western snowy plover is an uncommon breeder in the Texas Panhandle, and winters along coastal areas. The study area lies within the migratory route used by the snowy plover, and they could potentially use locations with suitable habitat as stopover sites. However, their potential use of the study area should be considered incidental relative to the large area regarded as their migration corridor (Cornell, 2017; eBird, 2018; NatureServe Explorer, 2018; Sibley, 2003; TPWD, 2018c).

The headwater catfish originally occurred throughout streams of the Edwards Plateau and the Rio Grande basin. This fish is currently limited to the Rio Grande drainage, including the Pecos River basin. This catfish is found in springs, sandy and rocky riffles, runs, and pools of clear creeks and small rivers (NatureServe Explorer, 2018; TPWD, 2018c). The NDD database includes one record where the headwater catfish was observed in the Pecos River within the boundaries of the study area, which was recorded in the 1940s (TPWD, 2018c). Since the headwater catfish is known from the Pecos River basin, it could occur within the study area.

The tiger beetle species inhabits grassland and herbaceous areas of the southwestern United States and northern Mexico. They inhabit dry areas on hillsides or mesas where soil is rocky or loamy and covered with grasses. This tiger beetle is diurnal and hibernates or aestivates and are active mostly for several days after heavy rains. The life cycle probably takes two years, so larvae would always be present in burrows in the soil. This tiger beetle could occur within grassland or herbaceous areas within the study area (NatureServe Explorer, 2018; TPWD, 2018c).

The arroyo darner is associated with streams with a moderate to high gradient. This darner lays eggs on aquatic plants. The larvae clings to the bottom of pools of streams, the invertivore adults forage widely in pools. The range of the arroyo darner extends from desert up to the pine-oak zone. The flight season extends from late June to early September. The Pecos River could provide habitat for the arroyo darner within the study area (NatureServe Explorer, 2018; TPWD, 2018c).

Balmorhea saddle-case caddisfly is an oviparous insect that is only known from Balmorhea in Reeves County, Texas and Page Springs, Arizona. The larvae make turtle-shaped cases of small pebbles attached to the underside of stones in swift-flowing streams and rivers. The Balmorhea saddle-case caddisfly is not expected to occur within the study area, since within Texas it is only known from Balmorhea (NatureServe Explorer, 2018; TPWD, 2018c).

The bleached skimmer is an invertivore dragonfly that occurs in alkaline-fed streams and marshes. Adults can oviposit directly into hot water in hot springs. The larvae live in cooler spring runs, and adults forage in brushlands. The flight season is from mid-June to late August. Presence of ponds and streams with emergent vegetation within the study area could provide habitat for the bleached skimmer (NatureServe Explorer, 2018; TPWD, 2018c).

Polling's hairstreak inhabits oak woodlands dominated with scrub oak (*Quercus grisea*) and Emory oak (*Quercus emoryi*). Larvae feeds on the new growth of scrub oak leaves, while adults feed on the nectar from a variety of flowers, such as milkweed (*Asclepias* spp.) and catclaw acacia. The flight season runs from mid-May to June and again from mid-August to early September. Due to the lack of oak-dominated habitats, it is not likely for Polling's hairstreak to be found within the study area (NatureServe Explorer, 2018; TPWD, 2018c).

Habitat data on the big-free tailed bat is sparse, but records indicate that this species prefers to roost in crevices and cracks in high canyon walls but will use buildings, as well. Reproduction data is sparse, but this bat gives birth to a single offspring late June to early July. Females gather in nursery colonies. Winter habits of this bat are undetermined, but they may hibernate in the Trans-Pecos area. The big-free tailed bat's range includes the study area. There is potential for the big-free tailed bat to occur within the study area (Davis and Schmidly, 1997; NatureServe Explorer, 2018; TPWD, 2018c).

The black-tailed prairie dog inhabits dry, flat, short grasslands with low, relatively sparse vegetation, including areas overgrazed by cattle. These mammals live in large family groups (Davis and Schmidly, 1997; NatureServe Explorer, 2018). This species is documented in NDD records in scattered locations within the south-central region of the

study area. The NDD record includes several communities southeast of the study area (TPWD, 2018b), and the grasslands within the study area could provide habitat for the black-tailed prairie dog.

The cave myotis bat is colonial and cave dwelling. This bat also roosts in rock crevices, old buildings, carports, under bridges, and even in abandoned cliff swallow nests. This bat roosts in clusters of up to thousands of individuals. They hibernate in limestone caves on the Edwards Plateau and gypsum caves in the Panhandle during winter. Due to the variety of habitat preferences, there is potential that the cave myotis bat could occur within the study area (Davis and Schmidly, 1997; NatureServe Explorer, 2018; TPWD, 2018c).

The Davis Mountains cottontail is a rabbit that inhabits brushy pastures, brushy edges of cultivated fields, and well-drained streamsides. This rabbit is active mostly at twilight and at night. They may forage in a variety of habitats, including open pastures, meadows, or even lawns. This rabbit rests during daytime in thickets or in underground burrows and small culverts. The Davis Mountains cottontail feeds on grasses, forbs, twigs, and bark. In Texas, the historic range of this rabbit included the Davis Mountains, Chisos Mountains, and Guadalupe Mountains. Since the study area does not include these mountain ranges, the Davis Mountains cottontail is not expected to occur within the study area (Davis and Schmidly, 1997; NatureServe Explorer, 2018; TPWD, 2018c).

The pale Townsend's big-eared bat roosts in caves, abandoned mine tunnels, and occasionally old buildings. These bats hibernate in groups during the winter. During the summer months, males and females separate into solitary roosts and maternity colonies, respectively. Single offspring are born in May and June. Little information is available regarding the distribution of this subspecies of the Townsend's big-eared bat. However, the Townsend's big-eared bat's range includes the study area. It is possible for the pale Townsend's big-eared bat to occur within the study area (Davis and Schmidly, 1997; NatureServe Explorer, 2018; TPWD, 2018c).

The Pecos River muskrat inhabits creeks, rivers, lakes, drainage ditches, and canals. This muskrat prefers shallow, fresh water with clumps of marshy vegetation such as cattails, bulrushes, and sedges. They live in dome-shaped lodges constructed of vegetation. Their diet is mainly vegetation. It is possible for the Pecos River muskrat to be present at or

near the Pecos River and its major tributaries within the study area (Davis and Schmidly, 1997; NatureServe Explorer, 2018; TPWD, 2018c).

The pocketed free-tailed bat inhabits semiarid desert grasslands. This bat roosts in caves and cliff crevices, and under building roof tiles. Due to the wide range of habitat preferences, there is potential that the pocketed free-tailed bat could occur within the study area (Davis and Schmidly, 1997; NatureServe Explorer, 2018; TPWD, 2018c).

Brune's tryonia is an endemic freshwater snail. A benthic dweller, it is currently only found in modified waters of Phantom Lake Spring, just southwest of the study area. This snail is abundant on firm substratum and in soft mud before modification. Brune's tryonia is vulnerable to declining groundwater resulting in reduction of spring flow. Brune's tryonia is known only from a single lake, Phantom Lake. Therefore, Brune's tryonia is not expected to occur within the study area (NatureServe Explorer, 2018; TPWD, 2018c).

The Stockton Plateau threeband is a snail species found in rocky hill country with short grasses and some dwarf oaks on the hills. This species is found between an elevation of approximately 3,900 to 5,000 feet above sea level. The NDD database includes one record for the Stockton Plateau threeband, which is south of the study area near the Glass Mountains. Due to the habitat preference, it is not likely for the Stockton Plateau threeband snail to occur within the study area (NatureServe Explorer, 208; TPWD, 2018c).

The dunes sagebrush lizard is restricted to the sand dunes of Andrews, Crane, Ward, and Winkler counties. Habitat consists of dwarf shin-oak sandhills with sagebrush and yucca. The lizard is absent where blow-outs, topographic relief, or shin-oak are lacking. Areas of sand prairie are present within the study area, and could provide habitat for the species (CNAH, 2018; Conant and Collins, 1998; NatureServe Explorer, 2018). This species is documented in NDD records in Ward County 24 miles east of the study area. Most observations were recorded in 1970, with more recent collections from 2010 in Monahans State Park (TPWD, 2018b). There is limited potential for the dunes sagebrush lizard to be present in the limited habitat available within the study area.

The spot-tailed earless lizard is found in central and southern Texas and adjacent Mexico. This lizard inhabits moderately open brushland. It prefers relatively flat areas free of

vegetation or other obstructions, including disturbed areas. Given the predominance of brushland in the study area, it is possible for the spot-tailed earless lizard to occur within the study area (CNAH, 2018; Conant and Collins, 1998; NatureServe Explorer, 2018). This species is documented in NDD records in Ward County near the City of Pyote, 3 miles east of the study area. A specimen was collected in 1967 but a 2009 survey at the location did not identify any individuals (TPWD, 2018b). There is potential for the spot-tailed earless lizard to be found wherever suitable habitat exists.

Although not included in the county lists, the NDD database includes records for the hooded skunk, western hog-nosed skunk, western spotted skunk, and speckled chub found within the study area (TPWD, 2018b).

3.6 Community Values and Community Resources

The term "community values" is included for the consideration of transmission line certification under Section 37.056(c)(4) of the Texas Utilities Code. The PUCT CCN application requires an assessment of values and resources important to the local community. At times, community values and resources could include the following:

- habitable structure locations;
- AM, FM, microwave, and other electronic installations in the study area;
- FAA-registered airstrips, private airstrips, and heliports located in the study area;
- irrigated pasture or croplands utilizing center-pivot or other traveling irrigation systems;
- input from public participation meeting;
- approvals or permits required from other governmental agencies;
- brief description of the area traversed; and
- comments received from community leaders and members of the public.

In addition to the above-listed items, Halff evaluated the proposed project for community resources that may not be listed by the PUCT, but that may also be important to communities. Halff defines the term "community resources" to be areas or other natural resources recognized by a national, regional, or local community. Examples of community resources would be parks, recreation areas, historical or archaeological sites, or a scenic vista. As discussed in **Section 2.2.1** and **Section 2.5**, Halff mailed consultation letters to

elected and appointed officials within the study area and hosted a public participation meeting to identify and collect information regarding community values and community resources. Oncor regional managers also met or otherwise communicated with city and county officials in the study area to discuss the proposed project. The above-listed values and resources important to the local community are discussed in the appropriate sections of this document.

3.7 Land Use

3.7.1 Urban/Residential Areas

The study area is situated across a geographic area that includes portions of Pecos, Reeves, and Ward counties. The study area includes the incorporated cities of Barstow and Pecos. Most of the study area consists of rural, undeveloped land used primarily for oil and gas production; livestock grazing; and/or irrigated crop production. Hunting, fishing, and other types of outdoor recreation may be integrated with these primary uses, but access via a county road (CR) network is limited in a majority of the study area. Additional commercial, residential, and industrial development is concentrated near the cities of Barstow and Pecos, US 285, and the state highway network in the study area.

Halff solicited information from the regional, city, and county officials. Halff also solicited information from school districts and various state and federal agencies regarding environmental and/or land use constraints within the study area. Copies of all written responses received are contained in **Appendix A**. Several of these responses are noted within the discussion in **Section 3.0** and/or **Section 7.0** of this report relevant to resource-specific comments made by the agency (e.g., NRCS regarding soils, and TPWD and USFWS regarding wildlife). For responses that addressed potential land use constraints in general, the following list provides a summary of each:

- GLO indicated that the project area did not appear to include any environmental issues or land use constraints; and
- Permian Basin Regional Planning Commission replied indicating no comment regarding land use or environmental constraints, and recommended coordination with each county judge.

3.7.2 Recreation Areas

A review of federal, state, and local websites and maps, as well as field reconnaissance surveys, identified several municipal park and recreational areas (e.g., managed lands, parks, golf courses) within the study area (TPWD, 2018a). No hiking or biking trails and conservation easements or wildlife management areas have been identified in the study area. A review of the National Park Service (USNPS) website indicated that no USNPS parks, wild and scenic rivers, national battlefields, historic trails, or national historic sites open to the public are located within the study area (USNPS, 2018a; 2018b). There are no TPWD parks or public hunting units (TPWD, 2018f) located within the study area.

3.7.3 Agriculture

Agriculture is an important component of the economy for each of the counties in the study area, as indicated by representative agricultural statistics from the USDA 2012 Census of Agriculture (USDA, 2012) shown in **Table 3-15**. The 2012 Census of Agriculture identified cattle as the primary livestock for all three counties in the study area. Forage production was the primary crop. In terms of statewide significance, crop sales or livestock inventory do not rank substantially among other Texas counties for those categories. Ward County ranks among the lowest in the state in total value of agricultural products sold. A concentration of center-pivot irrigation systems are found west of the City of Pecos and other scattered locations in the study area.

TABLE 3-15. AGRICULTURAL STATISTICS FOR COUNTIES REPRESENTED IN THE STUDY AREA.

Statistical Category	Study Area County		
	Pecos	Reeves	Ward
Market Value of Products Sold (in $ millions)			
Crop Sales	$27.6M	$10 8M	$0.1M
Livestock Sales	$19 9M	$43 3M	$1 6M
TOTAL SALES	$47 5M	$54.1M	$1 7M
Top Crop Types and Livestock Inventory			
1st Crop Type and Acreage	Forage [1] 9,462	Forage [1] 9,266	Forage [1] 270
2nd Crop Type and Acreage	Cotton 7,034	Cotton 2,372	Pecans 20
3rd Crop Type and Acreage	Grapes 2,423	Pecans 528	No Data

Statistical Category	Study Area County		
	Pecos	Reeves	Ward
4th Crop Type and Acreage	No Data	Sorghum 141	No Data
1st Livestock Type and Number of Animals	Cattle 29,389	Cattle 24,806	Cattle 2,926
2nd Livestock Type and Number of Animals	Sheep/Lambs 25,043	Goats 766	Horse/Pony 295
3rd Livestock Type and Number of Animals	Goats 9,564	Horse/Pony 284	Layers 274
Source: USDA, 2012 Notes: [1] Land used for all hay, grass silage, and greenchop.			

3.7.4 Industry

Oil and natural gas production is prominent in the study area with over 4,600 registered records within RRC databases. The number of records is distributed throughout the study area between the project endpoints, with the heaviest concentrations near the cities of Barstow and Pecos. The pipeline network is proportionately numerous within the study area. Several large pipelines (greater than 12-inch diameter) originate from a facility north of the Sand Lake Switch and a facility in Fort Stockton in Pecos County, northeast of the Solstice Switch. There are also numerous smaller pipelines that traverse the study area with the highest density in Ward County. During field reconnaissance, well and pipeline facilities not shown on the aerial or in the RRC database were either constructed, under construction, or being staked for construction, indicating that this particular land use constraint is very dynamic and subject to change depending on the date of observation.

3.7.5 Aesthetics

Aesthetics is included as a factor for consideration in the evaluation of transmission facilities in Section 37.056(c)(4)(A)-(D) of the Texas Utilities Code. For the purposes of this study, the term aesthetics is utilized by Halff to address the subjective perception of natural beauty in a landscape. This evaluation attempts to define and evaluate the scenic qualities of an area.

Consideration of the visual environment includes a determination of aesthetic values (i.e., where the major potential effect of an action on the resource is considered visual) and recreational values (i.e., where the location of a transmission line could potentially affect the scenic enjoyment of the area). Halff considered the following aesthetic values in this study, which combine to give an area its aesthetic identity:

- topographical variation (hills and valleys);
- prominence of water in the landscape (rivers and lakes);
- vegetation variety (woodlands, meadows);
- diversity of scenic elements;
- degree of human development or alteration; and
- overall uniqueness of the scenic environment compared to the larger region.

The study area is mostly open shrubland with small amounts of cropland and prairie grasses. Large permanent waterbodies and forested canopy riparian corridors are generally absent. In contrast to a rural Texas community with a largely agricultural economy, the oil and gas industry is the primary aesthetic for a great majority of the study area. The public road network is sparse compared to private road access to individual well locations, and oil and well facilities and the vehicles that service them are persistent and prominent from most public viewsheds.

A review of a TxDOT *Texas Highways* publication found that none of the 46 Texas locations listed as having particularly strong aesthetic views or settings are located within the study area (TxDOT, 1998). In the TxDOT review of Texas landscapes, scenic value based on tourists' favorite overlooks demonstrates a preference for mountain or coastal vistas. In addition, a review of the USNPS website identified no wild and scenic rivers, historic trails, national parks, national monuments, or national battlefields within the study area (USNPS, 2018a; 2018b). No other aesthetic resources, designated scenic views, scenic roadways, or unique visual elements were identified from the literature review or field reconnaissance of the study area.

3.7.6 Transportation/Aviation

A network of federal highways, state highways, FM, Ranch-to-Market (RM), CR, and private ranch roads facilitate transportation throughout the study area. Federal and state highways include the following:

- IH 10: located along the southern edge of the study area, extends from the City of Balmorhea and proceeds past the southeastern boundary of the study area towards Fort Stockton;

- IH 20: located within the northern third of the study area, passing through both the City of Pecos and the City of Barstow;
- US 285: enters the study area from the north-central edge of the study area and proceeds in a southeastern direction, extending past the southeastern edge towards Fort Stockton; and
- SH 17: extends from IH 20 just west of Pecos southward towards Saragosa, passing through the western boundary of the study area.

In addition to these facilities, there is a limited network of FM and CRs that facilitate public access throughout the study area. Coordination with the TxDOT Odessa District identified no proposed new construction or expansion of existing facilities within or near the study area. TxDOT did provide information for construction coordination regarding the crossing of state highways with utilities and constructing driveway access across state highways.

Field reconnaissance coupled with a review of the FAA Southwest Region Airport Directory (FAA, 2018), TxDOT Airport Directory (TxDOT, 2017), USGS topographic maps (NGS, 2016), input from attendees at the public participation meeting, and recent aerial photography (DigitalGlobe, 2016; 2017) revealed seven aircraft landing facilities listed in **Table 3-16** that are either located within the study area (**Figures 3-1A** and **3-1B**) or within close proximity to the study area. The following summarizes the types of aircraft facilities described in **Table 3-16**:

- FAA registered airports with a runway greater than or equal to 3,200 feet: two total; one public use airport in the study area; one private use airport outside the study area;
- FAA registered airports with all runways less than 3,200 feet: none;
- Non-registered aircraft landing strips with all runways less than 3,200 feet: four total; one inside the study area; and
- FAA registered heliports: one total in the study area.

TABLE 3-16. AIRCRAFT LANDING FACILITIES IN OR NEAR THE STUDY AREA.

Facility Name [1]	FAA ID	Facility Use	County	Relative Location
FAA REGISTERED AIRPORT WITH RUNWAY GREATER THAN 3,200 FEET				
Gnaws Farm	96XA	Private	Reeves	Southwest of Pecos Municipal Airport
Pecos Municipal Airport	PEQ	Public	Reeves	South of Pecos along IH 20
NON-REGISTERED LANDING STRIP				
Worsham Airfield	n/a	Private	Reeves	Southwest of Pecos Municipal Airport
Landing Strip	n/a	Private	Reeves	South of IH 10 near Sandia Creek
Landing Strip	n/a	Private	Reeves	North of Saragosa and southwest of Verhalen
Landing Strip	n/a	Private	Reeves	Southeast of Verhalen
HELIPORTS				
Pecos Municipal Airport	PEQ	Public	Reeves	South of Pecos along IH 20

Sources: DigitalGlobe, 2016; DigitalGlobe, 2017; FAA, 2018; TxDOT, 2017; NGS, 2016, Halff field reconnaissance (2018).
Notes:
[1] Aircraft support facilities are grouped by type of facility, whether the facility is registered with the FAA, and length of runway. Identification code assigned to facilities registered with the FAA.

3.7.7 Communication Towers

Numerous communication towers are located within the study area as shown in **Figures 3-1A** and **3-1B**. Communication towers may include a mix of cellular phone communications, microwave towers, and other similar electronic installations located throughout the study area. One AM radio transmitter and three FM radio transmitters were identified within the study area.

3.8 Cultural Resources

A records examination for known archaeological and historical sites was made to help determine the likelihood of finding historic and prehistoric archaeological sites along potential transmission line routes in the study area. This research was conducted utilizing the THC Texas Archeological Sites Atlas (TASA, 2018). This database contains published and unpublished data on cultural resources surveys, districts, and properties listed on or determined eligible for listing in the National Register of Historic Places (NRHP), State Antiquities Landmarks (SALs), Official Texas Historical Markers (OTHM), cemeteries, and previously recorded archaeological sites, including any archaeological sites listed on or eligible for listing on the NRHP.

3.8.1 Cultural History

A brief overview of the cultural history for the Trans-Pecos Region of Texas is synthesized from previous investigations in the region that began in the 1940s. This region has not been intensively studied, and only a few large-scale projects have been conducted (Miller

and Kenmotsu, 2004). The chronological framework for human occupation in this region is as follows:

Historic	A.D. 1540 to present
Protohistoric	A.D. 1400 to A.D. 1540
Late Prehistoric	A.D. 200/900 to A.D. 1400
Archaic	6,000 B.C. to A.D. 200/900
Paleoindian	10,000 B.C. to 6,000 B.C.

3.8.1.1 Paleoindian

The Paleoindian period is associated with distinctive Clovis, and later Folsom and Midland, projectile points (Bousman et al., 2004). There are examples of Clovis, Folsom, and Midland projectile points discovered in the Trans-Pecos Region of Texas, including four found in Ward County and one in Pecos County; however, no Clovis points have been found in Reeves County (Bever and Meltzer, 2007). Little is known about the Clovis Complex in the region outside of some isolated discoveries of distinctive fluted projectile points associated with the complex (Holliday, 1997; Miller and Kenmotsu, 2004). The lack of cultural materials from this earliest stage of the Paleoindian period may indicate that early inhabitants were widely spread in the eastern Trans-Pecos region (Sanchez, 1999) or may reflect the minimal archaeological work conducted in the region. By contrast, much more is known about the Folsom and Midland complexes (Miller and Kenmotsu, 2004). Most of what is known about eastern Trans-Pecos Folsom occupation comes from excavations at the Chispa Creek site located in southwest Culberson County (Lindsay, 1969). The site contains a Folsom component along with other Paleoindian materials. Chispa Creek is considered an occupation site (Mallouf, 1985), despite the fact that no definitive Paleoindian habitation structures have been discovered there or elsewhere in the Trans-Pecos region. This is likely due to the seasonal hunting and gathering lifeway of early Paleoindian people. Additional evidence for the Folsom culture in the region includes four sites located in the Van Horn area, west of Balmorhea, in Culberson County, one of which is identified as a kill site (Sommers, 1974) and an isolated find in Presidio County (Walter, 2015). The Hot Tubb site in Crane County contains both Folsom and Midland components (Meltzer et al., 2006). Midland sites, which may be partially contemporary with Folsom, include Winkler-1 (Blaine et al., 2017) and the Shifting Sands site (Rose, 2011).

3.8.1.2 Archaic

The Archaic period is generally subdivided into the Early (6000 to 4000/3000 B.C.), Middle (4000/3000 to 1200 B.C.) and Late (1200 B.C. to A.D. 200) periods. Archaeological evidence for each period is demonstrated through morphological differences in projectile points and through variations in subsistence activities (Miller and Kenmotsu, 2004). Characteristics of Archaic groups include seasonal variation in subsistence activities and a variety of site types. Among the most significant developments during the Archaic period is evidence for the adoption of plant cultivation circa 2500 B.C. (Miller and Kenmotsu, 2004). An increase in the number of sites during this period is attributed to population increases and the region experiencing a wetter, cooler climate.

3.8.1.3 Late Prehistoric

During the Late Prehistoric period, despite significant changes that occurred in occupation patterns in the rest of the region, the Eastern Trans-Pecos area generally retained the same settlement pattern that was established during the late Archaic. Two exceptions to this continuing lifeway occur in the Presidio Bolson near modern Presidio, Texas, and the Salt Flat Basin on the west side of the Guadalupe and Delaware Mountains (Miller and Kenmotsu, 2004). Evidence of manufactured pottery and small pithouse villages have been discovered in these areas. However, high levels of mobility are still evident despite the presence of more permanent settlements. Artifact assemblages contain evidence of technological changes with the introduction of the bow and arrow and ceramics, though the use of the bow and arrow was more widespread than that of ceramics in the region (Sanchez, 1999). Dependence on specialized, agricultural crops in the region reached its culmination between A.D. 1250 and 1450 (Miller and Kenmotsu, 2004), and bison appeared during the mesic periods, providing a prominent subsistence source.

3.8.1.4 Protohistoric

The Protohistoric period is the transition between the prehistoric and historic periods. Historic Native American sites are virtually unknown in most parts of the region, and the primary evidence of occupation is the occasional discovery of a glass trade bead, metal arrowhead, or crevice burials (Skinner, 2016).

3.8.1.5 Historic

The Historic period in the Trans-Pecos Region is divided into three phases. The Spanish Phase ranges from 1540 to 1821 A.D. Several Spanish explorers visited the Pecos River during this period but left little evidence of their presence (Chipman, 1992). The Mexican Phase lasted from 1821 to 1846, and the Anglo Phase occurred from 1846 to the present. The area was sparsely populated until after 1846 at the start of the Anglo Phase. In 1854, Fort Davis was built to protect travelers and settlers in the region. Drought and the Great Depression impacted the region heavily, and although the counties are sparsely populated, large scale ranching and vegetable farming are viable industries in the region (Miller and Kenmotsu, 2004).

Pecos County was created from part of Presidio County in 1871 (Justice and Leffler, 2016a). Reeves County was then separated from Pecos County in 1883 (Smith, 2016). Shortly thereafter, in 1887, Ward County was created from Tom Green County (Justice and Leffler, 2016b). Access to the Pecos River influenced the growth and development of these three counties. Initial settlers relied on an economy dependent on sheep and cattle ranching subsidized by corn and cotton farming. The discovery of oil and related introduction of railroads helped to boost the counties' economies and populations through the first few decades of the 20th century. This was followed by a major drought and the Great Depression, which decreased the numbers and values of crops and livestock, as well as oil. Both Ward and Pecos counties rebounded dramatically in the 1950s. Over the last 50 years, oil production has continued to increase while ranching has fluctuated but is generally on the decline.

3.8.2 Records Review

3.8.2.1 Previous Archaeological Investigations

The lack of large-scale surveys and excavated sites is the main reason that the archaeology of the study area is not well understood; however, the geomorphology of the study area also contributes to this deficit of archaeological information. The study area is in the arid Trans-Pecos region, where water is limited to the major waterways like the Pecos River.

Twenty-one previously conducted archaeological projects fall within or partially within the study area (TASA, 2018). Nine of these projects, dating from 1970 through 1999, only have location information available along with the reviewing or sponsoring agency. The earliest three projects date from the 1970s and were TxDOT projects that parallel portions of IH 10, FM 3334, and FM 1216 (TASA, 2018). An EPA project was surveyed just southeast of the City of Pecos in 1977. In 1984, a U.S. Department of Housing and Urban Development (U.S. HUD) sponsored water line was surveyed between the City of Pecos and water tanks to the southeast. A 49-acre block 5 miles southwest of the City of Pecos was surveyed for the Federal Energy Regulatory Commission. In 1995, seven linear segments (likely pipelines) were surveyed in the Worsham Oil Field and reviewed by the EPA. In 1998, a 4-acre area was surveyed on the south side of FM 1450 for the U.S. Air Force. In 1999, a 5-acre area was surveyed on the south side of IH 20 at the City of Pecos for the General Services Administration. No sites were recorded during these projects, and no further information is available about them.

In 2012, a sewer line was installed along 7th street in the City of Pecos (Keller, 2012). Archaeology Consultants, Inc. monitored the installation of the line as it paralleled the northwest side of the Santa Rosa Cemetery. No cultural resources were found during the monitoring.

In 2014, AR Consultants, Inc. (ARC) surveyed high potential segments along the Perry Ranch—Barstow pipeline route. Three of these segments are within the study area approximately 2.5 to 4.5 miles northwest of the City of Barstow, paralleling FM 516. Historic sites 41RV87, 41RV88, and 41RV89 were recorded along the northern two segments (Hall and Rutherford, 2014). That same year, URS Corporation (URS) surveyed 23.5 miles for the Pecos NGL Pipeline. This survey resulted in the recording of 41RV60 and 41WR85. In 2016, Tetra Tech surveyed drainages along the Oryx Trans Permian West Pipeline, but no more information is available. It does not appear that any sites were recorded during this survey.

In 2017, two electric transmission lines (Oncor Permian Basin—Culberson 138kV transmission line and Texas-New Mexico Power Company [TNMP] Worsham to Wickett), three small pipeline crossings (Brazos Midstream), and the perimeter of the Old Pecos Cemetery were surveyed for cultural resources. The Oncor Permian Basin—Culberson

survey conducted by URS recorded 19 archaeological sites, seven of which (41RV129, 41WR85, 41WR98, 41WR99, 41WR100, 41WR101, and 41WR103) are within the current study area. No sites were recorded during the TNMP Worsham to Wickett survey (conducted by HDR) or the Brazos Midstream project (surveyed by Tierras Antiguas Archaeological Investigations). The Old Pecos Cemetery boundary was expanded due to the results of the investigations conducted by AmaTerra Environmental, Inc. and the cemetery was recorded as site 41RV127.

In 2018, the Barilla Junction—Permian Basin Transmission Line Rebuild survey was conducted by Power Engineers, Inc. approximately 10 miles north of IH 10, but no information is yet available about the survey. No sites were found. Two rectangular areas totaling 63 acres were surveyed 4 miles north of the City of Pecos as a part of a larger linear study area, but no information besides their location is available on TASA (2018).

3.8.2.2 Previously Recorded Archaeological Sites

In total, 63 archaeological sites have been recorded in the study area: 45 in Reeves County and 18 in Ward County. Most of the sites are prehistoric lithic scatters (41RV23, 41RV27, 41RV29, 41RV31, 41RV60, 41WR72, and 41WR85) and camps (41RV33, 41RV34, 41RV35, 41RV38, 41RV39, 41RV40, 41RV41, 41RV42, 41RV43, 41RV44, 41RV45, 41RV46, 41RV47, 41RV48, and 41RV62) that have been determined ineligible for listing on the NRHP, though some were not fully recorded, and the unrecorded portions have undetermined eligibilities. Several other prehistoric lithic scatters (41RV67, 41RV81, 41RV94, 41RV95, and 41WR104) and camps (41RV6 and 41RV8) were recorded, and, though no official NRHP eligibility determination was made, they were recommended ineligible as a whole or within the associated project right-of-way, or no further archaeological work was recommended at the sites. A few prehistoric camps (41RV64) were determined or recommended eligible for listing on the NRHP, or further archaeological work was recommended. Sites 41RV32, 41RV36, and 41RV37 are prehistoric camps with undetermined NRHP eligibility. An Archaic camp (41RV63) and a shelter from an unknown time period (41RV3) have undetermined NRHP eligibility statuses. Several sites (41RV20, 41RV24, 41RV25, 41RV26, 41WR9, and 41WR10) have no information available on TASA besides their locations.

The prehistoric camp 41RV7 is along the southeast edge of the now mostly dry Toyah Lake. It was originally recorded in 1979 and revisited in 2015. As of 2015, the site contained stone projectile points, debitage, burned rock features, choppers, and hammerstones. Prehistoric site 41RV28 is along the eastern edge of a dry basin and consists of 40 thermal features, a few chipped stone flakes and tools, and a few ground stone fragments scattered across an area measuring 570 meters by 165 meters. The site was determined eligible for listing on the NRHP. Site 41RV68 is located on a prominent elevation on the north side of Salt Draw and consists of burned rock and chipped stone artifacts. It was recommended that the site be avoided. Sites 41WR5, 41WR7, and 41WR8 were recorded within 450 meters of each other in 1981 and were revisited in 1990. All three sites are extensive lithic scatters and further work was recommended at each of them in 1990.

All but one of the 16 historic sites have been determined or recommended ineligible for listing on the NRHP. The site types range from artifact scatters (41RV93, 41RV97, 41WR87, 41WR88, 41WR100, and 41WR103) to ranches and farmsteads (41RV30, 41RV65, 41RV66, 41WR89, 41WR99, 41WR101, and 41WR110), a berm (41WR98), and an unknown site type (41RV128). The Old Pecos Cemetery/Pioneer Graveyard (41RV127) has an undetermined NRHP eligibility status.

3.8.2.3 Historic Sites

The National Park Service lists no properties or districts within the study area on the NRHP. No State Historic Sites are within the study area. Though there are three farms or ranches in Reeves County and one in Pecos County that are recorded as Century Farm or Ranch, none are located within the study area. No century farms or ranches are recorded in Ward County (Texas Department of Agriculture [TDA], 2016).

Six cemeteries have been identified within the study area, according to information on TASA and USGS maps. The Barstow Cemetery is located just northwest of town, while the other five cemeteries (Dean Memorial, Fairview, Mount Evergreen, Old Pecos/Pioneer Graveyard, and Santa Rosa) are scattered throughout the City of Pecos.

The THC Atlas indicates sixteen OTHM are in the study area, of which two are in the City of Barstow and the rest in the City of Pecos. The markers identified the 1901 Old Ward

County Bank and the First Public Library in Ward County located in the City of Barstow. Markers found in the City of Pecos include: a marker commemorating George R. Reeves, a Civil War veteran and the county's namesake; the First Christian and First Baptist churches; the Old Camp Hospital, the oldest permanent hospital in the Trans-Pecos region; the World's First Rodeo held in 1883; the 1896 Orient Hotel; the Pioneer Graveyard, which was first used in 1881 for those who succumbed to the hazards of railroad construction; the Neighbors-Ford Trail 1849 wagon road from Austin to El Paso; the City of Pecos; Reeves County; Emigrants' Crossing; the public benefactor Lillie W. Cole; Spanish Explorers, who visited the region in the late 1500s; and the famed Pecos Cantaloupe, which is grown on farms throughout the county.

In addition to a review of reported archaeological and historic sites, a historic map review was conducted. The 1922 Reeves County General Soil Map, the 1936 Pecos, Reeves, and Ward counties general highway maps (GHMs), 1955 Pecos County GHM, and the 1956 Reeves and Ward counties GHMs were reviewed by ARC. The more accurately scaled 7.5' USGS topographic maps were also examined (USGS 1961-1981). Three hundred and seventy-five potential historic resources were identified from structure locations on these maps. Each potential historic resource may contain multiple structures. Due to the abundance of structures in them, cities, such as the cities of Barstow and Pecos, were each identified as single, large potential resources. Each of these potential historic resource locations may have intact structures and/or structures should be evaluated by an archaeologist and/or architectural historian prior to affecting them.

In addition to these 375 locations, several other features could represent or contain historic resources. Multiple oil fields are mapped on historic maps and each may contain features that should be recorded as archaeological sites. Furthermore, windmills, railroads, bridges, gravel pits, canals, and unmapped ranch and oil field features, such as corrals, pads, roads, and fences, are likely present and should be considered historic sites if more than 50 years old.

4.0 IDENTIFICATION OF PRELIMINARY ALTERNATIVE ROUTE LINKS

Upon completion of the various data collection activities and constraints mapping process, the next step for the proposed project was to identify preliminary alternative routes to connect the planned Oncor Sand Lake Switch to the AEP Texas Solstice Switch. Potential alternative routes were plotted on recent aerial photography (DigitalGlobe, 2016; 2017), based on the findings of the reconnaissance surveys, the findings from the various data collection activities, the environmental and land use constraints map, and property boundary maps. The initial property boundary maps utilized to locate apparent property boundaries consisted of GIS data from each county appraisal district. Digital gas and petroleum pipeline data obtained from the RRC (2018) were used to identify pipeline corridors and other oil and gas facilities (e.g., natural gas pads, individual well sites, etc.). Where practical, Halff verified the location of some of the pipelines and above ground oil and gas facilities by reviewing aerial photography or field reconnaissance but did not alter the RRC digital data. The environmental and land use constraints map (**Figures 3-1A** and **3-1B**) shows the locations of pipelines and oil and gas well sites, based on the data as received from the RRC. Existing and potential future electric transmission line corridors were digitized by utilizing GIS data provided by Oncor and AEP Texas, which Halff then verified by locating towers and/or poles through field reconnaissance and use of high-resolution aerial photography.

In the development of preliminary alternatives, Halff considered existing corridors (e.g., existing utility ROW, existing transmission lines, public roadways) and apparent property and land use boundaries, in accordance with the provisions of PUCT Substantive Rules Section 25.101. Pipelines were not considered as existing compatible corridors. Aerial maps (DigitalGlobe, 2016; 2017) revealed a variety of potential topographic constraints that were also considered. Ultimately, Halff identified numerous preliminary alternative route links that, when combined, form an assortment of preliminary alternative routes to connect the project endpoints.

Oncor and AEP Texas defined a specific point of origin from each terminal station from which each terminal link would connect. The point of origin accounts for the layout of each station, which may contain connecting points from other pre-existing or proposed facilities in the study area. For example, all preliminary route links for the proposed project connect

to the south side of the Sand Lake Switch and the north side of the Solstice Switch. A link is defined as a route segment that progresses in a generally forward progressing direction, prior to diverging, or branching, in at least two different directions, or new links. Each branch vertex is defined as a node.

Constraints such as oil and natural gas wells, transportation corridors (e.g., IH 20, US 285, and FM 1450), and the City of Pecos urban area, influenced the development of preliminary alternative route links. In many instances, property or land use boundaries are not readily apparent, and to parallel said features may require a series of angles and turns that would only increase the length of a route across the landscape. The preliminary links included four networks originating from the Sand Lake Switch that then progressed toward the Solstice Switch. The network of preliminary links is described in two corridors, as provided below. There is no clear boundary between the two regions.

North Study Area Corridor

While developing preliminary links, Halff considered corridor opportunities relative to the developed limits within the City of Pecos and the Pecos River floodplain environment. The Link C series provides four routing alternatives around the City of Pecos and City of Barstow urban areas. The western network considered Pecos Municipal Airport south of IH 20 and agricultural sites, including pivot irrigation, found throughout the western region of this corridor. Three eastern networks considered the dense clustering of existing and developing oil and gas fields, crossing IH 20, and varying terrain constraints of the Pecos River. Two existing transmission line corridors were identified that provided routing opportunities: one north of the IH 20 corridor east of the City of Barstow, and one north of the FM 1450 roadway corridor. The use of these and/or other transmission line corridors were limited or excluded by the presence of oil and gas facilities near the existing transmission line(s). The US 285 and FM 1450 roadway corridor crossings required consideration for current and developing oil and gas activities before proceeding south. Routing of these preliminary route links had to consider apparent limits of operation/excavation, while simultaneously ensuring sufficient spacing to construct minimum spans across IH 20, US 285, FM 1450, an existing railroad, and other physical constraints.

South Study Area Corridor

The southern corridor is generally associated with preliminary links located south of US 285. As preliminary alternative route links progressed southward, apparent constraints became fewer. The presence of oil and gas activity in the region dissipated from north to south with increased regular distribution. The Link K series utilized several exiting transmission line corridors that were identified for providing routing opportunities in progression towards the Solstice Switch. The Link J series included consideration for agricultural lands utilizing pivot irrigation. The southeastern region of the corridor was designed to minimize overlap with the AEP Texas Lower Colorado River Authority Bakersfield—Solstice Switch 345 kV transmission line project concurrently being developed. Four preliminary link networks enter the Solstice Switch from the north side.

Oncor and AEP Texas presented the preliminary links at the public participation meeting, as further discussed in **Section 5.0**. The figures located in **Appendix B** depict the preliminary links that were presented at the public participation meeting. After the public participation meeting, Halff made modifications to the preliminary route links after considering updated property data, guidance from Oncor and AEP Texas, additional field investigations, and comments received from the public participation meeting. **Section 6.0** provides a detailed description of the new links and modifications to the preliminary route links that were made following the public participation meeting.

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5.0 PUBLIC INVOLVEMENT PROGRAM

The various data collection activities utilized in the development of a constraints map and in the ultimate selection of preliminary alternative routes were presented at the public participation meeting. The public participation meeting was held on August 15, 2018, at the Reeves County Civic Center. In consideration of comments received and information provided by landowners attending the meeting, Halff considered modifications to preliminary alternative route links. The figures found in **Appendix B** depict the location of the preliminary alternative route links that were presented at the public participation meeting.

Nine people signed in as attendees at the public participation meeting, including one member of the local media and one local official. The local official (City of Pecos Public Works Director) provided electronic data of city well sites and pipeline locations to Halff via email correspondence with Oncor after the public meeting. From other attendees, one questionnaire was received at the meeting. No questionnaires and/or letters were received via mail after the meeting by either Oncor, AEP Texas, or Halff. Results of the completed questionnaire from the public participation meeting indicated that the need for the proposed project had been adequately explained and that the exhibits and explanations of the need for the proposed project were helpful. Likewise, the respondent indicated that the information presented was helpful to them in understanding the proposed project.

The questionnaire requested input concerning transmission line routing issues regarding land use, paralleling existing corridors, and community values/resources. Respondents were asked to rank different factors as the most important consideration of land use, their preference for paralleling existing corridors when considering potential routes for the proposed project, and to rank a list of habitable structures, community values, and other resources in order of importance regarding maximizing the distance from the proposed project. With the questionnaire received, the respondent indicated a preference for minimizing length across residential areas, or maximizing the distance from residences, historical and/or archeological sites, and road frontages. Regarding paralleling existing corridors, noted preferences included existing transmission lines, with a preference of avoiding roadways and property boundaries.

The questionnaire also provided space for respondents to include any general comments or remarks. The respondent recommended relocating the preliminary alignment of Link C1 south of the respondent's property to better avoid dwellings, a pipeline, and permitted salt-water discharges in affected parcels.

6.0 ADDITION/MODIFICATION OF ALTERNATIVE ROUTE LINKS

As documented in **Section 2.2.2**, Halff performed reconnaissance surveys the day of and day after the public participation meeting and performed aerial reconnaissance on September 11, 2018. The aerial reconnaissance facilitated a verification of potential visible constraints that were not located on aerial photography or from the public rights-of-way. Closer inspection of the numerous oil and gas facilities and general construction requirements warranted the modification of multiple links. Where new well site construction was consistent with downloaded RRC records, the well sites are indicated on the referenced figures with the corresponding data point. Where data is not available from the RRC record, the approximate pipeline or well site is noted with text. After considering new information, including that provided by public participation meeting attendees, route link modifications were adopted, the results of which are described in detail below; all referenced figures are provided in **Appendix C**. Those route link modifications that were caused by slight modifications in property boundary data were not included in the following list.

Links A, B1, and B2

- **Figure 6-1** – Link A was modified to better align with apparent property boundaries upon receipt of updated parcel data. Link B1 and B2 were shifted slightly to accommodate this change.

Link C1

As noted in **Section 5.0**, one landowner requested that Oncor shift a central portion of the Link C1 alignment further south. Oncor considered these requests, but other nearby constraints limited the use of a southern alignment, and changes were not made near the requested location. The following descriptions refer to other necessary edits along Link C1.

- **Figure 6-2** – Reconnaissance surveys showed areas of recent construction activity along the east side of FM 1216 between the existing transmission lines shown on the figure. This reach of Link C1 was shifted to the north where aerial reconnaissance identified no apparent constraints.

- **Figure 6-3** – The westernmost reaches of Link C1 were shifted accordingly to provide adequate setback distance from recent oil and gas facilities identified during aerial reconnaissance.

Links C2, D1, and D2

- **Figure 6-4** – Link C2 and D2 were modified to better align with apparent property boundaries south of IH 20 upon receipt of updated parcel data. This adjustment shifted the node location and Link D1 was adjusted accordingly.

Link C4

- **Figure 6-5** – Link C4 was modified to avoid a new oil and gas facility east of CR 149 identified during aerial reconnaissance.

Link D1

- **Figure 6-6** – This reach of Link D1 was shifted to the southeast to avoid new oil and gas facilities and other development along the US 285 corridor.

Links C4, D3, and D4

- **Figure 6-7** – The western limits of Link D41 were shifted to the north to avoid new tank facilities observed during the aerial reconnaissance adjacent to the north side of the existing transmission line (Link D4 was split into Link D41 and D42 as shown on **Figure 6-9**). The node adjustment resulted in minor adjustment to Link C4 and Link D31 (Link D3 was split into Link D31 and D32 as shown on **Figure 6-9**).

Link D41

- **Figure 6-8** – North of the IH 20 corridor, Link D41 was shifted to the northeast to avoid multiple saltwater disposal ponds that were identified during the aerial reconnaissance. South of IH 20, the alignment was shifted to the east side of an interior access road to avoid a pipeline and new construction that was identified on the west side of the road.

Links D41, E3, and E4

- **Figure 6-9** – Link D41 was modified to better align with an apparent property boundary upon receipt of updated parcel data. Link E3 (see also **Figure 6-11**) and E4 were modified to avoid a conflict with a City of Pecos water pipeline that parallels the south side of the existing transmission line. The entire length of Link E4 was relocated to the north in consideration of other nearby oil and gas constraints. As previously mentioned, this modification of Link E4 split Link D3 and D4 into Links D31 and D32, and Links D41 and D42, respectively.

Link E2

- **Figure 6-10** – Link E2 was modified to avoid recent construction activity observed during aerial reconnaissance near the intersection with Links D2 and F3.

Link E3

- **Figure 6-11** – Link E3 was shifted to the north to avoid a conflict with a City of Pecos water pipeline that parallels the south side of an existing transmission line. As previously mentioned, Link E4 was shifted to the north (see **Figure 6-9**).

Links F1, G1, and I1

- **Figure 6-12** – Links F1 and I1 were adjusted to better align with apparent property boundaries upon receipt of updated parcel data. After this initial adjustment, Link G1 was adjusted to account for the new node location.

Links F2 and G1

- **Figure 6-13** – Link F2 was adjusted to avoid a conflict with a pipeline identified in the RRC database, the location (north of the existing transmission line) of which was verified through aerial reconnaissance. The Link F2 alignment was shifted to the north to avoid a coincident location with the pipeline. A portion of Link G1 was shifted to the north to avoid new oil and gas facilities identified.

Links F4 and H1

- **Figure 6-14** – Link F4 was shifted to the north to provide adequate setback distances from nearby oil and gas facilities. Link H1 was adjusted slightly to better align with apparent property boundaries.

Link F5

- **Figure 6-15** – Link F5 was shifted to the west to avoid a conflict with pipeline locations verified during aerial reconnaissance.

Link H1

- **Figure 6-16** – Link H1 was shifted to the south to avoid new oil and gas facilities along the US 285 corridor.

Links H2 and J2

- **Figure 6-17** – Minor adjustments were made to Link H2 to better align with property boundaries as shown in the map inset. Near the US 285 corridor, Link H2 was shifted to the north to avoid oil and gas facilities and isolated depressions that were observed ponding a substantial amount of water during aerial reconnaissance. This modification split Link J2 into Links J21 and J22.

Links I1, K1, and K2

- **Figure 6-18** – Link I1 was shifted to better align with apparent property boundaries upon receipt of updated parcel data. Link K11 and K2 required minor adjustments based on the new node location (Link K1 was split into Link K11 and K12 as shown on **Figure 6-27**).

Links G5 and I2

- **Figure 6-19** – Link I2 was shifted to the east to avoid a new oil and gas facility constructed along the north side of an existing transmission line. This modification split Link G5 into G51 and G52.

Link I3

- **Figure 6-20** – Link I3 was shifted to the west to better align with apparent property boundaries upon receipt of updated parcel data. Links J1 and J2 required minor adjustments based on the new node location.

Link J1

- **Figure 6-21** – This reach of Link J1 was modified to avoid general construction activity observed during the reconnaissance surveys.

- **Figure 6-22** – This reach of Link J1 was shifted to the west to avoid new oil and gas facilities that were under construction during aerial reconnaissance.

Link K11

- **Figure 6-23** – Link K11 (Link K1 was split to Link K11 and K12 as shown on **Figure 6-27**) was adjusted to avoid crossing several natural features south of CR 310.
- **Figure 6-24** – Link K11 was adjusted to the south to avoid an existing windmill and other facilities south of an existing transmission line.

Link K2

- **Figure 6-25** – Link K2 was revised to avoid new oil and gas facilities during the aerial reconnaissance along the south side of the existing transmission line easement.

Link K3

- **Figure 6-26** – Link K3 was revised to avoid oil and gas facilities during the aerial reconnaissance along the south side of the existing transmission line easement.

Links K11 and K3

- **Figure 6-27** – The southern end of Link K3 was shifted to avoid interruption during construction to the sole road access to oil and gas facilities on adjacent properties. This modification split the preliminary alignment of Link K1 into Link K11 and K12.

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7.0 EVALUATION OF THE ALTERNATIVE ROUTES

The environmental evaluation presented in this section addresses impacts to the environment in consideration of the requirements of Section 37.056(c)(4)(A)-(D) of the Texas Utilities Code, the PUCT's Substantive Rules Section 25.101 including the PUCT's policy of prudent avoidance, comments from the public participation meeting, reconnaissance surveys, and the information and responses obtained from local officials and state and federal agencies. Measurements for the majority of the environmental criteria were obtained from DigitalGlobe aerial photography (DigitalGlobe, 2016; 2017), which was ortho-rectified to National Standards for Spatial Data Accuracy of 10.16 meters (or approximately 30 feet) to true ground location.

Halff professionals with expertise in different environmental disciplines (geology/soils, hydrology, terrestrial ecology, wetland ecology, and land use/aesthetics) evaluated the alternative routes based upon environmental conditions present along each route and the general routing criteria developed by Oncor, AEP Texas, and Halff. In addition, Halff retained ARC to evaluate potential impacts to archaeological and other historical sites. Each researcher independently analyzed the routes defined in **Table 7-1** (found in **Appendix D**) and the environmental and land use data presented in **Table 7-2** (found in **Appendix E**) for the researcher's technical discipline. Halff's and ARC's evaluations of impacts are discussed below.

7.1 Impacts on Physiography and Geology

Construction of the proposed project would have no significant effect on the physiographic or geologic features/resources of the area. The erection of the structures would require the removal and/or minor disturbance of small amounts of surface and near-surface materials but would have no measurable impact on the geologic resources or features along any of the alternative routes, and no geologic hazards are anticipated.

7.2 Impacts on Soils

7.2.1 Soil Associations

The construction and operation of transmission lines normally create very few long-term adverse impacts on soils. The major potential impact upon soils from transmission line

construction would be erosion and soil compaction. The potential for soil erosion is generally greatest during the initial clearing of the ROW until vegetation cover reestablishes.

To provide adequate space for construction activities, to improve reliability, and to minimize corridor maintenance problems, most woody vegetation would be removed from the ROW of the proposed project. In these areas, only the leaf litter and a small amount of herbaceous vegetation would remain, and both would be disturbed by the movement of heavy equipment during construction, service, and maintenance activities.

The most important factor in controlling soil erosion associated with construction activity is to revegetate areas immediately following construction. Natural succession would quickly revegetate most of the ROW. Other critical areas, such as steep slopes and areas of shallow topsoil, may similarly require erosion control blankets and additional seeding to maintain soil stability.

The ROW will be inspected both during and after construction to ensure that problem erosion areas are identified. In addition, Oncor and AEP Texas will develop a Storm Water Pollution Prevention Plan (SWPPP), if required, which will detail measures to minimize impacts associated with potential soil erosion and downstream sedimentation, as well as measures to be taken following construction to revegetate disturbed areas.

7.2.2 Prime Farmland

As discussed in **Section 3.3.2**, no soils within the study area are categorized as prime farmland, whether with or without irrigation. None of the alternative links cross farmland of statewide importance; Link D41 crosses soils categorized as farmland of statewide importance, if irrigated. From aerial photography assessment (DigitalGlobe, 2016; 2017), this region of the study area in Ward County is predominantly occupied with oil and gas activities, instead of agricultural pivot or canal irrigation systems. Other than potential construction-related erosion (mitigated per SWPPP), impacts to farmland of statewide importance soils, both with and without irrigation, are anticipated to be insignificant and limited to the physical occupation of small areas at the base of support structures.

7.3 Impacts on Water Resources

7.3.1 Surface Water and Floodplains

The construction of the proposed project is unlikely to have significant impacts to surface water resources (e.g., streams, open water lakes, wetlands) in the study area. Any stream that would be crossed by the proposed project would be spanned by the proposed project, and no supporting structures would be placed in any streambed. The main potential impacts to surface waters and floodplains resulting from any major construction project are siltation resulting from erosion and pollution resulting from spillage of petroleum products (e.g., fuel or lubricants) or other chemicals. Vegetation removal could result in increased erosion potential of the affected areas, so that slightly higher than normal sediment yields may be delivered to area streams following a heavy rainfall. However, these short-term effects should be minor, as a result of the relatively small area disturbed at any particular time; the short duration of the construction activities; preservation of stream side vegetation where practical; Oncor and AEP Texas' efforts to manage runoff from construction areas through the use of best management practices (BMPs); and implementation of the SWPPP, if required.

Most of the potential stream crossings in the study area are associated with ephemeral streams that may only have flowing water after substantial rain events. However, it is still possible that transmission line structures would be located within the floodplain of the Pecos River and Toyah Creek. When locating transmission line structures within a floodplain, the structures would be designed and constructed so as not to impede the flow of water or create any hazard during flooding. Also, if tower structures are to be located within floodplains, Oncor and AEP Texas would coordinate in advance with the appropriate county floodplain administrators. Construction of the proposed project should not have significant impacts on the function of floodplains, nor adversely affect adjacent or downstream properties.

The USACE regulates the discharge of dredged and fill material into waters of the U.S., including wetlands, under Section 404 of the Clean Water Act (Section 404). USACE regulations implementing Section 404 include specific authorization under Nationwide Permit (NWP) 12 for Utility Line Activities (77 Federal Register 10184, March 19, 2017). NWP 12 authorizes the construction, maintenance, or repair of utility lines (including

overhead transmission lines), associated foundations, access roads, and substations, in all jurisdictional water features. Generally, transmission lines are designed to span stream or wetland crossings in most instances, thereby obviating the need for a Section 404 permit. Four of the 53 alternative links (i.e., Links C1, C2, D31, and D41) cross NWI-mapped wetlands, all of which are associated with crossing the Pecos River. Link F1 and Link K11 cross small playa wetland depressions identified from the NHD database.

NWP 12 specifies certain conditions which necessitate filing a pre-construction notification (PCN) to the USACE and written approval before construction activities may begin. In a January 12, 2017 public notice, the USACE indicates that a PCN may be required for authorization under NWP 12 for activities that involve a discharge of fill material associated with mechanized land clearing of wetlands dominated by woody shrubs. Per NWP 12 general conditions, the conversion of a forested or scrub-shrub wetland to an herbaceous wetland in a permanently maintained utility line ROW may require compensatory mitigation under the Section 404 program.

As mentioned previously, transmission lines are designed to span stream or wetland crossings in most instances, thereby obviating the need for a Section 404 permit. Many links cross either a creek, stream, or river found within the study area. However, many of these crossings, as accounted in **Table 7-2**, are small ephemeral headwater drainages derived from NHD sources. Three links cross Toyah Creek (i.e., Links D2, Link F1, and Link F2). As discussed in **Section 3.4.1**, TPWD has identified Toyah Creek, upstream of the Pecos River, as an ecologically significant stream segment (TPWD, 2018a). Of the three links crossing Toyah Creek, only Link D2 crosses where the creek is designated as an ecologically significant stream segment. In correspondence dated August 1, 2018, TPWD recommended that transmission line routes avoid the vicinity of this segment, where feasible. Proposed links were selected to limit paralleling and crossing streams to minimize habitat fragmentation. There are some alternative routes that can avoid crossing Toyah Creek. Where links crossed streams or riparian areas, these locations were selected for the apparent prior disturbance to also minimize further fragmentation within the area.

Field verification will be required to determine if NWI-mapped features meet wetland criteria under the Section 404 program. If wetlands are cleared during construction for the

proposed project, there should be no change in pre-construction contours or local drainage patterns, and wetlands should eventually re-establish within the ROW. Consistent with TPWD guidance (2018a), the location of the proposed project minimizes impacts to waterways, associated floodplains, riparian corridors, playa features, and wetlands, and maintains buffers to these features by minimizing fragmentation and utilizing/paralleling existing disturbed corridors where available.

Oncor and AEP Texas will implement a SWPPP, if required, and will seek to minimize impacts to surface waters during construction of the proposed project. Oncor and AEP Texas will also comply with any compensatory mitigation requirements that may be required as part of the Section 404 permitting process. From a water resources perspective, the proposed project should have no significant impacts to surface water.

7.3.2 Groundwater/Aquifer

The construction, operation, and maintenance of the proposed project are not expected to adversely affect groundwater resources in the study area or its vicinity. The amount of recharge area disturbed by construction is insignificant compared with the total amount of recharge area available for the groundwater systems in the region. No measurable alteration of aquifer recharge capacity should occur, and the likelihood of groundwater contamination would not be significant.

The main potential impact on groundwater resources from any construction project is pollution resulting from the accidental spillage of petroleum or other chemical products. Use of industry-standard BMPs during construction for proper control and handling of any petroleum or other chemical products will be implemented. Therefore, the project should have no significant impacts to groundwater.

7.4 Impact on Ecosystems

7.4.1 Vegetation

7.4.1.1 Terrestrial Vegetation

The primary impact to vegetation resulting from the site preparation and construction of the proposed project would be the removal of existing woody vegetation from the areas

required for the ROW. **Table 7-2** (**Appendix E**) presents the linear extent of different land cover types crossed by each of the alternative routes. All alternative routes would require some clearing of woody vegetation. As shown in the table, the great majority of any route crosses what is classified as rangeland pasture, which consists of a mixture of upland grasses and shrub growth, but insufficient woody structure to provide a canopy that would be generally associated with a forested type. Therefore, removal of woody vegetation is recognized in the rangeland type and not in the upland woodland type. A distinction in **Table 7-2** provides for riparian areas (**Section 7.4.1.2**) that similarly contain woody shrub growth, most of which is associated with crossings of the Pecos River floodplain and other smaller drainages scattered throughout the study area. The clearing of these communities could cause some degree of habitat fragmentation. Minimal clearing would be necessary where paralleling existing roads or other linear corridor ROW. The only land lost to grazing would be that which is occupied by the base of the transmission line towers.

A substantial portion of the proposed project would be constructed on land utilized primarily as rangeland pasture. Consistent with project-specific recommendations from TPWD regarding the prevention of habitat fragmentation, construction within the ROW will be performed in such a manner as to minimize adverse impacts to vegetation and to retain existing ground cover wherever possible (TPWD, 2018a). All brush and undergrowth within the ROW will be removed. Soil and plant conservation practices will be undertaken to protect native vegetation and ensure a successful restoration program for disturbed areas emphasizing native species. Erosion and stream sedimentation would be controlled as required by procedures set forth in the SWPPP, if required.

7.4.1.2 Aquatic/Hydric Vegetation

Based on photo-interpretation of aerial photography, review of USGS topographic maps, and review of NWI maps, the approximate impacts associated with each of the alternative routes were measured in linear feet. Potential wetlands occurring along the alternative routes include riparian habitat, but not all riparian areas may be considered jurisdictional wetlands by the USACE. Most of the riparian areas are associated with the floodplain of the Pecos River, Toyah Creek, and major associated stream segments. These classifications may overlap when interpreting NWI map data. However, within the study area, NWI-mapped wetland areas are most likely to occur as playa type depressions independent of a local floodplain. Delineation of jurisdictional wetlands would require

detailed site-specific examination of vegetation, hydrology, and soils. All alternative routes would cross riparian habitat which may include wetlands. Link K11 has the greatest total length across riparian areas (25,049 linear feet). Link I2 has the longest continuous crossing of a riparian area (2,842 linear feet). All the alternative routes would cross potential wetland habitat. Link K11 has the greatest total length across potential wetland habitat (4,111 linear feet). Link J7 has the longest continuous crossing of potential wetland habitat (171 linear feet).

7.4.1.3 Commercially or Recreationally Important Vegetation

Commercially important vegetation within the study area includes forage and row crops. Small amounts of these areas may be temporarily affected during the construction phase of the project in fields near the Sand Lake Switch and for routes that utilize Link C1. However, once construction is complete, a full resumption of crop production would be anticipated. The area is proportionately small compared to the size of the study area such that impacts to production should not be significant.

7.4.1.4 Endangered and Threatened Plant Species

The range of one federally-listed threatened plant species, the Pecos sunflower, is known to include Reeves County, including the study area (USFWS, 2018a), and habitat for the species may be found in limited capacity in isolated wetland areas within the study area. The TPWD NDD search found one record of occurrence for this species within the study area (TPWD, 2018a; 2018b) through which Link D1 crosses. This area is of limited locational certainty, associated with a record of observation from 1970 which noted the species was infrequently dispersed in the immediate area. The preliminary alternative routes minimize crossings of the potential wetlands in the area, few of which may be spring fed, if any, and it is not anticipated that the proposed project would affect this species.

TPWD county lists of rare species and TPWD NDD data (TPWD, 2018a; 2018b; 2018c) support that the study area contains rare species or vegetative communities for which TPWD requests additional consideration. The cienega false clappia-bush has been documented in three records within the study area, all of which are near the City of Pecos in Reeves County. One record for grayleaf rock-daisy is included in the NDD database within the study area; however, notes for this record indicates an uncertainty whether the specimen was collected in either Pecos County, or the City of Pecos in Reeves County.

The NDD record for Wright's trumpet includes the southern end of the study area near the Solstice Switch. For these species and other plant species listed in **Table 3.3**, TPWD recommends surveying the proposed project where suitable habitat may be present to minimize potential impacts to these rare resources. If specimens are found, TPWD requests notification for potential plant/seed collection, and recommends avoidance and minimization measures, such as instruction of construction crews and protection by construction fencing.

7.4.2 Fish and Wildlife

7.4.2.1 Terrestrial Wildlife

The primary impact of construction activities on wildlife would be the result of vegetation clearing and associated ground disturbances. Increased noise and activity levels during construction may also affect wildlife outside the perimeter of the construction area, temporarily displacing animals for a short distance on either side of the transmission line corridor. The impacts of transmission lines on wildlife can be divided into short-term effects resulting from physical disturbance during construction and long-term effects resulting from habitat modification. The net effect on local wildlife of these two types of impacts is usually minor given the narrow focus of transmission line corridors. A general discussion of the impacts of transmission line construction and operation on terrestrial wildlife is presented below.

The increased noise and activity levels during construction could potentially disturb breeding or other activities of species inhabiting the areas adjacent to the ROW. Dust and gaseous emissions should only minimally affect wildlife. Although the normal behavior of many wildlife species would be disturbed during construction, little permanent damage to the populations of such organisms should result.

Any required clearing and other construction-related activities would directly and/or indirectly affect most animals that reside or wander within the transmission line ROW. The heavy machinery may harm some small, low-mobility animals. These include several species of amphibians, reptiles, and mammals. If ROW clearing and construction occurs during the breeding season, impacts may occur to the young of many species including nestling and fledgling birds. Impacts to nesting birds will require mitigating measures to

ensure compliance with the Migratory Bird Treaty Act (MBTA). Fossorial animals (i.e., those that live underground), such as mice and gophers, may be harmed or displaced because of soil compaction caused by heavy machinery. Larger, more mobile species like birds, deer, rabbits, and coyotes would likely vacate the area upon initial clearing and move into adjacent areas outside the ROW. Wildlife in the immediate area may experience a slight loss of browse or other forage material. However, the prevalence of similar habitats in adjacent areas and regrowth of vegetation in the ROW following construction would minimize the effects of this loss.

After construction is completed and grasses, forbs, and shrubs can recover, many forms of wildlife are anticipated to re-occupy the ROW area. Periodic vegetation maintenance within the ROW may temporarily cause some negative impacts to wildlife habitat. Maintenance clearing activities during the breeding season may destroy some nests and broods. With the increase in sunlight penetration to a previously dense shrub/tree stratum, more perennial forbs and grasses would be expected to germinate. Such edge habitats are preferred by many species, such as the eastern cottontail rabbit, white-tailed deer, and northern bobwhite quail. Species like the white-tailed deer, that require open areas, as well as dense cover, may also use the ROW.

Transmission line structures could benefit some bird species, particularly raptors, by providing resting and hunting perches, especially in open, treeless habitats (Avian Power Line Interaction Committee [APLIC], 2006). Study area resident raptors, such as the American kestrel and the red-tailed hawk, often utilize the support structures as nesting sites, as well as hunting or resting perches. By such benefits, transmission lines have increased raptor populations in some areas of the U.S. (APLIC, 2006). The danger of electrocution to birds would be insignificant since the distance between conductors, or between conductor and ground wire on 345 kV transmission lines, is greater than the wingspan of any bird in the area (i.e., greater than 8 feet). Also, it is Oncor and AEP Texas' standard practice to install devices to deter bird landings on the insulator between the conductor and structure. This standard practice is consistent with agency-recognized guidelines for minimizing bird collision risks (APLIC, 2006; 2012).

Transmission lines (both structures and wires) could present a hazard to flying birds, particularly migrants, and especially near crossings of water features. Collisions tend to

increase in frequency during the fall when migrating flocks are denser and flight altitudes are lower in association with cold air masses, fog, or inclement weather. Studies indicate that higher rates of mortality exist during periods when poor light and weather conditions persist (Bevanger and Brøseth, 2004; Electric Power Research Institute [EPRI], 1993). This is important to note, given that most migratory species will continue to migrate regardless of weather conditions (Gauthreaux, 1971). Overall wire strikes are greatly reduced during bright daylight hours (Pandey et al., 2008). Species at higher risk for wire strikes are those that fly in fast-moving and/or tight flocks and larger-bodied birds with more awkward flight characteristics (Winning and Murray, 1997; Rusz et al., 1986). For resident birds or for birds during periods of non-migration, those most prone to collision are often the most common raptors in a given area because of a greater number of repeated flights across power lines particularly when in pursuit of prey (APLIC, 2006). Nevertheless, resident birds and those in an area for an extended period may learn the location of power lines and become less susceptible to wire strikes (Janss, 2000).

All the alternative routes cross shrub-dominated rangeland pasture and riparian areas, and therefore may potentially impact wildlife. However, these impacts are anticipated to be temporary and minimal. The greatest potential impact to wildlife from the proposed project would result from the clearing of brushland pasture habitat, clearing the ROW within 100 feet of streams, and clearing or crossing riparian areas and wetlands. Direct impacts to wildlife and habitat fragmentation are greatly reduced by utilizing or paralleling existing ROW to the greatest practical extent.

7.4.2.2 Fish and Aquatic Wildlife

Potential impacts to aquatic systems by transmission line construction activities involve mainly the effects of increased erosion and sedimentation. Land clearing and/or construction may result in increased suspended solids entering streams traversed by the transmission line, which in turn may negatively affect many aquatic organisms that require relatively clear water for feeding and reproduction. The proposed project would span perennial and ephemeral streams, and erosion controls would be utilized to minimize any impacts to aquatic systems.

In evaluating impacts to aquatic systems, factors taken into consideration include the number of potential wetlands crossed, the amount of ROW within 100 feet of streams, the

number of stream crossings, and the amount of open water crossed. Although streams and wetlands can usually be spanned, increased sedimentation and turbidity could result during rainfall. Routes parallel to and near to a stream could have a similar effect.

Physical habitat loss or modification could result whenever temporary access roads cross a perennial stream, or through sedimentation due to erosion, increased suspended solids loading, or accidental petroleum spills directly into a stream. Erosion results in suspended solids, which negatively affects many aquatic organisms, notably game fish that require relatively clear water for feeding and reproduction. The primary aquatic ecosystems that could be directly affected by the proposed project are the Pecos River, Toyah Creek, the few seasonally flooded reaches of its larger tributaries, and the scattered man-made ponds within the study area. Water quality degrades as a result of particulate loading caused by construction within stream beds, by clearing of riparian vegetation, and by siltation from erosion in newly disturbed areas. Particularly sensitive in this respect are gravel, riffle, and sand bottom habitats. Blanketing of these areas by fine sediments could eliminate habitats important for fish spawning, resident benthic invertebrates, the aquatic nymphal stages of dragonflies, mayflies and caddisflies, and freshwater mussels. These impacts would be largely, if not completely, obviated by appropriate industry-standard construction techniques. No heavy equipment will operate in flowing stream segments, and it is anticipated that a temporary road crossing of the Pecos River will not be required. Herbicides or other chemicals will not be used in areas where they might enter the aquatic ecosystems and cause significant adverse impacts to the aquatic communities therein. In addition, implementation of the SWPPP, if required, would further minimize any potential impacts to aquatic communities.

For the most part, the alternative routes would span streams at a perpendicular angle, thereby minimizing the amount of stream habitat affected. All the alternative routes would cross some open water, the majority of which are associated with the spanning of the Pecos River. Considering the avoidance measures used to plan and construct the proposed project, no significant impact to study area aquatic resources is anticipated.

7.4.2.3 Commercially or Recreationally Important Fish and Wildlife Species

Construction of the proposed project is not expected to have significant impacts on commercially or recreationally important species occurring within the study area.

Furbearers like the common raccoon, Virginia opossum, common gray fox, coyote, bobcat, and striped skunk, and game species, such as the white-tailed deer, mourning dove, northern bobwhite quail, and eastern cottontail rabbit, are very mobile and would leave the immediate vicinity during the initial construction phase. Wildlife in the immediate area may experience a temporary loss of browse or other forage vegetation during construction; however, the abundance of similar habitats in adjacent areas would minimize the effect of the loss. As noted in **Section 7.4.1.2**, impacts to aquatic habitat would be minimal thereby minimizing any impacts to fish in the study area.

7.4.2.4 Endangered and Threatened Fish and Wildlife Species

Although federally-listed threatened or endangered wildlife species may occur within the study area, it is unlikely that the proposed project would affect federally listed fish or wildlife species. This conclusion is based on consultation with TPWD (2018a) and reconnaissance surveys of the study area. Information from the USFWS indicates there is no designated critical habitat for any federally-listed threatened or endangered species within the study area. Five miles from the southwest corner of the study area is an identified critical habitat, located at East Sandia Springs in Reeves County, for the Pecos assiminea snail, phantom springsnail, phantom Tryonia, and diminutive amphipod. None of these species are expected to occur within the study area (USFWS, 2018b). For all listed and otherwise rare wildlife species, TPWD advised that precautions should be taken if any endangered, threatened, or rare animal species included on county rare species lists (see listing in **Table 3-14**) are known to occur in the study area or have been documented in the recent past (TPWD, 2018a).

Several of the endangered or threatened species and unlisted rare species of potential occurrence in the study area are either migratory and present only for brief periods, or highly mobile. These include the interior least tern, piping plover, and western burrowing owl.

Species, such as the federally-listed endangered Pecos gambusia, the state-listed threatened Pecos pupfish, and rare species like the speckled chub and headwater catfish are aquatic species limited to very specific aquatic habitats that can be easily avoided during construction. NDD records of the Pecos pupfish denotes the observation of the species in the Pecos River northeast of the City of Pecos (TPWD, 2018b). The species

has been observed both up and downstream of the study area, thus it is reasonable to assess that any stretch of the Pecos River has the potential for presence of the Pecos pupfish, which Links C1, C2, D31, and D41 cross. TPWD (2018a) recommends avoiding impacts to aquatic and riparian habitat and minimize number of crossings of major creeks and rivers. In addition, TPWD recommends that construction activities should avoid spawning periods whenever possible. Alternative route crossings over the Pecos River were selected for areas with prior disturbance that minimized paralleling the river, a measure that serves to avoid direct and indirect impacts to the aquatic resource.

The state-listed threatened Texas horned lizard is a possible resident of the area that has more limited mobility and could be harmed by the heavy machinery, should they occur within the ROW of the proposed project. TPWD (2018a) provides specific recommendations for the state-listed Texas horned lizard, recommending pre-construction surveys for suitable habitat and relocation when individuals are found. Exclusion recommendations to prevent individuals from re-entering the disturbance area are also provided. If suitable habitat cannot be avoided, TPWD further recommends that a permitted biological monitor be present during construction to relocate Texas horned lizards, if found, and to minimize disturbance of harvester ant mounds (the species' primary food source) during construction.

TPWD also provides recommendations for other rare species – black-tailed prairie dog, western burrowing owl, hooded skunk, western hog-nosed skunk, and western spotted skunk. TPWD recommends surveying the proposed project for the presence of black-tailed prairie dog colonies and avoiding these areas, if found, during construction and the locating of structures. Located colonies should also be surveyed for nesting western burrowing owls, which would be protected under the MBTA. Nesting areas should be avoided until eggs have hatched and the nestlings have fledged.

Endangered, threatened, or rare species listed in **Table 3-14**, but not mentioned in this section, are either extirpated within the study area (e.g., gray wolves) or are restricted to habitat within or near perennial water habitats (e.g., insects, crustaceans, fish, and mollusks), and are unlikely to be affected by construction and operation of the proposed project. Construction of transmission line towers that would span aquatic habitats would

not appreciably affect the quality or quantity of such habitat. Therefore, the populations of rare species that may be present are not expected to be affected.

7.5 Summary of Natural Resources Impacts

Several natural resource areas have been evaluated to determine the relative ecological impacts of the alternative routes. For the proposed project, these areas primarily included potential impacts to vegetation and wildlife. Although all the alternative routes have the potential to impact natural resources, none of the alternative routes for the proposed project are anticipated to have any significant impacts to the natural resources of the area.

7.6 Impacts on Community Values and Community Resources

Impacts on community resources can be classified into two areas: (1) direct effects, which are those effects that would occur if the location and construction of a transmission line results in the removal of a valued resource or loss of public access to a valued resource; and (2) indirect effects, or those effects 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, structures, or ROW.

Impacts on community resources, whether direct or indirect, can be more accurately gauged as they affect recreation areas, recreational resources, or the visual environment of an area (aesthetics). The sections that follow discuss impacts to community values and community resources.

7.7 Land Use Impacts

Land use impacts from transmission line construction are determined by the amount of land (of whatever 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. Noise and dust from construction, as well as disruption of traffic flow, may also temporarily affect residents and businesses in the area immediately adjacent to the ROW. Coordination between Oncor, AEP Texas, contractors, and landowners regarding access to the ROW, and construction scheduling, should minimize these disruptions. Most existing land uses may continue during construction.

The primary criteria considered to measure potential land use impacts from the proposed project include overall route length, proximity to habitable structures, length parallel to existing corridors (including apparent property boundaries), and potential impacts to park/recreation areas.

7.7.1 Urban/Residential

Important measures of potential land use impacts include the number of habitable structures located near each alternative route and the proximity of each habitable structure to the alternative route. Halff determined the number and distance of habitable structures located within 500 feet of the centerline of each alternative route through the interpretation of aerial photography and verification during reconnaissance surveys, where practical. The aerial photography used to determine the distance of habitable structures within 500 feet of the centerline of each alternative route has a horizontal accuracy of +/- 30 feet. To account for this level of accuracy, Halff identified all habitable structures within a measured distance of 530 feet of the alternative route centerline. Habitable structures within the study area near the alternative routes primarily consist of single-family residences (SFR) or ranch facilities concentrated near major highways, city streets, or ranch roads. The largest concentrations of habitable structures are associated with the northern portion of the study area, located near developed portions of the cities of Barstow and Pecos. Habitable structures within 530 feet of the alternative routes are documented in **Table 7-3** which provides distance and direction from the habitable structure to each link (attached as **Appendix F**), as well as a general description of the habitable structure. **Figures 3-1A** and **3-1B** show the location of habitable structures in **Table 7-3**, in relation to each link.

PUCT Substantive Rules Section 25.101(b)(3)(B) requires, among other things, that the PUCT consider whether new transmission line routes parallel existing compatible ROW, property lines, or other natural or cultural features in selection of a route. The length of alternative routes parallel to existing corridors (including apparent property boundaries) range between 13 and 49 percent of the total route length. These totals are reflected in in **Table 7-2** in **Appendix E**. The length parallel to compatible corridors is also through paralleling apparent property boundaries, roadways, and other existing transmission lines. Pipelines were not considered as existing compatible corridors. In several instances, portions of links may deviate from paralleling compatible ROW to account for habitable structures, oil and gas facilities, or other environmental or land use constraints. Alternative

routes were selected to avoid entirely the cities of Barstow and Pecos. Given the general isolation of the study area from urban centers, the proposed project should have minimal impacts on urban or residential areas.

7.7.2 Recreation Areas

As noted in **Table 7-2**, parks and recreation areas are identified as areas owned by a governmental body or an organized group, club, or church. Potential impacts to recreation areas include the disruption or preemption of recreational activities. Identified parks, trails, or other recreational points of interest were noted in the urban centers of the cities of Pecos and Barstow. No parks, trails, or recreational points of interest are within 1,000 feet of the proposed project. Impacts to parks/recreational areas are not anticipated as a result of the proposed project.

7.7.3 Agriculture

Impacts to agricultural lands can generally be ranked by degree of potential impact, with the least potential impacts occurring in areas where grazing is the primary use (pasture or rangeland) and the highest degree of potential impact occurring to cultivated cropland. Given that agriculture is the predominant land use for most of the entire study area, all the alternative routes would cross rangeland pasture. Since Oncor and AEP Texas will not fence the ROW for the proposed project or otherwise separate the ROW from adjacent lands, there would be no long-term or significant displacement of farming or grazing activities. Most existing land uses may be resumed following construction. In general, traveling irrigation systems or other aboveground mechanical components (e.g., windmills; water troughs) should not be adversely affected as a result of the proposed project.

7.7.4 Aesthetics

Aesthetic impacts, or impacts on 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. In the case of valued community resources and recreation areas, the significance of the impact is related to the importance of the existing setting in the use and/or enjoyment of an area.

Construction of the proposed project could have both temporary and permanent aesthetic effects. Temporary impacts may include views of the actual assembly and erection of the structures. Where wooded areas are cleared, the brush and wood debris could have an additional negative temporary impact on the local visual environment. Permanent aesthetic impacts from the proposed project may include the views of the structures and lines.

To evaluate aesthetic impacts, reconnaissance surveys were conducted to determine which segments of the proposed project would be visible from selected publicly accessible areas. These areas included those of potential community value, community resources, public recreation areas, and federal and state highways that cross the study area. Measurements were made to estimate the length of each alternative route that would fall within recreational or major highway foreground visual zone (i.e., one-half mile, unobstructed by topography, structures, or vegetation). This determination of the visibility of the transmission line from various points was calculated from USGS maps and recently flown aerial photography.

Halff's evaluation of potential aesthetic impacts first concentrated on the alternative links that would be within the foreground visual zone of the federal and state highways within the study area. Of the 53 alternative route links, parts of 15 links are within the one-half mile foreground visual zone of the mentioned facilities as summarized below in **Table 7-4**.

TABLE 7-4. LINK LENGTH WITHIN VISUAL FOREGROUND ZONE OF FEDERAL AND STATE HIGHWAYS

Highway Name	Link ID	Length (feet)
Business IH 20	C2	5,654
	D31	6,004
IH 10	K11	8,153
	K12	534
	K3	1,801
	L1	994
	L2	2,166
	Z	2,149
IH 20	C1	8,172
	C2	4,244
	D1	3,675
	D2	1,719
	D31	5,423
	D41	5,789
SH 17	C1	5,280
US 285	C1	8,534

Highway Name	Link ID	Length (feet)
	D1	6,403
	F3	5,539
	H1	6,856
	H2	5,290

The evaluation of potential aesthetic impacts also includes the proximity of the proposed project within the visual foreground zone of public parks and recreation areas. The discussion in **Section 7.7.2** considered potential interference of a transmission line with activities occurring in parks and recreation areas within 1,000 feet of the proposed project. In contrast, the evaluation considers the parks and recreation areas with links within the visual foreground zone, and whether the proposed project would affect aesthetic views from these areas. No alternative link was within the visual foreground zone of public parks and/or recreational areas within the study area, and thus there is no expectation for impacts to the aesthetic views of these areas.

7.7.5 Transportation/Aviation

Potential impacts to transportation could include temporary disruption of traffic and conflicts with proposed roadway and/or utility improvements and may include slightly increased traffic during construction of the proposed project. However, such impacts are usually temporary and short-term.

The FAA provided a letter dated June 1, 2018 in response to a solicitation for information relevant to the proposed project. The FAA's letter requested compliance with its guidelines for the construction of structures that may affect navigable airspace and provided instructions on the procedure for obtaining FAA approval for transmission lines proposed near an airport (FAA, 2000).

Typical transmission line structure heights would be approximately 125 feet for Oncor and 165 feet for AEP Texas. According to Federal Aviation Regulations (14 CFR Part 77), notification of the construction of the proposed project is required if structure heights exceed the height of an imaginary surface extending outward and upward at a slope of 100 to 1 for a horizontal distance of 20,000 feet from the nearest point of the nearest runway of a public or military airport having at least one runway longer than 3,200 feet in length; 50 to 1 for a horizontal distance of 10,000 feet from the nearest runway of a public

or military airport where all runways are less than 3,200 feet in length; or 25 to 1 for a horizontal distance of 5,000 feet for heliports.

Halff's review of federal and state aviation/airport maps and directories, aerial photo interpretation, and reconnaissance surveys identified:

- two FAA-registered airports with a runway greater than 3,200 feet in length within 20,000 feet of a proposed alternative route link;
- no FAA-registered airport with no runway greater than 3,200 feet in length within 10,000 feet of a proposed alternative route link;
- no private airstrips within 10,000 feet of a proposed route link; and
- no heliport within 5,000 feet of a proposed alternative route link.

Approximate nearest distances to alternative route links for these facilities, sorted by facility type, consistent with CCN application requirements, are provided in **Table 7-5**.

TABLE 7-5. AIRCRAFT LANDING FACILITIES WITHIN OR NEAR THE STUDY AREA.

Facility Name	FAA ID [1]	Facility Use	County	Distance to Link (feet)	Direction to Link
FAA Registered Airport with Runway Greater Than 3,200 Feet Within 20,000 Feet of Route [2]					
Pecos Municipal Airport	PEQ	Public	Reeves	9,780	Southeast to Link D1
				18,360	Northwest to Link C1
Gnaws Farm	96XA	Private	Reeves	19,270	Northeast to Link C1

Sources. DigitalGlobe, 2016; DigitalGlobe, 2017, FAA, 2018, TxDOT, 2017, RRC, 2018, NGS, 2016, Halff field reconnaissance in 2018.
Notes:
[1] Identification code assigned to facilities registered with the FAA.
[2] Airports and airstrip information CCN Application Question No. 21.

Once the PUCT selects a route, Oncor and AEP Texas will closely evaluate these constraints related to potentially affected airstrips along the selected route during the engineering phase of the proposed project and will notify and coordinate with the FAA as necessary.

7.7.6 Communication Towers

As noted in **Section 3.7.7**, several communication towers are within the study area. One link is located within 10,000 feet of one AM radio transmitter in the study area. No links are located within 2,000 feet of any FM radio transmitter based on Federal Communications Commission data and field reconnaissance. Several other communication towers are within 2,000 feet of four alternative links. The types of communications towers and approximate nearest distances from all towers to alternative route links within 2,000 feet (AM towers within 10,000 feet) are as follows:

AM Radio Towers

1. KIUN Tower – Link C1 is 6,890 feet to the northwest.

FM Radio Towers

There are no links within 2,000 feet of an FM radio transmitter

Other Communication Towers

1. Tower – Link D1 is 1,240 feet to the northwest;
2. Tower – Link E2 is 1,190 feet to the northeast;
3. Tower – Link H1 is 420 feet to the northwest;
4. Tower – Link J21 is 650 feet to the northeast; and
5. Tower – Link J21 is 940 feet to the west.

7.8 Cultural Resources Impacts

Construction activities associated with the proposed project have the potential to adversely impact cultural resources through changes in the quality of the archaeological, historical, or cultural characteristics that qualify a property to meet the eligibility for listing in the NRHP. These impacts occur when an undertaking alters the integrity of location, design, setting, materials, construction, or association that contribute to a resource's significance in accordance with the NRHP criteria.

As discussed in 36 CFR Part 800, adverse impacts on the NRHP or eligible properties may occur under conditions that include, but are not limited to:

- destruction or alteration of all or part of a property;

- isolation from or alteration of the property's surrounding environment (setting); or
- introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting.

Impacts may be direct or indirect. Direct impacts typically occur during construction. Indirect impacts include those caused by construction that occur later in time or are farther removed but are foreseeable. These impacts may include alterations in the pattern of land use, changes in population density, or accelerated growth rates, all of which may have an impact on properties with historical, architectural, archaeological, or cultural significance.

The preferred form of mitigation for direct or indirect impacts for cultural resources is avoidance. An alternative form of mitigation of direct impacts can be developed for archaeological 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.

One of the methods utilized to assess an area for potential prehistoric cultural resources is to identify high probability areas (HPA). 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 other areas where lithic resources could be found. When defining HPAs, a distance relationship to a water resource (about 1,000 feet) is set that would encompass landforms that may have attracted past human activity and are therefore deemed appropriate for the presence of cultural resource sites.

As a formal cultural resources survey has not been conducted for any of the alternative routes, the possibility of affecting unknown archaeological sites exists. Correspondence from THC (June 4, 2018) advised that "the proposed study area contains numerous recorded archaeological sites," and further recommended the identification of HPAs by a qualified archaeologist. HPAs along the alternative routes were identified using USGS topographic maps and soil survey data. Following PUCT approval of a route for the proposed project, a cultural resources survey will be conducted in accordance with the pre-approved research design developed by Oncor, AEP Texas and THC for new

transmission line studies. Any cultural resources discovered during this initial survey will be mitigated in consultation with the THC. In the event Oncor, AEP Texas, or their contractors encounter any archeological artifacts or other cultural resources during construction of the proposed project, Oncor and AEP Texas will cease work in the immediate vicinity of the resource and report the discovery to the THC. It is anticipated that the proposed project will have no substantial impacts to cultural resources.

A review of the maps at the TARL and the THC's Archeological Sites Atlas identified recorded archaeological sites and previously recorded historic structures in the study area. Further examination of the recorded sites' location identified those which appear to be within 1,000 feet of the alternative routes.

7.8.1 Historical Summary

As described in **Section 3.8.2.3**, no properties or districts are recorded in the NRHP within the study area. No farms or ranches recorded as a Century Farm or Ranch are in the study area (TDA, 2016). Six cemeteries were identified within the study area, one located in the City of Barstow and five located in the City of Pecos. A cemetery identified as the Barstow Cemetery during field investigations is over half a mile southeast of Link C3. None of the known cemetery locations are within 1,000 feet of an alternative route link. Of the 16 OTHM located within the study area, none are located within 1,000 feet of an alternative route link.

Field reconnaissance of the study area provided a better understanding of surviving property types in the region, and potentially historically significant resources were observed. Most of the study area retains a rural, agricultural character intermixed with industry. Typical historic resources in the study area vicinity may include intact farms or the remnants of farms, with structures consisting primarily of farmhouses, associated barns and outbuildings, fencing and other components including water storage tanks, troughs, animal pens, and windmills. These observations are based on views of areas in the region from public roadways, additional potentially historic features may be found in areas that are not visually accessible.

7.8.2 Archaeological Summary

Several archaeological sites are located within 1,000 feet of the ROW centerline of one or more alternative route links, as described below:

- Link B1 is 430 feet southeast of Site 41WR87;
- Link B1 is 100 feet northwest of Site 41WR98;
- Link D1 crosses Site 41RV6;
- Link D41 is 120 feet south of Site 41WR85;
- Link F3 is 80 feet east of Site 41RV67;
- Link F5 is 590 feet east of Site 41RV23;
- Link H2 is 40 feet east of Site 41RV42;
- Link H2 is 830 feet east of Site 41RV38; and
- Link K3 crosses Site 41RV3.

None of these sites is currently listed on the NRHP or designated as a SAL. However, records review alone could not determine whether each of these sites has been submitted to the THC for evaluation of its eligibility status.

Significant prehistoric sites recorded near the study area are generally associated with dunes, rock outcrops containing lithic materials useful for making stone tools, or significant water sources. Although permanent water sources are infrequent throughout the study area, the overall lack of significant development allows the possibility of intact archaeological material. Consequently, HPAs were identified within the study area. HPAs typically consist of areas that contain deep soils and lie within 300 meters (nearly 1,000 feet) of natural water sources. However, in this more arid environment, these areas include:

- uplands overlooking bodies of water, typically a major stream or river;
- terraces and bluffs adjacent to stream channels;
- dunes;
- outcrops containing lithic materials useful for making stone tools; and
- structures (including windmills) identified on historic maps.

Several links pass through HPAs. **Table 7-6** summarizes HPAs in relation to link crossings.

TABLE 7-6. ALTERNATIVE LINK PROXIMITY TO HIGH PROBABILITY AREAS FOR ARCHAEOLOGICAL SITES.

Link	High Probability Area [1]	Distance (feet)
Figure 3-1A		
A	Unnamed canal	150
B1	Potential historic resource	100
B1	Potential historic resource	360
B2	Unnamed canal	380
B2	Main Line Canal	360
B3	Unnamed canal	380
C1	Unnamed canal	180
C1	Lateral No 2 Canal	260
C1	Unnamed canal	210
C1	Lateral No. 1 Canal	360
C1	Unnamed canals, Pecos River crossing, railroad terrace crossing, and floodplain	18,780
C1	Railroad terrace crossing	610
C1	Railroad terrace crossing	360
C1	Salt Draw crossing and mapped elevation	3,900
C1	Potential historic resource	310
C1	Potential historic resource	280
C2	Gatuna, Lateral No. 2 Canal, Pecos River, and mapped elevation	31,900
C3	Main Line Canal	390
C4	Cedarvale Canal and unnamed tributaries of the Pecos River	7,530
C4	Unnamed canal	320
C4	Unnamed tributary crossings	2,650
D1	Dry Salt Lake of Toyah Lake	6,510
D1	Potential historic resource and unnamed tributaries of Salt Draw drainage	6,400
D1	Salt Draw crossing	3,570
D2	Toyah Creek crossing and Gatuna	4,220
D31	Unnamed tributaries to Quarry Draw and Pecos River crossings, floodplain, and elevation	46,130
D41	Unnamed tributary crossings	13,090
F1	Toyah Creek crossing and floodplain	6,320
F1	Unnamed tributary crossings and mapped elevation	5,340
F2	Toyah Creek crossing and floodplain	5,330
F3	Barrilla Draw crossing, dunes crossing, and floodplain	15,940
F3	Potential historic resource	50
G52	Unnamed tributary crossing	1,920
H1	Unnamed tributary crossings and mapped elevation	5,880
I2	Barrilla Draw crossing	2,540
I3	Unnamed tributary crossing to Barrilla Draw	1,960
J1	Mapped elevation and Gatuna	5,020
J1	Potential historic resource	60

Link	High Probability Area [1]	Distance (feet)
J1	Unnamed tributary crossing	2,080
J6	Tributary crossings of Barrilla Draw	3,640
K11	Sandia Creek	3,330
K11	Barrilla Draw and tributary crossings	8,130
K3	Unnamed tributaries and Barrilla Draw crossings	8,360
K3	Unnamed tributary crossing	1,920
K3	Potential historic resource	1,860
Figure 3-1B		
D41	Unnamed tributary crossings	4,180
D41	Unnamed tributary crossings	6,550
D41	Unnamed tributary to an unnamed playa lake	2,660
D41	Railroad terrace crossing	630
D41	Unnamed tributary crossing to Quito Draw and mapped elevation	4,680
D41	Unnamed tributary crossing to the Pecos River and mapped elevation	2,920
D41	Unnamed tributary crossing to the Pecos River	3,100
D41	Pecos River crossing, floodplain, and mapped elevation	24,210
D42	Mapped elevation	990
E3	Unnamed tributary crossing to Toyah Creek	2,040
E3	Unnamed tributary crossing	1,950
E4	Unnamed tributary crossings	5,340
F4	Unnamed tributary crossing	2,370
F4	Unnamed tributary crossings	6,720
F5	Unnamed tributary crossings and mapped elevation	5,550
F5	Unnamed tributary crossings and mapped elevation	13,970
H1	Unnamed tributary crossings	5,540
H1	Unnamed tributary crossing	2,310
H2	Unnamed tributary crossing	2,030
H2	Potential historic resource	220
J2	Unnamed playa lake	1,410
J3	Unnamed playa lake	1,820
K5	Hackberry Draw crossing	2,870

Note.
[1] Some HPAs occur in more than one figure, but are listed once within the table.

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8.0 LIST OF PREPARERS

Halff prepared this Environmental Assessment and Alternative Route Analysis for Oncor and AEP Texas. ARC provided assistance with the evaluation of potential impacts to cultural resources. **Table 8-1** provides a list of the project team with primary responsibilities for the preparation of this document.

TABLE 8-1. LIST OF PREPARERS.

Responsibility	Name	Title
Project Manager	Russell Marusak	Environmental Scientist
Assistant Project Manager	Chris Sanderson	Environmental Scientist
Physiography and Geology	Melissa Mills	Environmental Scientist
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Vegetation Ecology	Melissa Mills	Environmental Scientist
Fish and Wildlife Ecology	Melissa Mills	Environmental Scientist
Land Use/Aesthetics	Melissa Mills	Environmental Scientist
Cultural Resources	Molly Hall	Archaeologist – ARC
Maps/Figures/Graphics	Brian Jonescu	Environmental Scientist
Data Management/Quality Review	Chris Sanderson	Environmental Scientist

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Aerial Source	Aerial Imagery Date
DigitalGlobe	03/17/2017
DigitalGlobe	04/10/2017
DigitalGlobe	05/10/2017
DigitalGlobe	09/06/2017
DigitalGlobe	09/11/2017
DigitalGlobe	09/18/2017

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Map Name	Original Map	Photo-Revision	Map Name	Original Map	Photo-Revision
Balmorhea	1980	–	Hermosa SE	1970	–
Barstow 3 NE	1970	–	Ligon Ranch	1963	1981
Barstow 3 NW	1970	–	Old X Ranch	1963	1981
Barstow 3 SE	1970	–	Pecos East	1963	1981
Barstow 3 SW	1970	–	Pecos West	1971	1981
Belding NW	1970	–	Pyote West	1969	1981
China Lake	1963	1981	Quito Draw	1963	1981
Cox Draw	1980	–	Sand Lake	1961	1981
Coyanosa NW	1973	–	Saragosa	1970	–
Coyanosa SW	1974	–	Soda Lake	1961	1981
Deep Well Ranch NW	1970	–	Soda Lake SE	1968	1981
Hermosa	1970	–	Toyah Lake	1963	–
Tucker Hill	1970	–	Verhalen South	1970	–
Verhalen North	1971	–	Worsham	1971	–

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Appendix A
Agency Correspondence

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APPENDIX A
AGENCY CORRESPONDENCE

May 2018
Proposed Sand Lake—Solstice 345 kV transmission line project in Pecos, Reeves, and Ward Counties, Texas

AGENCIES

HALFF

May 24, 2018
AVO 34437

The Honorable Olga Abila
Mayor
City of Barstow
PO Box 98
Barstow, TX 79719-0098

Re: Oncor Electric Delivery Company, LLC's and AEP Texas Inc.'s proposed Sand Lake—Solstice 345 kV transmission line project in Reeves, Ward, and Pecos Counties, Texas

Dear Mayor Abila:

Oncor Electric Delivery Company LLC (Oncor) and AEP Texas Inc. (AEP) propose to construct a 345 kilovolt (kV) transmission line between the existing (under construction) Oncor Sand Lake Switch in Ward County and the existing AEP Solstice Switch in Pecos County. The Sand Lake Switch will be located proximal to the Pecos River approximately six miles northeast of the City of Pecos on the northwest side of Farm-to-Market Road 3398. The Solstice Switch is located along the north side of Interstate Highway 10 approximately 2.5 miles east of the Pecos/Reeves County Line. The distance between these project endpoints as shown in the attached map is approximately 40 miles.

Halff Associates is preparing an Environmental Assessment (EA) and Alternative Route Analysis to support an application for a Certificate of Convenience and Necessity (CCN) from the Public Utility Commission of Texas (PUC). Halff is currently in the process of gathering data on the existing environment and identifying environmental land use constraints within the project study area that will be used in the creation of an environmental and land use constraints map. Halff will identify potential alternative routes that consider environmental and land use constraints.

Halff is requesting that your office provide environmental and land use constraints information regarding existing or planned land development projects, city projects, or other areas of interest to the City of Barstow within the project study area. Your comments will be an important consideration in the evaluation of alternative routes and in the assessment of impacts. Upon certification of a final route for the proposed project, Oncor and AEP will determine the need for other approvals and/or permits. If your jurisdiction has approvals and/or permits that would apply to this project, please identify them in response to this inquiry. If permits are required from your office, Oncor and AEP will contact your office following certification of a final route.

Thank you for your assistance with this transmission line project. If you have any questions or require additional information, please contact me at (214) 346-6367. Your earliest reply will be appreciated.

Sincerely,
HALFF ASSOCIATES, INC.

Russell Marusak
Environmental / Natural Resources Team Leader

Attachment (1)

HALFF ASSOCIATES, INC.
1201 NORTH BOWSER ROAD RICHARDSON, TX 75081-2275
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HALFF

May 24, 2018
AVO 34437

The Honorable Elia Florez
Alderperson
City of Barstow
PO Box 98
Barstow, TX 79719-0098

Re: Oncor Electric Delivery Company, LLC's and AEP Texas Inc.'s proposed Sand Lake—Solstice 345 kV transmission line project in Reeves, Ward, and Pecos Counties, Texas

Dear Alderperson Florez:

Oncor Electric Delivery Company LLC (Oncor) and AEP Texas Inc. (AEP) propose to construct a 345 kilovolt (kV) transmission line between the existing (under construction) Oncor Sand Lake Switch in Ward County and the existing AEP Solstice Switch in Pecos County. The Sand Lake Switch will be located proximal to the Pecos River approximately six miles northeast of the City of Pecos on the northwest side of Farm-to-Market Road 3398. The Solstice Switch is located along the north side of Interstate Highway 10 approximately 2.5 miles east of the Pecos/Reeves County Line. The distance between these project endpoints as shown in the attached map is approximately 40 miles.

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Halff is requesting that your office provide environmental and land use constraints information regarding existing or planned land development projects, city projects, or other areas of interest to the City of Barstow within the project study area. Your comments will be an important consideration in the evaluation of alternative routes and in the assessment of impacts. Upon certification of a final route for the proposed project, Oncor and AEP will determine the need for other approvals and/or permits. If your jurisdiction has approvals and/or permits that would apply to this project, please identify them in response to this inquiry. If permits are required from your office, Oncor and AEP will contact your office following certification of a final route.

Thank you for your assistance with this transmission line project. If you have any questions or require additional information, please contact me at (214) 346-6367. Your earliest reply will be appreciated.

Sincerely,
HALFF ASSOCIATES, INC.

Russell Marusak
Environmental / Natural Resources Team Leader

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HALFF

May 24, 2018
AVO 34437

The Honorable Carol Guerrero
Alderperson
City of Barstow
PO Box 98
Barstow, TX 79719-0098

Re: Oncor Electric Delivery Company, LLC's and AEP Texas Inc.'s proposed Sand Lake—Solstice 345 kV transmission line project in Reeves, Ward, and Pecos Counties, Texas

Dear Alderperson Guerrero:

Oncor Electric Delivery Company LLC (Oncor) and AEP Texas Inc. (AEP) propose to construct a 345 kilovolt (kV) transmission line between the existing (under construction) Oncor Sand Lake Switch in Ward County and the existing AEP Solstice Switch in Pecos County. The Sand Lake Switch will be located proximal to the Pecos River approximately six miles northeast of the City of Pecos on the northwest side of Farm-to-Market Road 3398. The Solstice Switch is located along the north side of Interstate Highway 10 approximately 2.5 miles east of the Pecos/Reeves County Line. The distance between these project endpoints as shown in the attached map is approximately 40 miles.

Halff Associates is preparing an Environmental Assessment (EA) and Alternative Route Analysis to support an application for a Certificate of Convenience and Necessity (CCN) from the Public Utility Commission of Texas (PUC). Halff is currently in the process of gathering data on the existing environment and identifying environmental land use constraints within the project study area that will be used in the creation of an environmental and land use constraints map. Halff will identify potential alternative routes that consider environmental and land use constraints.

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Thank you for your assistance with this transmission line project. If you have any questions or require additional information, please contact me at (214) 346-6367. Your earliest reply will be appreciated.

Sincerely,
HALFF ASSOCIATES, INC.

Russell Marusak
Environmental / Natural Resources Team Leader

Attachment (1)

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May 24, 2018
AVO 34437

The Honorable Linda Martinez
Alderperson
City of Barstow
PO Box 98
Barstow, TX 79719-0098

Re: Oncor Electric Delivery Company, LLC's and AEP Texas Inc.'s proposed Sand Lake—Solstice 345 kV transmission line project in Reeves, Ward, and Pecos Counties, Texas

Dear Alderperson Martinez:

Oncor Electric Delivery Company LLC (Oncor) and AEP Texas Inc. (AEP) propose to construct a 345 kilovolt (kV) transmission line between the existing (under construction) Oncor Sand Lake Switch in Ward County and the existing AEP Solstice Switch in Pecos County. The Sand Lake Switch will be located proximal to the Pecos River approximately six miles northeast of the City of Pecos on the northwest side of Farm-to-Market Road 3398. The Solstice Switch is located along the north side of Interstate Highway 10 approximately 2.5 miles east of the Pecos/Reeves County Line. The distance between these project endpoints as shown in the attached map is approximately 40 miles.

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Sincerely,
HALFF ASSOCIATES, INC.

Russell Marusak
Environmental / Natural Resources Team Leader

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