common persimmon (*Diospyros virginiana*), sweetgum, sassafras (*Sassafras albidum*), greenbrier (*Smilax*), yaupon (*Ilex vomitoria*), wax myrtle, American beautyberry (*Callicarpa americana*), hawthorn, supplejack, winged elm (*Ulmus alata*), beaked panicum (*Panicum anceps*), sprangle grass (*Uniola paniculata*), Indiangrass (*Sorghastrum*), switchgrass (*Panicum virgatum*), and three-awn (*Aristida*).

4.4.5 Threatened and Endangered Plant Species

According to TPWD and the U.S. Fish and Wildlife Service (USFWS), one federally (and state) listed threatened plant species is known or likely to occur within the study area. Earth fruit (*Geocarpon minimum*) is found in vegetated edges of slick spots in saline barren complexes associated with the floodplains of the Neches River. Due to the distance between the study area and the Neches River, this species is not likely to occur within the study area.

4.4.6 Wetlands

Wetlands are especially valued because of their location on the landscape, the wide variety of ecological functions they perform, their ability to store or convey floodwaters, and the uniqueness of their vegetation and animal communities. Wetlands also provide high-quality habitats for wildlife, including foraging and nesting areas for birds and spawning and nursery areas for fish, and sites for educational research. Figure 3-2 shows the USFWS National Wetland Inventory (NWI) data within the study area.

Based on the NWI data, there are a multitude of distinctive types of wetland categories in the study area. These various wetland types fall into three broad categories: lacustrine, palustrine, and riverine. The palustrine system includes all non-tidal wetlands dominated by trees, shrubs, and emergent vegetation (herbaceous plants). The riverine system includes all wetlands and deepwater habitats contained within a channel, except for wetlands dominated by trees, shrubs, persistent emergents, emergent moss, or lichens, and habitat with water containing ocean-derived salts in excess of 0.5 percent. The lacustrine system includes all wetlands and deepwater habitats located in a topographic depression or a dammed channel; lacking trees, shrubs, and emergent vegetation; and exceeding 20 acres in size or 2 meters in depth at low water (Cowardin et al, 1979). The majority of the wetlands occurring within the study area belong to the palustrine system. The study area contains five main groups of palustrine wetlands: emergent, forested, scrub-shrub, unconsolidated shore, and unconsolidated bottom. The riverine wetlands include lower perennial unconsolidated shore and lower perennial unconsolidated bottom. These riverine wetlands are associated with the Sabine River located in the eastern portion of the study area.

4.4.7 Wildlife

The study area shown in Figure 3-1 is primarily used for timber, oil, and gas production. The majority of the land found within the study area that is not currently used for timber, oil, or gas production is used for livestock production. Native wildlife is found throughout the study area in the pine plantations and, to a lesser extent, in the pasture lands.

Mammals that are likely to occur within the study area include: white-tailed deer (*Odocoileus virginianus*), bobcat (*Lynx rufus*), coyote (*Canis latrans*), gray fox (*Urocyon cinereoargenteus*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), striped skunk (*Mephitis mephitis*), armadillo (*Dasypus novemcinctus*), and cottontail rabbit (*Sylvilagus floridanus*) (TPWD, 2015c).

Birds commonly encountered within the study area include: the double-crested cormorant (*Phalacrocorax auritus*), great blue heron (*Ardea herodias*), great egret (*Ardea alba*), cattle egret (*Bubulcus ibis*), black vulture (*Coragyps atratus*), turkey vulture (*Cathartes aura*), wood duck (*Aix sponsa*), red-shouldered hawk (*Buteo lineatus*), red-tailed hawk (*Buteo jamaicensis*), northern bobwhite (*Colinus virginianus*), American coot (*Fulica americana*), killdeer (*Charadrius vociferous*), common snipe (*Gallinago delicate*), ring-billed gull (*Larus delawarensis*), rock dove (*Columba livia*), mourning dove (*Zenaida macroura*), yellow-billed cuckoo (*Coccyzus americanus*), eastern screech owl (*Megascops asio*), barred owl (*Strix varia*), red-bellied woodpecker (*Melanerpes carolinus*), downy woodpecker (*Picoides pubescens*), Carolina chickadee (*Poecile carolinensis*), tufted titmouse (*Baeolophus bicolor*), Carolina wren (*Thryothorus ludovicianus*), northern cardinal (*Cardinalis cardinalis*), American robin (*Turdus migratorius*), and the scissor-tailed flycatcher (*Tyrannus caudifasciatus*) (Wolfe, 2001).

Amphibians and reptiles likely to occur within the study area include: the marbled salamander (*Ambystoma opacum*), bronze frog (*Rana clamitans clamitans*), Louisiana milk snake (*Lampropeltis Triangulum amaura*), southern leopard frog (*Rana sphenocephala*), southern copperhead (*Agkistrodon contortrix contortrix*), western cottonmouth (*Agkistrodon piscivorus leucostoma*), and timber rattlesnake (*Crotalus horridus*) (TPWD, 2015c).

Fish likely to occur within the study area lakes and rivers/creeks include: the spotted gar (*Lepisosteus oculatus*), largemouth bass (*Micropterus salmoides*), flier (*Centrarchus macropterus*), redfin shiner (*Lythrurus umbratilis*), warmouth (*Lepomis gulosus*), and flathead catfish (*Pylodictis olivaris*) (TPWD, 2015c).

Various species throughout the study area are considered recreationally or commercially valuable. These species provide human benefits as a result of both non-consumptive recreational activities and hunting

activities. Non-consumptive activities include bird-watching, wildlife photography, etc. These types of activities apply to all wildlife within the study area. The majority of recreational activity in the study area consists of hunting. Commonly hunted animals within the study area include: white-tailed deer, squirrel, rabbit, dove, quail, and various types of migratory waterfowl. The relative abundance of streams and lakes in the study area make the area likely to be used as a recreational or commercial fishery. Major rivers, such as the Sabine River, provide recreational fishing but have no known commercial fisheries. Common game fish in Murvaul Lake include largemouth bass, channel catfish (*Ictalurus punctatus*), flathead catfish (*Pylodictis olivaris*), black crappie (*Pomoxis nigromaculatus*), white crappie (*Pomoxis annularis*), bluegill (*Lepomis macrochirus*), and various species of sunfish (TPWD, 2015c). Other lakes found within the study area would be anticipated to contain similar species.

4.4.8 Threatened and Endangered Animal Species

According to TPWD and USFWS, 25 threatened or endangered species (excluding those known to be extirpated) are known or likely to occur within the study area in Rusk and Panola Counties (Table 4-2). Figure 3-2 depicts the Texas Natural Diversity Database (TXNDD) data related to threatened or endangered species received from TPWD; it contains the location of two state-listed but no federally listed threatened and endangered species locations within the study area. The TXNDD only contains documented occurrences of species that have been reported to TPWD, and, thus, the absence of records in the TXNDD is not evidence of the lack of sensitive species.

Only those species listed as threatened or endangered by USFWS are protected by federal law. A brief description of habitats used by the 25 protected species listed by TPWD and USFWS within the counties crossed by the project is provided below.

The peregrine falcon inhabits open areas usually associated with high cliffs and bluffs over rivers and coasts, but they may also nest on buildings and bridges in urban areas. These falcons are observed most often during the spring and fall migration, especially in areas with high concentrations of shorebirds and waterfowl (TPWD, 2015d). Both the peregrine falcon and its subspecies, American peregrine falcon (*Falco peregrinus anatum*), are state-listed as threatened.

Bachman's sparrow is a small bird that inhabits pine forests with a grass understory, regenerated pine clearcuts, or open grassy habitats. Bachman's sparrow is a ground nesting bird with the nest formed from woven grasses (Shackleford, 1997).

Table 4-2: Protected Species that are Known or Likely to Occur within the Study Area

Species	State Status[a]	Federal Status[a]	Counties of Occurrence	Potential for Occurrence in Study Area
Peregrine falcon (*Falco peregrinus*)	T	DL	Rusk & Panola	Likely
Bachman's sparrow (*Aimophila aestivalis*)	T	--	Rusk & Panola	Likely
Bald eagle (*Haliaeetus leucocephalus*)	T	DL	Rusk & Panola	Likely
Interior least tern (*Sterna antillarum athalassos*)	E	LE	Rusk & Panola	Likely
Piping plover (*Charadrius melodus*)	T	LT	Rusk & Panola	Likely
Sprague's pipit (*Anthus spragueii*)	--	C	Rusk & Panola	Likely
Wood stork (*Mycteria americana*)	T	--	Rusk & Panola	Likely
Red-cockaded woodpecker (*Picoides borealis*)	LE	E	Panola	Likely
Red knot (*Calidris canutus rufa*)	--	T	No county specified by USFWS	Not likely
Creek chubsucker (*Erimyzon oblongus*)	T	--	Rusk & Panola	Likely
Paddlefish (*Polyodon spahula*)	T	--	Rusk & Panola	Likely
Blackside darter (*Percina maculata*)	T	--	Panola	Not likely
Black bear (*Ursus americanus*)	T	T/SA	Rusk & Panola	Likely
Louisiana black bear (*Ursus americanus luteolus*)	T	LT	Rusk & Panola	Not likely, extirpated
Rafinesque's big-eared bat (*Corynorhinys rafinesquii*)	T	--	Rusk & Panola	Likely
Red wolf (*Canis rufus*)	E	LE	Rusk & Panola	Not likely, extirpated
Alligator snapping turtle (*Macrochelys temminckii*)	T	--	Rusk & Panola	Likely
Northern scarlet snake (*Cemophora coccinea copei*)	T	--	Rusk & Panola	Likely
Texas horned lizard (*Phrynosoma cornutum*)	T	--	Rusk	Likely
Timber rattlesnake (*Crotalus horridus*)	T	--	Rusk & Panola	Likely
Louisiana pigtoe (*Pleurobema riddellii*)	T	--	Rusk & Panola	Likely
Sandbank pocketbook (*Lampsilis satura*)	T	--	Rusk & Panola	Likely
Southern hickorynut (*Obovaria jacksoniana*)	T	--	Rusk & Panola	Likely
Texas heelsplitter (*Potamilus amphichaenus*)	T	--	Rusk & Panola	Likely
Texas pigtoe (*Fusconaia askewi*)	T	--	Rusk & Panola	Likely
Earth fruit (*Geocarpon minimum*)	T	LT	Panola	Likely

Source: TPWD & USFWS, 2015

(a) E – Endangered, T – Threatened, LE – Listed Endangered, LT – Listed Threatened, C – Concern, T/SA – Threatened due to similarity of appearance.

During winter, bald eagles congregate near rivers and reservoirs with open water and often near large concentrations of waterfowl. They usually perch within a riparian corridor or along lake shores where there is limited human activity. In addition to feeding on fish, bald eagles also feed on dead or crippled waterfowl, small mammals, and carrion. During winter nights, bald eagles may congregate at communal roosts (TPWD, 2015e).

Interior least terns nest in small colonies on sandbar islands in major rivers and sand and gravel pits. Suitable nesting sites have sparse or no vegetation and are well back from the water line. Interior least terns forage along shorelines, sandbar margins, backwaters, and chutes usually within a few hundred meters of the nesting colony. Their diet consists almost entirely of small fish, primarily minnows (TPWD, 2015f).

Piping plovers have similar habitat requirements to the interior least tern and are often found nesting in close proximity to the interior least tern. Piping plovers live on open sandy beaches or rocky shores, often in high, dry sections away from water. Nests are typically located near small clumps of grass, drift, or other windbreak. They mainly eat small insects, marine worms, and crustaceans (TPWD, 2015g).

Sprague's pipit are found in Texas and Mexico where they overwinter on open grasslands and coastal prairies. Sprague's pipit prefers a mix of native prairie grasses with minimal shrub and tree growth; however, they have adapted to use grassy roadsides, turf farms, and pastures with introduced grasses (USFWS, 2010).

Wood storks nest primarily in the upper sections of cypress trees and dead hardwoods that are located over water or adjacent to lakes. The wood stork feeds primarily on fish found in shallow waters like marshes, swamps, and flooded fields (Natureserve, 2015a).

Red-cockaded woodpeckers roost and nest in cavities within live pine trees. Red-cockaded woodpeckers live in family groups and only use large old pines to create the cavities in which they nest. They prefer open pine forests with widely spaced older trees and are typically found in clusters that include from 1 to 30 cavity trees (TPWD, 2015h).

The red knot is a migratory bird that is one of the longest-distance migrants, with some birds traveling more than 9,300 miles from south to north in the spring. Due to the long travel distances, Red knots rely on stop-over areas that are rich in easily digestible food that includes juvenile clams and mussels and horseshoe crab eggs (USFWS, 2013).

The creek chubsucker is a freshwater fish typically found in small rivers and creeks and rarely found in impounded waters like lakes and ponds. The young of this species are typically found in headwaters and occasionally in lakes (Natureserve, 2015b).

Paddlefish prefer to live in slow moving water like that found in large rivers and reservoirs with water deeper than 4 ft. Paddlefish feed on plankton found in the water; the plankton are filtered through the fish's gill rakers. Spawning season is from March through June, and eggs are broadcast over gravel or sandbars. Paddlefish are often referred to as spoonbill, spoonbill cat, and shovelnose cat, but the paddlefish is not related to catfish. Historically, paddlefish have been found in the Sabine River (TPWD, 2015i).

Blackside darter is a freshwater fish that is typically found in creeks and small to medium sized rivers. They prefer quiet pools and pools with small amounts of current with gravel or sand substrate (Natureserve, 2015c).

The Louisiana black bear (a subspecies of the American black bear) is not known to occur within Texas. However, suitable habitat for the Louisiana black bear has been identified within the eastern portion of the state. All subspecies of black bear that occur within Texas are state-listed species and are also federally listed due to the similarity of appearance to the federally listed Louisiana black bear (TPWD 2015j). Black bears are classified as habitat generalists, being able to make use of a wide variety of habitats, but they prefer bottomland hardwood forests that have a large species diversity (USFWS, 2015a).

Rafinesque's big-eared bats roost in cave entrances, hollow trees, abandoned buildings, and under bridges. Unlike most other bats, Rafinesque's big-eared bats are nocturnal instead of crepuscular (active at twilight hours). Their diet consists primarily of moths but will also include beetles, mosquitos, and flies (TPWD, 2015k).

The red wolf is extirpated from the state and is not anticipated to occur within the study area.

Alligator snapping turtles are typically found in slow-moving, deep water associated with rivers, oxbows, canals.

Northern scarlet snake is found in hardwood, pine, and mixed forests with sandy or loamy well-drained soils (Natureserve, 2015d).

Texas horned lizards are found in arid and semiarid habitats in open areas with sparse plant cover. They feed on ants and other small insects, are found on loose sand or loamy soils, and dig burrows for hibernation and nesting (TPWD, 2015l).

Timber rattlesnake are the second largest venomous snake found in Texas and prefer moist lowland forests and hilly woodlands located near permanent bodies of water. Timber rattlesnakes are more likely to rely on their camouflage than to use their rattle and attack a threat that is provoking them (TPWD, 2015m).

The counties crossed by the project include several protected mollusk species. Louisiana pigtoe are mollusks that are found in streams and moderately sized rivers with substrates of mud, sand, and gravel. Louisiana pigtoes are not typically found in impounded water bodies and are typically found at depths of 20 ft. or less. Sandbank pocketbooks are mollusks that are found in small to large rivers with substrates of gravel or sand that also have a moderate flow. Southern hickorynuts are mollusks that are found in small to large rivers with substrates of gravel and moderate flow. Texas heelsplitters are mollusks that are found in small to medium rivers with substrates of mud or sand and can also be found in reservoirs. Texas pigtoes are mollusks that are found in rivers with substrates comprised of a mixture of mud, sand, and fine gravel.

4.5 Social Resources

The following is a description of the social resources located in the study area. Topics addressed include community values and resources and socioeconomic patterns.

4.5.1 Community Values and Community Resources

The term "community values" is included as a factor for the consideration of transmission line certification under PURA § 37.056(c)(4)(A)-(D). Community values have been interpreted in different ways. Past decisions by the PUCT have included the following within the discussion of community values:

- A shared appreciation of an area or other natural or human resource by members of a national, regional, or local community;
- Amplitude Modulation (AM), Frequency Modulation (FM), microwave, and other electronic installations in the area;
- Approvals or permits required from governmental agencies;
- Comments received from community leaders and the public;

- Description of the area traversed;
- FAA-registered airstrips, private airstrips, and heliports in the area;
- Habitable structures within 500 ft. of the centerline of the proposed project;
- Irrigated pasture or cropland utilizing center-pivot or other traveling irrigation systems; and
- Public meeting or public open-house participation.

In addition to the above mentioned items, Burns & McDonnell also evaluated the proposed project for community resources that may be important to a particular community as a whole, but may not be specifically identified by the PUCT, such as: parks or recreational areas, schools, cemeteries, historical and archeological sites, or scenic vistas within the study area.

Burns & McDonnell mailed consultation letters to federal, state, and local officials (Appendix A) and attended two public open-house meetings hosted by Garland and Rusk to identify and collect information regarding community values and community resources. These community values and community resources are discussed in the following sections.

4.5.1.1 Land Use and Development Patterns

Land use throughout the study area is dominated by timberland and oil and gas production, with some smaller areas of pasture land. The pasture land is fairly evenly dispersed throughout the study area, except for the area along the Sabine River, which is almost exclusively forested. The developed land is primarily found around the various towns in the study area. The largest percentage (74 percent) of the land found in the study area is forested land.

4.5.1.2 Agriculture

Agriculture in Rusk County consists primarily of the production of beef cattle. According to the 2012 Census of Agriculture, the total number of cattle and calves in Rusk County was 36,731 from 922 cattle farms. The top crop item was forage (hay, grass silage, and greenchop). The total acreage dedicated to forage crops in the county was 31,242 acres. There are records of corn, peanuts, vegetables, potatoes, and orchards within Rusk County. The acreage of agricultural land in the county is slowly decreasing. From 2007 to 2012, land in farms was down 8 percent from 300,900 acres to 274,327 acres (USDA, 2012 and 2007).

The main agricultural enterprise in Panola County in 2012 also was the production of beef cattle. According to the 2012 Census of Agriculture, the total number of cattle and calves produced in Panola County was 33,563 from 701 cattle farms. The number of forage production farms ranked second, with

561 farms. Other agricultural income was derived from the production and sale of swine, sheep, eggs, sorghum, cotton, vegetables, potatoes, orchards, and edible beans. The acreage of agricultural land in the county has increased. From 2007 to 2012, land in farms increased 4 percent from 217,757 acres in to 227,369 acres (USDA, 2012 and 2007).

4.5.1.3 Urban and Residential Areas

Urban development primarily occurs within the few municipalities located in the study area, including Carthage and Gary City. The majority of the study area consists of scattered rural residences. The total number of housing units follows a similar trend as the total population, as discussed in Subsection 4.5.2.1. Panola County had the lowest number of housing units for the study area, with 10,920 in 2010. Rusk County had 21,191 housing units in 2010 (USCB, 2010).

Both counties have Independent School Districts (ISDs) located within the study area. Rusk County has 11 ISDs and Panola County has 7 ISDs. One of the ISDs is in both counties, for a total of 17 ISDs across both counties. Of the 11 ISDs that occur within Rusk County, only 1 is located within the study area. Of the seven ISDs that occur within Panola County, four are located within the study area. Due to the rural nature of the study area, most of the schools within the ISDs are located within towns located outside of the study area. Gary City School located in the city of Gary is the only school located within the study area (Texas Education Agency, 2015).

4.5.1.4 Park and Recreation Areas

Several park and recreation areas are located within the study area. George W. Pirtle Scout Reservation is located along the eastern edge of Lake Murvaul in the south-central portion of the study area and is one of the largest recreation areas in the study area. The Sabine River Authority has land located along the south bank of the Sabine River in the southeastern portion of the study area and offers boat ramps to launch boats onto the Sabine River, a recreation area, and hunting areas. There are several other public boat ramps found throughout the study area, and they are primarily associated with Lake Murvaul and the Sabine River. Gary City School also has associated recreational facilities, including tennis courts, a baseball field, and a basketball court. In addition to these park and recreation areas, private landowners within the study area often use their land for hunting, fishing, wildlife, bird watching, and other recreational activities that are not available to the general public.

4.5.1.5 Transportation and Aviation

The study area is traversed by U.S. and state highways, county roads, Farm-to-Market (FM) roads, and local streets, as shown on Figure 3-2. One U.S. highway (U.S. 59) traverses the central portion of the

study area roughly from north to south. Two state highways (SH 149 and SH 315) are located in the study area. SH 149 serves as a bypass connecting U.S. 79 and U.S. 59 and is located in the southwestern portion of the city of Carthage. SH 315 runs northeast through the western portion of the study area.

A review of the FAA National Flight Data Center (NFDC) GIS data identified one public airport within 20,000 ft. of the study area (NFDC, 2015). Field reconnaissance did not identify any additional airports that are not on file with the FAA. Panola County-Sharpe Field is the only identified public airport within 20,000 ft. of the study area and is located approximately 6,600 ft. north of the study area. During the public open house meetings, a landowner identified the alignment of a new proposed private airstrip and provided a letter from the FAA indicating its approval. This airport is called the Hilltop Springs Airport.

One active railroad (Burlington Northern Santa Fe) traverses the study area and runs approximately north to south, connecting Carthage, Gary City, and Tenaha.

4.5.1.6 Utility Facilities

Existing utilities within the study area include existing 115-kV, 138-kV, and 345-kV electric transmission lines and associated substations primarily owned and operated by Oncor Electric Delivery and Southwestern Electric Power Co. (Figure 3-2). Cooperative utilities, including Deep East Texas Electric Cooperative, Panola Harrison Electric Cooperative, and Rusk County Electric Cooperative, also own and operate transmission lines, distribution lines, and substations within the study area. There are multiple oil and gas collection, transmission, and distribution-level facilities throughout the study area. The study area contains a large number of oil and gas wells, as well as associated collection lines, pump stations, and compressor stations owned and operated by a number of different pipeline companies.

4.5.1.7 Visual Character

The visual character of an area is a function of the terrain, land cover, and land use. Throughout the study area, the land cover is comprised primarily of pine plantations with intermittent pastureland. Land is dominated agriculturally by pine plantations with the occasional livestock production area. There are scattered residential areas and municipalities. Physiographically, the terrain of the study area is generally characterized as rolling hills. The rolling hills are primarily located within the southwestern portion of the study area, and the terrain generally flattens out towards the east and north. Both the rolling hills and predominant woodlands help to limit long view spans throughout the study area.

4.5.1.8 Communication Towers

Several communication towers were identified within the study area. The communication towers are primarily located near towns, cities, and main highways and appear to be primarily microwave

communication towers (Federal Communications Commission [FCC], 2015). Other than microwave communication towers, several cellular, business/industrial, and public safety radio installations were also identified in the study area.

4.5.2 Socioeconomic Patterns

The following is a description of the socioeconomic patterns in the study area, including population, employment, and income.

4.5.2.1 Population

According to the U.S. Census Bureau (USCB), in 2010, the estimated population of Rusk County was significantly higher than Panola County. Between the 2000 census and the 2010 census, the populations of both Rusk and Panola Counties increased (Table 4-3).

Table 4-3: Population Data by County

County	2000 Population	2010 Population	Percent Change
Rusk	47,372	53,336	12.6%
Panola	22,756	23,796	4.6%

Source: USCB, 2000 and 2010

4.5.2.2 Employment and Income

Table 4-4 summarizes employment sectors by county for the study area. According to USCB data, Rusk County had approximately 21,720 persons in the civilian work force and an unemployment rate of 3.4 percent in 2010. Rusk County had approximately 22 percent of the civilian work force employed in the educational services, and health care and social assistance sector. The mean household income for Rusk County was $61,263 per year in 2010.

Panola County had approximately 10,000 persons in the civilian work force and an unemployment rate of 3.4 percent in 2010. Panola County had approximately 21 percent of the civilian work force employed in both the agriculture, forestry, fishing and hunting, and mining sector and the educational services, health care and social assistance sector. The mean household income for Panola County was slightly higher than Rusk County, at $67,278 per year.

Table 4-4: Employment by Sector (2010)

Sector	Rusk County		Panola County	
	Persons Employed	Percentage	Persons Employed	Percentage
Educational services, and health care and social assistance	4,692	21.6%	2,113	21.1%
Agriculture, forestry, fishing and hunting, and mining	2,302	10.6%	2,110	21.1%
Manufacturing	2,308	10.6%	813	8.1%
Retail trade	2,059	9.5%	897	9.0%
Construction	1,887	8.7%	972	9.7%
Arts, entertainment, and recreation, and accommodation and food service	1,499	6.9%	302	3.0%
Professional, scientific, and management, and administrative and waste management services	1,398	6.4%	476	4.8%
Other services except public administration	1,300	6.0%	479	4.8%
Transportation and warehousing, and utilities	1,240	5.7%	638	6.4%
Public administration	1,199	5.5%	355	3.5%
Wholesale trade	822	3.8%	325	3.2%
Finance and insurance, and real estate and rental and leasing	754	3.5%	492	4.9%
Information	260	1.2%	32	0.3%
Total employed populations 16 years and over	21,720	--	10,004	--

Source: USCB, 2010

4.6 Cultural Resources

Cultural resources are defined as sites, features, structures, or properties that are 50 years old or older and that may hold significant cultural, historical, or scientific value. Section 106 of the National Historic Preservation Act secures the protection and review of cultural resources by ensuring that they are considered as part of federal project planning, funding, and permitting. Regulations developed by the Advisory Council on Historic Preservation direct the implementation of the Section 106 process. The National Register of Historic Places (NRHP), administered by the Secretary of Interior, establishes significance criteria for inclusion on the register. Cultural resources are evaluated based on these criteria, and may be considered historic properties if they meet the criteria and are determined eligible for inclusion or if they are placed on the NRHP by the Secretary of the Interior. In addition, cultural resources that have not been discovered or evaluated, but may meet eligibility criteria, are considered historic properties.

The Texas, archaeological record is divided into four periods: Paleo-Indian (beginning 9200 B.C., perhaps earlier, and lasting to around 6000 B.C.), Archaic (commencing around 6000 B.C. and lasting up to A.D. 700 or the beginning of the Christian era in some locales), Late Prehistoric (beginning approximately A.D. 700 and lasting until A.D. 1600), and Historic. The beginning and ending of an archaeological period is not clearly defined and is affected by a variety of influences, including the size of the area in question, diversity in both local and regional ecosystems, and the amount of archaeological work conducted in an area. The following subsections describe the prehistoric and historic periods in the Texas archaeological record.

4.6.1 Prehistoric Cultural Background

The following subsections describe the three prehistoric periods: Paleo-Indian, Archaic, and Late Prehistoric.

4.6.1.1 Paleo-Indian Period

Currently, estimates of initial human occupation in the Americas vary from 11,200 to 200,000 years ago. However, the earliest, most well-documented evidence is the Clovis Complex, so named for the diagnostic projectile points of the period: distinctive lanceolate-shaped, fluted points and other chipped stone artifacts (e.g., side scrapers, end scrapers, drills, burins, gravers, and knives). The better-known Clovis sites in Texas include the Gault Site in Central Texas, the Aubrey Site in Denton County, and the Miami site, a mammoth kill site, in Roberts County. None of these sites are in the study area. The Clovis period occurred during the Late Pleistocene, and tight dating of such sites, combined with widespread Clovis point distribution, makes the type an excellent horizon marker. The Folsom Complex follows the Clovis Complex, beginning around 8800 to 8200 B.C. It is named for the type site and distinctive projectile point. Folsom points are also lanceolate-shaped, fluted points with concave bases. The differences between the two are in the morphology. Clovis fluting consists of the removal of several flakes whereas Folsom fluting consists of the removal of one long flake covering nearly the entire surface of the point.

Other projectile points that define subsequent Paleo-Indian occupations include Dalton, San Patrice, and Plainview, all of which coincide with the terminal Pleistocene-emergent Holocene geologic period. This period was a time of great environmental change (Delcourt and Delcourt, 1981). As vegetation changed significantly, megafauna were vanishing and hunter-gatherers were adapting to a warmer and more diverse environment. Also during this period, humans began exploiting forest mammals and increasing their reliance on plant foods. A change in lithic technology reflects adaptations for the exploitation of changing available resources. Scottsbluff, Golodondrina, and Angostura projectile points are examples of

this change, with Angostura marking the end of the period (Hester and Turner, 1999). At the end of the Paleo-Indian period, there is great diversification of point types, and some groups appear to retain their tool manufacturing and settlement patterns (Hester and Turner, 1999).

4.6.1.2 Archaic Period

The Archaic period is marked by the start of the Hypsithermal climatic episode. This episode was a period of warmer and drier climates that led to a vegetation shift. As a result of the climatic change, previously exploited larger species became extinct, necessitating the exploitation of smaller mammals, such as white-tail deer, rabbits, and squirrels. The Archaic peoples continued with hunting and gathering practices, exhibiting changes in the style of projectile points and tools, changes in the distribution of site types, and introduction of grindstone tools and implements. These changes indicate a gradual population increase and greater reliance on abundant plant and animal resources.

The Archaic period covers a broad span of prehistory in Texas and is divided into three periods: Early, Middle, and Late. Each period is defined by changes in cultural patterns, which include specific artifact forms, methods of hunting, types of sites utilized, and other elements (Hester and Turner, 1999). The Early Archaic dates from 6000 to 2500 B.C. and is the least understood. Settlements during this time appear to be small, dispersed, and highly mobile. Distinctive lithic artifacts include Martindale, Uvalde, Early Triangular, Andice, and Bell or Calf Creek projectile points. The Middle Archaic, beginning around 2500 B.C. and continuing up to 1000 B.C., is typified by significant population growth, increased site densities, and occurrence of Fary and Kent, Pedernales, Langtry, and Tortugas projectile points. In addition, associated burnt rock middens begin to appear. The Late Archaic, dating from 1000 B.C. to A.D. 700, maintains settlement and subsistence patterns of the previous period but is marked by distinctive projectile points, such as Ensor, Darl, Frio, and Fairland. Diversity is represented regionally, with cemeteries more prominent in the southeast; bison kill sites occurring in Central Texas, lower Pecos, the Panhandle, and the South Plains; the emergence of more permanent settlements in east Texas; and the occurrence of many rock art sites, particularly in the lower Pecos (Hester and Turner, 1999).

4.6.1.3 Late Prehistoric Period

The Late Prehistoric period (A.D. 700 to the beginning of the historic period) is distinguished by the emergence of pottery and the appearance of small arrow points, which mark the introduction of the bow and arrow across the region. Bison hunting was common throughout the period, while more sedentary villages, ceremonial centers, and established social hierarchies emerged in some groups, such as the Caddoan. Local types of projectile points include Livermore in the Trans-Pecos, Friley and Catahoula on the Texas-Louisiana border, Lott and Garza on the Llano Estacado, and McGloin and Bulbar Stemmed on

the coast. Some styles that developed with the use of the bow and arrow include the Scallorn and Perdiz. Late Prehistoric people also participated in long-distance trade, as indicated by the presence of obsidian, with some of the obsidian coming from as far as Wyoming, Idaho, and Central Mexico (Hester and Turner, 1999).

4.6.2 Historic Cultural Background

The Historic period is marked by changes in the native population brought on by Spanish and French expeditions, as well as the intrusion of the Apache and later, the Comanche. In the Caddo areas, there are recognizable changes in the pottery and some prominent projectile point types, such as Harrell and Washita. Rock art records the changes that occurred, with the inclusion of churches and horse-riding Indian warriors or Spaniards. By the late 18th century, chipped stone tools are replaced by worked glass, brass, and iron, particularly for arrow points. The counties in the study area had similar historic periods, with slight variations. A summary of each county's history is provided below.

4.6.2.1 Panola County

Panola County gets its name from the Cherokee work "ponolo," meaning cotton. Prior to the arrival of Anglo-American settlers in what would become Panola County, the Caddo and Hisinain controlled the area. The combined Native American confederations were known as the Timber Tribes. The Sabine River, which runs across the county from the northwest to southeast, divided the two confederations. Anglo-American settlers arrived in the region by following the Red River or through Trammel's Trace and the Old San Antonio Road. The earliest documented settler was Daniel Martine, who arrived in 1833. After the Texas Revolution ended with the Battle of San Jacinto in 1836, Anglo-American settlers began a land rush that claimed large portions of the county. From the land rush to after the end of World War II, logging and cotton were at the center of the local economy. During the Great Depression, roughly one-third of all farmers in the county left. From the mid-1940s through the 1970s, cotton production decreased while petroleum production increased after the Jordan well was drilled near Carthage, revealing a massive underground reservoir that underlays approximately half of the county (LaGrone, 1979). The county has 56 recorded historical markers, of which 15 are in the study area (THC Atlas, 2015).

4.6.2.2 Rusk County

According to the archaeological record, the earliest humans in the region which would become Rusk County, arrived during the Archaic Period. Prior to the arrival of Anglo-Americans, the Caddo inhabited the area. Between 1761 and 1810, two Tejas Villages were within the county. Tejas is the Spanish spelling for the Caddo word "taysha" meaning ally. The first Anglo-American settler to be issued a land grant in the region was William Elliot in 1822. As with Panola County, the population grew rapidly after

the Texas Revolution. Settlers arrived by following the Green Grass Trail, Nacogdoches Road, and Trammel's Trace. During the 1820s through the 1830s, the western portion of the county was inhabited by Native Americans belonging to the Cherokee and Shawnee tribes. After the Cherokee War of 1839, the Shawnee and Cherokee were removed from the area, and the western portion of the county opened up to Anglo-American settlement. Rusk County formed on January 16, 1843. By 1860, Rusk County was the most populated county in Texas and had a population of 15,803 inhabitants. The end of the Civil War brought economic disaster to the county. Prior to the war, slaves accounted for nearly half of all taxable property on the county. The economy would not rebound until Dad Joiner discovered the East Texas Oilfield in 1930. The East Texas Oilfield would become one of the richest oil finds in the United States. With the discovery of oil in the county, the economic focus switched from tenant farming to petroleum production. Due to the oil boom in the county, the Great Depression did not affect the inhabitants of Rusk County as harshly as it did the rest of Texas. The county has 106 recorded historical markers, of which 3 are within the study area (THC Atlas, 2015).

4.6.3 Records Search

In an effort to identify known cultural resources that could be affected by this project, an online search of the THC Texas Atlas was conducted by Burns & McDonnell archaeologists in May 2015 and was followed up by a file search at the Texas Archaeological Research Laboratory. The search also included state archaeological landmarks, historical markers, NRHP properties, cemeteries, military sites, sawmills, and bridges. In addition, a search of the National Park Service's NRHP database was conducted.

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5.0 IDENTIFICATION OF PRELIMINARY ALTERNATIVE ROUTES

After completion of the data gathering and constraint mapping process as described in Sections 4.1-4.3 and as summarized in Sections 3.1-3.3, the project team identified preliminary alternative routes to connect the proposed Rusk Switching Station to the proposed Panola Switching Station. Following is a more detailed description of the activities that resulted in the identification of the preliminary alternative routes.

Burns & McDonnell utilized the following to identify and refine the preliminary alternative routes:

- Input received from the various correspondence with local officials and others, as described in Chapter 6.0;
- Input received from two public open-house meetings;
- Results of the visual reconnaissance activities of the study area;
- Review of recent aerial photography;
- Findings of the various data collection activities;
- Environmental and land use constraints;
- Apparent property boundaries;
- Existing compatible corridors; and
- Location of towns and cities.

Based on the findings of the ground reconnaissance survey and the various data collection activities, and utilizing the environmental and land use constraints map and property boundary maps, the Burns & McDonnell project team identified preliminary alternative routes on aerial photography (NAIP flown in 2014 and 2015). The property boundary maps that were utilized to locate apparent property boundaries consisted of digital data obtained from the County Appraisal Districts and the ownership information received from the County Assessor's offices. Burns & McDonnell obtained digital gas pipeline data and oil/gas well data from the GIS data maintained by the RRC as shown on Figure 3-2. The digital gas pipeline data and the oil/gas well data were intended for the internal use of the RRC and, therefore, the RRC makes no claim as to its accuracy or completeness. Burns & McDonnell used the RRC data as a resource to identify pipeline corridors to avoid paralleling where possible, as well as to identify the location of oil and gas wells (to be avoided by potential preliminary alternative routes and their associated ROWs). Where possible, Burns & McDonnell verified the location of certain pipelines and oil/gas wells by reviewing the aerial photography and then verifying the locations during the various field reconnaissance efforts.

Based on the data obtained, the Burns & McDonnell project team identified preliminary route segments that, when combined, would connect the proposed Rusk Switching Station to the proposed Panola Switching Station. Route segments are typically short sections between branches of other segments that, when combined with other segments, provide a complete route between the project endpoints. To the extent possible, route segment development was based on avoiding the environmental and land use constraints within the study area while also taking advantage of routing opportunities, such as existing transmission lines, public roads, and apparent property boundaries, in accordance with 16 Tex. Admin. Code § 25.101.

Burns & McDonnell evaluated numerous segments that could be developed into preliminary alternative routes to connect the proposed Rusk Switching Station to the proposed Panola Switching Station. These preliminary segments were refined and altered to develop the preliminary alternative route network that was presented at the open-house meetings and as shown on Figure 3-3.

5.1 Route Modifications

After developing the preliminary alternative routes described above and as shown in Figure 3-3, the segments comprising the preliminary alternative routes were then presented at two public open-house meetings, as further discussed in Chapter 6.0. The set of four 11- by 17-inch aerial photography figures located in Appendix B of this report depict the preliminary alternative routes that were presented at the public open-house meetings. After the public open-house meetings, based on the input and comments received from the meeting attendees and agency comments, Burns & McDonnell removed two segments (Segments 40 and 47), made modifications to portions of Segments 8, 14, 33, 42, 45, and 49, and added a new segment (Segment 52). Chapter 7.0 provides a detailed description of the additions and adjustments to the preliminary alternative route segments that were made following the public open-house meetings. The resulting set of segments comprising the 96 primary routes is shown in Figure 3-4. Appendix C also provides detailed descriptions of the 96 primary routes by segment.

The 96 primary routes developed by Burns & McDonnell can generally be classified into three corridors of routes: Northern, Central, and Southern. Prior to categorizing these into the Northern, Central, and Southern corridors, routes containing Segments 20, 22, and 25 were dropped from further consideration, as described in Section 8.1.

5.2 Northern Routes

The Northern primary routes (containing Segments 1-3, 5, 8, 14, 15, 26, 27a, 27b, 28, 31, 34, 35, 37, 38, 41-46, 48, 49, 51, and 52) leave the proposed Rusk Switching Station using either Segment 1 to the

northeast or Segments 2 and 3 to the east. All of the Northern primary routes pass to the north of Lake Murvaul and continue easterly and then pass south of Carthage on either Segments 14 or 15. These primary routes parallel existing transmission lines more than the other primary routes. From either Segments 14 or 15, the Northern primary routes continue eastward towards the Panola Switching Station. The Northern primary routes enter the proposed Panola Switching Station using any of the three potential route segment options (Segments 43, 48, or 51).

5.3 Central Routes

Like the Northern primary routes, the Central primary routes (containing Segments 1-7, 9-13, 16, 18-21, 23, 24, 28, 29, 31, 34, 35, 41-46, 48, 49, and 51) leave the proposed Rusk Switching Station on any of the three potential route segment options (Segments 1-3). After the Central primary routes go around Lake Murvaul (either to the north or south), they converge back towards the center of the study area and proceed roughly east. All of the Central primary routes use Segment 31and then again diverge to enter the proposed Panola Switching Station using any of the three potential route segment options (Segments 43, 48, or 51). The Central primary routes primarily parallel existing property boundaries to the extent possible; the Central primary routes that pass north of Lake Murvaul also parallel an existing transmission line.

5.4 Southern Routes

The Southern primary routes (containing Segments 2-4, 6, 11, 12, 16, 17, 19, 30, 32, 33, 36, 39, 44-46, and 48-51) exit the proposed Rusk Switching Station to the east and then proceed south of Lake Murvaul before gradually turning northeast to enter the proposed Panola Switching Station. None of the Southern primary routes parallel existing transmission lines, but they do parallel existing property boundaries to the extent possible. The Southern primary routes only have two potential ways to enter the Panola Switching Station: Segments 48 or 51.

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6.0 RESULTS OF THE PUBLIC INVOLVEMENT PROGRAM

This chapter provides a summary of the contacts made with agency and public officials, as well as a summary of the public input received through the public involvement program implemented for the project.

6.1 Correspondence With Agencies And Officials

One of the first data collection activities for this project was the development of a list of officials to be mailed a consultation letter regarding the proposed project. The purpose of the letters was to inform the various officials and agencies of the proposed project and give them the opportunity to provide information they may have regarding the study area. Burns & McDonnell mailed notice of the project to approximately 67 federal, state, and local agencies. Burns & McDonnell utilized websites from area counties and various municipalities to identify local officials. Various state and/or federal agencies that may have potential permitting requirements for the proposed project were also contacted. Copies of correspondence sent to and received from the following local officials, departments, and various state/federal regulatory agencies are included in Appendix A.

State/Federal agencies that were mailed a consultation or informational letter include:

- National Park Service (NPS);
- Environmental Protection Agency (EPA);
- NRCS;
- USACE (Forth Worth District);
- USFWS;
- FAA (Southwest Region);
- Texas Department of Transportation (TXDOT) (Tyler District, Lufkin District, and Atlanta District);
- Texas General Land Office;
- TWDB;
- Texas Parks & Wildlife Department (TPWD; Wildlife Habitat Assessment Program, Nongame and Rare Species Program, and the Texas Natural Diversity Program);
- Texas Historical Commission (THC) (State Historic Preservation Office [SHPO], History Division, Archeology Division, and Architecture Division);
- Texas Department of Agriculture;
- Texas Department of State Health Services;

- Texas State Soil and Water Conservation Board;
- Texas Commission on Environmental Quality (TCEQ);
- RRC;
- State officials at the Texas State Senate (District 1) and the House of Representatives (Districts 9 and 11); and
- Officials at the State Board of Education (District 9).

Local officials and private organizations contacted include:

- County officials in Panola and Rusk Counties (including Farm Bureaus and Historical Commissions for both counties);
- East Texas Council of Governments;
- Gary City;
- City of Carthage, including the Carthage Economic Development Corporation;
- The Nature Conservancy;
- Texas Land Trust Council;
- Texas Land Conservancy;
- Connemara Conservancy;
- Lake Murvaul Water Board;
- Deep East Texas Electric Cooperative;
- Rusk County Electric Cooperative; and
- Panola-Harrison Electric Cooperative.

The following independent school districts were mailed a consultation letter:

- Gary;
- Carthage;
- Henderson;
- Tenaha; and
- Joaquin.

6.2 Correspondence Response Summary

Responses to the consultation and informational letters were received from the following agencies and or officials: USACE, USFWS, NRCS, FAA, TXDOT, THC SHPO, TPWD, Panola County, and the City of Carthage. Responses were not received from any other agency or officials who were mailed a consultation

letter. Copies of all consultation letters and responses are available in Appendix A. Agency comments and concerns were taken into account during the development of preliminary routes and this environmental assessment. Below is a summary of the consultation responses received.

6.2.1 U.S. Army Corps of Engineers

On November 12, 2015, the Chief of the Regulatory Division of USACE first responded that a regulatory project manager and project number had been assigned to the project and that the project manager would be evaluating the project as expeditiously as possible. The letter also provided links to reference material available on the USACE website for submittals.

On December 1, 2015, the Regulatory Division sent another letter indicating the project had been reviewed and would likely require authorization from the USACE under Section 404 and/or Section 10 of the Clean Water Act. USACE requested, when available, additional information, including detailed maps showing where the line would cross waters of the United States or where structures would be placed within waters of the United States and detailed design and impact information. This level of detailed information is not available until a route is certified by the PUCT and final design is completed. USACE also requested that during project planning, the routes avoid and minimize adverse impacts to streams, wetlands, and other waters of the United States, as well as consider impacts to cultural resources and protected species. A document listing the conditions permitted under a Nationwide Permit 12 and documents describing the general recommendations for USACE permit submittals were included in their response.

6.2.2 U.S. Fish and Wildlife Service

On November 2, 2015, USFWS responded via email that their Information, Planning, and Conservation System (IPaC) should be used to determine federally listed endangered/threatened species listed for the counties of interest. The IPaC report is included in Appendix A. The following federally listed endangered and threatened species are known to occur in the study area: least tern, piping plover, red knot, and Geocarpon minimum (a plant). The report also listed 29 migratory birds, as well as several wetland areas, that could be impacted by the project. The report listed no critical habitat or refuges in the study area.

6.2.3 Natural Resources Conservation Service

On November 13, 2015, the NRCS responded that it could not complete a full evaluation of the project until an exact location and acreage of the proposed project were provided. This level information will not be available until a route is certified by the PUCT.

6.2.4 Federal Aviation Administration

The FAA response, sent on November 30, 2015, referred to Title 14 CFR Part 77 to determine if the proposed transmission line would have an effect on navigable airspace or airports.

6.2.5 Texas Department of Transportation

TXDOT sent two response letters. The first letter, sent on November 5, 2015, from the Atlanta District Director of Operations, indicated that it would work to accommodate the project for placement of utilities on or across state ROW as governed by TXDOT policies and procedures and Title 43, Chapter 21, Subchapter C of the Texas Administrative Code. The second letter, sent on November 9, 2015, by the Tyler District Engineer, listed concerns related to the project. It described limitations of pole sizes placed within road ROW, requirements when crossing near bridges, and minimum vertical clearances over state highways.

6.2.6 Texas Historical Commission

On November 4, 2015, the THC responded that much of the area between the two endpoints of the project has not been previously surveyed and that it could include a moderate to high potential for previously unrecorded sites. Previous surveys in the area have resulted in the identification of archeological sites that could be affected by this project. THC indicated that an archaeological survey may be required for portions of the study area and that a project archeologist performing such a survey must first obtain an Antiquities Permit from THC's office.

6.2.7 Texas Parks and Wildlife Department

On November 24, 2015, the TPWD responded by reiterating the project description and then outlining the various laws and permits that may apply to the project. In general, TPWD recommended that existing transmission facilities be used whenever possible, or to route along existing roads, pipelines, existing transmission lines, and other utility ROWs to reduce habitat fragmentation and minimize adverse impacts to fish and wildlife resources. The TPWD recommended consulting and incorporating the design suggestions referenced in "TPWD Recommendations for Electric Transmission / Distribution Line Design and Construction (2009)" when feasible.

Under the discussion of federal regulations for migratory birds, TPWD recommended avoiding riparian areas, wetlands, and open water habitat when feasible; crossing streams perpendicularly; avoiding options that parallel streams; installing line markers at stream crossings; and using perch guards and other measures to minimize potential impacts to migratory birds. They recommended following the guidelines published by the Avian Power Lines Interaction Committee (APLIC) in "Reducing Avian Collisions with

Power Lines: State of the Art in 2012 (2012)" and "Suggested Practices for Avian Protection on Power Lines (2006)". The TXNDD data contains two known occurrences of colonial waterbird rookeries within the study area. TPWD recommended that if rookeries or heronries are located within the vicinity of a route, clearing and human foot traffic and machinery use should be restricted within a 300-meter buffer around the sites, especially during the nesting season. TPWD also recommended a secondary buffer of 1,000 meters for clearing and activity around the sites during the breeding season (courting and nesting).

With regard to the Endangered Species Act (ESA), the TXNDD identified no known occurrences of federally listed threatened, endangered, or candidate species within the study area. TPWD recommended that site surveys be performed to identify suitable habitat for federally listed species, to assess potential impacts, and to make route adjustments to avoid or minimize impacts. TPWD further recommended that if an impact to a federally listed species is anticipated, the USFWS be consulted for any additional requirements or information.

For the Bald and Golden Eagle Protection Act, the TXNDD contains a known occurrence of the bald eagle within the study area. TPWD recommended assessing any routes near lakes and rivers for the presence of habitat for bald eagles, avoiding disturbance near any eagle nests, and consulting with USFWS if impacts are anticipated.

TPWD also recommended that Garland / Rusk consult with the USACE for potential impacts to waters of the U.S., and avoid or minimize impacts to waterways, floodplains, riparian corridors, lakes, and wetlands as much as feasible to minimize impacts to valuable wildlife habitat. This recommendation includes allowing natural buffers contiguous to these features to remain undisturbed; using existing bridges for construction traffic to cross creeks; avoiding disturbance to inert microhabitats such as snags, brush piles, fallen logs, creek banks, pools, and gravel stream bottoms; and installing erosion control techniques prior to construction and maintaining them until permanent vegetation is achieved.

For state-protected species, TPWD noted that the project is likely to contain the state-threatened Texas heelsplitter, timber rattlesnake, northern scarlet snake, and Texas horned lizard. It recommended that site surveys be completed for these species and potential impacts be assessed so that route adjustments may be made to avoid or minimize impacts. TPWD listed several possible mitigation strategies to avoid or minimize impacts to protected species and recommended that the project identify those measures to be employed to protect the species that may occur in the study area. TPWD further recommended that any employees or contractors on the project be informed of the presence of the protected snakes and instructed to avoid impacts to them, that a biological monitor be present during clearing and construction to assist

with the detection of these state-protected species, or that these species be allowed to safely leave the site or be translocated outside the construction area. For soil stabilization of disturbed areas, TPWD recommended using seed/mulch stabilization materials that avoid entanglement hazards to snakes and other species and requested that any encounters with state-listed species be reported to the TXNDD. For state-listed aquatic species, TPWD recommended using Best Management Practices, such as avoiding unnecessary access roads across streams, avoiding pole placement in streams, retaining riparian vegetation, and using appropriate sediment controls practices to avoid or minimize impacts to these species. TPWD noted that absence of species records in the TXNDD data provided to Burns & McDonnell does not indicate the absence of rare, threatened, or endangered species and recommended that a review of the habitats within the study area be undertaken to determine impacts.

TPWD advised that several small streams and either the Sabine River or Toledo Bend Reservoir will be crossed by the project. TPWD recommended that measures be taken to avoid adverse impacts to aquatic organisms in these streams, including all native freshwater mussel species, and to avoid dewatering, and placement of temporary fills, culverts, or structures into waters containing suitable habitat for these species. If construction were to occur when water is present in these streams, TPWD recommended that an Aquatic Resource Relocation Plan be developed and that the species be relocated once the plan is approved by TPWD.

TPWD identified the following parks and public recreation areas from its inventory of Land and Water Conservation and Recreation Plan (LWCRP) data within the study area: Panola County Fresh Water District's Decker – Hill Park, Rosie Jones Park, and Tinkle Park; and the Sabine River Authority's Yellow Dog Recreation Site and Panola County Unit 630 Hunting Area. TPWD recommended avoiding these areas and contacting the management entities early in the planning process.

TPWD identified four conservation easements within the study area from its LWRCRP inventory: the Protected Areas Data Portal managed by the USGS, and the National Conservation Easement Database. These conservation easements are all Wetland Reserve Program easements managed by the NRCS. TPWD recommended first avoiding these properties during the routing phase, then accounting for any impacts (if unavoidable) in the alternative route impacts assessment.

TPWD recommended that precautions be taken to avoid Species of Greatest Conservation Need and important habitats as well. It noted that the project is located within the Western Gulf Coastal Plain and that the TXNDD identified the presence of Water Oak – Willow Oak Series G4S3 Communities within the study area. TPWD further recommended that areas exhibiting a native grass and forbs component be

protected from disturbance and from introduction of non-native vegetation during construction, maintenance, and operation activities. TPWD identified the dominant cover types within the study area using the Ecological Mapping Systems of Texas (EMST) data. TPWD recommended incorporating the land classifications identified in the EMST into the routing study and then minimizing any impacts to native vegetation by routing through lower-quality habitat such as introduced pasture, already fragmented areas, or pine plantation woodland compared to natural woodland communities, and then re-seeding disturbed areas with site-specific native species.

TPWD recommended that revegetation efforts include planting or seeding native milkweed and nectar plants when possible and scheduling ROW maintenance to occur after seed from pollinator plants is released to encourage the proliferation of monarch butterflies.

For invasive species, TPWD recommended that Garland / Rusk review and adhere to the "TPWD Clean/Drain/Dry Procedures and Zebra Mussel Decontamination Procedures for Contractors Working in Inland Public Waters (2015)" to avoid transporting zebra mussels or other aquatic invasive species. For invasive plant species, TPWD recommended that a revegetation and maintenance plan be developed to monitor, treat, and control invasive species during construction and operation.

Finally, TPWD recommended the preparation of a mitigation plan for compensatory mitigation for any impacts to species and habitats covered under federal and state law, as well as state resources not covered by state or federal law. The mitigation plan would be developed after a specific route has been certified by the PUCT, but the potential cost of mitigation should be considered during the route selection phase.

The TPWD response included several maps and data tables depicting the resources of concern mentioned in the body of the letter.

6.2.8 Panola County

The Panola County Judge provided several observations pertaining to the proposed project in an email on November 4, 2015. The Judge indicated a preference for the project avoiding private conservation lands and avoiding interruption to historical markers located around the Sabine River area. The Judge also noted that the project will have to cross several FM roads and she provided contact information for the two county commissioners as well, with whom our team met on November 17, 2015 (see Section 6.3, below).

6.2.9 City of Carthage

The City Secretary in Carthage provided a water line map via email on November 24, 2015, showing the water line running from just below the dam of Lake Murvaul into Carthage. A crossing of the water line is possible by several preliminary alternative routes, but paralleling the water line is not possible as it extends in a direction generally perpendicular to the proposed project.

6.2.10 Sabine River Authority

Burns & McDonnell contacted a representative of the SRA on December 30, 2015. The SRA representative provided a letter response in which he stated that the SRA property within the Toledo Bend Project falls under the jurisdiction of the FERC. The representative provided Burns & McDonnell with a Google Earth-based file depicting the FERC boundary. This boundary extends quite a bit north along the Sabine River to the confluence with Murvaul Creek, well beyond the extent of known SRA-owned lands located in the southern portion of the study area. All but one proposed segment crosses this boundary. Routes that cross the boundary will require additional permitting efforts to get FERC and SRA approval. The SRA representative indicated that multiple pipelines have been successfully permitted to cross this boundary in the past.

6.3 Key Stakeholder Meetings

Meetings were also held with several county officials and other key stakeholders (officials, agencies, and representatives of other organizations) prior to the public meetings.

On October 21, 2015, members of the project team from Burns & McDonnell, Garland, and Rusk met with Panola County Judge Lee Ann Jones and Panola County Commissioner John Gradberg and then with Rusk County Judge Joel Hale. At both meetings, the project team first introduced the project, explained why the project is being proposed, explained Garland's role in the project, generally described the SCT Project, and then described the upcoming public participation program. The Panola County Commissioner Gradberg expressed concern about the restoration process for roadways. Both the commissioner and the judge expressed support for the tax revenue to be generated by the project. The Rusk County judge also asked about the tax revenue benefits. He suggested we also contact Commissioner Freddy Swann who also represents the study area.

On November 17, 2015, project team representatives met with General Manager Kathy Wood from Panola Harrison Electric Cooperative to discuss the project and the public involvement process. Ms. Wood inquired about ownership and maintenance of the line, as well as the development and need for the

project. She was asked to refer any member related concerns or issues to the project team. She requested no additional information.

An additional follow-up meeting was held on November 17, 2015, with Panola County Commissioner, Precinct #1 Ronnie LaGrone and Panola County Commissioner, Precinct #4, Dale LaGrone. The two commissioners represent the study area in Panola County. At this meeting, the commissioners provided insight into public concerns related to pipeline projects in the area, asked for an additional review of a water pipeline that could be paralleled in the southern area of the project, and asked for consideration of routing on "paper company land," which the commissioners believed would have minimal impact to the public. Both commissioners stated they would attend the public meetings, as well.

On November 30, 2015, project representatives met with Deep East Texas Electric Cooperative, Rusk County Electric Cooperative, and Cherokee County Electric Cooperative. This meeting was held to provide the local electric service providers with a preview of the information that was going to be shown to the public at the subsequent public meetings. This also offered them the opportunity to provide feedback on the preliminary alternative route alignments and look for any issues that may cause service problems. No critical issues were discovered.

6.4 Public Meetings

To provide landowners, elected officials, and the various communities in the area with information about the project, and to gather input on preliminary alternative routes and community values, Garland and Rusk held two public open-house meetings in December 2015. Open-house meeting notices were mailed to landowners within 500 ft. of any preliminary alternative route shown on Figure 3-3 and on maps contained in Appendix B (1,078 notices were mailed for all parcels crossed or within 500 ft. of the centerline; these parcels represent approximately 631 unique landowners), as well as to key stakeholders (50 key stakeholder letters were sent).

The two open-house meetings were held on December 1 and 2, 2015, at the Carthage Civic Center located at 1702 South Adams, Carthage, Texas. The meetings were held after the preliminary alternative routes were identified. The purpose of the meetings was to:

- Solicit comments and input from residents, landowners, public officials, and other interested parties concerning the proposed project, the preliminary alternative routes, and the overall transmission line routing process

- Promote a better understanding of the proposed project including the purpose, need, schedule, routing procedure, potential benefits and impacts, and the decision-making process
- Encourage public involvement in the routing and certification process
- Identify and consider the values and concerns of the public and community leaders in the decision-making process

The open-house meetings included displays with information on project need, engineering, permitting, ROW, and preliminary alternative route segments. Representatives from Garland, Rusk, and Burns & McDonnell were present to address the public's questions and take comments. The project need station discussed the overall project and its interconnection with the SCT Project; the engineering station had illustrations of the proposed switching stations and proposed structures; the permitting station included a display of the potential environmental permits and agency approvals required for the project; the ROW station included a display of the easement acquisition process and the ROW width required; and the preliminary alternative routes station included detailed maps of the preliminary alternative routes. Preliminary alternative route segments developed for the proposed transmission line were depicted on 2014 aerial photographs (Appendix B) and on three computer stations at which landowners could provide comments regarding their property and other concerns. These comments would then be recorded digitally as a data record with the property.

Interested citizens and property owners were encouraged to visit each station in order, so that the entire process could be explained in the general sequence of project development. The information station format is advantageous because it allows attendees to process information in a more relaxed manner and also allows them to focus on their particular area of interest and ask specific questions. Furthermore, the one-on-one discussions with the open house team encouraged more interaction from those citizens who might be hesitant to participate in a speaker-audience format.

Participants at the open-house meetings received a written questionnaire to communicate their opinions to the project team and provide input into the routing process. Appendix B contains a sample questionnaire.

A total of 80 people signed-in as attending the open-house meeting in Carthage on December 1, and 39 people signed-in as attending the meeting on December 2, for a total attendance of 119. In total, 72 questionnaires were submitted: 41 were returned at the open-house meetings, 10 were submitted via the online questionnaire, and 21 were mailed in following the open house meetings. Additionally, there were 102 comments recorded at the computer stations by property owners.

Following the adjustments made to the preliminary alternative route segments after the open houses (see Section 3.6 and Chapter 7.0), notification letters were sent out to newly-affected landowners within 500 ft. of the new or modified segments and to previously notified landowners where the route segment location was modified on their property. A total of 104 letters were mailed, representing 73 unique landowners. They were provided with a map of the modified segment, documentation depicting the open house materials, and a link to the website for additional project information, and were also provided an opportunity to comment on the adjustments via the website or a questionnaire that was mailed with the letter and map. (Contact information for project representatives was also provided.) We received 7 comments back from the landowners that were mailed a letter regarding the segment modifications following the open house meetings (one was submitted online and the remainder were mailed in). These comments are included in the following summary of comments.

Results of the questionnaires received from people attending the meetings show that the majority of the respondents thought that the open-house format (93 percent), information provided (91 percent), and staff (91 percent) were helpful. Approximately 55 percent of the respondents found that the need for the project had been adequately explained. The majority of respondents (68 percent) indicated that a preliminary alternative route was close to their home; over 18 percent indicated a route was close to their business or farm; and 1 percent indicated they would be unaffected. About 13 percent of respondents indicated they were affected in other ways.

The questionnaires asked people to rank various routing factors and other considerations from highest to lowest importance. The factors included land use considerations, as well as corridor paralleling options. Corridor paralleling options included paralleling existing transmission lines, roads, and property lines. Among these three options, paralleling existing lines was the most preferred, and paralleling roads was least preferred. Land use considerations included potential impacts to ecological factors such as woodlands, wetlands, and streams; potential impacts to historic and cultural sites; impacts to cultivated land; distances from residences, public facilities, and businesses; total length of line; and visibility of the line. The preferred (highest ranked) factor was maximizing the distance to residences, and the lowest ranked factor was minimizing the total length of the line.[3] The list below shows the factors ranked (most preferred to least preferred) on the questionnaires by the public.

- Maximize distance from residences;

[3] On the questionnaire, the factor for lesser prairie chicken habitat was actually ranked lowest; however, it was included in error as a holdover from a previous project and was not used to help identify importance of any factors found within this study area because the study area does not contain habitat for the lesser prairie chicken.

- Minimize loss of trees;
- Maximize length along existing transmission lines;
- Minimize visibility of the line;
- Minimize length across cropland;
- Maximize distance from public facilities (e.g., parks, schools, religious facilities, cemeteries);
- Maximize length along property boundaries;
- Minimize length through wetlands and number of stream / river crossings;
- Maximize length along highways or other roads;
- Minimize impacts to archaeological and historic sites and/or Native American lands;
- Maximize distance from businesses; and
- Minimize total length of line (reducing the total cost).

The questionnaire also asked respondents to provide specific comments and concerns pertaining to specific segment numbers. Segments 4, 7, 8, 16, 22, 26, and 42 were mentioned the most frequently (four to seven times). The primary comments associated with these segments involved proximity to residences, existing utility encumbrances, and clearing concerns.

In addition to the questions already mentioned above, respondents were asked if they preferred monopole or lattice structures. Nearly 73 percent of respondents indicated a preference for monopoles, while only about 3 percent indicated a preference for lattice structures. Nearly 25 percent indicated no preference in structure type.

The questionnaire also allowed space for respondents to write in general comments and/or concerns. Below is a synopsis of typical comments and concerns received in letter or questionnaire format:

- Concern about amount of land already encumbered by utility easements (primarily pipelines);
- Concern about proximity to existing and planned residences;
- Concern about the impact to property values;
- Concern about visual impacts from the project;
- Concern about limitation of future timber production or loss of income from current timber;
- Concern about impacts to cattle ranches and property;
- Concern about health effects of electric and magnetic fields;
- Concern about effects on wildlife and natural resources (bald eagles, ponds, creeks, wetlands, pastures, etc.); and
- Concern about limitations to future oil/gas development on properties crossed by the line.

7.0 MODIFICATION/ADDITION OF ALTERNATIVE ROUTES FOLLOWING THE PUBLIC INVOLVEMENT PROGRAM

After the public open-house meetings, based on the input and comments received from the meeting attendees and agency comments, Burns & McDonnell modified the preliminary alternative routes shown at the open houses (Figure 3-3) by adjusting six existing segments (Segments 8, 14, 33, 42, 45, and 49), removing two segments (Segments 40 and 47), and adding one segment (Segment 52). The resulting set of route alternatives is referred to as the primary routes (Figure 3-4). Following is a detailed description of the route segment modifications made.

Segment 8 was adjusted to the northwest to move the preliminary alternative route approximately 120 ft. further away from a new house and pond that are being built just to the east of the proposed segment (Figure 7-1). The new house is now approximately 250 ft. from the modified proposed segment.

Segment 14 was adjusted due to a new trailer house that was constructed just west of FM 10 almost directly under the previous alignment (Figure 7-2). Another comment was received west of this location on the same segment that a new fertilizer plant and storage facility were being constructed just east of the railroad. Though we were not able to verify the exact location of these facilities, the adjustment around the house resulted in an option that could also avoid the majority of the property with the new fertilizer plant.

Segment 42 was adjusted after a landowner reported plans for two new houses just south of the preliminary alternative route alignment. The presence of another home and habitable outbuilding to the immediate north of the preliminary alternative route alignment meant the route had to be moved approximately 620 ft. north to increase the distance from the planned home sites, as well as the other homes in the vicinity (Figure 7-3).

At the open houses, a landowner identified a future airstrip on his property and provided documentation from the FAA that indicated that the airstrip has been approved. Segment 47 extended directly over the proposed airstrip alignment, which runs generally southeast to northwest (Figure 7-4). As a result, this segment was dropped from consideration because any adjustment to the north of the airstrip would essentially be in the same area as Segment 46 and because Segment 45 already extended to the south. However, because Segment 45 extended very close to the southeastern end of the proposed airstrip alignment, this segment was adjusted approximately 2,400 ft. south to avoid impacts to the future private airstrip and its approach surface (Figure 7-5). Segment 49 was also adjusted slightly to accommodate the adjustment to Segment 45, as well as the removal of Segment 47 (Figure 7-5).

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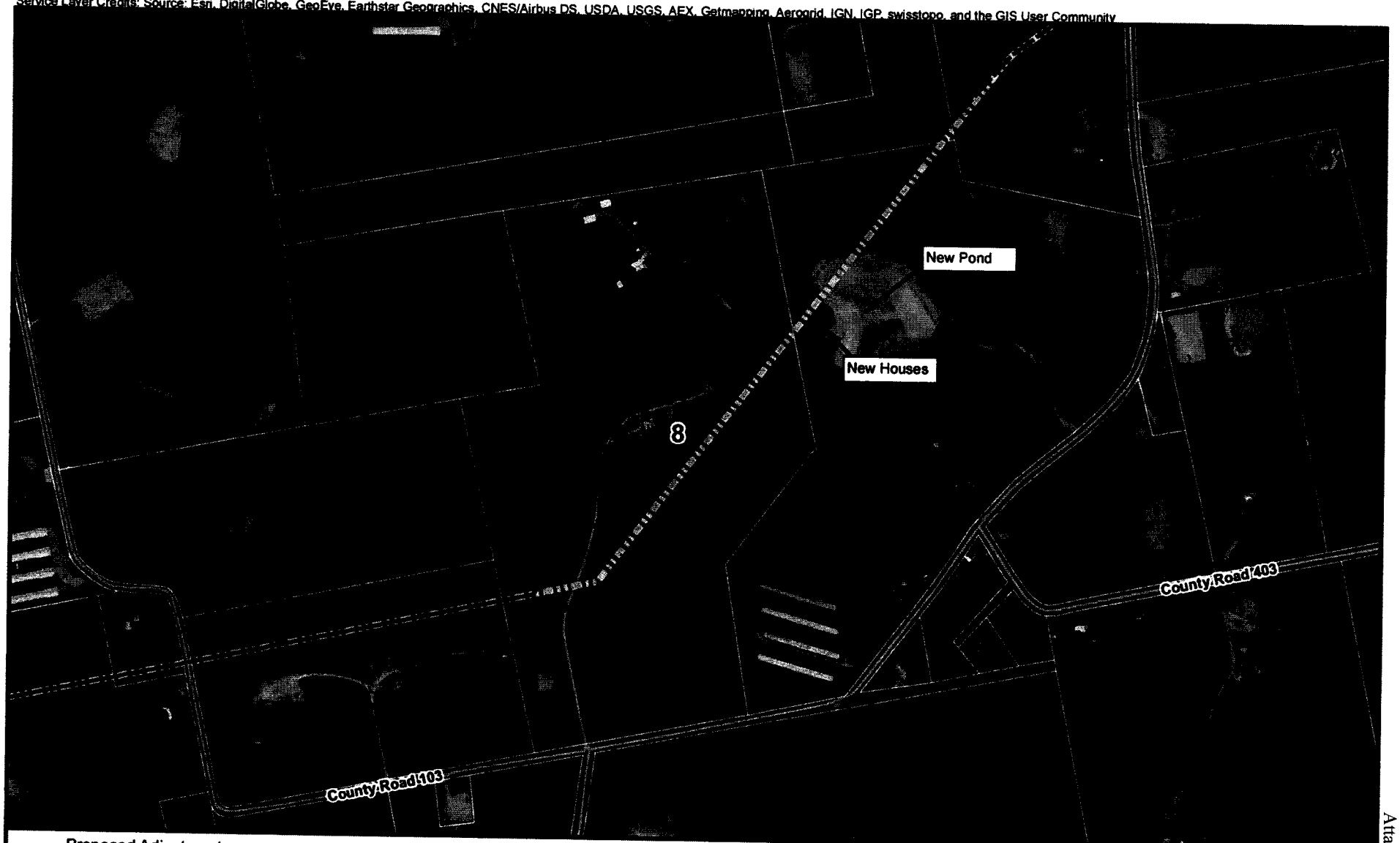
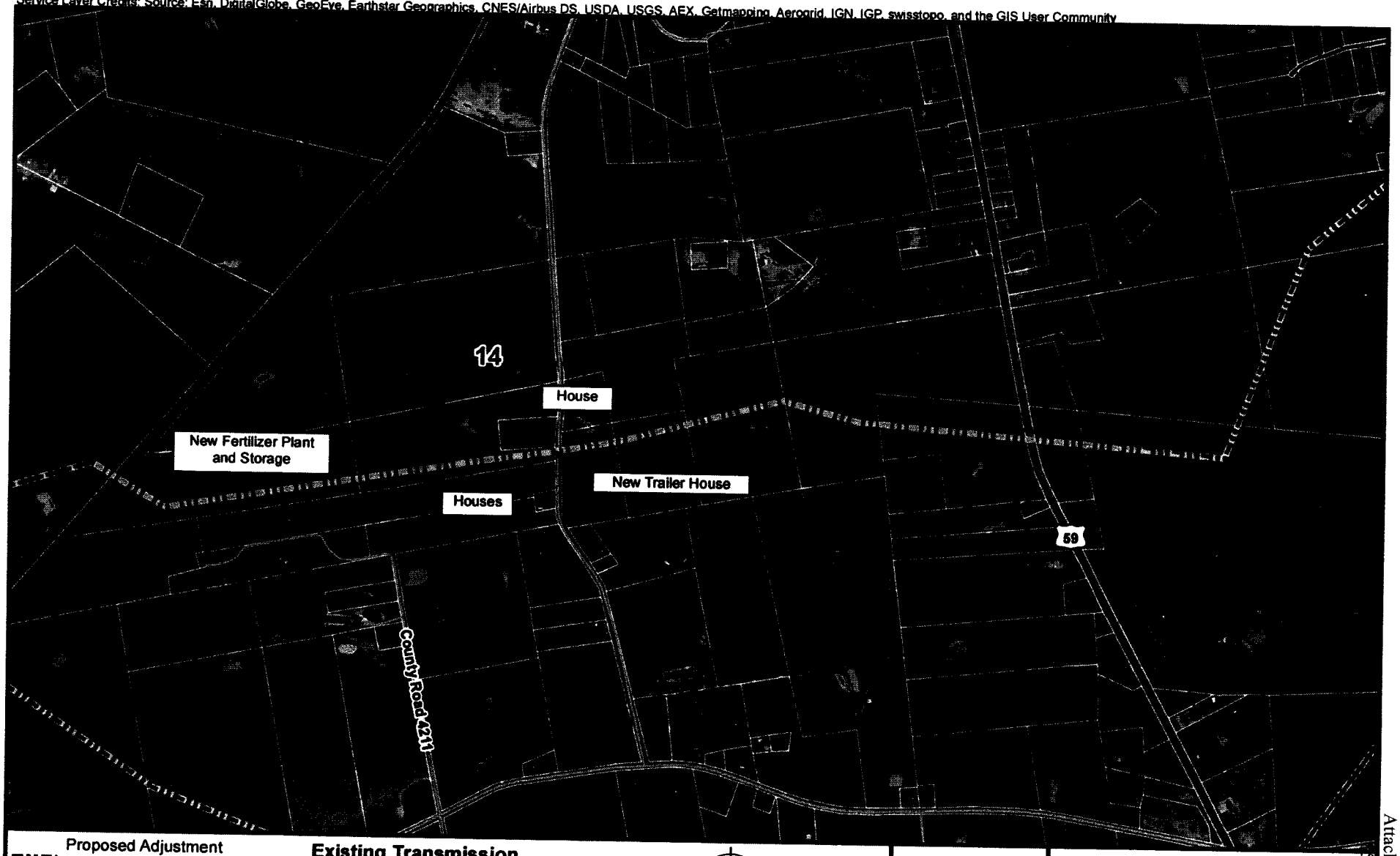


Figure 7-1
Segment 8 Adjustment
Rusk-Panola
Transmission Project

Source: Esri, Panola County Appraisal District, TNRIS, Texas Railroad Commission, Prichard & Abbott Inc., Ventyx Velocity, and Burns & McDonnell Engineering Company, Inc.

Issued: 2/2/2016



Source: Esri, Panola County Appraisal District, TNRIS, Texas Railroad Commission, Prichard & Abbott Inc., Ventyx Velocity, and Burns & McDonnell Engineering Company, Inc

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Figure 7-2
Segment 14 Adjustment
Rusk-Panola
Transmission Project

Issued: 2/2/2016

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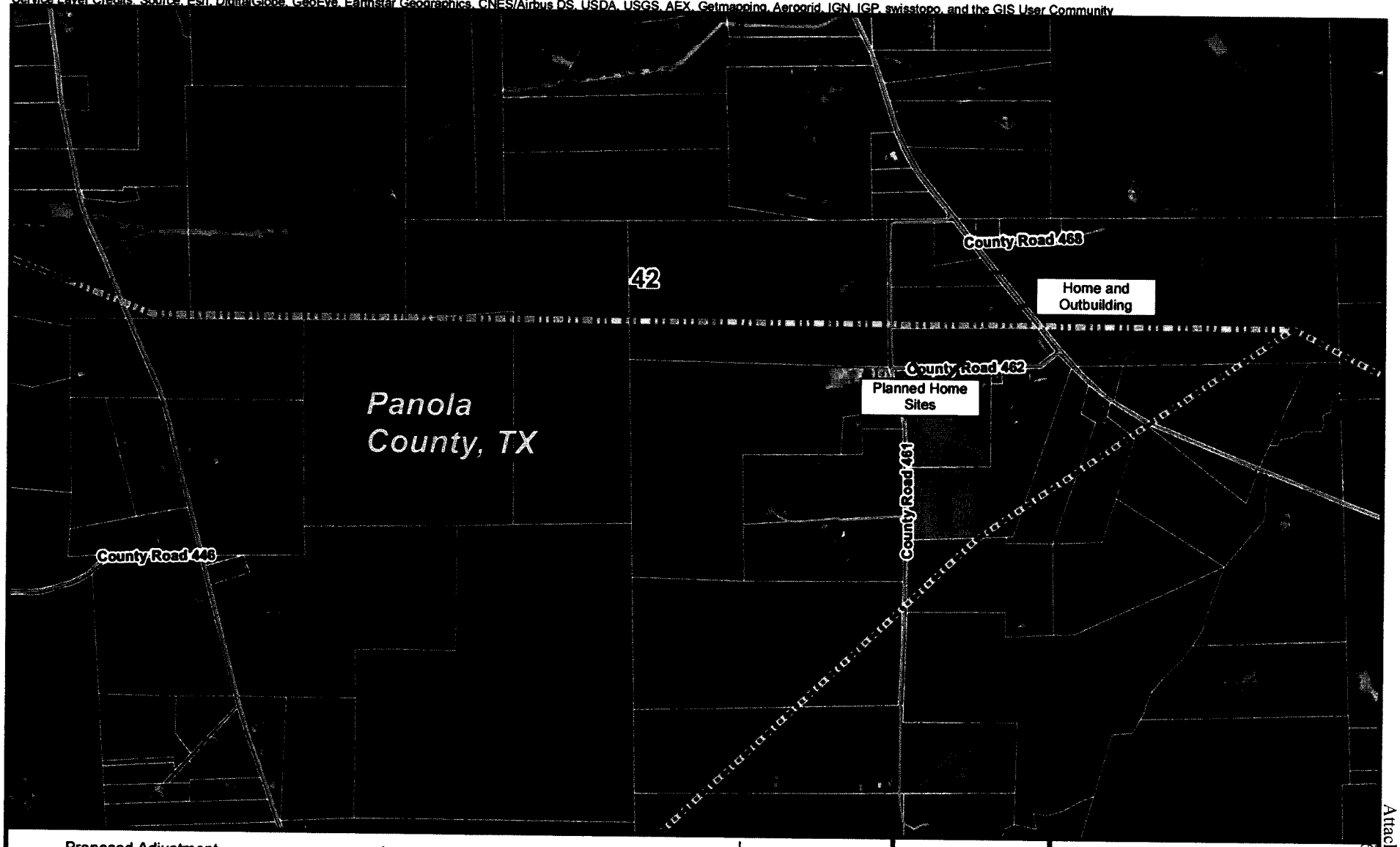
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Proposed Adjustment (Following Open Houses)

Preliminary Routes (As Shown at Public Open Houses)

Oil/Gas Pipeline

Apparent Parcel Boundary

Local Roads

NORTH

1,500 750 0 1,500

Scale in Feet

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Figure 7-3
Segment 42 Adjustment
Rusk-Panola Transmission Project

Source: Esri, Panola County Appraisal District, TNRIS, Texas Railroad Commission, Prichard & Abbott Inc, and Burns & McDonnell Engineering Company, Inc.

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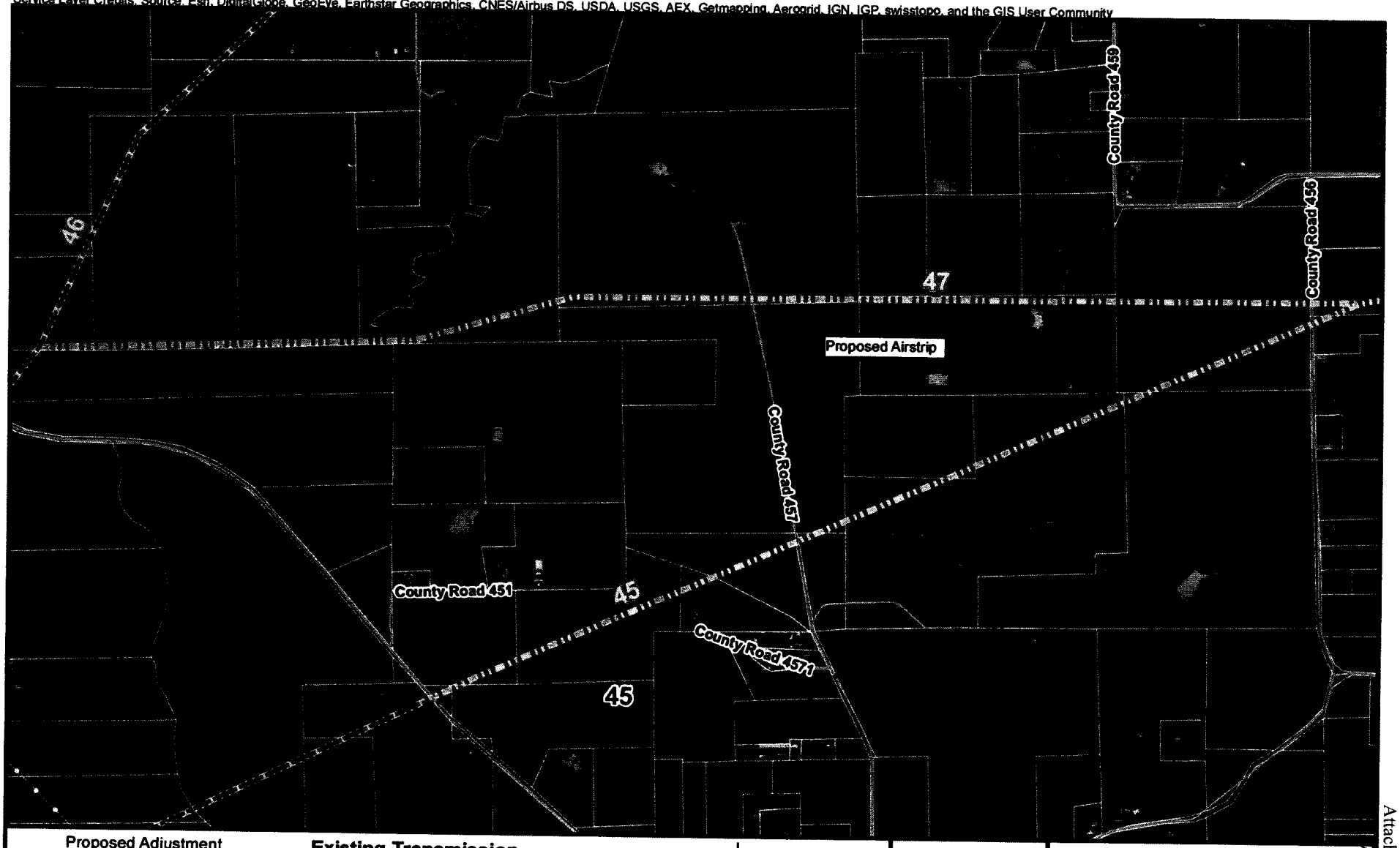

Proposed Adjustment (Following Open Houses)
138
Preliminary Routes (As Shown at the Open Houses)
Oil/Gas Pipeline
Apparent Parcel Boundary

Existing Transmission
138-kV
Local Roads

NORTH

1,500 750 0 1,500
Scale in Feet

BURNS McDONNELL

Figure 7-4
Segment 47 Removal
Rusk-Panola
Transmission Project

Source: Esri, Panola County Appraisal District, TNRIS, Texas Railroad Commission, Prichard & Abbott Inc., Ventyx Velocity, and Burns & McDonnell Engineering Company, Inc.

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Attachment 1
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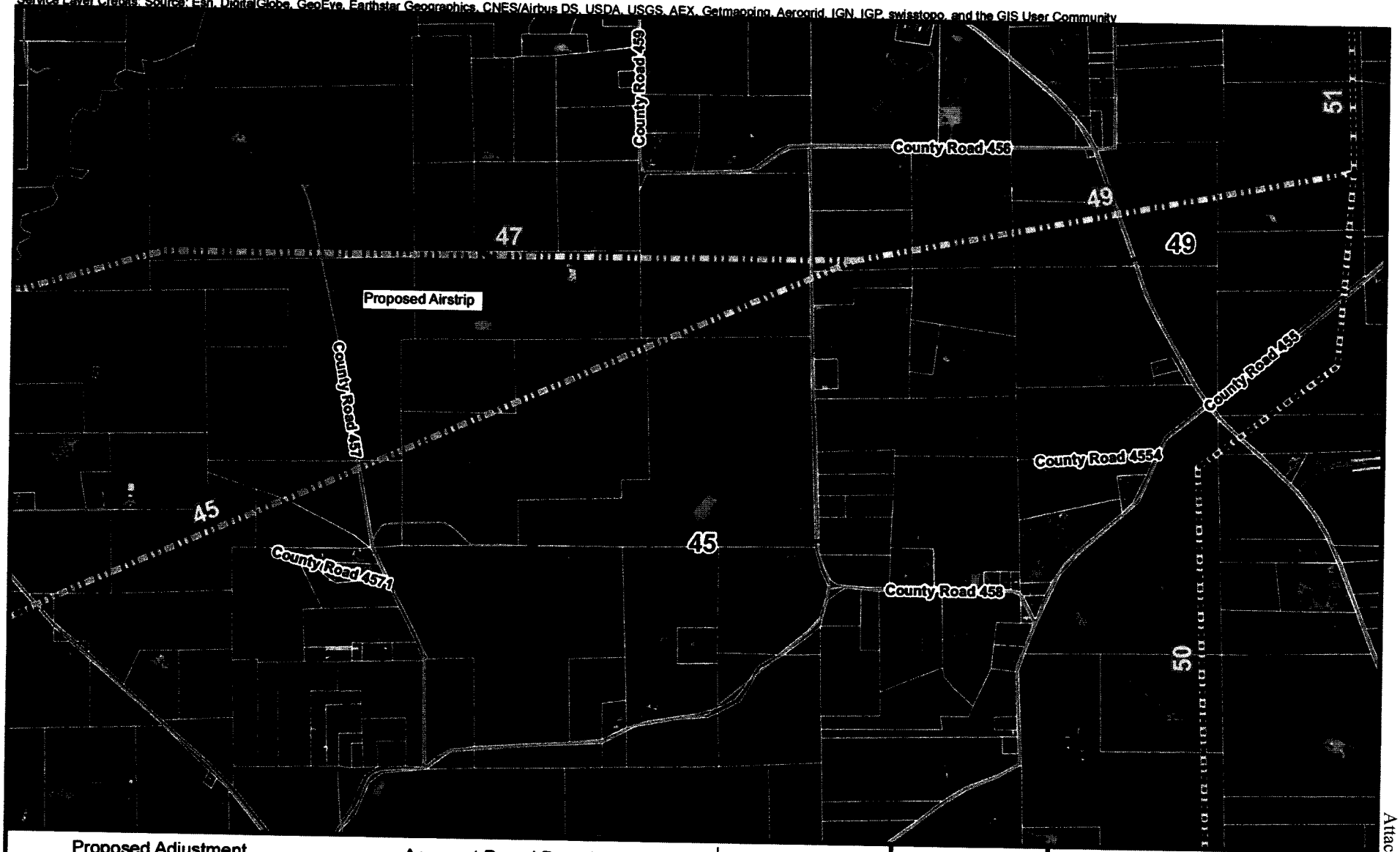

Source: Esri, Panola County Appraisal District, TNRIS, Texas Railroad Commission, Prichard & Abbott Inc., Ventyx Velocity, and Burns & McDonnell Engineering Company, Inc.

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Figure 7-5
Segments 45 and 49 Adjustment
Rusk-Panola
Transmission Project

Issued: 2/2/2016

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Segment 33 was adjusted approximately 130 ft. south to increase the distance from a new home identified by a landowner at the open houses (Figure 7-6).

Segment 40 was removed from consideration because it was determined that the segment not only crosses a substantially large amount of wetlands, but also crosses a large portion of land managed by the Sabine River Authority (Figure 7-7). The TWPD indicated in its letter that it would be preferable if the project avoided crossing these environmentally sensitive lands. They specifically mentioned the Yellow Dog Recreation Site, which was located approximately 3,000 ft. south of this segment, and the Unit # 630 hunting recreation area (land managed by the Sabine River Authority), a large portion of which was crossed by this segment.

Segment 52 was added following a comment left by a potentially affected landowner along Segment 27 that the line should follow the existing line, rather than cutting across his property (Figure 7-8). Because it is generally preferable to follow existing lines when possible and when all other factors are equal, this segment was added for consideration. The segment crossing this landowner's property was also retained for consideration. Adding Segment 52 divided Segment 27 into Segment 27A to the west of the intersection with Segment 52 and Segment 27B to the east of the intersection.

After all of these modifications, additions, and removals were made, a total of 51 segments remained (Figure 3-4).

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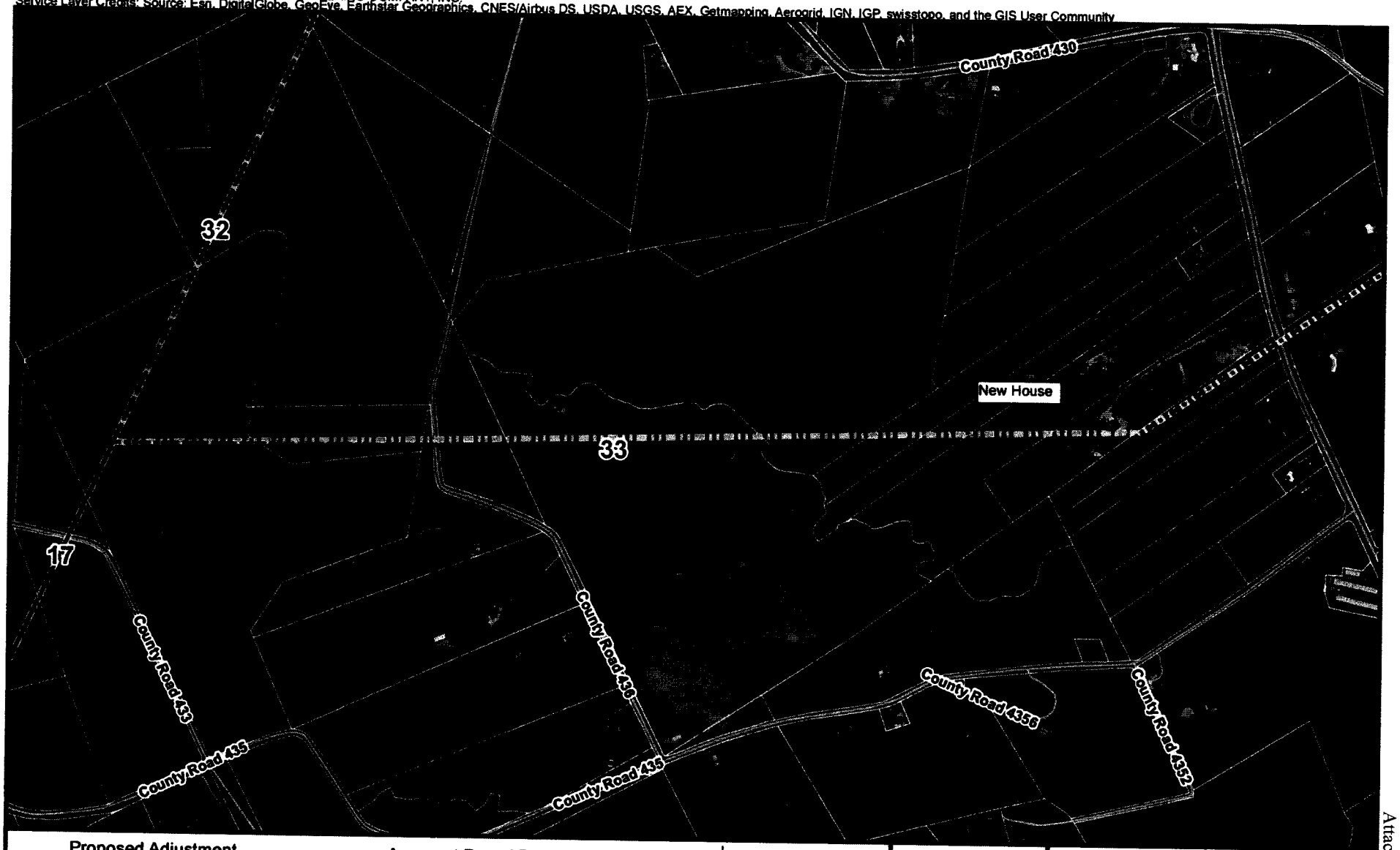

Proposed Adjustment (Following the Open Houses)

Preliminary Routes (As Shown at the Open Houses)

Oil/Gas Pipeline

Apparent Parcel Boundary

Local Roads

NORTH

1,000 500 0 1,000

Scale in Feet

BURNS McDONNELL

Figure 7-6
Segment 33 Adjustment
Rusk-Panola
Transmission Project

Source: Esri, Panola County Appraisal District, TNRIS, Texas Railroad Commission, Prichard & Abbott Inc., Ventyx Velocity, and Burns & McDonnell Engineering Company, Inc.

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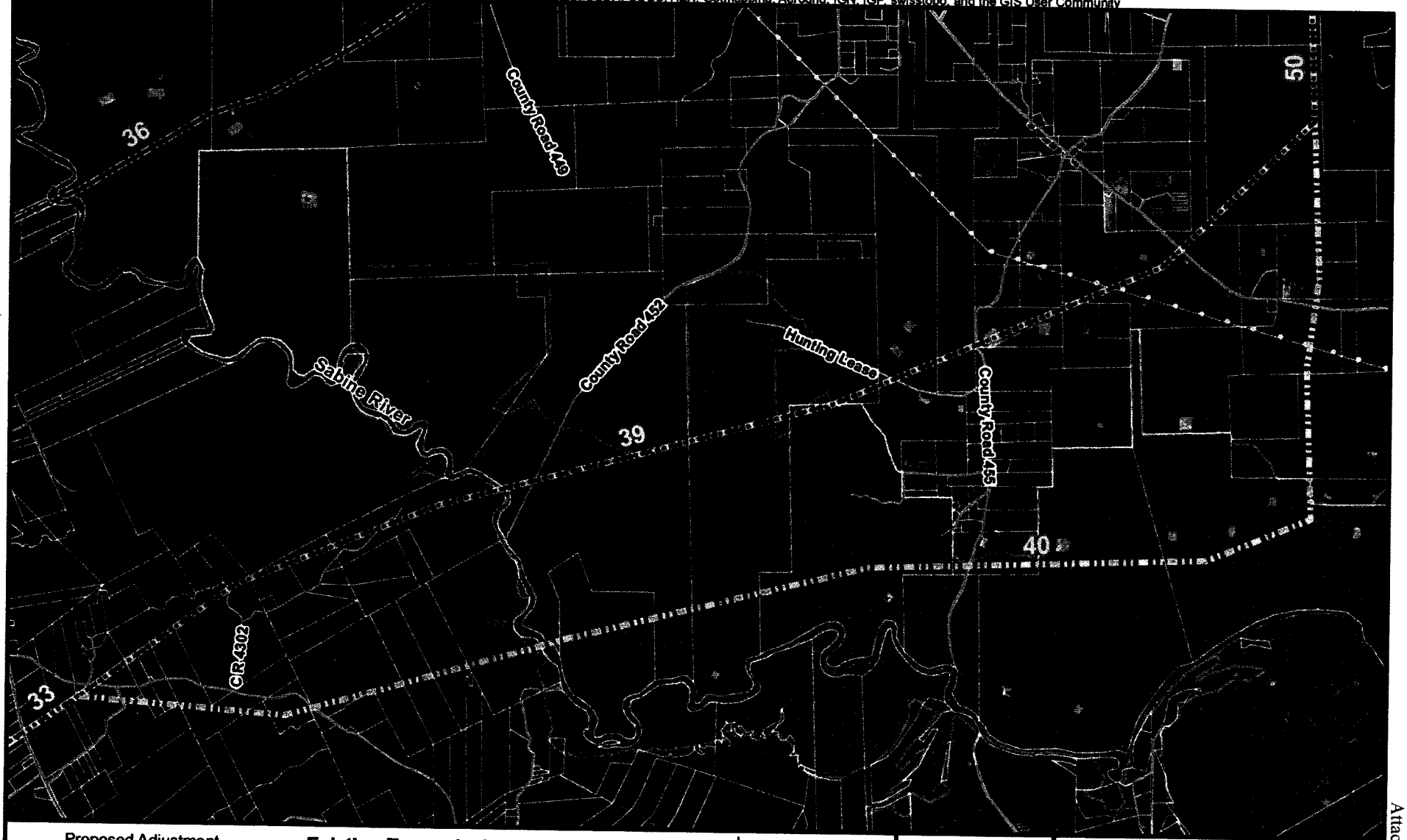

Source: Esri, Panola County Appraisal District, TNRIS, Texas Railroad Commission, Prichard & Abbott Inc., Ventyx Velocity, and Burns & McDonnell Engineering Company, Inc.

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8.0 ENVIRONMENTAL IMPACTS OF THE ALTERNATIVE ROUTES

This chapter provides a summary of the route screening and selection process, as well as a quantification of the impacts that would potentially occur from construction of each of the proposed routes.

8.1 Route Screening and Selection

After modifications to the existing segments were made (as described in Chapter 7.0), a total of 96 primary routes were identified. Appendix D includes the route data for all 96 primary routes. Burns & McDonnell completed a screening methodology that included the consideration of multiple environmental and land use criteria as well as the results of the public involvement program. Thirty-nine environmental and land use criteria (shown in Table 8-1) were quantified for each of the primary routes. The criteria were based on routing factors set forth in PURA § 37.056 (c)(4)(A)-(D), the PUCT CCN Application form, 16 Tex. Admin. Code § 25.101(3)(b), as well as a few additional factors that captured the potential impacts of the primary routes. The letters "RP" (for Rusk-Panola) were placed before route numbers to distinguish complete routes from route segments (as shown in Tables 3-1, Tables 8-4 through 8-10, and Appendix D). The routing criteria included such units as length, acres, and counts of particular resources and are therefore not directly comparable. In addition, no single route had the lowest impact value for all of the measured criteria. For example, while a particular route may have been the shortest, it may have higher number of habitable structures within 500 ft. making it less desirable than a slightly longer route with fewer habitable structures. Given the complexity resulting from the number of routes and variations on the individual criteria measurements, it is difficult to conduct a route-by-route comparison to identify a particular route or routes that would minimize overall potential impacts. Therefore, as part of an overall evaluation to compare all of the primary routes and variable criteria together, Burns & McDonnell used a statistical z-score analysis to transform the variable measurements into comparable units, screen the primary routes, and identify a set of 12 proposed routes warranting further investigation and comparison (Figure 3-5). The z-score analysis did not use all 39 of the environmental and land use criteria shown in Table 8-1; rather, the z-score analysis incorporated only a subset of those 39 factors (as shown in Table 8-3) that varied among the 96 primary routes so that the project team could evaluate the relative difference among the primary routes.

Table 8-1: Environmental and Land Use Criteria

	Criteria	Units
1	Total length	ft.
2	Length parallel to transmission lines	ft.
3	Length parallel to roads	ft.
4	Length parallel to oil/gas pipelines	ft.
5	Length parallel to apparent property lines	ft.
6	Length parallel to railroads	ft.
7	Total length parallel to existing facilities	ft.
8	Habitable structures located within 0-500 ft.	count
9	Length across parks and recreation areas	ft.
10	Park and recreation areas located within 1,000 ft.	count
11	Rangeland within ROW	acres
12	Cultivated land within ROW	acres
13	Length across mobile irrigation systems	ft.
14	Wooded areas within ROW	acres
15	Forested/scrub-shrub wetlands within ROW	acres
16	Emergent and riverine wetlands within ROW	acres
17	Number of streams crossed	count
18	Number of ecologically significant stream segments crossed	count
19	Length parallel to streams (within 100 ft.)	ft.
20	Known rare/unique plant species in right-of-way	count
21	Length through potential threatened and endangered species habitat	ft.
22	Number of recorded cultural sites crossed	count
23	Number of recorded cultural sites within 1,000 ft.	count
24	Length through High Probability Areas	ft.
25	Number of FAA registered airstrips within 20,000 ft. with runway lengths greater than 3,200 ft. in length	count
26	Number of FAA registered airstrips within 10,000 ft. with runway lengths less than 3,200 ft. in length	count
27	Number of private airstrips within 10,000 ft.	count
28	Number of heliports within 5,000 ft.	count
29	Length across open water	ft.
30	Number of AM towers within 10,000 ft.	count
31	Number of FM towers within 2,000 ft.	count
32	State/federal highway crossings	count
33	Other public road crossings	count
34	Length of line within foreground visual zone of state/federal highways	ft.

	Criteria	Units
35	Length of line within foreground visual zone of parks and recreation areas	ft.
36	Oil/gas wells within 500 ft.	count
37	Unique landowners crossed	count
38	Angles between 3 and 29 degrees	count
39	Angles greater than 30 degrees	count

Once the criteria totals for each primary route were determined, a z-score was calculated for each of the 21 weighted criterion (as shown in Table 8-3) for each primary route. The z-score analysis uses the mean (or average) value within a set of data to compare with each individual route value, and to determine the degree of difference (standard deviation) each route value is from the mean. For example, the total length of all the primary routes would be quantified, and the mean value for the entire set of primary route lengths would be determined. Next, the total length for each primary route would be compared to that mean value. If the individual route length was equal to the mean value, the z-score would be zero, as there would be no difference. If the total length was greater than the mean, the z-score would be a positive number; if the total length was less than the mean, the z-score would be a negative number. In addition, the further below or above the mean a route value is for a particular criterion, the more negative/positive the corresponding z-score. Z-scores were determined for each criterion of each of the 96 primary routes.

A weighting system was applied to the calculated z-scores to better capture the relative importance of categories of impacts to the public and agencies. The level of public concern for each factor varied, as indicated by the ratings recorded on the questionnaires at the open houses or on the website (Table 8-2). These 12 factors are a generalization of the factors considered in the route analysis to reduce the complexity of the public questionnaire while still gathering the necessary data to determine appropriate weights.

Burns & McDonnell staff assigned weights to the factors based on the input from the public via the questionnaires, input from agencies, input from engineers, and Burns & McDonnell's professional experience with transmission line projects across the country. The weights associated with each routing criterion are presented in Table 8-3. The names of the routing factors vary slightly from the descriptions on the public questionnaire, but are the same in meaning.