

Final

Environmental Assessment/Habitat Conservation Plan For Issuance of an Endangered Species Act Section 10(a)(1)(B) Permit For Incidental Take of the Houston Toad (*Bufo houstonensis*) by Aqua Water Supply Corporation, Lower Colorado River Authority, Bluebonnet Electric Cooperative, Inc., and Austin Energy During the Routine Maintenance and Repair of Facilities and Installation of New Facilities in Portions of Bastrop and Lee Counties, Texas

Prepared for

United States Fish and Wildlife Service

Prepared by

SWCA® Environmental Consultants

February 16, 2005

Final Environmental Assessment/Habitat Conservation Plan For Issuance of an Endangered Species Act Section 10(a)(1)(B) Permit for Incidental Take of the Houston Toad (*Bufo houstonensis*) by Aqua Water Supply Corporation, Lower Colorado River Authority, Bluebonnet Electric Cooperative, Inc., and Austin Energy During the Routine Maintenance and Repair of Facilities and Installation of New Facilities in Portions of Bastrop and Lee Counties, Texas

February 16, 2005

**United States Fish and Wildlife Service
10711 Burnet Road, Suite 200
Austin, Texas 78758**

COVER SHEET

Title for Proposed Alternative: Final Environmental Assessment/Habitat Conservation Plan For Issuance of an Endangered Species Act Section 10(a)(1)(B) Permit For Incidental Take of the Houston Toad (*Bufo houstonensis*) by Aqua Water Supply Corporation, Lower Colorado River Authority, Bluebonnet Electric Cooperative, Inc., and Austin Energy During the Routine Maintenance and Repair of Facilities and Installation of New Facilities in Portions of Bastrop and Lee Counties, Texas

Unit of United States Fish and Wildlife Service Proposing Action: Regional Director-Region 2, United States Fish and Wildlife Service, Albuquerque, New Mexico

Legal Mandate for Proposed Action: Endangered Species Act of 1973, as amended, section 10(a)(1)(B), as implemented by 50 CFR 17.22

Applicants: Aqua Water Supply Corporation, Lower Colorado River Authority, Bluebonnet Electric Cooperative, Inc., and Austin Energy

Permit Number: TE-078366-0

Duration: 30 years

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1.0 INTRODUCTION

Aqua Water Supply Corporation (Aqua), the Lower Colorado River Authority (LCRA), Bluebonnet Electric Cooperative, Inc. (BEC), and Austin Energy (AE)(collectively, the “Applicants”) have a long history of working cooperatively and productively with the U.S. Fish and Wildlife Service (Service) to comply with the federal Endangered Species Act (ESA) of 1973 as amended, provided by 50 CFR 17.22, and to protect the endangered Houston toad (*Bufo houstonensis*). In an effort to further enhance this relationship and protect the Houston toad, approximately three years ago the Applicants began actively participating with Bastrop County and others in an effort to develop the Bastrop County Lost Pines Habitat Conservation Plan (HCP) and obtain an incidental take permit. The anticipated Bastrop County permit will authorize take of the Houston toad associated with a multitude of activities, including activities performed by the Applicants. After a year of this effort the Applicants determined that it would be in their best interests to develop an HCP and apply for an incidental take permit that would be tailored specifically to their needs. As a result, the Applicants submitted a preliminary draft Environmental Assessment and Habitat Conservation Plan (EA/HCP), dated April, 2002, to the Service. The Service provided comments and the document was revised. A second draft and third draft was submitted to the Service on October 22, 2002 and July 03, 2003. Further comments were submitted to the Applicants and the EA/HCP was revised to produce a draft EA/HCP that was submitted to the Regional Office on October 07, 2003. The RO and Solicitor provided additional comments on November 24, 2003. The EA/HCP was again revised to produce this final draft. The Applicants are still participating as a stakeholder in the Bastrop County Lost Pines HCP effort.

The Applicants have voluntarily submitted an application for a section 10(a)(1)(B) permit that authorizes incidental take of the endangered Houston toad during otherwise lawful activities to be conducted over a 30-year period in portions of Bastrop and Lee counties, Texas. The Applicants desire to be fully covered under the ESA for any incidental take of the Houston toad that may occur as a result of their activities, to reduce their risk of liability as they conduct various activities. The Applicants propose to avoid and minimize impacts to the Houston toad, and mitigate for any remaining impacts as described in Section 6 of this document.

The proposed area to be covered by the permit (proposed permit area) includes approximately 142,526 acres within central, eastern, and northern Bastrop County (106,953 acres) and western Lee County (35,573 acres) (Figure 1). Within the 142,526-acre proposed permit area, covered activities may occur on approximately 6,792 acres (approximately 4.8 percent of the proposed permit area). Approximately 67,214 acres (47.2 percent) of the proposed permit area in Bastrop County is designated critical habitat for the Houston toad and approximately 75,312 acres (52.8 percent) of the proposed permit area lie outside of designated critical habitat for the species. Another listed species, the threatened bald eagle (*Haliaeetus leucocephalus*), is known to occur within the proposed permit area; incidental take coverage is not being sought for this species.

An HCP that specifies what steps the Applicants will take to avoid, minimize, and mitigate the potential impacts to the Houston toad to the maximum extent practicable (Section 6.0 of this EA/HCP) has been included as part of the preferred alternative. This EA/HCP also includes specific steps the Applicants will take to avoid and minimize to insignificant the potential for impacts to the bald eagle. Because of this, the Applicants believe take coverage for the bald eagle is not necessary. Both the Service and the Applicants agree that not all portions of the

proposed permit area contain suitable Houston toad habitat, and not all covered activities will result in take of the Houston toad. However, in an effort to efficiently and effectively allow normal business practices to continue, and to compensate for any impacts to the Houston toad, the Applicants are proposing to mitigate for all activities performed within the proposed permit area as described in this document, unless they are otherwise covered by an individual permit. The Applicants proposed this mitigation strategy (Section 6) so that the cost of mitigation can be spread over the life of the permit concurrent with undertaking all new linear and fixed foundation facilities. Additionally, under this strategy the costs associated with mitigation could be incorporated into long-term budgeting and planning. Mitigation at the proposed rate would occur whether or not covered activities would result in take.

The proposed mitigation fee as described in Section 6 may initially appear to be lower than other permits that have been issued within this area. However, since most activities (92.2 percent) under the requested permit will occur within existing, previously disturbed rights-of-way (predominantly roadway rights-of-way or “ROWs”), are often temporary in nature, would not be authorized (without Service approval) on lands recognized by the Service as lands being managed as a preserve for the Houston toad, and the Applicants will be mitigating for all activities conducted regardless of whether or not it results in an impact to the toad or its habitat, when considered cumulatively, the level of mitigation is expected to be similar to, or exceed other issued permits. Additionally, the Applicants have developed best management practices (BMPs), as described in Section 6, that further reduce the likelihood of impacting the species. Through an adaptive management strategy, Service and the Applicants will be able to improve BMPs based on information developed in the future (Section 6.4). The Service believes the proposed mitigation is commensurate with the anticipated impacts.

Aqua actions authorized under the requested permit would generally include the routine installation and repair of below-ground water lines and fixed-foundation facilities (tanks, wells, pump stations, and standpipes), installation of below-ground water lines and fixed-foundation facilities (tanks, wells, and a filter plant), and upgrades to these facilities. LCRA actions authorized under the requested permit would generally include maintenance, repair, and new installation of linear facilities (transmission lines, water and wastewater lines, fencelines, and trails) and fixed foundation facilities (substations, lift stations, telecommunication facilities, park pavilions, cabins, or restrooms). BEC actions authorized under the requested permit would generally include the maintenance and repair of above-ground distribution lines and fixed-foundation substations, installation of above-ground distribution lines and fixed-foundation substations, and upgrades to above-ground distribution lines and fixed-foundation substations, installation of below-ground distribution lines, and ROW maintenance. AE activities authorized under the requested permit would generally include the routine maintenance and repair of above-ground transmission lines and upgrades to these facilities. All proposed activities are described in more detail in Section 4.1 of this document.

It is possible, although not likely, that one or more of the Applicants may be required to undertake projects outside the scope of those described above within the proposed permit area

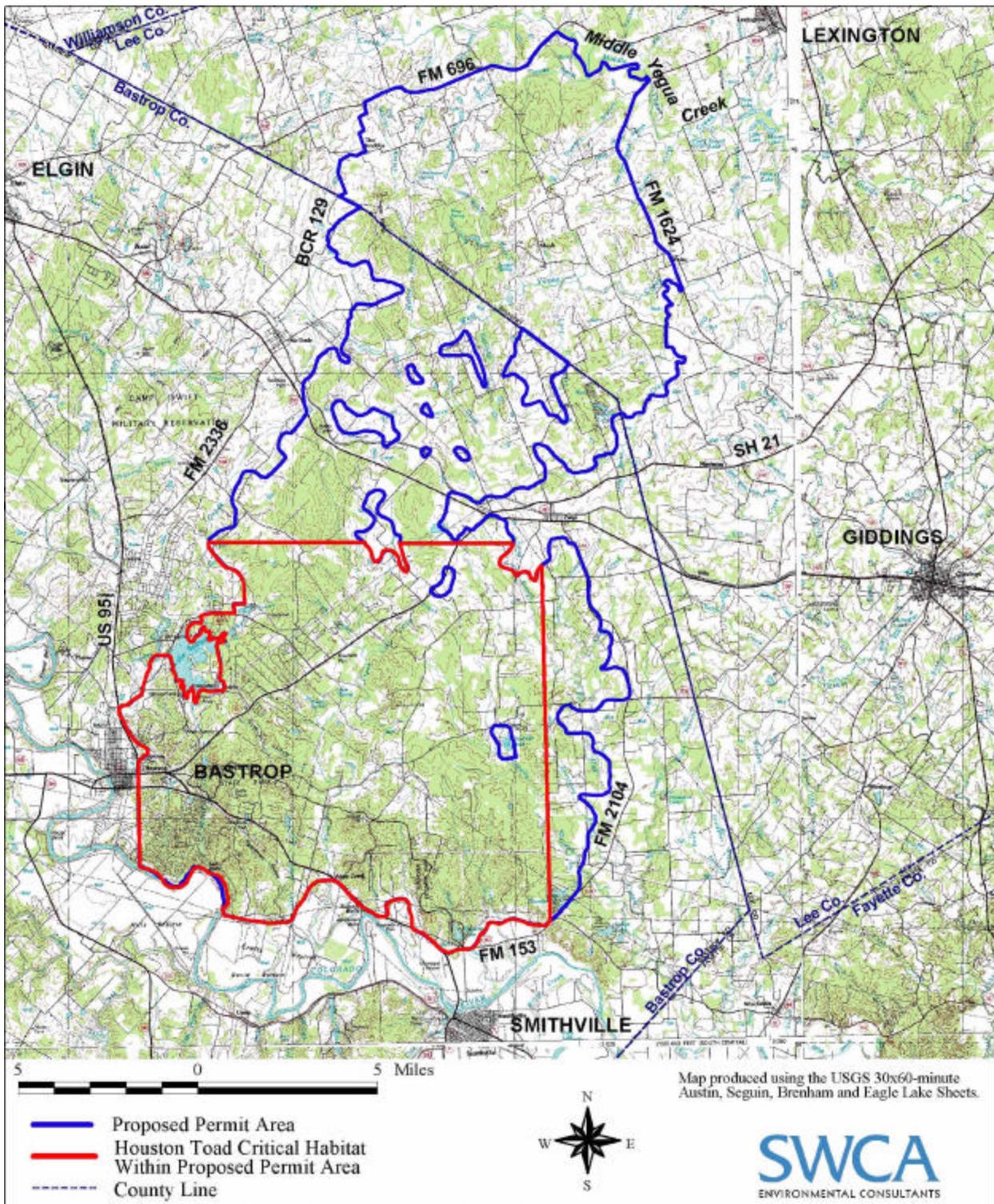


Figure 1. Proposed Permit Area, Bastrop and Lee Counties, Texas.

during the life of the requested permit. The Applicant(s) will consult with the Service to determine the potential for such unanticipated projects to adversely affect the Houston toad and whether the project(s) could be authorized under the permit.

2.0 PURPOSE AND NEED FOR ACTION

Section 9 of the ESA prohibits “take” of any federally listed endangered or threatened species that has not been exempted through a permit. Take, as defined by the ESA, means “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.” Harm is further defined as “significant habitat modification or degradation where it actually kills or injures wildlife by significantly interfering with essential behavioral patterns including breeding, feeding and sheltering” (50 CFR 17.3). Disturbing or destroying endangered species habitat, in areas where species are likely to occur, could potentially be in violation of the ESA if the species are killed, injured, or prevented from breeding, feeding or sheltering. If it is not possible to change a proposed action to avoid take of a listed species, a non-federal entity may request a permit that will authorize take of the species. The Service, under limited circumstances, may issue permits to take endangered wildlife species incidental to, and not the purpose of, otherwise lawful activities.

The purpose of this EA/HCP is to specify what steps the Applicants will take to avoid, minimize, and mitigate the potential impacts to the Houston toad to the maximum extent practicable and to avoid adverse impacts to the bald eagle. Thereby contributing to the species’ long-term survival while allowing otherwise lawful utility-related actions to proceed. The proposed alternatives necessitate an evaluation of the environmental impacts for issuance of a section 10(a)(1)(B) permit for the preferred alternative and the other alternatives that were considered. The permit would authorize the incidental take of the federally listed Houston toad associated with routine business activities within the approximately 142,526-acre proposed permit area boundary. This EA/HCP will establish the conditions under which the Applicant will meet the requirements for a section 10(a)(1)(B) permit under the Act.

3.0 DESCRIPTION OF AFFECTED ENVIRONMENT

The proposed permit area encompasses approximately 142,526 acres of central, eastern, and northern Bastrop County and portions of western Lee County (Figure 1). Approximately 106,953 acres (about 75 percent) of the proposed permit area lies within Bastrop County and approximately 35,573 acres (about 25 percent) lies within Lee County, approximately 67,214 acres of which (47.2 percent) lies within critical habitat for the Houston toad (United States Fish and Wildlife Service 1984).

The Bastrop County portions of the proposed permit area are based on maps, prepared by the Service, of the distribution of potential Houston toad habitat in Bastrop County. Distribution of potential habitat is based largely on a combination of geology, soils, vegetative cover, known Houston toad sightings, and land use. In Bastrop County, the proposed permit area is generally bounded to the south by the northern limit of the Colorado River floodplain and extends northward to the Lee County line between U.S. Highway (US) 95, Farm to Market Road (FM) 2336, and Bastrop County Road (CR) 129 to the west and FM 153, FM 2104, and State Highway (SH) 21 to the east.

As shown on Figure 1, several “islands” occur within the perimeter of the proposed permit area. These “islands” are not included within the proposed permit area and consist of areas of unsuitable habitat that lie at least one-quarter mile from potential Houston toad habitat. Since these areas are not currently believed to be Houston toad habitat, no impacts to the species are anticipated. Even though these areas are not part of the proposed permit area, the Applicants will perform the proposed avoidance measures for the bald eagle (Section 6.1.1) in these areas.

The portion of the proposed permit area in Lee County is contiguous with the portion in Bastrop County. The Lee County portion of the proposed permit area is bounded to the south by the Bastrop County line, to the west by the exposed contact between the Carrizo Sand and Wilcox Group geologic units and Lee CR 305, to the north by FM 696 and Middle Yegua Creek, and to the east by FM 1624 and Bluff Creek. The Lee County portion of the proposed permit area was delineated based on general overlap of vegetative cover, soils, geology, known Houston toad sightings, land use, and the Applicants’ service area. The proposed permit area does not represent the entire range of the Houston toad within Lee County. These additional areas are outside the service area for the Applicants.

The City of Bastrop lies in the southwestern portion of the proposed permit area. U.S. 290, a heavily traveled highway, runs roughly east/west through the center of the proposed permit area between the towns of McDade and Paige.

3.1 VEGETATION

The proposed permit area lies within the Post Oak Savannah geographic region (Kutac and Caran 1994). The southern portion of the proposed permit area, generally south of U.S. 290 but excluding the Colorado River floodplain, lies within a vegetation community locally referred to as “the Lost Pines.” Undisturbed vegetation in this community is typically composed of loblolly pine (*Pinus taeda*)/post oak (*Quercus stellata*) woodlands interspersed with post oak woodlands and native grasslands. Other commonly occurring tree species in this community include eastern red cedar (*Juniperus virginiana*), water oak (*Quercus nigra*), cedar elm (*Ulmus crassifolia*), blackjack oak (*Quercus marilandica*), and hackberry (*Celtis* sp.). Yaupon (*Ilex vomitoria*) is a common understory shrub in area woodlands. Typical riparian woodlands in this portion of the proposed permit area contain cedar elm, American elm (*Ulmus americana*), pecan (*Carya illinoensis*), and black willow (*Salix nigra*) trees.

That portion of the proposed permit area that lies within the floodplain of the Colorado River supports typical riparian tree species such as pecan, American elm, cedar elm, and black willow. Open post oak woodland and agricultural lands are also present in areas along the floodplain.

The remainder of the proposed permit area, generally that north of U.S. 290, contains vegetation more typical of the Post Oak Savannah region. Undeveloped lands in this portion of the proposed permit area primarily support post oak/eastern red cedar woodland interspersed with grassland, rangeland, and pastureland. In addition to post oak and red cedar, commonly occurring tree species in this area include cedar elm, hackberry, loblolly pine, and mesquite (*Prosopis glandulosa*). Yaupon is often dominant to heavily dominant in the shrub layer of woodlands. Riparian areas support American elm, cedar elm, pecan, sycamore (*Platanus occidentalis*), and ash (*Fraxinus* sp.).

3.2 WILDLIFE

The proposed permit area lies within the Texan biotic province as defined by Blair (1950). This province generally grades into the Austroriparian biotic province of east Texas, but its western boundary is sharply demarcated by the Balcones Escarpment. The proposed permit area also lies in an area defined as East Texas by Davis and Schmidly (1994) based on the distribution of mammal species.

Davis and Schmidly (1994) indicated that approximately 55 species of mammals occur in the Post Oak Savannah region. According to Kutac and Caran (1994), common mammals within the proposed permit area are expected to include Virginia opossum (*Didelphis virginiana*), eastern red bat (*Lasiurus borealis*), nine-banded armadillo (*Dasypus novemcinctus*), eastern cottontail (*Sylvilagus floridanus*), black-tailed jackrabbit (*Lepus californicus*), eastern fox squirrel (*Sciurus niger*), Attwater's pocket gopher (*Geomys attwateri*), hispid pocket mouse (*Chaetodipus hispidus*), fulvous harvest mouse (*Reithrodontomys fulvescens*), white-footed mouse (*Peromyscus leucopus*), hispid cotton rat (*Sigmodon hispidus*), house mouse (*Mus musculus*), common gray fox (*Urocyon cinereoargenteus*), common raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), and white-tailed deer (*Odocoileus virginianus*).

Approximately 245 species of birds are considered likely to occur within the proposed permit area on a nearly annual basis, either during the breeding season, in winter, or during migration (SWCA, Inc. pers. comm.). The bird checklist for Bastrop and Buescher State Parks lists 277 species as having been observed in the parks and at Lake Bastrop, with nine of these species considered accidental (Freeman 1996). Of the 277 species, 74 species are listed as breeding or probably breeding in the parks, at Lake Bastrop, or in the immediate vicinity. Permanent resident bird species expected to be common or widespread within the proposed permit area include great blue heron (*Ardea herodias*), black vulture (*Coragyps atratus*), turkey vulture (*Cathartes aura*), red-tailed hawk (*Buteo jamaicensis*), killdeer (*Charadrius vociferus*), rock dove (*Columba livia*), mourning dove (*Zenaida macroura*), eastern screech-owl (*Otus asio*), red-bellied woodpecker (*Melanerpes carolinus*), downy woodpecker (*Picoides pubescens*), blue jay (*Cyanocitta cristata*), American crow (*Corvus brachyrhynchos*), Carolina chickadee (*Poecile carolinensis*), tufted titmouse (*Baeolophus bicolor*), Carolina wren (*Thyrothorus ludovicianus*), eastern bluebird (*Sialia sialis*), northern mockingbird (*Mimus polyglottos*), loggerhead shrike (*Lanius ludovicianus*), European starling (*Sturnus vulgaris*), northern cardinal (*Cardinalis cardinalis*), lark sparrow (*Chondestes grammacus*), red-winged blackbird (*Agelaius phoeniceus*), eastern meadowlark (*Sturnella magna*), great-tailed grackle (*Quiscalus mexicanus*), brown-headed cowbird (*Molothrus ater*), and house sparrow (*Passer domesticus*).

Dixon (2000) indicates that 22 species of amphibians may occur within the proposed permit area. Amphibians likely to be common within the proposed permit area include smallmouth salamander (*Ambystoma texanum*), Blanchard's cricket frog (*Acris crepitans blanchardi*), green treefrog (*Hyla cinerea*), gray treefrog (*Hyla versicolor*), Strecker's chorus frog (*Pseudacris streckeri streckeri*), Texas toad (*Bufo speciosus*), and Gulf Coast toad (*Bufo valliceps*) (Kutac and Caran 1994).

Dixon (2000) also indicates that 53 species of reptiles may occur within the proposed permit area. According to Kutac and Caran (1994), reptiles expected to be common within the proposed permit area include common snapping turtle (*Chelydra serpentina serpentina*), ornate box turtle

(*Terrapene ornata ornata*), red-eared slider (*Trachemys scripta elegans*), green anole (*Anolis carolinensis*), Texas spiny lizard (*Sceloporus olivaceus*), ground skink (*Scincella lateralis*), six-lined racerunner (*Cnemidophorus sexlineatus sexlineatus*), Great Plains rat snake (*Elaphe guttata emoryi*), Texas rat snake (*Elaphe obsoleta lindheimeri*), eastern hognose snake (*Heterodon platirhinos*), broad-banded water snake (*Nerodia fasciata confluens*), diamondback watersnake (*Nerodia rhombifera rhombifera*), Texas brown snake (*Storeria dekayi texana*), rough earth snake (*Virginia striatula*), Texas coral snake (*Micrurus fulvius tener*), and broad-banded copperhead (*Agkistrodon contortrix laticinctus*).

3.3 SPECIES OF SPECIAL INTEREST

Two federally listed species are known to occur regularly in Bastrop County; the threatened bald eagle and the endangered Houston toad. The Houston toad is the only federally listed species known to occur regularly in Lee County. The Houston toad is a permanent resident in portions of the proposed permit area and the bald eagle likely occurs within the proposed permit area as a transient on a nearly annual basis.

Three listed bird species have the potential to occur in Bastrop and Lee counties during migration, the whooping crane (*Grus americana*), interior least tern (*Sterna antillarum athalassos*), and piping plover (*Charadrius melodus*). The crane and tern are listed as endangered. The wintering population of piping plover is listed as threatened. No listed plant species occur in either county, nor do any plant or animal species proposed for listing or designated as candidates for listing.

Five other rare animal species have the potential to occur in Bastrop County. Four are birds, the reddish egret (*Egretta rufescens*), white-faced ibis (*Plegadis chihi*), loggerhead shrike (*Lanius ludovicianus*), and Audubon's oriole (*Icterus graduacauda*), and one is a reptile, the Texas horned lizard (*Phrynosoma cornutum*). Two other rare species have the potential to occur in Lee County, the Texas horned lizard and Bachman's sparrow (*Aimophila aestivalis*). All five listed species and the six additional rare species are discussed below.

3.3.1 Bald Eagle

The bald eagle was listed as endangered in all but five (Minnesota, Michigan, Wisconsin, Washington, and Oregon) of the contiguous 48 states in 1978 (43 FR 6230-6233), and downlisted to threatened in 1995 (60 FR 35999-36010). Due to successful reintroduction programs and decreased habitat loss, as well as reductions in levels of certain pesticides in the environment, the bald eagle was proposed for delisting on 6 July 1999 (64 FR 36453). To date, a final rule has not been made on this proposal.

Bald eagles typically occur in the vicinity of coasts, large rivers and estuaries, and large lakes where they feed primarily on fish. Nests are usually constructed in tall trees and occasionally on cliffs. Currently the breeding range for the species includes large portions of Canada and Alaska, as well as the northern Great Lakes and New England states, much of the coastal region of Washington, Oregon, and California, the northern Rocky Mountain states, the Atlantic and Gulf of Mexico coastal regions, the central Mississippi River Valley states, and a few other scattered localities. In Texas, bald eagles are uncommon migrants and winter residents throughout the state and rare local residents (Texas Ornithological Society 1995). Breeding populations in

Texas are primarily found on the coastal plain and at scattered inland locations, generally along major rivers and reservoirs. Wintering populations occur primarily in the Panhandle, central, and eastern portions of the state, and in other areas of suitable habitat throughout the state (Campbell 1995).

Texas Parks and Wildlife Department (TPWD) records of bald eagles for the region include a confirmed observation of a nesting pair in Bastrop County near the confluence of Wilbarger Creek and the Colorado River approximately 6 miles east of the proposed permit area. The species is an occasional transient through the proposed permit area and may occur at Lake Bastrop within the proposed permit area in late fall, winter, and early spring (Freeman 1996). No incidental take authorization for this species is being requested.

3.3.2 Houston Toad

The Houston toad was listed as endangered on October 13, 1970 (35 FR 16047) and critical habitat was designated in Bastrop (98,000 acres) and Burleson counties (2,000 acres) on January 31, 1978 (43 FR 4022; 50 CFR 17.95). This species was first discovered in the Houston area and was formally recognized as a distinct species in 1953. By the 1970s, toad populations spanning three counties (Harris, Fort Bend, and Liberty) disappeared from the Houston area due to urban expansion (USFWS 1984). Current populations occur where pine and/or oak woodlands grow on geologic formations that support deep sandy soils. Houston toads have been documented in nine counties since 1989 – Austin, Bastrop, Burleson, Colorado, Lavaca, Lee, Leon, Milam, and Robertson (Yantis 1989-1992). The toad may also exist in Freestone and southern Bastrop counties, but no populations have been confirmed. Houston toads have not been found in Lavaca County since 1991 (Yantis 1989-1992), or in Burleson County in the area designated as critical habitat since 1983 (Dixon 1983, Yantis 1989-1992). Additional surveys are warranted to confirm their absence from these two areas.

The Lost Pines forest in Bastrop County supports the largest known population of Houston toads throughout their limited range, although their population in Bastrop County and range-wide is unknown. Additional significant breeding events have recently been identified near the Lee County and Bastrop County line (Kuhl 1997, Forstner and Dixon 2000). Seal (1994) estimated 2,000 Houston toads within Bastrop County in 1994. In 2001 TPWD estimated the population of Houston toads in Bastrop County as at least 2,000 adults (TPWD 2001) and surveys conducted in 2002 along roadways in portions of Bastrop County resulted in an estimate of approximately 1,200 male Houston toads under “the most liberal evaluation” of the survey data (Forstner 2002a). Forstner (2003) reported making an assumption-laden conclusion and drawing a liberal estimate using data from Griffith League Ranch and Bastrop State Park that Houston toad densities may not exceed 1 adult toad per 25 acres of habitat. Based on the studies conducted at Bastrop State Park and by Forstner, the Houston toad population within the proposed permit area may consist of a few to several thousand adult toads. In mark-recapture surveys of Houston toads in Bastrop, observed sex ratios of males to females have been highly skewed in favor of males, ranging from 3:1 to 10:1 (Dixon et al. 1990, Forstner 2002a, 2002b, Andy Price, TPWD, pers. comm. 2002). Recent trend analyses indicate that Houston toad numbers in Bastrop State Park are declining (USFWS 1999). Reasons for the decline are not known, but are likely related to development activities and drought conditions in the 1990s (Forstner 2002a, Andy Price, TPWD, pers. comm. 2002).

Houston toad habitat is described as pine or oak woodland and savannah (Campbell 1995) and as pine and/or mixed deciduous woodland interspersed with some open grassy areas (USFWS 1984). Currently the Service believes, at least within Bastrop County, this species is more closely associated with pine and oak forests with deep sandy soils. Because the skin of Houston toads is semi-permeable to water, they aestivate to escape drought conditions. Because Houston toads are ectotherms (“cold-blooded”) and have skin that is semi-permeable to water, they become dormant to escape harsh weather conditions, such as winter cold (hibernation) and summer drought (aestivation). Aestivation and hibernation are typically performed in burrow although shorter term sheltering from adverse weather conditions (such as overnight cold) may be accomplished by burrowing into sand or hiding under rocks, leaf litter, logs, or in abandoned animal burrow (Forstner 2003, Hillis et al. 1984). Houston toads are typically associated with woodland habitat, but also breed in and migrate across sparsely wooded and cleared areas near woodlands. They may also breed in and traverse areas that do not support deep sandy soils, including clay and gravel substrates, provided these areas are near woodlands underlain by pockets of deep sandy soils. The extent to which Houston toads use cleared areas is unknown. However, two years of trapping results on the Griffith League Ranch failed to collect any Houston toads in pastures at any distance greater than 50 meters from the forest edge (Forstner 2002b).

Houston toads are generally brown and speckled. However, individual toad coloration can vary considerably. Some appear to be light brown and others almost black. They may also have a slightly reddish, yellowish, or grayish hue. Their legs are banded with darker pigment, and two dark bands extend from each eye down to the mouth. A variable white stripe is present along the spine and whitish streaks are present along the sides of the body. The underside is usually pale with small dark spots. Males have a dark throat that appears bluish when distended. Adult Houston toads are 2 to 3.5 inches long and, like all true toads, are covered with raised patches of skin that resemble warts and have two enlarged parotoid glands which contain chemicals that make the toad distasteful, and sometimes poisonous, to predators. Adult toads are indiscriminate feeders and eat a wide variety of insects and other invertebrates (USFWS 1984).

Houston toads breed from January to June with a peak in February and March. Individually marked male and female Houston toads have been observed to move between breeding ponds that are almost one mile apart (Andy Price, TPWD, unpubl. data). Houston toads typically use ephemeral rain pools for breeding, although the species has been known to breed in a variety of other aquatic sites (USFWS 1984). Houston toads appear to prefer ephemeral pools over permanent ponds (USFWS 1999) and need shallow water areas for breeding. In wet years, breeding may occur wherever sufficient standing water is present. For successful breeding, water must persist for at least 30 to 60 days to allow time for egg hatching, tadpole maturation, and emergence of toadlets (Hillis et al. 1984; USFWS 1984). Algae and pollen occurring in permanent or ephemeral water bodies comprise the primary food source for tadpoles (Hillis et al. 1984). Mortality in young is high due to predation and drying of breeding sites, and less than 1 percent of eggs laid are believed to survive to adulthood (USFWS 1994).

Under suitable environmental conditions, Hillis et al. (1984) observed Houston toad males calling just before sunset from burrow or thick layers of pine needles along gulleys leading to ponds and while traveling to ponds. Location of burrows ranged from three feet (one meter) to over 130 feet (40 meters) from the shore, and after breeding, the burrow appeared to be

abandoned. Forstner (2003) also identifies the area immediately adjacent to ponds as being especially important habitat for the toad. Females arrive later in the evening. Pairs remain in amplexus for six hours at minimum and eggs are laid in the early morning hours. Reported clutch sizes per female vary from 512 to 6,199 eggs (Kennedy 1961, Quinn and Mengden 1984, Quinn et al. 1987)

Following metamorphosis, juveniles disperse into terrestrial habitats. Many amphibians use terrestrial sites at substantial distances from the nearest breeding pond (Dodd and Cade 1998). Members of the *Bufo* genus are among the most terrestrial anurans (frogs and toads) (Landreth and Ferguson 1968). They live continually on land following metamorphosis and return to water only briefly during the breeding season (Christein and Taylor 1978). Because of the dependence of toads on terrestrial habitats, conservation actions that focus solely on breeding sites are unlikely to be successful (Laan and Verboom 1990; Pechmann and Wilbur 1994; Findlay and Houlahan 1997; Dodd and Cade 1998; Gibbs 1998; Semlitsch 1998).

Threats to the Houston Toad

Reasons for increased extinction rates of plant and animal species include decreased habitat size and quality, increased distance between similar habitats, the degree of difference in the intervening matrix, changes in biotic and abiotic properties of habitats, and ecosystem vulnerability to extrinsic disturbances (Harris 1984; Lord and Norton 1990; Reh and Seitz 1990; Soule et al. 1992; Pechmann and Wilbur 1994; Vos and Chardon 1998). Providing several large tracts of high quality habitat, avoiding fragmentation, maintaining connectivity, buffering from negative effects, and instituting habitat management greatly influence the persistence of species (Shafer 1997).

Small, sedentary species like the Houston toad, with restricted distributions, specialized habitat niches, and narrow climatic tolerances are particularly vulnerable (Welsh 1990; Demaynadier and Hunter 1998). Population viability analyses for the Houston toad indicate that risk of extinction increases with reduced migration, survivorship, reproductive success, and continued gradual and sustained reduction of available habitat. Probability of population survival is enhanced by maintaining several populations of relatively large and equal sizes that are interconnected to allow dispersal and recolonization to occur (USFWS 1994).

Loss and Fragmentation of Terrestrial Habitat

Primary threats to the Houston toad include the destruction, conversion, and fragmentation of habitat throughout its range as a result of urbanization, logging, and agricultural production. Habitat conversion, often being permanent, poses the most serious threat to the Houston toad. Woodlands inhabited by the toad have been destroyed, degraded, and/or made sub-optimal by increased urban/suburban sprawl. Conversely, Houston toads currently persist, although in much smaller numbers than in historical reports, in semi-rural, large lot subdivisions in fairly close proximity to homes and ranches (Forstner 2002a).

Large habitat patches generally contain larger animal and plant populations with lower extinction probabilities, and these larger patches tend to be occupied more often than smaller ones (Soule et al. 1992). Habitat destruction and degradation contribute to habitat fragmentation (smaller patches with greater distances between patches). Increased fragmentation isolates

habitat and increases the Houston toad's vulnerability to adverse impacts, including predation, interspecific competition, and reduced food availability. Habitat fragmentation contributes to the genetic isolation of populations or population fragmentation (which in turn can reduce genetic variation and viability necessary to produce healthy offspring). This increases the risk of extinction by reducing survival, reproduction, and dispersal. Isolation also precludes recolonization should one or more populations be eliminated. These risks are compounded when populations are surrounded by an inhospitable environment that continually imposes a high degree of threats on the remnant habitat (Denton et al. 1997; Laan and Verboom 1990; Reh and Seitz 1990; Soule et al. 1992; Pechmann and Wilbur 1994; Shafer 1997; Gibbs 1998; Semlitsch 1998; Vos and Chardon 1998). As numbers of populations are reduced and numbers of individuals in populations decline, the species also becomes vulnerable to catastrophic events, such as severe and prolonged drought conditions. Droughts may reduce small populations to such low numbers that they are unable to recover (Soule et al. 1992; Pechmann and Wilbur 1994).

Loss/Degradation of Breeding Habitat

Small wetlands are crucial to the survival of many amphibians, other vertebrates, and invertebrate species. Water is an important factor in the survival of the Houston toad, since reproduction cannot occur without adequate water levels in breeding pools. Houston toads typically prefer to breed in small, temporary pools that may be destroyed or degraded by modern agricultural practices, logging operations, and/or urbanization. Run-off, erosion, and application of pesticides and fertilizers may contaminate breeding sites. Since Houston toads require shallow areas for breeding activities, deepening of ponds or pools may effectively eliminate breeding and/or attract predators (Denton et al. 1997; Hecnar and M'Closkey 1997; Kupferberg 1997; Knutson et al. 1999) and competitors (see interspecific competition, below). The creation of stock ponds, recreational fishing ponds, or other permanent water bodies also provide avenues for invading species such as bullfrogs (*Rana catesbeiana*), which have been known to cause severe detrimental effects on native amphibians and reptiles through predation and/or competition (Kupferberg 1997). Bullfrogs were first reported in Bastrop State Park in 2000 (Andy Price, TPWD, pers. comm. 2000).

Protecting terrestrial habitat adjacent to breeding sites is also essential to conserving breeding habitat. Terrestrial habitat provides continuity needed to allow for movement between ponds and recolonization of areas should a local population extinction occur (Laan and Verboom 1990; Rudolph and Dickson 1990; Welsh 1990; Demaynadier and Hunter 1998; Gibbs 1998; Knutson et al. 1999). The loss of habitat that supports the terrestrial phase of the toad's life would most likely reduce recruitment of juveniles into the breeding population, adult survival, and the persistence of the population (Laan and Verboom 1990; Pechmann and Wilbur 1994; Findlay and Houlahan 1997; Dodd and Cade 1998; Gibbs 1998; Semlitsch 1998).

Interspecific Competition

The range of the Houston toad overlaps with only two other *Bufo* species, Woodhouse's toad and the Gulf Coast toad. Woodhouse's toad occurs in a variety of habitats and is the most widespread toad in North America. The Houston toad appears to be a poor competitor that has adapted to an environment where, under natural conditions, few interspecific interactions occur (Yantis 1989). The presence of woodlands provides an important separation between the habitat of the Houston

toad and Woodhouse's toad. Although the breeding seasons of the Houston toad and Woodhouse's toad are similar, their different habitat requirements tend to keep them separated. In Bastrop County, the Houston toad occurs throughout the pine forest, while Woodhouse's toad populations surround the forest. Since Woodhouse's toads are generally found in more open habitats, extensive land clearing practices can quickly diminish numbers of Houston toads in favor of Woodhouse's toads. Hybridization between these two species occurs primarily along habitat edges where the forest has been cleared and permanent ponds have replaced ephemeral pools (USFWS 1984).

The Gulf Coast toad is primarily a lowland species with a range that extends from Louisiana and Texas south to Costa Rica. The primary isolating mechanism between the Houston toad and the Gulf Coast toad is the separation of their breeding seasons – the Gulf Coast toad tends to breed later in the year. However, there is some overlap in the breeding seasons, particularly when breeding in the Houston toad is delayed due to cold weather. The Gulf Coast toad also tends to prefer permanent breeding ponds rather than the temporary rain pools used by the Houston toad, so some degree of habitat partitioning also occurs between these two species. Elimination or modification of temporary rain pools, or their conversion to permanent ponds, forces Houston toads to use permanent ponds where they may be outnumbered by Gulf Coast toads (USFWS 1984).

Differences in species densities may also be an important factor contributing to interspecific competition and hybridization (Brown 1971). The Houston toad is soon replaced by Woodhouse's or Gulf Coast toads in areas where these species are more abundant (Hillis et al. 1984). An abundance of Woodhouse's or Gulf Coast toads in an area is an indication that Houston toads may be absent (Yantis 1991). Brown (1971) documented a location near Bastrop State Park where Woodhouse's toads rapidly invaded a Houston toad breeding pond following land clearing. Hybridization was reported shortly after the area had been cleared (Brown 1971), and Houston toads later disappeared from this site. However, the Houston toad appears to have a competitive advantage at sites where it outnumbers Woodhouse's and Gulf Coast toads (that is, terrestrial habitat with ephemeral ponds).

Predators (Native and Non-native)

Native predators of Houston toads include birds, mammals, snakes, and turtles. Introduction of domestic pets, particularly house cats and dogs, and an increase in some native mammals (raccoons and opossums) generally accompanies human settlements and can have negative impacts on amphibian and other vertebrate populations (Soule et al. 1992). The red-imported fire ant (*Solenopsis invicta*) also tends to benefit from destruction of native habitats and the presence of humans (Tschinkel 1988, Porter et al. 1988, 1991). Where fire ant infestations occur, they undoubtedly impact the toad both directly and indirectly through predation and competition. Fire ants have been observed preying on newly metamorphosed Houston toads (less than 10 days old) as they emerged from the water (Freed and Neitman 1988; Mike Forstner, SWTU, pers. comm. 2001). The fire ant is an aggressive predator, and current evidence shows that it has a devastating and long-lasting impact on native ant populations and other invertebrate communities (Vinson and Sorensen 1986, Porter and Savignano 1990), which provide food for the Houston toad.

Research in some areas, including the fire ant's native range, indicate that fire ants are associated with open habitats disturbed as a result of human activity (e.g., old fields, lawns, roadsides, ponds, and other open, sunny habitats), but are absent or rare in late succession or climax communities such as mature forest (Tschinkel 1988). Thus, maintaining large, undisturbed areas of woodlands may help control the spread of fire ants (Porter et al. 1991) and protect native ant populations (Porter et al. 1988, 1991; Suarez et al. 1998). Several native ants are known to attack and kill founding fire ant queens and are especially important in deterring fire ants from colonizing non-infested areas (Porter et al 1991).

Vehicle Strikes

Traffic mortality has a significant negative effect on local population densities of some invertebrates, small mammals (Mader 1984; Mader et al. 1990), and amphibians (Van Gelder 1973; Reh and Seitz 1990; Soule et al. 1992; Fahrig et al. 1995; Yanes et al. 1995; Findlay and Houlahan 1997; Gibbs 1998; Vos and Chardon 1998; Knutson et al. 1999). Roadways eliminate and fragment habitat and result in mortality from vehicle strikes, presenting a serious threat to survivorship and dispersal (Reh and Seitz 1990; Fahrig et al. 1995; Findlay and Houlahan 1997; Vos and Chardon 1998). Roadways can have serious demographic consequences and result in adult mortality and reduced connectivity and migration among remnant habitat patches (Reh and Seitz 1990; Fahrig et al. 1995; Findlay and Houlahan 1997; Vos and Chardon 1998). Amphibians that are slow-moving and ground-dwelling are especially vulnerable to roadway mortality (Vos and Chardon 1998).

Roadway mortality can severely impact amphibian populations (Vos and Chardon 1998). The proportion of mortality from vehicle strikes increases with increasing roadway density and traffic (Fahrig et al. 1995; Vos and Chardon 1998). Surveys along an approximately 5-mile stretch of Highway 21 in Bastrop County during 1990 reported 67 percent of the Houston toads observed were dead on the road (Price 1990). Van Gelder (1973) found that about 30 percent of female European toads (*Bufo bufo*) crossing a 13-foot wide asphalt road, with traffic equal to about 10 cars/hour, were run over. Later studies concluded that 24 to 40 cars/hour killed 50 to 100 percent of amphibians crossing the roads (Fahrig et al. 1995; Vos and Chardon 1998).

The presence of forest generally has a positive effect on toad densities (Fahrig et al. 1995), and the removal of forest associated with road construction can pose significant risks to wetland biodiversity (Findlay and Houlahan 1997) and isolation of breeding ponds (Vos and Chadron 1998). Vos and Chardon (1998) suggest that the distribution of suitable terrestrial habitat may be a limiting factor in the mortality of amphibians in the terrestrial phase of their life cycle, and that dispersal may be more effective in landscapes with large proportions of suitable habitat. Other road-related factors, such as pollutants in road run-off, exhaust emissions, vibrations, and noise, may also affect toad densities either by causing direct mortality or interrupting normal behavior (Fahrig et al. 1995).

Pesticides, Fertilizers, and Contaminants

There is no evidence that pesticides or other chemicals have caused significant adverse effects to Houston toads. However, pesticides and other chemicals have the potential to impact the Houston toad directly, particularly during the aquatic phase of its life cycle, and/or indirectly by lowering the abundance and diversity of its food supply. Research indicates that amphibians,

particularly their eggs and larvae, are sensitive to many pollutants, such as heavy metals, herbicides, certain insecticides (e.g., endosulfan, endrin, toxaphene, parathion, malathion and dieldrin), nitrites, salts, and petroleum hydrocarbons (Harfenist et al. 1989). Because toads have semi-permeable skin, their eggs and larvae develop in water, and because of their position in the food web, these amphibians can be exposed to waterborne and airborne pollutants (Bishop and Pettit 1992). Pesticides can change the quality and quantity of amphibian food and habitat (Bishop and Pettit 1992). The amount and quality of food and shelter may be reduced when insecticides and herbicides contaminate wetland ecosystems. In sufficient concentration, pesticides could change or reduce macrophyte, algal, and invertebrate populations, resulting in a loss of food and/or cover for Houston toad adults, young, and tadpoles.

Pesticides may enter Houston toad habitat through direct application, drift from sprays, and/or through agricultural and urban run-off. Herbicides used along highways and other roads, as well as roadway run-off, may be harmful to the Houston toad. The commonly used herbicide Atrazine has been shown by Hazelwood (1970) to seriously affect frog eggs and is now known to be an endocrine disrupter to amphibians (Hayes et al. 2002). Pesticides commonly used by area residents also have the potential to adversely impact Houston toads. Heavy metals and petroleum hydrocarbons deposited by automobiles along highways may accumulate to the point of becoming toxic to the Houston toad. Toxic effects to amphibians from pollutants may be either lethal or sub-lethal, including morphological and developmental aberrations, lowered reproduction and survival, and changes in behavior and certain biochemical processes.

Use of ephemeral ponds for breeding by the Houston toad likely reduces the potential impacts mentioned above in comparison to those anuran species that utilize permanent ponds. Sorption of pollutants to soil and sediment particles is a significant factor in pollutant transport (USGS 2000). Since permanent ponds have larger watersheds and accumulate more sediment, permanent ponds have a greater capacity to accumulate pesticides and other potentially harmful pollutants over time.

Edge Effects and Small Population Size

Maintaining adequate areas of native vegetation is essential to prevent detrimental “edge effects” (e.g., heating, drying, shift in species composition and abundance, invasion of exotic species, increased predation/competition). Edge effects are changes to the floral and faunal communities where different habitats, such as forest/pasture, forest/clear-cut, or forest/suburb, meet. The length and width of the edge and the contrast in types of land cover between the habitats all contribute to the amount of impacts that an edge can produce (Harris 1984; Smith 1990). Some types of edge effects include increases in solar radiation, changes in soil moisture due to elevated levels of evapotranspiration, and wind buffeting (Ranny et al. 1981), changes in nutrient cycling and disruptions to the hydrological cycle (Saunders et al. 1990), and changes in the rate of leaf litter decomposition (Didham 1998). These edge effects cause disruptions in native plant communities, which in turn impact associated animal species. The effects of edge on animal communities generally are greater than the effects on vegetation communities (Wilcove et al. 1986).

For vegetation, edge effects have been documented to extend inward from the margin to between 52 and 449 feet (Jiquan et al. 1992; Stefan and Fairweather 1997; Meiners and Steward 1999). These edge effects include decreased density, elevated tree mortality, increased growth rates and

recruitment of dominant species (Jiquan et al. 1992), increased proportions of exotic species, decreased proportions of native species (Stefan and Fairweather 1997), and changes in species richness and percentage of cover (Meiners and Steward 1999).

For animal communities, reported edge effects are typically 164 to 328 feet or greater (Lovejoy et al. 1986; Wilcove et al. 1986; Laurance 1991; Laurance and Yensen 1991; Kapos et al. 1993; Andren 1995; Reed et al. 1996; Burke and Nol 1998; Didham 1998; Suarez et al. 1998). Native ant communities tend to be more abundant in native vegetation and less abundant in areas with exotic vegetation. Edges and their associated effects often allow just enough disruption for invasive species to gain a foot-hold where native vegetation had previously prevented their spread (Saunders et al. 1990; Kotanen et al. 1998; Suarez et al. 1998; Meiners and Steward 1999). The invasion of red-imported fire ants is known to be aided by “any disturbance that clears a site of heavy vegetation and disrupts the native ant community” (Porter et al. 1988). Thus, maintaining large, undisturbed areas of woodlands can help sustain native ant communities needed to help combat the fire ant threat (Porter et al. 1988; Porter et al. 1991).

The detrimental effects of edge increase as the size of a habitat patch decreases. Populations in small habitat patches are much more vulnerable to extinction than populations within large, contiguous patches (Diamond 1975; May 1975; Wilcove et al. 1986; Soule et al. 1992; Denton et al. 1997; Gibbs 1998). Small, isolated populations occurring in small habitat patches likely have a higher extinction rate because they lose more emigrants than are compensated for by immigration. Immigrants reduce the risk of extinction of local populations by a “rescue” effect, since colonizations are necessary to compensate for local extinctions. The ability of individuals to move between preferred habitat patches is essential for colonization and population viability (Fahrig and Merriam 1994; Kattan et al. 1994; Eber and Brandl 1996; Hill et al. 1996; Kozlov 1996; Kuussaari et al. 1996; Turner 1996; Kindvall 1999). Some studies demonstrate higher emigration as patch size decreases, while immigration tends to increase as patch size increases (Kuussaari et al. 1996; Kindvall 1999). Large circular or square patches tend to have less emigration than narrow, elongated patches because the probability of encountering a patch boundary decreases with increasing patch size and decreasing edge/patch ratios. Likewise, large patches have a higher probability of colonization than small patches. Patch shapes that allow connection with the highest number of neighboring patches increases the likelihood that a neighboring patch will be occupied (Fahrig and Merriam 1994; Kuussaari et al. 1996; Tiebout and Anderson 1997; Kindvall 1999). If movement between populations is restricted and a population is isolated, the habitat patch size must be large enough to ensure population survival on its own (Fahrig and Merriam 1994).

Threats from Agriculture

Agricultural production (including timber harvesting) contributes to the loss of habitat through the conversion of woodlands to pasture or cropland; the draining, filling, or deepening of wetlands important for Houston toad reproduction; soil compaction; application of fertilizers and pesticides; and/or mortality or disturbance of aestivating toads (Knutson et al. 1999). Conversion of woodlands to exotic sod-forming grasses (such as bermudagrass) and other cover types increases threats of competition to the Houston toad by providing habitat for Woodhouse's toad and the Gulf Coast toad, increases Houston toad exposure to predators, and hinders Houston toad mobility and dispersal capabilities. Habitat conversion also encourages the establishment of fire ants.

Threats from Urbanization

Knutson et al. (1999) conducted a study that concluded a consistent negative association between the presence of urban land and effects across all anuran guilds. Residential development within suburban settings leads to the introduction of exotic turfgrasses (and increased application of pesticides) that can limit and decrease Houston toad mobility and dispersal. In addition, residential development leads to the construction of more roads, increasing the likelihood of motor vehicle strikes. There are also increased threats from predators and competitors, loss of breeding ponds, and the spread of red-imported fire ants (*Solenopsis invicta*). These factors work together to decrease the population and distribution of the Houston toad, and ultimately may lead to local toad extinctions.

The adverse effects of residential development on the demography of Houston toads are likely due to a combination of factors. The construction of homes and associated infrastructure in high density results in permanent habitat loss, degradation, and fragmentation (including conversion of woodlands to sod-forming turfgrass lawns and other exotic vegetation, soil compaction, erection of privacy fencing, introduction of imported top-soils, and application of pesticides). Direct mortality may occur during site clearing, preparation, and construction. In addition, residential development increases road and traffic densities with the increased likelihood of mortality from motor vehicle strikes. These terrestrial habitat changes inhibit the mobility and dispersal needed for Houston toad survival (e.g., access to food and breeding sites, protection from predators and competitors, genetic exchange, etc.), eliminate shelter (sandy soils, leaf litter, or animal burrow) needed to escape predators and adverse weather conditions (cold, heat, and drought), reduce the abundance and diversity of invertebrate communities fed on by Houston toads, create habitat conditions favored by predators and competitors, and result in the direct mortality of toads (including roadkills and from construction activities).

Suburban development can also result in the destruction or degradation of breeding ponds so that reproduction declines or ceases. Breeding sites may be destroyed during the construction of homesites, septic systems, and lawns. Some homeowners may eliminate, enlarge, or aerate breeding ponds in an effort to discourage breeding mosquitoes. Ponds may also be stocked with fish. Since Houston toads require shallow areas for breeding activities, deepening of ponds may effectively eliminate breeding and/or increase predation and competition that reduce survival and reproduction.

Habitat changes and associated edge effects increase the exposure of Houston toads to competition from Woodhouse's and Gulf Coast toads and predators, including domestic pets (dogs and cats), native mammals (e.g., raccoons and opossums) attracted to predictable food sources found in residential areas (trash cans and pet food dispensers), and fire ants. Fire ants may be introduced through imported topsoils and nursery plants, and/or may increase in intensity and distribution due to land clearing and suburban development. The increasing density of human activities also increases the chances of encountering toads and the potential for humans pursuing, trapping, capturing, and/or collecting Houston toads, and either accidentally or intentionally wounding or killing toads. Malicious killing of other toad species has been documented in some residential areas (Lisa O'Donnell, USFWS, pers. comm. 2000).

3.3.3 Whooping Crane

The whooping crane was listed as endangered in 1967 (32 FR 4001). Whooping cranes breed in Alberta, Canada and winter on the Gulf Coast of Texas at Aransas National Wildlife Refuge (NWR) in Aransas and Calhoun counties. It is likely that some whooping cranes fly over Bastrop County and/or Lee County on an annual basis while traveling to and from their wintering grounds.

Whooping cranes utilize wetlands and croplands as feeding and resting stops during migration (Campbell 1995). Cranes usually migrate during the day and travel individually or in small groups (Campbell 1995). Whooping cranes are known to congregate during migration along the Red River in Texas, Cimarron River in Oklahoma, and the Platte, Middle Loup, and Niobrara Rivers in Nebraska, where they often roost on sandbars in the rivers (Campbell 1995). No migratory concentrations of cranes are known to occur south of the Red River, although it is expected that individual or small groups of cranes occasionally alight while traveling between Aransas NWR and the Red River. Potential exists for this species to occur on the ground within the proposed permit area, although no evidence exists that suggests migrating whooping cranes regularly rest and/or feed within the proposed permit area. No incidental take authorization for this species is being requested.

3.3.4 Interior Least Tern

The interior least tern is a subspecies of the least tern that was listed as endangered in 1985 (50 FR 21784-21792). Nesting habitat includes large areas of bare or sparsely vegetated sand, shell, and gravel beaches, sandbars, islands, and salt flats near large rivers and reservoirs. Interior least terns are known to breed in Texas along portions of the Rio Grande, Canadian River, and Prairie Dog Town Fork of the Red River (Campbell 1995). Least terns winter along the coasts of Central and South America. Interior least terns could occur occasionally in Bastrop and Lee counties during migration, where they would primarily be expected to occur on large waterbodies such as Lake Bastrop, Lake Somerville, and the Colorado River. No incidental take authorization for this species is being requested.

3.3.5 Piping Plover

The piping plover is regarded as having three breeding populations, the northern Great Plains, Great Lakes, and Atlantic Coast. In 1985, the northern Great Plains and Atlantic Coast populations were listed as threatened and the Great Lakes population was listed as endangered (50 FR 50726-50734). This species winters on coastal beaches and mud flats of the southern United States and northeastern Mexico. Piping plovers occurring at inland locations in Texas are generally considered to be migrating individuals from the northern Great Plains population. Migrating plovers typically occur on beaches or mudflats associated with lakes, major rivers, and large sewage treatment plants. Little suitable habitat for this species occurs within the proposed permit area. No incidental take authorization for this species is being requested.

3.3.6 Other Rare Species

As previously discussed, six non-listed rare species have the potential to occur in Bastrop and/or Lee counties. These species include the reddish egret, white-faced ibis, loggerhead shrike, Bachman's sparrow, Audubon's oriole, and Texas horned lizard. No incidental take authorization for these species is being requested.

Species Likely to Occur within the Proposed Permit Area

The white-faced ibis is a common wading bird along the Texas Gulf Coast, breeds at scattered localities in the western two-thirds of the state, and is a rare to uncommon migrant throughout the state (TBRC 1995). The white-faced ibis is not known to breed within the proposed permit area nor anywhere else in Bastrop and Lee counties (TBRC 1995). This species typically occurs in marshes, wet meadows, rice fields, and irrigated croplands, and could occur anywhere within the proposed permit area as a post-breeding visitor or transient in appropriate habitat such as the wet, marshy margins of a stock pond. The white-faced ibis may occur in or fly over the proposed permit area on an annual basis.

The loggerhead shrike is a predatory species of songbird that occurs in a wide range of open and semi-open habitats and usually nests in shrubs or small trees (Ehrlich et al. 1988). Shrikes often impale prey items on thorns to store them for later use or to delineate territory boundaries. The species regularly occurs along roadsides, likely because these are often bordered by utility lines and/or barbed wire fences, which provide perches and, in the case of fences, opportunities to impale prey items. This species occurs as a permanent resident throughout much of the state, with populations augmented in winter by migratory individuals from more northerly populations (TBRC 1995). Loggerhead shrikes undoubtedly occur as a permanent resident in appropriate habitat throughout the proposed permit area.

Texas horned lizards historically occurred throughout Texas and Oklahoma, as well as portions of Louisiana, Arkansas, Missouri, Kansas, Colorado, New Mexico, Arizona, and northeastern Mexico (Stebbins 1985). Populations decreased greatly in the 1950s and 1960s and now the species occurs in Texas primarily in the western two-thirds of the state (Garrett and Barker 1987). Based on records submitted to the TPWD through its Texas Horned Lizard Watch program, the species is known to be extant in Bastrop County. No records of the species have been submitted to the agency from Lee County, but it is likely to occur there based on known occurrences in adjacent Bastrop, Burleson, and Milam counties (L. Linam, TPWD, pers. comm. 2002). The species primarily eats large ants and typically occurs in areas with loose sandy soil and sparse vegetation. Texas horned lizards hibernate in burrow generally from October to April (Garrett and Barker 1987). It is possible that small numbers of Texas horned lizards occur in relatively undisturbed portions of the proposed permit area where soils are sandy and vegetation is open.

Species Unlikely to Occur within the Proposed Permit Area

The reddish egret is a coastal species of heron typically associated with saltwater beaches and mudflats. This species is a permanent resident on the Texas Gulf Coast, with immature

individuals occasionally wandering inland, usually in late summer or early fall after conclusion of the breeding season (TBRC 1995). Reddish egrets do not breed within the proposed permit area and would only be expected to occur in the area on an irregular and accidental basis. This species will not be discussed further in this assessment.

Bachman's sparrow is a non-migratory and relatively sedentary songbird that occurs in open pine forests, usually with a grassy understory. The species occurs in the southeastern United States and in Texas is restricted to the eastern portion of the state, apparently east of the Trinity River (Shackleford 2001). Bachman's sparrow is not known or considered likely to regularly occur within the proposed permit area; the nearest known population occurs roughly 100 miles to the northeast. This species would be expected to occur within the proposed permit area only on an extremely irregular and accidental basis and will not be discussed further in this assessment.

Audubon's oriole is an uncommon permanent resident of brushlands and woodlands of south Texas, generally occurring north to Live Oak and Goliad counties roughly 100 to 120 miles south of the proposed permit area (TBRC 1995, SWCA pers. obs.). This species would be expected to occur within the proposed permit area only on an extremely irregular and accidental basis and will not be discussed further in this assessment.

3.4 WETLANDS

National Wetland Inventory maps prepared by the Service that encompass the proposed permit area were reviewed by SWCA. Based on these maps, wetlands are relatively common and distributed widely throughout the proposed permit area. Virtually all areas identified as wetlands are associated with man-made stock ponds or stream and river channels. Approximately 1,850 man-made ponds occur within the proposed permit area and the vast majority of these (more than 95 percent) are described as palustrine, open-water, permanently flooded, impounded, or diked wetlands. Stream and creek channels primarily support temporarily or seasonally flooded palustrine, broad-leaved deciduous forested wetlands. Wetlands associated with the margins of the Colorado River are generally permanently, seasonally, or temporarily flooded, classified as riverine or palustrine, and primarily support broad-leaved deciduous forest or scrub-shrub vegetation.

3.5 GEOLOGY AND SOILS

Nine geologic units are present within the proposed permit area, the Wilcox Group, Carrizo Sand, Reklaw Formation, Queen City Sand, Weches Formation, Sparta Sand, Cook Mountain Formation, fluvial terrace deposits, and alluvium (Barnes 1983). These units are described in order as they outcrop from west to east across the proposed permit area, with the exception of the fluvial terrace deposits and alluvium, which occur throughout the area along the Colorado River and larger stream channels. All geologic units were deposited during the Eocene Epoch of the Tertiary Period, with the exception of the alluvium and fluvial terrace deposits, which are Quaternary in age.

The majority of the western portion of the proposed permit area is underlain by the Wilcox Group (Barnes 1983). This group is subdivided into the Calvert Bluff, Simsboro, and Hooper formations. The Calvert Bluff and Hooper formations primarily consist of mudstone with various amounts of sandstone and lignite. The Calvert Bluff Formation has a thickness of up to

1,000 feet and the Hooper Formation has a thickness of up to 500 feet. The Simsboro Formation consists of sand, some mudstone, clay and mudstone conglomerate and has a thickness of up to 300 feet. This formation typically forms gently rolling hills.

The Carrizo Sand Formation is made up of sandstones with a minimum thickness of 100 feet (Barnes 1983). From the surface, this formation is often characterized by ridges thickly forested with oak. The Reklaw Formation consists of sand and clay with a thickness of approximately 80 feet (Barnes 1983). This formation forms deep, red soil. The Queen City Sand Formation consists of fine-grained quartz with a minimum thickness of approximately 200 feet (Barnes 1983).

The Weches Formation consists primarily of green sand, sand, and clay with a thickness of approximately 50 feet (Barnes 1983). Marine megafossils and microfossils are abundant in this formation. The Sparta Sand Formation consists of quartz sand with a thickness of approximately 150 to 200 feet (Barnes 1983). The Cook Mountain Formation primarily consists of clay and is approximately 200 to 300 feet thick (Barnes 1983). Marine megafossils and microfossils are also abundant in this formation.

Fluvial terrace deposits occur on terraces along the Colorado River and larger stream channels (Barnes 1983). These deposits primarily consist of gravel, sand, silt, and clay and were laid down during the Pleistocene Epoch. Deposits of alluvium also occur along the course of the Colorado River, primarily within the boundaries of the floodplain (Barnes 1983). Alluvial deposits are recent and consist primarily of clay, silt, sand, and gravel.

Review of the Soil Survey of Bastrop County, Texas indicates that soils within that portion of the proposed permit area in Bastrop County are classified into five general associations: Patilo-Demonia-Silstid, Axtell-Tabor, Crockett-Wilson, Behring-Crockett-Heiden, and Bosque-Smithville-Norwood (Soil Conservation Service 1979).

The majority of soils within the proposed permit area in Bastrop County lie within the Patilo-Demonia-Silstid and Axtell-Tabor associations (Soil Conservation Service 1979). Soils within the Patilo-Demonia-Silstid Association generally occur on uplands. These soils are sloping to strongly sloping with a sandy surface layer and lower layers that are moderately to slowly permeable. Soils within the Axtell-Tabor Association generally occur on stream terraces and uplands. These soils are nearly level to strongly sloping and have a loamy surface layer and very slowly permeable lower layers.

Soils in the Crockett-Wilson Association occur in the northeastern edge of Bastrop County (Soil Conservation Service 1979). These soils, found on uplands, are nearly level to strongly sloping with a loamy surface layer and very slowly permeable lower layers. Soils in the Behring-Crockett-Heiden Association occupy the southwestern and northeastern areas of the proposed permit area. These soils, found on uplands, are gently sloping to strongly sloping soils that have a loamy to clayey surface layer and slowly to very slowly permeable lower layers.

Soils present along the Colorado River lie within the Bosque-Smithville-Norwood Association (Soil Conservation Service 1979). These soils, generally occurring on low terraces and floodplains, are nearly level, have a loamy surface layer and moderately permeable lower layers.

The U.S. Department of Agriculture Natural Resources Conservation Service is in the process of updating the soil survey for Lee County, which was originally prepared in 1906 and is out of print. Nine soil series were mapped as occurring within the proposed permit area in Lee County, although most of the area is covered by five of these: Houston black clay, Orangeburg fine sand, Lufkin gravelly loam, Norfolk fine sand, and Orangeburg fine sandy loam (Burgess and Lyman 1906).

Houston black clay was mapped as occurring over much of the southern portion of the proposed permit area in Lee County, generally in the area that lies between SH 21 and FM 1624 (Burgess and Lyman 1906). This soil was described as occurring on gently rolling topography with dark loam and clay loam overlying heavy clay. Orangeburg fine sand was mapped as occurring throughout much of the remainder of the proposed permit area in Lee County (Burgess and Lyman 1906). This soil was described as having an upper layer of 18 to 36 inches of fine to medium, loose sand overlying 30 to 36 inches of red sandy clay.

Lufkin gravelly loam was mapped as occurring in patches throughout the proposed permit area (Burgess and Lyman 1906). It typically occurred on divides between larger streams and consisted of up to 15 inches of fine gray sand, clay, and loam mixed with gravel and overlying 24 to 84 inches of sandy clay.

Norfolk fine sand was mapped as occurring in patches in the central and northern portions of the proposed permit area in Lee County (Burgess and Lyman 1906). Norfolk fine sand was described as fine, loose gray sand that was greater than 36 inches deep. Orangeburg fine sandy loam was limited to areas in the North and Middle Yegua Creek drainages. This soil was described as 6 to 15 inches of fine to medium, reddish-brown to gray, sandy loam overlying more than 36 inches of red sandy clay.

3.6 LAND USE

The vast majority of land within the proposed permit area is rural, with much of it containing ranches, farms, woodlands, savannah, and low to very low density residential development. Municipalities present in or immediately adjacent to the proposed permit area include Bastrop, McDade, Paige, and Smithville in Bastrop County; the municipalities of Lexington and Giddings lie a few miles to the east of the proposed permit area in Lee County (Figure 1).

Several heavily traveled highways pass through the proposed permit area, including SH 71, SH 21, and US 290 in Bastrop County. Numerous county roads and smaller roadways are present within the proposed permit area as well. Large recreational tracts within the proposed permit area include Bastrop and Buescher State Parks, which total approximately 6,800 acres and are operated by TPWD, and the Lake Bastrop Recreational Area, which includes the approximately 906-acre Lake Bastrop and two parks (North Shore Park and South Shore Park) totaling roughly 268 acres that are operated by LCRA. These areas offer fishing opportunities, golf, and passive recreation such as hiking and bird-watching. The Boy Scouts of America own and operate the approximately 4,848-acre Griffith League Ranch and approximately 541-acre Lost Pines Scout Reservation to the north of Lake Bastrop.

3.7 WATER RESOURCES

The Colorado River forms the southern boundary of the proposed permit area. South of US 290, numerous creeks, streams, and small tributaries drain into the Colorado River. North of US 290 in Bastrop and Lee counties, creeks drain into three branches of Yegua Creek that flows into Lake Somerville.

Lake Bastrop is present in the southwest portion of the proposed permit area. Lake Bastrop was created from impoundment of Spicer Creek in 1963 to provide a source of cooling water for the Lost Pines Power Park, a power generation partnership operating Sim Gideon and the Lost Pines I Power Plant. The lake has a surface area of 906 acres at the operating elevation of 450 feet above mean sea level. In addition to furnishing industrial water, the lake provides public recreation. A 10-acre stocked fishing lake is present in the southwestern portion of the proposed permit area at Bastrop State Park and Buescher Lake, a 25-acre stocked fishing lake, is present in Buescher State Park in the southeastern portion of the proposed permit area. Review of National Wetland Inventory maps indicates that approximately 1,850 man-made stock ponds are present throughout the proposed permit area.

The Wilcox Group, Carrizo Sand, Reklaw Formation, Queen City Sand, Sparta Sand, and alluvial deposits all provide groundwater resources within the proposed permit area (Follet 1970). The Carrizo Sand and Wilcox Group combine to form the Carrizo-Wilcox Aquifer, which is the most important groundwater resource within the proposed permit area. It provides most of the water used by the City of Bastrop and other municipalities and industries in the region. The City of Bastrop also has six wells that draw water from a Colorado River alluvial aquifer (City of Bastrop no date). The Reklaw Formation, Queen City Sand, and Sparta Sand primarily provide groundwater to small rural users such as ranchers and homeowners in unincorporated areas; the Reklaw Formation also provides a portion of the water used by the City of Smithville in Bastrop County (Follett 1970).

3.8 AIR QUALITY

Bastrop County, the City of Bastrop, and Lee County are currently full attainment areas for all air quality criteria pollutants of the Environmental Protection Agency (EPA) and the Texas Commission on Environmental Quality (TCEQ). Changes in attainment standards could affect future attainment status.

3.9 WATER QUALITY

According to the 1996 Texas Natural Resource Conservation Commission (TNRCC, now TCEQ) Summary of River Basin Assessments, the segment of the Colorado River that passes along the southern edge of the proposed permit area (Segment 1434) is characterized as having a possible concern for total dissolved solids, chlorides, sulfates, fecal coliform bacteria, and metals and nutrients (TNRCC, 1996). The TNRCC summary assessment states that “over the past decade, the city of Austin has upgraded existing treatment facilities and has brought the South Austin Regional Wastewater Plant online, resulting in an upgrade in the designated aquatic life use to exceptional in Segments 1428 and 1434.”

Currently, water quality within the proposed permit area is good. The reach of the Colorado River within the proposed permit area has only minor water quality problems and a low vulnerability to stressors according to the Index of Watershed Indicators (IWI) of the EPA. Yegua Creek has better water quality and a lower vulnerability to stressors according to the IWI. Groundwater from the Carrizo-Wilcox Aquifer within the proposed permit area meets or exceeds all EPA drinking water requirements (Aqua, 1999).

3.10 CULTURAL RESOURCES

An archaeological background literature and records search was performed by SWCA archaeologists to determine the location and content of any previously conducted surveys and recorded sites within the proposed permit area. The investigation included examining records at the Texas Archeological Research Laboratory (TARL) and the Texas Historical Commission (THC). Site files, relevant maps, and National Register of Historic Places (NRHP) listings were examined. Nineteen USGS 7.5-minute topographic maps were reviewed at TARL and the THC.

The background review revealed that numerous small to large-scale archaeological projects have been conducted within the proposed permit area over the past 40 years. As a result, over 650 archaeological sites and historic properties have been documented across the proposed permit area. The vast majority of these sites have been recorded during archaeological surveys of several large areas in Bastrop County, including Camp Swift Military Reservation, Lake Bastrop, and Bastrop and Buescher State Parks. Smaller cultural resource management projects associated with the development of the Bastrop area also account for many of the recorded sites.

The recorded sites range from 10,000-year old prehistoric campsites to turn-of-the-century historic buildings and homesteads. No records or information for 56 of these mapped sites are available. Of the remaining sites, 396 are prehistoric, with 271 located in Bastrop County and 125 in Lee County. Prehistoric sites documented in the area are typically composed of scatters of lithic debris and tools with associated burned rock hearths and middens. These sites are commonly interpreted as campsites and are generally found near waterways such as the Colorado River, Alum Creek, Pin Oak Creek, and other major tributaries of the Colorado River. Prehistoric sites cover a wide span of prehistory, from 10,000 years before present (B.P.) to 300 B.P.. Other types of prehistoric sites found in the area include lithic quarries where prehistoric peoples procured raw materials for stone tool production. Though a large percentage of prehistoric sites documented within the proposed permit area have been found to be non-significant and ineligible for listing on the NRHP, many have also been recommended as potentially significant and/or are lacking definitive information on significance. Testing and data recovery excavations have been conducted at several important sites within the proposed permit area.

A total of 219 historic sites have been recorded within the proposed permit area, 171 in Bastrop County and 48 in Lee County. The types of historic sites within the proposed permit area vary more than the types of prehistoric sites but are predominantly historic homesteads and farmsteads dating to European and Anglo settlement and growth in the Bastrop area. These homesteads and farmsteads commonly include structures or evidence thereof, artifact scatters, walls, wells, and other associated facilities. Other types of historic sites located within the proposed permit area include cemeteries, church sites, military structures/installations at Camp Swift, trash dumps, and mines. As with the prehistoric sites, at least half of the historic sites

have been found to be not eligible for listing on the NRHP, but recommendations and information are lacking on many. In addition, as illustrated by the NRHP listing, many important historic sites are present within the proposed permit area.

Finally, 37 multi-component sites, holding both prehistoric and historic resources, have been documented within the proposed permit area, 24 in Bastrop County and 13 in Lee County. These types of sites are generally historic homesteads or farmsteads established on older prehistoric campsites.

A review of the NRHP listings for the proposed permit area revealed up to 98 historic properties listed within the proposed permit area, all within Bastrop County. Most of these properties are historic houses and other structures located in downtown Bastrop. Examples include the Bastrop County Courthouse and Jail complex, the J.C. Buchanan House, the Dawson House, the Erhard House, the Jung Storage Building, the Old Bastrop County Pavilion, and the Richard Starcke House. Portions of the Smithville Commercial and Residential Historic Districts are also located in the southern portion of the proposed permit area.

Overall, the background records review revealed a moderate to high density of archaeological sites and historic properties throughout the proposed permit area. Many southern portions of the proposed permit area have been surveyed and assessed while the northern, more rural section in Lee County has not been examined as intensively. Over 650 archaeological sites have been documented in the project area, including numerous prehistoric campsites, historic homesteads, farms, and structures. Many of these sites have been found to be non-significant, but a substantial number have also been found to be significant with the potential to contribute new or important information on the prehistory and history of the area.

3.11 SOCIOECONOMIC ENVIRONMENT

The population of Bastrop County is growing rapidly. This growth is probably largely due to the near proximity of the City of Austin, which has experienced substantial population growth, and the Austin Bergstrom International Airport, which is about 25 miles west of the City of Bastrop.

According to the U.S. Census Bureau (USCB), after showing a general decline from 1900 through 1960, the estimated population of Bastrop County has since grown steadily, from 16,925 in 1960 to 38,263 in 1990 (USCB 1995). The estimated population then grew to 57,733 by 2000, an increase of almost 51 percent over that decade (USCB 2002a). From 1 April 2000 to 1 July 2001 the population is estimated to have increased by about 7.5 percent (USCB 2002b).

The Texas State Data Center (TSDC) and the Center for Demographic and Socioeconomic Research and Education (CDSRE) developed population estimates for Bastrop County based on projections ranging from moderate growth to high growth (TSDC and CDSRE 2001). Based on these projections, the population of Bastrop County could range from 97,601 to 145,598 in 2020, 123,734 to 226,163 in 2030, and 153,392 to 344,904 in 2040. The TSDC and CDSRE (2001) recommend that the moderate-growth scenario is the most appropriate scenario for most counties during the present time, though no recommendation specific to Bastrop County is provided. According to population projections developed by the Texas Water Development Board (TWDB), the population of Bastrop County in 2020, 2030, and 2040, could be 77,030, 89,779, and 97,624, respectively (TWDB 2002).

Despite its rapid population growth, Bastrop County remains largely rural. Based on data available for the final quarter of 2001, the five industries with the greatest employment in the county were (in descending order) local government, trade/transportation/utilities, leisure and hospitality, education and health services, and manufacturing (Texas Workforce Commission, TWC 2001). The average monthly rate of unemployment for the county in 2001 was 4.0 percent (TWC 2001).

The population of Lee County showed a general decline from 1900 to 1970, but has been growing steadily since, albeit at a rate lower than that in Bastrop County (USCB 1995 and USCB 2002a). The estimated population of Lee County grew from 12,854 in 1990 to 15,657 in 2000, an increase of almost 22 percent. From 1 April 2000 to 1 July 2001 the population is estimated to have increased by about 3.2 percent (USCB 2002b). Based on TSDC and CDSRE (2001) projections assuming moderate to high growth, the population of Lee County could range from 20,362 to 24,305 in 2020, 22,483 to 28,922 in 2030, and 24,194 to 32,925 in 2040. The TSDC and CDSRE (2001) recommend that the moderate-growth scenario is the most appropriate scenario for most counties during the present time, though no recommendation specific to Lee County is provided. According to population projections developed by the TWDB (2002), the population of Lee County in 2020, 2030, and 2040, could be 17,176, 18,144, and 19,408, respectively.

Lee County is also largely rural. Based on data available for the final quarter of 2001, the five industries with the greatest employment in the county were (in descending order) trade/transportation/utilities, local government, construction, natural resource and mining, and state government (TWC 2001). The average monthly rate of unemployment for the county in 2001 was 3.8 percent (TWC 2001).

The proposed permit area is predominantly rural and includes the City of Bastrop and other smaller municipalities in both Bastrop and Lee counties. Farming, livestock production, and small scale timber harvesting are the primary economic activities in the rural areas.

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, mandates that federal agencies identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of programs on minority or low-income populations. According to TSDC and CDSRE (2001), in 2000 Bastrop County, in which the majority of the proposed permit area is located, had a total population of 57,733 of which 19,564 (about 34 percent) were of non-Anglo descent. Lee County had a total population of 15,657 of which 4,860 (about 31 percent) were of non-Anglo descent.

It is the goal of each Applicant to provide services without displacing, disadvantaging, or discriminating against any individual or group. New installations would typically be conducted in response to increased need for service and thus provide benefits to the general public. Each Applicant has a policy or procedures in place for avoiding discrimination:

Aqua provides service to anyone who abides by the Aqua tariff that is on file at its Bastrop office and is approved by the TCEQ.

LCRA recognizes that its mission to provide electricity, water, wastewater, recreational opportunities, economic development, and other important services must be achieved without causing particular segments of the population where it works to bear a disproportionate amount of adverse human health or environmental effects. Adhering to LCRA's processes precludes intentional discrimination through regular environmental, health, safety, economic, and real estate review in addition to public and partner input processes. Local residents within the project area have the ability to participate meaningfully in decision-making about land uses that may affect them, which includes a guarantee of equal access to relief not based on race, ethnicity and/or socioeconomic status. Throughout project processes, LCRA staff continues to evaluate and respond, as needed, to environmental justice issues that arise during implementation.

BEC policy calls for full compliance with all requirements of Title VI of the Civil Rights Act of 1964. Under this policy, BEC is committed not to discriminate against any person on the grounds of race, ethnicity, or national origin in its policies and practices relating to application for service and any other policies and practices relating to treatment of beneficiaries and participants including rates, conditions and extension of service, use of any of its facilities, attendance at and participation in any meetings of beneficiaries and participants, or the exercise of any rights of such beneficiaries and participants in the conduct of the operation of the Cooperative.

The policy of AE is to provide service and conduct business in such a way as to avoid discrimination against any person based on their race, ethnicity, or national origin.

4.0 ALTERNATIVES INCLUDING THE PREFERRED ALTERNATIVE

If the Applicants were to choose to proceed with maintenance, upgrades, or new construction without an incidental take permit for the Houston toad, they would lack regulatory assurance that they would be safe from litigation initiated by a third-party over non-compliance with the provisions of the Act. This situation could also place the Service at risk of third-party litigation for failing to enforce the ESA regardless of whether the Applicants' actions actually resulted in take of Houston toads.

The four utility companies submitting this application and operating in Bastrop and Lee counties are faced with several choices if they wish to continue to provide safe, reliable utility services to their customers:

- 1) apply jointly for a section 10(a)(1)(B) incidental take permit covering activities to be performed under an extended time period;
- 2) apply individually for section 10(a)(1)(B) incidental take permits as necessary on a project by project basis;
- 3) wait for and participate in a Bastrop area stakeholder-based permit; or
- 4) avoid conducting any further maintenance, upgrade, or new installation activities in Bastrop and Lee counties with potential to cause take of Houston toads.

Each of these choices has limitations for toad recovery and/or utility business. The preferred alternative proposed below seeks to enhance the opportunity for toad protection and recovery

while at the same time allowing the utilities to pursue reliable operation and system enhancements to best serve their community.

The following sections provide descriptions of the preferred alternative and the reasonably practicable alternatives that have been considered. Alternatives include: 1) preferred alternative - issuance of a joint section 10(a)(1)(B) permit to cover all activities of the Applicants within the proposed permit area; 2) alternative action - acquisition of individual section 10(a)(1)(B) permits on a project by project basis; 3) alternative action - waiting for the development of a Bastrop County HCP; and 4) no action. Environmental consequences of each of these alternatives are presented in Section 5.0 of this EA/HCP.

4.1 ALTERNATIVE 1 - PREFERRED ALTERNATIVE

The preferred alternative is the issuance of a permit under section 10(a)(1)(B) of the ESA to authorize the potential incidental take of the Houston toad within the proposed permit area by the Applicants performing routine business activities for 30 years. Their routine activities include, but are not limited to, maintenance, repairs, upgrades, and new installation of linear and fixed foundation facilities. The Applicants cooperatively developed this alternative in order to provide tangible conservation measures for the Houston toad and wildlife in general, provide a reliable source of funding available for the purchase of preserve lands and/or for support of other conservation initiatives, provide realistic and immediate solutions to business needs, and continue to provide timely and affordable services to local residents.

If issued, Aqua actions authorized under this permit would include the construction and/or installation of below-ground water lines and fixed-foundation facilities (tanks, wells, and a filter plant) on up to 182.2 acres of which approximately 47 percent (86.1 acres) would likely occur within existing ROWs. In addition, Aqua would conduct routine repair, emergency repair, and maintenance of water lines and fixed-foundation facilities, and routine placement of water meters for customer service. Aqua would not exceed 182.2 acres of new installations within the proposed permit area during the life of the permit, and would not exceed 1,200 new meter installations during any year of the life of the permit. The total activity area for Aqua facilities and activities would not exceed 779.6 acres (existing facilities occupy 597.4 acres, future new facilities would occupy up to 182.2 acres). Aqua anticipates conducting below-ground repairs and meter sets over approximately 98.4 acres of existing facilities during the life of the permit. A summary of existing and anticipated Aqua facilities and activities by acreage is provided in Table 1.

According to an understanding between the Service and Aqua, Aqua has decided to provide to landowners requesting new service in portions of Bastrop and Lee counties an information sheet summarizing issues related to the Houston toad and its habitat, the ESA, incidental take, and incidental take permits. The information sheet also includes Service contact information. Aqua requires landowners to sign a form indicating that they understand the information sheet, and the form is maintained in Aqua records. By signing this form it clarifies Aqua is not responsible for any direct or indirect impacts associated with the customer's actions.

If issued, LCRA actions authorized under this permit would include the construction and/or installation of new linear facilities (transmission lines, water and wastewater lines, non-impervious roadways, fence lines, and trails) and fixed-foundation facilities (substations, lift

stations, telecommunications sites, park pavilions, cabins, parking areas, impervious roadways, and restrooms) on up to 182.1 acres. In addition, LCRA would conduct routine repair, emergency repair, and maintenance of linear and fixed-foundation facilities, and maintenance of some ROWs. LCRA would not exceed 182.1 acres of new installations during the life of the permit. The total activity area for LCRA facilities and activities would not exceed 1,385.7 acres (existing facilities occupy 1,203.6 acres, future new facilities would occupy up to 182.1 acres). LCRA anticipates conducting below-ground repairs over approximately 1.5 acres of existing facilities during the life of the permit. A summary of existing and anticipated LCRA facilities and activities by acreage is provided in Table 2.

If issued, BEC actions authorized under this permit would include the construction and/or installation of above-ground distribution lines and fixed-foundation substations on up to 2,186.1 acres of which approximately 87 percent (1,898.4 acres) would be within established ROWs. In addition, BEC would conduct routine repair, emergency repair, and maintenance of above-ground distribution lines and fixed-foundation substations, upgrades to above-ground distribution lines and fixed-foundation substations, and maintenance of some ROWs. Upgrades would include the scheduled replacement of distribution line poles. BEC would not exceed 2,186.1 acres of new installations over the life of the permit. The total activity area for BE facilities and activities would not exceed 4,397.6 acres (existing facilities occupy 2,211.5 acres, future new facilities would occupy up to 2,186.1 acres). A summary of existing and anticipated BEC facilities and activities by acreage is provided in Table 3.

According to an understanding between the Service and BEC, BEC has decided to provide to landowners requesting new service in portions of Bastrop and Lee counties an information sheet summarizing issues related to the Houston toad and its habitat, the ESA, incidental take, and incidental take permits. The information sheet also includes Service contact information. BEC requires landowners to sign a form indicating that they understand the information sheet, and the form is maintained in BEC records. By signing this form it clarifies BEC is not responsible any direct or indirect impacts associated with the customer's actions.

If issued, AE activities authorized under this permit would include the routine and emergency repair and maintenance of above-ground transmission lines and upgrades to these facilities; upgrades to facilities would include scheduled replacement of transmission line standards. These facilities occupy approximately 229 acres. No new installations of AE facilities are anticipated; therefore, the total activity area for AE would be 229 acres. A summary of existing AE facilities and anticipated activities by acreage is provided in Table 4.

Issuance of the permit would authorize incidental take of the Houston toad during activities being conducted by the Applicants as described above and in Tables 1 through 4 throughout the approximately 142,526-acre proposed permit area. Installation of new facilities by the Applicants would be accomplished gradually over the life of the permit. It is expected that over the life of the permit these activities would occur on approximately 6,792 acres (the "activity area"), or roughly 4.8 percent of the proposed permit area (Tables 5 through 7). The majority (about 4,241.2 acres, 62.4 percent of the activity area) of this acreage is attributable to facilities in existence at the time of preparation of this EA/HCP, with the remaining approximately 2,550.4 acres (37.6 percent of the activity area) resulting from installation of new facilities (Tables 5 through 7).

Table 1. Area (acres) within the proposed permit area that would contain Aqua Water Supply Corporation (Aqua) facilities and activities covered under the requested permit. An “existing right-of-way (ROW)” is defined as a ROW in place prior to the installation of the facility; the most typical example of an existing ROW is a roadway ROW. All fixed-foundation facilities are assumed to occur outside of existing ROWs. Numbers in parentheses are not included in totals, as these activities would be conducted within areas containing existing facilities.

Facilities	Area	Comments
Existing facilities	597.4	
below-ground water lines within an existing ROW	298.1	<ul style="list-style-type: none"> approximately 1,731,000 linear-feet within 15-foot ROW Aqua does not maintain any ROW associated with these lines. These areas are allowed to re-vegetate back to their prior condition.
below-ground water lines outside of existing ROWs	298.1	<ul style="list-style-type: none"> approximately 1,731,000 linear-feet within 15-foot ROW Aqua does not maintain any ROW associated with these lines. These areas are allowed to re-vegetate back to their prior condition.
fixed-foundation HT Tank Site	0.2	<ul style="list-style-type: none"> this area is equivalent to the area of the facility plus associated managed grounds maintenance: regular visual inspections; general repair and maintenance as needed, typically infrequent and accomplished with light equipment and minimal ground disturbance; vegetation management 1 to 3 times per year and only within and adjacent to footprint
fixed-foundation McDade Tank and Well Site	0.2	<ul style="list-style-type: none"> this area is equivalent to the area of the facility plus associated managed grounds maintenance: as with HT Tank Site above
fixed-foundation Lottman Tank Site	0.2	<ul style="list-style-type: none"> this area is equivalent to the area of the facility plus associated managed grounds maintenance: as with HT Tank Site above
fixed-foundation Highway 21 Pump Station	0.1	<ul style="list-style-type: none"> this area is equivalent to the area of the facility plus associated managed grounds maintenance: as with HT Tank Site above
fixed-foundation 1441 Pump Station	0.1	<ul style="list-style-type: none"> this area is equivalent to the area of the facility plus associated managed grounds maintenance: as with HT Tank Site above
fixed-foundation Pump Station M sited	0.2	<ul style="list-style-type: none"> this area is equivalent to the area of the facility plus associated managed grounds maintenance: as with HT Tank Site above
fixed-foundation Pinehills Standpipe	0.1	<ul style="list-style-type: none"> this area is equivalent to the area of the facility plus associated managed grounds maintenance: as with HT Tank Site above
fixed-foundation Booth Standpipe	0.1	<ul style="list-style-type: none"> this area is equivalent to the area of the facility plus associated managed grounds maintenance: as with HT Tank Site above
Future facilities	182.2	
below-ground water lines within existing ROWs	86.1	<ul style="list-style-type: none"> approximately 125,000 linear-feet within a 30-foot construction ROW and a 15-foot permanent ROW (construction ROW was used to calculate area) based on existing conditions, it is assumed that 50 percent of future below-ground lines would be placed within existing roadway ROWs Aqua does not manage or maintain any of these ROWs after installation. These areas are allowed to re-vegetate back to their prior condition.
below-ground water lines outside of existing ROWs	86.1	<ul style="list-style-type: none"> approximately 125,000 linear-feet within a 30-foot construction ROW and a 15-foot permanent ROW (construction ROW was used to calculate area) based on existing conditions, it is assumed that 50 percent of future below-ground lines would be placed within existing roadway ROW Aqua does not manage or maintain any of these ROWs after installation. These areas are allowed to re-vegetate back to their prior condition.
fixed-foundation wells and tanks	5.0	<ul style="list-style-type: none"> this represents the maximum combined footprint and managed grounds for multiple facilities; the actual area may be less maintenance: as with HT Tank Site above
fixed-foundation filter plant	5.0	<ul style="list-style-type: none"> this represents the maximum footprint and managed grounds; the actual area may be less maintenance: as with HT Tank Site above
install meters at below-ground water lines	(82.6)	<ul style="list-style-type: none"> assumptions: based in part on (1) review of meter installations for 1997 through 2000 (501, 581, 693, and 838 meters, respectively); (2) meter installations for the life of the permit would increase yearly and then plateau or decrease; (3) based on the above, assume 1,200 installations per year over the 30-year life of the permit; (4) approximately 100 square-feet of disturbance per installation, or about 2.7552 acres per year for 30 years this area would be contained within the areas presented above for existing and future below-ground lines based on review of existing conditions, it is likely that 50 percent of these installations would occur within roadway ROWs
repair below-ground water lines	(15.8)	<ul style="list-style-type: none"> assumptions: (1) approximately 200 repairs per 1,713,000 linear-feet of line per year; (2) 1,981,000 linear-feet of line [existing plus anticipated future lines]; (3) based on the above, assume 230 repairs per year over the 30-year life of the permit; (4) approximately 100 square-feet of disturbance per repair, or about 0.528 acres per year for 30 years this is an over-estimate as the total amount of line would initially be 1,713,000 linear-feet and would not reach 1,981,000 linear-feet until build-out this area would be contained within the areas presented above for existing and future below-ground lines based on review of existing conditions, it is likely that 50 percent of these repairs would occur within roadway ROWs
TOTAL AREA	779.6	

Table 2. Area (acres) within the proposed permit area that would contain Lower Colorado River Authority (LCRA) facilities and activities covered under the requested permit. An “existing right-of-way (ROW)” is defined as a ROW in place prior to the installation of the facility; the most typical example of an existing ROW is a roadway ROW. All fixed-foundation facilities, fences, hiking trails, and park-related facilities are assumed to occur outside of existing ROWs. Numbers in parentheses are not included in totals as these activities would be conducted within areas containing existing facilities.

Facilities	Area	Comments
Existing facilities	1,203.6	
above-ground transmission lines outside of existing ROWs	1,066.8	<ul style="list-style-type: none"> approximately 422,400 linear-feet of line within a 110-foot ROW typical maintenance activities: ROW prescription once per 67 years; visual inspection once per year; climbing inspection once per 10 years; ROW vegetation management once per 2-4 years; these activities typically cause little soil disturbance typical repair activities: gate/fence repair once per 26 years; steel/concrete structure repairs once per 10 years; line overhaul once per 10 years; road/creek crossing repair once per 4-6 years; emergency repairs as needed; these activities may cause some soil disturbance
below-ground water lines within existing ROWs	19.8	<ul style="list-style-type: none"> approximately 86,400 linear-feet within 10-foot ROWs LCRA does not maintain any ROW associated with these lines. These areas are allowed to re-vegetate back to their prior condition.
below-ground water lines outside of existing ROWs	2.2	<ul style="list-style-type: none"> approximately 9,600 linear-feet within 10-foot ROWs LCRA does not maintain any ROW associated with these lines. These areas are allowed to re-vegetate back to their prior condition.
fixed-foundation Alum Creek Substation	2.8	<ul style="list-style-type: none"> this area is equivalent to the area of the facility plus associated managed grounds maintenance: semi-annual grounds inspection; semi-annual herbicide application; general maintenance as needed; these activities may cause some soil disturbance repairs typically conducted as detected during inspections, these activities may cause some soil disturbance no upgrades planned
fixed-foundation Bastrop Substation	2.3	<ul style="list-style-type: none"> this area is equivalent to the area of the facility plus associated managed grounds maintenance, repairs, and upgrades as with Alum Creek Substation above
fixed-foundation Sim Gideon Substation	10.0	<ul style="list-style-type: none"> this area is equivalent to the area of the facility plus associated managed grounds maintenance, repairs, and upgrades as with Alum Creek Substation above
fixed-foundation LCRA equipment at the Bluebonnet Electric Coop. Paige Substation	0.2	<ul style="list-style-type: none"> this area is equivalent to the area of the facility, LCRA does not maintain the grounds general periodic inspection, maintenance, and repairs
fixed-foundation lift stations	0.3	<ul style="list-style-type: none"> this is the combined area for three facilities, each with a 0.1-acre footprint area these lift stations are on tracts within subdivisions maintenance: regular inspections and maintenance as needed for safety and operational concerns; only the portion of the tracts within the vicinity of the facilities are managed; mowing/trimming approximately 5 times per year, including occasional removal of small woody vegetation with hand tools; typically no soil disturbance
boundary/cross fences at the Lake Bastrop Recreational Area	23.3	<ul style="list-style-type: none"> approximately 63,360-linear feet within a 16-foot ROW maintenance: visual inspection, mowing/trimming; repair of trail surfaces; typically little or no soil disturbance
hiking trails at South Shore Park	5.9	<ul style="list-style-type: none"> approximately 15,965 linear feet within a 16-foot ROW approximately 25 percent (15,480 linear-feet) is currently mowed or recently maintained maintenance: visual inspection, mowing to maintain fire lines; repair of wires and posts; selective herbicide application; typically little or no soil disturbance
fixed-foundation facilities at the 137-acre North Shore Park	15.0	<ul style="list-style-type: none"> combined for both parks, this includes 60 recreational vehicle/tent camp sites, 6 screened enclosures, 5 parking lots, 5 septic systems, 4 public restrooms, 2 picnic shelters, 2 boat ramps, 2 entrance stations, 2 maintenance buildings/storage areas, 2 septic lift-stations, 2 recreational vehicle holding-tank dump stations, 1 playground, 1 volleyball court, and 1 park office
fixed foundation facilities at the 131-acre South Shore Park	55.0	<ul style="list-style-type: none"> maintenance: general activities related to maintaining facilities (painting, pressure washing, etc); mowing/trimming as needed; herbicide application for edging as needed; application of Amdro for fire ant control as needed
Future facilities	182.1	
below-ground utility lines within existing ROWs	39.0	<ul style="list-style-type: none"> up to 170,000 linear-feet within a 10-foot ROW all of these lines would be installed in existing roadway ROWs within or adjacent to planned subdivisions LCRA would not manage or maintain any of these ROWs after installation. These areas are allowed to re-vegetate back to their prior condition.
fixed-foundation load-serving substations	20.0	<ul style="list-style-type: none"> this is the combined area for 2 facilities, each on a 10-acre tract and with an assumed 10-acre footprint each facility may occupy an area less than the tract size, therefore 20 acres may be an over estimate
fixed-foundation lift stations	0.4	<ul style="list-style-type: none"> this is the combined area for 4 facilities, each on a 0.25-acre tract and with an assumed 0.1-acre footprint these facilities would be installed on tracts within subdivisions
fixed-foundation facilities on 76 acres at South Shore Park	10.0	<ul style="list-style-type: none"> combined for both parks these facilities would include 20 cabins, 4 parking lots, 2 septic systems, 2 restrooms, and 1 lodge
fixed-foundation facilities on 46 acres at North Shore Park	6.0	

Table 2. Continued.

Facilities	Area	Comments
upgrade to existing above-ground transmission lines	106.7	<ul style="list-style-type: none"> this area is equal to 10 percent of the existing ROW (1,067 acres) and is the approximate area adjacent to the existing ROW that would be needed as temporary construction ROW potential upgrades include: replacing line; replacing hardware; and potentially replacing support structures
repair below-ground water lines	(1.5)	<ul style="list-style-type: none"> assumptions: (1) up to 22 repairs per year [2 repairs per 25,000 linear-feet, assume a total of 266,000 linear feet of existing plus anticipated lines]; (2) 100 square-feet of disturbance per repair, or 0.050512 acres per year for 30 years this is an over-estimate as the total amount of line would initially be 96,000 linear-feet and would not reach 266,000 linear-feet until build-out this area would be contained within the areas presented above for existing and future below-ground lines based on review of existing conditions, it is likely that 90 percent of these repairs would occur within roadway ROW
TOTAL AREA	1,385.7	

Table 3. Area (acres) within the proposed permit area that would contain Bluebonnet Electric Cooperative (BEC) facilities and activities covered under the requested permit. An “existing right-of-way (ROW)” is defined as a ROW in place prior to the installation of the facility; the most typical example of an existing ROW is a roadway ROW. All fixed-foundation facilities are assumed to be occur outside of existing ROW.

Facilities	Area	Comments
Existing facilities	2,211.5	
above-ground distribution lines within existing ROWs	1,922.9	<ul style="list-style-type: none"> approximately 2,791,623 linear-feet of line within a 30-foot ROW typical maintenance activities: routine line inspection of about 264,000 linear-feet per year; primary vegetation management of about 264,000 linear-feet per year (may include trimming limbs encroaching on lines, removing smaller vegetation, mowing, spot herbicide treatment, may cause some soil disturbance); secondary vegetation management on about 114,048 linear-feet per year (may include tree trimming, removal of some woody vegetation, herbicide application, use of some heavy equipment, typically with some soil disturbance) typical repair activities: repairs and emergency repairs as needed; line/pole replacement of about 114,048 linear-feet per year (may include some area outside of the ROW for storage and temporary construction easement, some medium and/or heavy equipment, typically with some soil disturbance)
above-ground distribution lines outside of an existing ROWs	287.3	<ul style="list-style-type: none"> approximately 417,139 linear-feet within 30-foot ROWs typical maintenance activities: routine line inspection of about 264,000 linear-feet per year; primary vegetation management of about 264,000 linear-feet per year (may include trimming limbs encroaching on lines, removing smaller vegetation, mowing, spot herbicide treatment, may cause some soil disturbance); secondary vegetation management on about 114,048 linear-feet per year (may include tree trimming, removal of some woody vegetation, herbicide application, use of some heavy equipment, typically with some soil disturbance) typical repair activities: repairs and emergency repairs as needed; line/pole replacement of about 114,048 linear-feet per year (may include some area outside of the ROW for storage and temporary construction easement, some medium and/or heavy equipment, typically with some soil disturbance)
fixed-foundation Paige Substation	1.3	<ul style="list-style-type: none"> management of vegetation is similar to that described above for linear facilities
Future facilities	2,186.1	
above-ground distribution lines within existing ROWs	1,898.4	<ul style="list-style-type: none"> up to 2,756,160 linear-feet within a 30-foot ROW maintenance, repair, and replacement as described above for existing facilities
above-ground distribution lines outside of existing ROWs	283.7	<ul style="list-style-type: none"> up to 411,840 linear-feet within a 30-foot ROW maintenance, repair, and replacement as described above for existing facilities
fixed-foundation substation	4.0	<ul style="list-style-type: none"> management of vegetation would be similar to that described above for linear facilities
TOTAL AREA	4,397.6	

Table 4. Area (acres) within the proposed permit area that would contain Austin Energy (AE) facilities and activities covered under the requested permit.

Facilities	Area	Comments
Existing facilities	228.7	
above-ground transmission lines	228.7	<ul style="list-style-type: none"> approximately 99,600 linear-feet of line within a 100-foot ROW typical light maintenance activities: visual inspection twice per year; minor maintenance with hand tools twice per year or as needed; vegetation management twice per year (may include mowing ground vegetation with a tractor, some tree trimming; typically little or no soil disturbance) more in-depth maintenance may occur on average once per year, frequently with little soil disturbance
Future facilities	0.0	<ul style="list-style-type: none"> AE does not anticipate installing any new linear or fixed foundation facilities under the requested permit
TOTAL AREA	228.7	

Table 5. Area (acres) occupied by existing facilities and areas anticipated to be occupied by future facilities installed under the requested permit. An “existing right-of-way (ROW)” is defined as a ROW in place prior to the installation of the facility; the most typical example of an existing ROW is a roadway ROW. All fixed-foundation facilities are considered to occur outside of an existing ROW. The percentages of future linear facilities placed in existing ROWs are assumed to be similar to those percentages for existing facilities. See Tables 1-4 for more specific information. Numbers in parentheses are not included in totals as these activities would be conducted within areas containing existing facilities.

Applicant	Area
Aqua Water Supply Corporation	779.6
Existing facilities	597.4
below-ground linear facilities within an existing ROW (about 50 percent of the total linear facilities)	298.1
below-ground linear facilities outside of an existing ROW (about 50 percent of the total linear facilities)	298.1
fixed-foundation facilities	1.2
Facilities to be installed	182.2
below-ground linear facilities within an existing ROW (about 50 percent of the total linear facilities)	86.1
below-ground linear facilities outside of an existing ROW (about 50 percent of the total linear facilities)	86.1
fixed-foundation facilities	10.0
install meters at below-ground water line	(82.6)
repair of below-ground water lines	(15.8)
Lower Colorado River Authority	1,385.7
Existing facilities	1,203.6
below-ground linear facilities within an existing ROW (about 90 percent of the total below-ground linear facilities)	19.8
below-ground linear facilities outside of an existing ROW (about 10 percent of the total below-ground linear facilities)	2.2
above-ground linear facilities outside of an existing ROW	1,066.8
boundary/fences at the Lake Bastrop Recreation Area	23.3
hiking trails at South Shore Park	5.9
fixed-foundation facilities	85.6
Facilities to be installed	182.1
below-ground linear facilities within an existing	39.0
fixed-foundation facilities	36.4
upgrade to above-ground linear facilities (estimated to be about 10 percent of the total area of upgraded facilities)	106.7
repair to below-ground water lines	(1.5)
Bluebonnet Electric Cooperative	4,397.6
Existing facilities	2,211.5
above-ground linear facilities within an existing ROW (about 87 percent of the total linear facilities)	1,922.9
above-ground linear facilities outside of an existing ROW (about 13 percent of the total linear facilities)	287.3
fixed-foundation facilities	1.3
Facilities to be installed	2,186.1
above-ground linear facilities within an existing ROW (about 87 percent of the total linear facilities)	1,898.4
above-ground linear facilities outside of an existing ROW (about 13 percent of the total linear facilities)	283.7
fixed-foundation facilities	4.0
Austin Energy	228.7
Existing facilities	228.7
above-ground linear facilities	228.7
Facilities to be installed	0.0
none	0.0
TOTAL ACTIVITY AREA	6,791.6

Table 6. Areas (acres) of existing facilities and anticipated future facilities occurring within and outside of existing rights-of-way (ROWs). An “existing ROW” is defined as a ROW in place prior to the installation of the facility; the most typical example of an existing ROW is a roadway ROW. Areas attributable to Aqua meter sets (82.6 acres), Aqua line repairs (15.8 acres), and LCRA line repairs (1.5 acres) are not included in this table, but would occur within ROWs. See Tables 1-5 for more specific information.

Facility		Area
Facilities within an existing ROW		4,264.3
	Existing facilities	2,240.8
	Aqua Water Supply Corp.	298.1
	Lower Colorado River Authority	19.8
	Bluebonnet Electric Cooperative	1,922.9
	Austin Energy	0.0
	Future facilities	2,023.5
	Aqua Water Supply Corp.	86.1
	Lower Colorado River Authority	39.0
	Bluebonnet Electric Cooperative	1,898.4
	Austin Energy	0.0
Facilities outside of an existing ROW		2,527.3
	Existing facilities	2,000.4
	Aqua Water Supply Corp.	299.3
	Lower Colorado River Authority	1,183.8
	Bluebonnet Electric Cooperative	288.6
	Austin Energy	228.7
	Future facilities	526.9
	Aqua Water Supply Corp.	96.1
	Lower Colorado River Authority	143.1
	Bluebonnet Electric Cooperative	287.7
	Austin Energy	0.0
TOTAL ACTIVITY AREA		6,791.6

Table 7. Areas (acres) of existing and anticipated future facilities as percentages of the proposed permit area and activity area. See Tables 1-6 for more specific information.

Description	Area (acres)	Percentage of Proposed area	Percentage of Activity Area
Proposed permit area	142,526	100.0	--
Activity Area	6,791.6	4.8	100.0
Existing facilities	4,241.2	3.0	62.4
within existing ROWs	2,240.8	1.6	33.0
outside of existing ROWs	2,000.4	1.4	29.5
Future facilities	2,550.4	1.8	37.6
within existing ROWs	2,023.5	1.4	29.8
outside of existing ROWs	526.9	0.37	7.8

Many of the existing facilities (occupying approximately 2,240.8 acres) occur within ROWs (primarily road ROWs) managed and maintained by other entities, and the Applicants estimate that 2,023.5 acres of the anticipated future facilities would be placed within similar ROWs. The remaining 526.9 acres of new facilities would likely be constructed outside of existing roadway ROWs and throughout the proposed permit area; this represents about 7.8 percent of the activity area and about 0.37 percent of the proposed permit area (Tables 5 through 7). This HCP and its related permit do not address activities related to the construction of any roadways, the creation of ROWs associated with such construction, or the maintenance of those roadway ROWs by other entities. However, this HCP and related permit do cover the maintenance of roadway ROWs by the Applicants.

New facilities authorized by the requested permit would be installed in response to increased demands for such services resulting from increased population within the proposed permit area. The number of new facilities expected to be installed can be estimated based on historical data and anticipated growth (see Section 3.11); however, the exact locations of new facilities that would be installed over the life of the permit cannot be determined at this time because their need is largely market driven. As such, it is not possible to predict in advance what proportion of new facilities would occur within or adjacent to Houston toad habitat or other woodlands, subdivisions, agricultural areas, or other disturbed areas. Except when within ROWs in existence at the time of issuance of the permit, the Applicants would not initiate new clearing or construction/installation on certain lands without prior discussion with and timely concurrence from the Service. These lands include Bastrop and Buescher state parks, the University of Texas M. D. Anderson Cancer Center Science Park-Research Division (UT Science Park), and any other lands the Service recognizes as being managed as a preserve for the Houston toad.

Similarly, it is impossible to predict where the need for repairs to existing or future facilities will arise at any given time. For this reason, it is not possible to estimate accurately what final percentage of the activities would occur in areas of Houston toad habitat. This alternative was designed in part to allow the Applicants to proceed with their activities without analyzing the potential for impacts to Houston toads on a case-by-case basis, thereby creating an efficient and effective process by which the Applicants can conduct their business. To accomplish this and provide for conservation of the species, an HCP has been included as part of this alternative. The HCP (Section 6.0 of this document) specifies what steps the Applicants will take to avoid, minimize, and mitigate the potential impacts to the Houston toad to the maximum extent practicable and to avoid and minimize to insignificant the potential for impacts to the bald eagle. Included in this HCP are BMPs that will be implemented while performing all authorized activities to avoid and minimize potential impacts to Houston toads and bald eagle. In addition, funds would be provided to mitigate for potential impacts associated with the construction of new installations, as well as operation and maintenance of existing facilities.

Adherence to these BMPs would represent a significant departure from typical operating procedures employed by the Applicants. Each Applicant is dedicated to proper and responsible stewardship of lands under their control, and each Applicant employs BMPs for managing their lands. However, the BMPs currently used are not as comprehensive as those proposed under this plan. Adherence to the BMPs would require the Applicants to alter their existing management practices in the selection of sites, installation of facilities, management of lands, and training of staff, so that Houston toad conservation would be a significant factor in considering and conducting activities within the proposed permit area. The training and public education component of the BMPs would provide accurate information to a large number of employees, contractors, and landowners. The Applicants are the four largest utility providers operating in the proposed permit area, and the modification of their operations in order to incorporate the BMPs would provide direct benefits to Houston toads, in terms of avoidance and minimization of impacts, and would serve to illustrate to other businesses in the area that consideration of Houston toads can be successfully incorporated into standard operating procedures.

The following is offered as an illustration of how elements of the HCP would function to allow the Applicants to avoid, minimize, and mitigate for potential impacts to Houston toads. Prior to initiating new construction/installation, an Applicant would enact BMPs (Section 6.1.2 (1)) related to training and educating employees and contractors in issues related to the Houston toad, and creating employee and contractor awareness related to the species and the BMPs contained in this HCP. The Applicants would also follow BMPs (Section 6.1.2 (2)) for selecting construction/installation sites so as to avoid impacts to the species to the maximum extent practicable. The Applicants would determine the installation area according to equations provided in Sections 6.2.1 and 6.2.2, and prior to initiating ground clearing, construction, or installation activities, would calculate mitigation according to equations provided in Sections 6.2.1.1 and 6.2.1.2.

During and following construction/installation, the Applicants would follow BMPs (Section 6.1.2 (3) and (5)) for avoiding and minimizing impacts related to construction/installation activities. In addition to BMPs and mitigation related to new construction/installation, each Applicant would follow BMPs (Section 6.1.2 (4)) and provide mitigation (Section 6.2.2) for avoiding and minimizing potential impacts to Houston toads resulting from repair, maintenance,

and upgrades to facilities. Each Applicant would submit an annual report (Section 6.3) to the Service with a summary of all activities conducted under the permit during the year, provide maps showing the locations of new installations and other covered activities, and provide information on the mitigation.

It is possible, although not likely, that projects outside the scope of those described in this section may be required within the proposed permit area by one or more of the Applicants during the life of the requested permit. If this happens, the Applicant(s) will consult with the Service to determine the potential for such unanticipated projects to adversely affect the Houston toad and whether the project(s) could be authorized under the requested permit.

4.2 ALTERNATIVE 2 - INDIVIDUAL SECTION 10(A)(1)(B) PERMITS

Under this alternative, the Applicants would seek an individual section 10(a)(1)(B) permit each time an Applicant desired to conduct activities that the Applicant believed might result in the incidental take of Houston toads within the proposed permit area. Assuming Aqua, LCRA, and BEC each conduct three new substantial installations (any combination of linear and/or fixed-foundation facilities) in potential toad habitat per year over the next 30 years, it is estimated this alternative would result in 270 section 10(a)(1)(B) permit applications. Maintenance, repair, and upgrade activities could also require acquisition of individual permits. Activities conducted under this alternative would be similar to those under the Preferred Alternative, and it is assumed that the total area in which activities occurred over the life of the permit would also be similar. However, it is unlikely that all activities performed by the Applicants within the proposed permit area would require a section 10(a)(1)(B) permit or notification of the Service. Not all of the proposed permit area is potential habitat for the toad, and only those activities that the Service and Applicants reasonably believed could impact toads would require a permit. Alternative 2 would be much more burdensome than would the Preferred Alternative as both the Applicants and Service would expend much time and effort attempting to obtain or issue many individual section 10(a)(1)(B) permits. Also, the Preferred Alternative would more efficiently address cumulative impacts and Houston toad conservation as it is much more difficult to evaluate the cumulative impacts of individual projects. The individual approach fosters incremental decision-making, focusing attention on individual projects rather than the species distribution or area-wide conservation.

4.3 ALTERNATIVE 3- BASTROP COUNTY SECTION 10(A)(1)(B) PERMIT

Under this alternative, each of the Applicants would continue to conduct activities identified in Section 4.1 within the proposed permit area while waiting for the development, authorization, and implementation of the Bastrop County Lost Pines Habitat Conservation Plan, a regional section 10(a)(1)(B) permit for Bastrop County. At such time, the Applicants would then participate under the permit as necessary to ensure compliance with the ESA. Prior to issuance of such a permit, the Applicants would either seek individual section 10(a)(1)(B) permits for their activities or take proper steps to ensure compliance with the ESA and conduct activities without permits. Efforts to develop this HCP and acquire this permit are currently underway and the Applicants are participating in that stakeholder-based process. However, it is possible that the effort may not result in issuance of a permit or that the permit may not authorize activities occurring outside of selected portions of Bastrop County. Additionally, because of the greater number of people/entities involved and the broader range of activities to be covered by

the Bastrop County effort, it is difficult to tell when this permit would be issued. It appears likely that a permit could be granted under the Preferred Alternative much sooner than one will be granted as a result of the Bastrop County effort.

4.4 ALTERNATIVE 4 - NO ACTION

Under the No Action Alternative, no section 10(a)(1)(B) permit would be issued to the Applicants to authorize activities within the proposed permit area. The Applicants would likely continue to conduct activities identified in Section 4.1 within the proposed permit area, but without certainty that such activities were in compliance with the ESA. No feasible alternative exists that would avoid impacts to the Houston toad.

5.0 ENVIRONMENTAL CONSEQUENCES

5.1 ALTERNATIVE 1 - PREFERRED ALTERNATIVE

The potential environmental impacts of the Preferred Alternative were assessed based on the Applicants performing their installations and other activities with adherence to the BMPs prescribed in the HCP (Section 6.1).

5.1.1 Direct/On-site Impacts

5.1.1.1 Vegetation

Tables 5, 6, and 7 provide a summary of the areas occupied by existing facilities and the areas that would be occupied by future facilities and activities. Covered activities may ultimately be conducted throughout the approximately 6,791.6-acre activity area; however, of this total area, installation of new facilities would occur on only approximately 2,550.4 acres. Approximately 2,023.5 acres (approximately 79.3 percent) of these new facilities are expected to be installed in existing managed and maintained ROWs, and approximately 2,240.8 acres of existing facilities are within such ROWs (Tables 5, 6, and 7). Based on known existing conditions and projected future installations, approximately 4,264.3 acres (approximately 62.8 percent) of the total 6,791.6-acre activity area may occur in ROWs (Tables 6 and 7).

Activities occurring in managed and maintained ROWs, including installation of new facilities, would generally be expected to result in disturbance to vegetation primarily consisting of mixed grasses and forbs, with occasional removal of small shrubs, seedlings, and saplings. Woody species most likely to be disturbed in ROWs include mesquite, eastern red cedar, yaupon, and hackberry. It is expected that following installation of facilities in existing ROWs, vegetation would revert nearly or completely to its original state and, generally, no significant change in existing condition of vegetation in these areas is expected.

Approximately 526.9 acres (0.37 percent of the proposed permit area) of new facilities are anticipated to be installed outside of ROWs (Tables 6, 7, and 8). Of this area, approximately 476.5 acres would be attributed to new linear facilities and upgrades to utility lines and approximately 50.4 acres would be attributed to new fixed-foundation facilities. It is presumed that vegetation within the approximately 50.4 acres to be used for fixed-foundation facilities would be significantly disturbed or removed. Vegetation within the approximately 476.5 acres

would likely be significantly disturbed during the installation process then reverted or converted from its original state to communities of mixed grasses and forbs. Many linear projects, once completed except for future repair areas, would allow natural recovery of vegetation within the ROW. This may include woody components from mid to late successional stages. Few allow full maturity of a woodland area to recover because repairs or upgrades are generally required on a 2- to 10-year cycle. Because it cannot be determined at this time where new facilities would be installed, it is not possible to fully describe expected disturbances to vegetation in the approximately 526.9 acres. However, by following the BMP's the Applicants will avoid ideal Houston toad habitat to the maximum extent practicable. The proposed permit area contains a mosaic of vegetation types, including loblolly pine/post oak woodland, post oak savannah, ranch land, pastureland, grassland, riparian woodland, and urban and suburban landscapes. The proposed activities are likely to result in varying amounts of disturbances to all these vegetation types at some point.

Aqua (approximately 298.1 acres), LCRA (approximately 1,098.2 acres), BEC (approximately 287.3 acres), and AE (approximately 228.7 acres) cumulatively own roughly 1,912.3 acres of existing utility line ROWs that have been installed outside of existing ROWs (Table 5). Aqua does not manage or maintain its ROWs (Table 1) and LCRA does not manage or maintain 2.2 acres of its ROWs (Table 2); thus, the area of existing ROWs managed by the Applicants is about 1,612.0 acres. This area represents about 23.7 percent of the 6,791.6-acre activity area. Vegetation within the 1,612.0 acres maintained by the Applicants likely consists primarily of mixed grasses and forbs with shrubs and small trees present in some areas. Woody species most likely present in ROWs outside of roadway ROWs include mesquite, eastern red cedar, yaupon, and hackberry. Activities occurring within the LCRA, BEC, and AE ROWs would be expected to include mowing and pruning as necessary to maintain ROW access and permit repairs, routine maintenance, and facility upgrades; activities occurring within Aqua easements would largely be limited to waterline repairs. In general, no significant change in existing condition of vegetation in these areas is expected.

Aqua (approximately 298.1 acres), LCRA (approximately 19.8 acres), and BEC (approximately 1,922.9 acres) cumulatively own roughly 2,240.8 acres of existing utility line that have been constructed within existing ROWs (Table 5). Aqua and LCRA do not maintain their easements within these ROW (Tables 1 and 2). Annually BEC inspects and conducts primary vegetation management on only about 9.4 percent of its easements; secondary vegetation management is conducted on about 4.1 percent of the easements (Table 3). As these easements are placed within existing ROWs, BEC maintenance activities here would not be expected to significantly change ROW conditions.

Aqua (approximately 1.2 acres), LCRA (approximately 85.6 acres), and BEC (approximately 1.3 acres) cumulatively own about 88.1 acres occupied by fixed-foundation facilities. Vegetation within these areas is heavily disturbed or absent. Disturbance to vegetation as a result of covered activities in these areas is expected to be negligible.

Assuming complete build-out, covered facilities and activities would occur on up to 6,791.6 acres, the approximately 4,241.2 acres occupied by facilities existing at the time of permit issuance, and the approximately 2,550.4 acres occupied by facilities that would be installed following permit issuance. Aqua would not manage or maintain any of its line easements, including areas disturbed for line repairs and installation of meters (Table 1). This would

account for 768.4 acres. LCRA would not manage or maintain any of its below-ground line easements, areas disturbed for repairs of below-ground lines, or the area disturbed as temporary construction ROWs for line upgrades (Table 2). This would account for 167.7 acres. Thus, vegetation on approximately 937.6 acres (about 13.8 percent) of the 6,791.6-acre activity area would not be actively managed. Vegetation here would be expected to revert back to its original state. Except for future repair areas, many linear projects once completed would allow natural recovery of vegetation within the ROW, including woody components to mid- to late-successional stages.

5.1.1.2 Wildlife

Proposed activities occurring within existing managed and maintained ROWs are generally expected to have minimal or temporary impacts on wildlife. Most disturbances in ROWs are likely to be associated with human and equipment presence in the project area and short- and long-term vegetation impacts. Maintained ROWs typically provide habitat more suitable to smaller mammals and birds, reptiles, and amphibians that prefer open habitats. Occupancy rates of maintained ROWs by larger animals are generally low to very low. Rates at which typical project activities are conducted generally allow more ambulatory wildlife to move out of the area to avoid harm. Smaller, less ambulatory wildlife species may be susceptible to adverse effects from ROW mowing, brush removal, vehicular traffic, pole hole digging, and trenching.

Proposed activities occurring outside of existing ROWs would result in disturbances to vegetation and, possibly, wildlife if facilities cannot be sited in manipulated pastures, along fence ROWs, or in other previously disturbed areas. Quality of wildlife habitat disturbed would vary depending on the type of vegetation disturbed; sites with greater structural complexity, species diversity, and productivity would generally provide higher quality wildlife habitat. Loss of wildlife habitat will be relative to the type of project; project type will dictate width and length of clearing, ability to avoid sensitive areas, and permanence of impacts. In addition to direct impacts on wildlife habitat, activities occurring outside of existing ROWs may result in increased fragmentation of wildlife habitat, particularly wooded habitat, and may impede movement of some wildlife species in affected areas. Effects on wildlife depend greatly on species requirements and the types of habitat present in and surrounding the project area. In general:

- Activities that create regularly maintained open space (e.g., transmission lines, pavilion or sport field areas) favor species that prefer open, grassy, and/or sparse shrubland communities, such as quail, doves, many rodents, cottontails, foxes and raptors; and
- Activities (e.g., water or wastewater lines, trail maintenance, fence lines, distribution lines) that create temporary open space that are allowed to recover to some level of woody canopy may favor savannah or woodland species, such as turkey, deer, raccoons, squirrels, armadillos, and many birds.

The potential for impacts to wildlife resulting from habitat fragmentation and reduced mobility would be minimal. New facilities constructed under the requested permit would occupy only approximately 526.9 acres of land outside of existing ROWs (Tables 6 and 7). Adherence to BMPs related to the management of vegetation and site selection (e.g. avoidance of forestlands with deep sands, possible breeding sites, and preferential selection of existing disturbed areas such as existing ROWs) (see Section 6.1) within the areas of these facilities and existing

facilities would reduce the likelihood of facilities acting as barriers to wildlife movement or creating significantly fragmented habitat within the proposed permit area.

5.1.1.3 Species of Special Interest

5.1.1.3.1 Bald Eagle

Bald eagles are not known to nest within the proposed permit area, but the species could occur anywhere within the proposed permit area as a transient, especially in the vicinity of the Colorado River corridor and at Lake Bastrop. This species may occur more frequently at Lake Bastrop or along the Colorado River corridor in winter, and these areas comprise a relatively small part of the proposed permit area. The regular occurrence of this species elsewhere within the proposed permit area is unlikely. The potential for impacts to bald eagle habitat resulting from covered activities is very low, and adherence to BMPs for avoiding potential impacts to bald eagles (see Section 6.1.1) would further reduce the likelihood. Most of the above-ground facilities expected to be covered under the requested permit would be relatively near to the ground. Because Lake Bastrop and the Colorado River comprise a relatively small portion of the proposed permit area, it is reasonable to assume that most above-ground facilities constructed under the requested permit would be constructed away from these areas. The potential for bald eagle collision with and/or electrocution on above-ground facilities covered under the requested permit is expected to be very low because of the relative low stature of most of the proposed facilities, the infrequent regular occurrence of eagles throughout most of the proposed permit area, and the anticipated placement of the majority of above-ground facilities away from the small portion of the proposed permit area where eagles are most likely to occur. No take authorization for this species is being requested or authorized by issuance of the proposed permit.

5.1.1.3.2 Houston Toad

Houston toads are known to occur within the proposed permit area, although not all of the approximately 142,526-acre proposed permit area is habitat for Houston toads. Portions of the proposed permit area do not contain Houston toad habitat (e.g., urbanized portions of the City of Bastrop and roadways). Also, within portions of the proposed permit area, soils and native vegetation communities are present that lack habitat characteristics favored by the species. Approximately 67,214 acres of the proposed permit area in Bastrop County have been designated as critical habitat for the Houston toad, although not all of this area is occupied by the species. The amount of occupied Houston toad habitat within the proposed permit area has not been and cannot reasonably be quantified because most of the area is private land. However, as indicated by presence/absence surveys that have been performed at Bastrop State Park, along some major roadways, and elsewhere, habitat for the toad, both typical foraging/burrowing habitat and ephemeral breeding habitat, is likely distributed throughout the proposed permit area in various-sized patches.

Though the proposed permit area comprises approximately 142,526 acres, activities covered under the requested permit would occur on only 6,791.6 acres (the “activity area”), or about 4.8 percent of the proposed permit area (Tables 6 and 7). Construction of new facilities would occur on 2,550.4 acres (1.8 percent of the proposed permit area, and 37.6 percent of the activity area); routine maintenance and repair would initially occur on up to 4,241.2 acres and, as new facilities

are constructed over the life of the permit, would occur on up to the entire activity area (Tables 6 and 7). Construction of new facilities would occur largely in response to requests for services from future customers. As such, the Applicants cannot at this time identify locations within the proposed permit area where construction and the subsequent maintenance and repair of new facilities will occur.

The Applicants will, to the maximum extent practicable, place new construction within existing, maintained ROWs, or other similar areas less favored by the toad. Up to 2,550.4 acres of new facilities would be constructed under the requested permit (Tables 6 and 7). Based on estimates derived from existing conditions, past practices, and future enhanced practices under the proposed 10a Permit, the Applicants anticipate that approximately 2,023.5 acres (about 79.3 percent) of new facilities would occur within existing maintained ROWs. It is anticipated that approximately 526.9 acres (about 20.7 percent) of land outside of existing ROWs will be occupied by new facilities. It is likely some, but not all, of this area would be located in toad habitat.

Activities occurring within the approximately 88 acres occupied by existing fixed-foundation facilities are not likely to cause adverse effects to Houston toads. Fixed-foundation facilities generally consist of structures such as lift stations, electrical substations, and pump stations that do not provide habitat resources for toads. Existing fixed-foundation facilities comprise approximately 1.3 percent of the 6,791.6-acre area in which activities are expected to be performed by the Applicants over the life of the permit.

Potential for Death and Injury

Some potential exists for activities covered under the requested permit to result in death of or injury to Houston toads. Death or injury may occur from vehicle or equipment strikes, toads being unearthed during ground-disturbing activities, and toad eggs and/or tadpoles being destroyed if breeding/nursery sites are damaged. These impacts could occur as a result of construction of new facilities or during routine maintenance and repair. However, the potential for covered activities to cause death of or injury to toads is not uniform throughout the proposed permit area. Not all of the proposed permit area is suitable toad habitat and activities occurring in non-habitat would not be expected to kill or injure toads. Adherence to the BMPs (described in Section 6.1) would serve to minimize the number of covered activities occurring within toad habitat and minimize the number of activities being performed during the toad's breeding season.

In those portions of the proposed permit area where Houston toads occur, the potential for toad injury or mortality is expected to be lessened by the BMPs incorporated into the HCP (see Section 6.1) that were designed to avoid and minimize impacts to toads and toad habitat. Most activities are expected to occur at times of the year when toads are not breeding, be performed in areas where toads are less likely to occur, and be conducted in a manner that minimizes the potential for harm to toads.

Potential for death or injury is also expected to be low because of the low density occurrence of Houston toads within the proposed permit area. While the Houston toad population within the proposed permit area is unknown, based on studies that have been conducted, the population is estimated to be a few to several thousand adults (see Section 3.3.2). Accordingly, excluding the breeding season when toads would be expected to be concentrated in the vicinity of breeding

sites, toad density throughout the proposed permit area likely averages about one adult toad every 14.3 to 47.5 acres (based on a 142,526-acre proposed permit area and an adult toad population of 3,000 to 10,000). This is consistent with Forstner's estimation of 1 adult toad per 25 acres (Forstner 2003). Actual average density of toads within the proposed permit area more likely ranges from zero in non-habitat areas to one adult toad every 7.1 to 38.0 acres in habitat areas (based on a population of 3,000 to 10,000 adult toads and the broad assumption that 50 to 80 percent of the proposed permit area contains toad habitat). As most activities would occur during the times of the year when toads were dispersed from breeding sites (as dictated by the BMPs) and based on the expected low density of toad occurrence, vehicle strikes are expected to be rare. Similarly, the probability of striking or unearthing a toad at any given site while excavating for an underground line, installation of utility poles, or to effect line repair is also expected to be very low, but is not zero. However, when the proposed activities are considered in aggregate, it is expected that some number of Houston toads would be harmed eventually, based on the proposed number of projects, expected frequency of activities, and the length of time involved. Impacts in areas of toad concentrations or to toad breeding/nursery sites would generally be precluded by adherence to the BMPs.

Both the Service and Applicants agree that not all portions of the proposed permit area contain suitable Houston toad habitat, and not all covered activities would result in take of the Houston toad. However, in an effort to efficiently and effectively allow normal business practices to continue, and to compensate for any impacts to the Houston toad, the Applicants propose to mitigate for all activities performed within the proposed permit area as described in this document, unless otherwise covered by an individual permit.

Potential for Adverse Habitat Impacts

Houston toad habitat has characteristics, to which the species has adapted, that allow toads to conduct necessary life-history activities, primarily breeding, feeding, and sheltering (including aestivation and hibernation). These habitat characteristics can also create an unsuitable environment to inter-specific competitors, or provide an environment in which Houston toads have a competitive advantage over such species.

In general, ground clearing activities, substantial soil disturbances, and construction activities have the potential to decrease suitability of Houston toad habitat by fragmenting habitat and locally altering native vegetation and soils. Such disturbances could either eliminate resources required by Houston toads or cause habitat to become more favorable for competing species. With regard to the proposed activities, most are not expected to adversely affect Houston toad habitat. Approximately 62.8 percent (approximately 4,264.3 acres out of 6,791.6 acres) of covered facilities occur or would be placed in existing maintained ROWs (Tables 6 and 7). Existing ROWs occur primarily along roadsides and are generally kept cleared of woody vegetation. Any detrimental effects to toad habitat that may have been caused by creation of these ROWs (e.g., habitat fragmentation) are not expected to be compounded by performance of covered activities in these same areas. Therefore, activities occurring in approximately 62.8 percent of the activity area are not expected to further fragment or otherwise alter existing Houston toad habitat.

Approximately 37.2 percent (approximately 2,527.3 acres out of 6,791.6 acres) of activities would occur outside of existing ROWs (Tables 6 and 7). Of this approximately 2,527.3 acres,

approximately 2,000.4 acres (roughly 29.5 percent of the activity area) contain existing facilities. No significant clearing of vegetation would occur in these areas and activities would generally be restricted to routine maintenance and repair. Accordingly, activities occurring in the approximately 2,000.4 acres would not be expected to alter any toad habitat beyond the level at which it was fragmented or otherwise disturbed by the initial facility construction. Thus, activities occurring in approximately 92.2 percent $[(4,264.3 + 2,000.4) / 6,791.6]$ of the activity area are not expected to further fragment or otherwise adversely alter Houston toad habitat.

The remaining approximately 7.8 percent of the activity area (0.37 percent of the proposed permit area) consists of the approximately 526.9 acres of new facilities that may be constructed outside of existing ROWs. Although, adherence to the BMPs, including locating new facilities within existing ROWs to the maximum extent practicable would likely further reduce this acreage figure. Of this area, approximately 50.4 acres may be occupied by fixed facilities (Tables 1 through 3). Adherence to the BMPs would minimize the extent to which any of the fixed facilities would be placed in Houston toad habitat, but the potential exists for construction of fixed facilities that would permanently remove and fragment Houston toad habitat. Some potential exists for vegetation clearing and other activities occurring in the remaining approximately 476.5 acres (526.9 – 50.4), but as discussed below, covered activities generally would not be expected to permanently remove all of the biological value of Houston toad habitat occurring in that area.

As previously discussed, not all of the proposed permit area contains toad habitat and, therefore, not all new facilities occurring outside of existing ROWs would be constructed in Houston toad habitat. Many activities that are conducted in toad habitat are not expected to permanently eliminate habitat viability with regard to meeting the breeding, feeding, and sheltering needs of the Houston toad. LCRA and the Texas Department of Transportation have conducted several surveys documenting the occurrence of successful breeding activity within their ROWs. One such survey concluded the Houston toad is a common inhabitant along the surveyed transmission lines (EH&A, Inc. 1992). Additionally, Houston toads have been observed exhibiting breeding behavior in other maintained ROWs, roadside ditches, manmade ponds, flooded fields and pastures, residential areas, and formerly at aquatic sites near runways on Ellington Air Force Base (USFWS 1984; Forstner 2002a, 2002b, 2003; Price 1992, 1993 C. Berkhouse, SWCA, pers. comm. 2002). Disturbances associated with covered activities are not expected to alter the number of potential breeding sites available to Houston toads or deter toads from breeding. Consequently, construction of new linear facilities would be expected to have minimal impacts on the ability of land to provide potential breeding sites for the Houston toad.

Clearing of vegetation associated with performance of covered activities is not expected to significantly impair Houston toad foraging. Houston toads feed primarily on terrestrial invertebrates, and currently occupy habitats ranging from woodland to savannah (USFWS 1984; Campbell 1995). Because clearing of vegetation would typically occur in narrow, linear swaths, the vegetation community structure in and surrounding a given project area following clearing would be expected to remain within the structural range occupied by the species. Upon completion of activities, project areas would re-vegetate and adherence to the BMPs (see Section 6.1.2) related to ROW management would result in the natural succession of plant life to occur. This vegetation would be expected to be capable of supporting a variety of invertebrate species and, therefore, any Houston toads present in the vicinity of the project areas would be expected

to ultimately continue foraging in those areas. Disturbances in project areas would likely result in a temporary decrease in abundance of potential prey items within project areas.

Disturbance associated with covered activities is not expected to significantly alter the soil profiles such that toads would be unable to burrow for aestivation/hibernation. Adherence to the BMPs (see Section 6.1.2) related to ROW management would result in natural succession of plant life providing surface cover for toads. While construction in project areas would result in a temporary decrease in ground cover in those areas, given the total area available to toads compared to the area that would be impacted by individual proposed activities, any temporary decrease in the amount of potential sheltering area available to Houston toads is not considered significant.

Covered activities could alter Houston toad habitat to such an extent that it could become more favorable for potential inter-specific competitors such as Woodhouse's toad or Gulf Coast toads. Covered activities would largely consist of narrow, linear projects. Since the proposed BMPs would be followed, and many of these ROWs would be allowed to revegetate back to the previous condition, covered activities would not be expected to result in significant landscape-scale changes that would alter the make-up of local faunal communities. Many paved and unpaved linear clearings cross through Houston toad habitat (e.g., utility ROWs, roads in Bastrop State Park, U.S. Highway 290, and State Highway 21) and have been present in that habitat for many years. Since Houston toads continue to occur adjacent to these clearings, it is expected that toads would continue to occur adjacent to linear clearings resulting from covered activities.

In summary, the Applicants believe that the potential for death of or injury to Houston toads resulting from covered activities is low because of the low density of toads within the proposed permit area, patchy distribution of toads within the proposed permit area, limited scope of individual activities, and adherence to the BMPs incorporated into the HCP. The Applicants also believe the potential for significant impacts to Houston toad habitat resulting from covered activities is low because project areas are expected to continue to provide resources for toad breeding, feeding, and sheltering and because clearing associated with covered activities would not result in permanent habitat loss within the structural range occupied by the species.

5.1.1.3.3 Whooping Crane

Whooping cranes are generally expected to occur within the proposed permit area only when flying over it during the spring and fall migration periods, although the potential exists at those times of year for individual or small groups of whooping cranes to land within the proposed permit area to rest or feed. Whooping cranes typically occur in open habitats away from human activity and are highly mobile. In general, whooping cranes would not be expected to occur near roadways and human development, where most of the proposed activities are expected to occur. Because any whooping cranes present within the proposed permit area should be able to readily detect and avoid activities associated with the preferred alternative, no significant adverse effects to this species are expected. No take authorization for this species is being requested or would be authorized by issuance of the proposed permit.

5.1.1.3.4 Interior Least Tern

This subspecies is expected to occur irregularly within the proposed permit area and only during migration. Interior least terns would likely occur only in association with larger bodies of water, which would not be disturbed by covered activities in the preferred alternative. No significant impacts to this subspecies are expected from the preferred alternative. No take authorization for this species is being requested or would be authorized by issuance of the proposed permit.

5.1.1.3.5 Piping Plover

Piping plovers may occasionally occur within the proposed permit area during migration, although little suitable habitat for this species is present in the area and that habitat generally occurs outside of areas where activities associated with the preferred alternative would be performed. If a piping plover was present in an area where an activity was initiated, it is expected that the bird could readily detect and avoid it. Therefore, no significant impacts to piping plover are expected from the preferred alternative. No take authorization for this species is being requested or would be authorized by issuance of the proposed permit.

5.1.1.3.6 White-faced Ibis

White-faced ibis are expected to occur regularly within the proposed permit area during migration and as post-breeding visitors. The species would most likely occur along the margins of larger stock ponds that support marshy edges. Because the white-faced ibis is not known or expected to breed within the proposed permit area, because most activities associated with the preferred alternative would take place away from ponds where this species is likely to occur, and because individual ibises would be able to readily detect and avoid such activities, no significant impacts to this species are expected to result from the preferred alternative. No take authorization for this species is being requested or would be authorized by issuance of the proposed permit.

5.1.1.3.7 Loggerhead Shrike

This species is expected to occur year-round within the proposed permit area and would be expected to occur along roadsides where the majority of proposed activities would take place. Activities associated with the preferred alternative would be unlikely to result in death or injury to adult shrikes but they could result in the occasional loss of a shrike nest. Nests could either be directly destroyed by vegetation clearing activities or lost as a result of abandonment if a nearby activity overly disturbed the nesting adults. The BMPs incorporated into the preferred alternative would minimize the potential for nest disturbance to occur because of the spring seasonal restriction on the performance of vegetation clearing activities.

Clearing activities may result in the minor degradation of shrike habitat in some areas, but may also result in slightly improved habitat conditions in other areas. Placement of overhead utility lines in open areas could improve shrike habitat by increasing the availability of perching spots, thereby increasing the ability of shrikes to find food. Non-nesting shrikes are not likely to be significantly disturbed by activities associated with the preferred alternative since these birds are highly mobile and should be able to avoid such activities. While the preferred alternative may result in adverse impacts to individual loggerhead shrikes, the preferred alternative is not

expected to cause significant adverse effects to the loggerhead shrike population within the proposed permit area. No take authorization for this species is being requested or would be authorized by issuance of the proposed permit.

5.1.1.3.8 Texas Horned Lizard

Because Texas horned lizards are expected to be rare within the proposed permit area and because many of the proposed activities would occur in wooded or disturbed habitats unsuitable for this species, the probability that any particular activity associated with the preferred alternative would result in adverse effects to this species is expected to be extremely low. However, because small numbers of this species may occur within the proposed permit area and because Texas horned lizards hibernate in burrow and can otherwise be relatively immobile during cool weather, the possibility that activities performed in open habitats could harm one or more Texas horned lizards over the life of the permit cannot be ruled out conclusively. Because very few Texas horned lizards are expected to occur within the proposed permit area and because the proposed activities in general are unlikely to result in adverse effects to this species, the preferred alternative is unlikely to cause significant adverse effects to the Texas horned lizard population within the proposed permit area. No take authorization for this species is being requested or would be authorized by issuance of the proposed permit.

5.1.1.4 Assessment of Take

The Houston toad is the only listed or proposed species likely to be incidentally taken as a result of the preferred alternative. Therefore, Houston toad is the only species that will be discussed in this section.

The Houston toad population within the proposed permit area is unknown, but may be on the order of a few to several thousand adult toads. It is unlikely that toads are uniformly distributed throughout the proposed permit area. Toad density within covered project areas may vary from zero in areas of non-habitat up to an average of one toad every 7 to 38 acres in occupied toad habitat. Apart from populations on public lands, toad densities throughout the approximately 142,526-acre proposed permit area have not been determined.

Not all of the proposed permit area supports ideal habitat for Houston toads. The proposed permit area contains natural areas lacking habitat characteristics preferred by the species, as well as areas that have been heavily disturbed by human activities. Since much of the proposed permit area has not been intensively surveyed, and the absolute distribution of the species is not known, the percentage of the proposed permit area that is not potential habitat for Houston toads is unknown. However, the Applicants and the Service believe that approximately 50 percent of the proposed permit area has been heavily disturbed by past human activities and as such does not provide ideal habitat for the species. Since occupied, potential, and non-habitats are interspersed, an attempt was made to include all areas of potential and actual habitat that also corresponds to the Applicants area of service in this application. This is the 142,526-acre proposed permit area (Figure 1). The Applicants have made no attempt to quantify or delineate occupied or potential toad habitat, or unsuitable habitat within the approximately 142,526-acre proposed permit area.

The Habitat Conservation Planning Handbook (USFWS and NMFS 1996) states that "...proposed incidental take levels can be expressed ... in one of two ways: (1) in terms of the number of animals to be 'killed, harmed or harassed' if those numbers are known or can be determined; or (2) in terms of habitat acres or other appropriate habitat units to be affected generally or because of a specific activity, in cases where the specific number of individuals is unknown or indeterminable." The number of Houston toads that would be killed, harmed, or harassed by activities authorized under the requested permit cannot be quantified. The Applicants cannot identify all areas of Houston toad habitat or potential habitat within the approximately 142,526-acre proposed permit area, estimate toad population size or density within potential project areas, or locate the future sites of projects that would be undertaken in response to requests for services. Therefore, an accurate assessment of take in terms of the number of Houston toads affected is not possible.

As discussed below, an accurate assessment of take in terms of habitat units is also speculative at best. Over the vast majority of the activity area, adverse impacts to Houston toad habitat are highly unlikely, but the potential does exist in those same areas for activities to result in death or harm to individual toads, primarily through vehicle/equipment strikes, excavation activities, and habitat modification. A total of approximately 6,791.6 acres are included in the activity area and are considered in this permit application. While not all of the activity area is likely to occur within Houston toad habitat it is possible that any particular activity within the proposed permit area may result in take of Houston toads since the distribution of occupied habitat within the covered area is unknown. However, it is also recognized that many activities authorized by the permit are not likely to result in incidental take.

In an effort to quantify impacts the following is provided. The requested permit would authorize all proposed activities within 6,791.6 acres (activity area) of the 142,526-acre proposed permit area. Within this area, covered activities occurring within existing maintained ROWs (approximately 4,264.3 acres or 62.8 percent of the activity area) are unlikely to adversely affect Houston toad habitat but do have the potential to directly impact individual toads. Maintenance/repair activities performed at existing facilities outside of ROWs (approximately 2,000.4 acres or 29.5 percent of the activity area) may result in temporary alteration of Houston toad habitat, but are unlikely to result in the permanent loss of toad habitat. The potential for similar activities outside of maintained ROWs to directly impact individual toads is greater than within maintained ROWs. Activities occurring in existing maintained ROWs or at existing facilities outside of ROWs would be conducted within approximately 6,264.7 acres or about 92.2 percent of the activity area.

Construction of new facilities would occur on up to 2,550.4 acres (Tables 6 and 7). It is anticipated, based on distribution of existing facilities and following the BMPs, that most (79.3 percent) of the area (approximately 2,023.5 of the 2,550.4 acres) occupied by new facilities would occur within existing maintained ROWs; the remaining 526.9 acres occupied by new facilities is projected to occur outside of existing maintained ROWs (Tables 6 and 7). Under the BMPs (Section 6) much of this area would be located outside existing Houston toad habitat and/or would be allowed to re-vegetate back to its previous or a similar condition. Construction of new facilities has the potential to kill or injure toads primarily through vehicle/equipment strikes and excavation activities. Potential for impacts to breeding sites would largely be avoided through adherence to the BMPs.

Routine maintenance and repair would initially occur on the approximately 4,241.2 acres containing existing facilities (Tables 5, 6, and 7). Maintenance and repair would not occur consistently or continuously throughout this area but would occur in response to need for repair or in accordance with cyclic maintenance schedules. The area containing existing facilities would increase incrementally over the life of the permit as new facilities are constructed, thus the area in which maintenance and repair activities would be conducted would increase over the life of the permit from approximately 4,241.2 acres up to 6,791.6 acres (Tables 6 and 7). Any direct impacts to toads resulting from routine maintenance and repair are likely to be caused by vehicle/equipment strikes and excavation activities. Maintenance of facility easements could result in minor, localized, and temporary decreases in quality of foraging and sheltering habitat.

As stated previously, approximately 526.9 acres would contain new installations outside of existing ROWs. Activities related to new construction in these areas have the potential to eliminate Houston toad habitat, decrease Houston toad habitat viability, and directly harm Houston toads through vehicle/equipment strikes and excavation work. The Applicants and the Service believe the potential for direct harm to toads is low assuming adherence to the BMPs and because of the low density at which toads are expected to occur within the proposed permit area. Significant habitat fragmentation is unlikely to result from covered activities because project areas are expected to continue to possess habitat value and clearing associated with the activities would generally occur in narrow, linear swaths.

As part of the preferred alternative, an HCP has been developed that specifies what steps the Applicants will take to avoid, minimize, and mitigate for impacts to the Houston toad and to assure that this alternative does not reduce the potential for survival and recovery of this species in the wild as mandated by requirements of 50 CFR Part 17.22(b)(1)(iii). The HCP is detailed in Section 6.0.

5.1.1.5 Wetlands

Wetlands are common and widespread within the proposed permit area. Most wetlands occur in association with man-made stock ponds or stream and river channels. Proposed activities are unlikely to result in disturbances to wetlands associated with man-made and natural ponds as these ponds are likely to be avoided, both because they represent potential Houston toad breeding sites and because of the construction problems they would present. Other wetlands that may occur within the proposed permit area would be avoided during the Houston toad breeding season as per the BMPs (see Section 6.1.2 BMPs for Avoiding and Minimizing Potential Impacts to Houston Toads).

It is possible that some proposed linear projects would cross stream channels that contain wetlands. In such cases, the Applicants will make every reasonable effort to avoid wetland areas and shall consult with the Service regarding the potential for adverse effects where avoidance is not an option and will ensure that the projects comply with the requirements of Section 404 of the Clean Water Act.

5.1.1.6 Geology and Soils

Given the scope of the proposed activities, surface soil alterations are expected to be minimal. New fixed-foundation facilities would occur on approximately 50.4 acres; soils in those areas would likely be heavily modified. Another approximately 476.5 acres of new facilities are expected to be installed outside of existing ROWs. These facilities would primarily be linear and disturbance to soils would be restricted to those areas that were trenched or excavated and then back-filled. Disturbance to soils in these areas is expected to be minor.

The Applicants will comply with all applicable local, state, and federal regulations for erosion and sedimentation control during the construction process as well as the BMPs prescribed in Section 6.1.2, which require restoration of large disturbed areas. Covered activities are generally surficial; therefore, grading and trenching for new construction is not expected to result in significant geologic alterations.

5.1.1.7 Land Use

The proposed activities are not expected to result in significant changes in land use. Approximately 62.4 percent of the expected total area of facilities currently exists. Expected new facilities will largely consist of utility lines whose presence will not appreciably change the ability to use the lands in or over which they are placed. Installation of new facilities would result from a demand for such facilities by the residents of the proposed permit area. Changes in land use within the proposed permit area (e.g., conversion of agricultural land to residential development) cause need for the proposed activities rather than the proposed activities causing change in the use of lands.

5.1.1.8 Water Resources

No significant effects to water resources are expected as a result of the proposed activities. Activities are typically expected to occur in upland areas and will be designed to avoid bodies of water.

One of the Applicants, Aqua, delivers water through some of the existing facilities and would deliver water through some of the future facilities. Aqua primarily obtains its water through pumpage of groundwater from the Carrizo Aquifer. Since demand for water by people within the proposed permit area will drive construction of new Aqua facilities, it is presumed that the amount of water delivered, and therefore pumped from the Carrizo Aquifer, by Aqua would increase as new facilities are constructed. However, the incremental increase in pumpage from the aquifer by Aqua is expected to be similar to that which would occur under any of the other alternatives considered in this EA/HCP since Aqua would generally conduct its operations in a similar fashion under all the alternatives [apart from any delays caused by the need to obtain any individual section 10(a)(1)(B) incidental take permits]. Therefore, pumpage from the aquifer is discussed in the Cumulative Impact Section 5.1.3.7.

5.1.1.9 Air Quality

Proposed activities that involve construction, new installations, or use of vehicles and/or power equipment may contribute temporarily to local noise and dust levels and exhaust emissions. Facilities operated by BEC and AE, and some of the facilities operated by LCRA, transmit electricity. Electricity transmitted by these three entities is generated, in part, at regional power plants such as the LCRA Sim Gideon power plant. Increases in demand for electrical power within the proposed permit area would drive construction of new BEC facilities. New LCRA facilities may be constructed as a result of increased electrical demand inside and outside of the proposed permit area. Regional power plants feed electricity into a power grid system that is tapped by local and regional utility companies. The grid that is fed, in part, by the Sim Gideon power plant and other plants in the region provides electricity throughout the region. Local demand on electricity represents a minute fraction of the total amount of electricity produced and transmitted through the grid system, and therefore operation of these power plants is outside the scope of this EA/HCP.

5.1.1.10 Water Quality

Minor amounts of sediment and suspended solids are expected to run off of project areas during construction of new facilities. Such impacts are expected to be temporary and of very short duration. Given the limited scope of the proposed activities, adherence to local, state, and federal erosion and sedimentation control, and the BMPs prescribed in Section 6.1.2, no significant impacts to local water quality are expected to occur as a result of the proposed activities.

5.1.1.11 Cultural Resources

The State of Texas cultural resource laws require that political subdivisions of the state ensure their proposed actions will not result in disturbance of significant cultural resources. Accordingly, LCRA, which is a political subdivision of the State of Texas, conducts cultural resource surveys in all new project areas and some maintenance/upgrade areas prior to conducting its proposed activities.

AE would construct no new facilities under the requested permit. Typically Aqua and BEC do not conduct cultural resources surveys prior to installing new facilities. Of the approximately 2,368.3 acres of new facilities expected to be constructed by Aqua and BEC, about 1,984.5 acres (83.8 percent) would be installed within existing disturbed ROWs. No significant impacts to cultural resources would be expected to occur in these areas. The remaining approximately 383.8 acres of new Aqua and BEC facilities would be constructed outside of existing ROWs. Depending on the previous levels of disturbance in these areas, some impacts to cultural resources could occur associated with the construction of these facilities.

5.1.1.12 Socioeconomic Environment

The proposed activities are required for the Applicants to respond to existing and anticipated demands for utility services by the growing population within the proposed permit area. Utility services are provided in response to requests for such services. Activities conducted under this

alternative would generally serve to benefit the socioeconomic environment within the proposed permit area by providing utilities to the populace.

As described in Section 3.11, all of the Applicants are committed not to discriminate against any person on the ground of race, ethnicity, or national origin. No established communities or minorities would be displaced or disadvantaged by any covered activities.

5.1.2 Indirect Impacts

“Indirect impacts” are defined by ESA regulations as effects that are caused by a proposed action and are later in time, but still are reasonably certain to occur (50 CFR 402.02). In order to address the potential indirect impacts of the Preferred Alternative, it is first necessary to identify events that would be reasonably certain to occur in the Permit Area as a result of the Preferred Alternative (i.e., those events with a causal link to the Preferred Alternative) and separate those from events that either are not reasonably certain to occur or that are reasonably certain to occur but would occur independent of activities performed by the Applicants.

Indirect impacts with potential to result from the proposed activities of the Applicants fall into two distinct categories: (1) those with potential to result from the direct impacts to soils and vegetation caused by performance of the proposed activities (“site-specific impacts”); and (2) those that could result from increased availability of utility service within or outside of the permit area (“growth-related impacts”). The general types of indirect impacts with potential to adversely affect the Houston toad are introduced and described in Section 3.3.2. Site-specific impacts and growth-related impacts as they pertain to the proposed action and the environmental factors tracked in this document are discussed individually below.

5.1.2.1 Indirect Site-specific Impacts

As discussed in Section 4.1, the Applicants are proposing to perform three general types of activities: (1) installation of new utility lines and fixed facilities; (2) maintenance and repair of existing facilities; and (3) construction of new recreational facilities, including fences (LCRA only). Performance of these activities is generally not expected to result in significant indirect site-specific impacts to geology and soils, land use, water resources, air quality, water quality, cultural resources, or the socioeconomic environment. Overall, maintenance and repair of existing facilities also is not expected to result in significant indirect impacts to vegetation or, consequently, to wildlife, including species of special interest, or to wetlands. Any changes in vegetation and wildlife habitat values adjacent to these facilities would have been induced by the original clearing of vegetation associated with installation of these facilities. Accordingly, the following discussion focuses on the potential for new construction of utility lines and recreational facilities to indirectly impact vegetation, wildlife, species of special interest, and wetlands.

Vegetation

In general, the clearing of vegetation, such as that which could occur during performance of some of the proposed activities, has potential to result in indirect and localized impacts to adjacent undisturbed vegetation. Those potential impacts, if realized, then have potential to affect individuals of some wildlife species. Impacts to vegetation can be caused by increased

availability of sunlight along newly created edge and increased exposure to wind, which can lead to drying of microclimates. Impacts to individuals of some wildlife species could then result from consequent changes in vegetation community composition and structure (changed wildlife habitat conditions). The degree to which these types of impacts manifest themselves depends on the structure of the local vegetation community (open communities are much less affected than closed communities since open communities are regularly exposed to sunlight and wind) and on what, if anything, is placed in the cleared area (e.g., a blacktopped parking lot may have greater effect on adjacent microclimate than might a grassy picnic area).

As summarized in Section 5.1.1.1 and Tables 5 through 8, installation of new facilities would occur on approximately 2,550.4 acres, with approximately 2,023.5 acres of these new facilities expected to be installed in existing managed and maintained ROWs, and approximately 526.9 acres of new facilities anticipated to be installed outside of existing ROWs. Installation of new facilities in existing ROWs would not be expected to result in significant indirect impacts to vegetation or, consequently, to wildlife, including species of special interest, or to wetlands because disturbances associated with installation of these facilities would not result in the creation of any new edges to the adjacent vegetation communities.

Installation of new facilities on the approximately 526.9 acres located outside of existing ROWs would require new clearing of vegetation. As discussed, approximately 476.5 acres of this would be attributed to new linear facilities and upgrades to utility lines, and approximately 50.4 acres would be attributed to new fixed-foundation facilities. Also as discussed, it is largely unknown where new facilities would be installed and, therefore, it is not possible to quantify expected indirect impacts to vegetation resulting from installation of new facilities. The proposed permit area contains a mosaic of vegetation types, including loblolly pine/post oak woodland, post oak savannah, ranch land, pastureland, grassland, riparian woodland, and urban and suburban landscapes. Any new installations placed in post oak savannah, ranch land, pastureland, grassland, or in urban or suburban landscapes would be unlikely to cause significant changes in the structure or composition of immediately adjacent vegetation because these types of vegetation communities or landscapes are largely open and subjected to greater exposure to sunlight and winds. Clearing for new installations placed in denser pine/post oak woodland may result in the increased development of shrubby vegetation, probably mostly yaupon, along the margins of newly created edges. Such clearing is not considered likely to significantly alter overall vegetation community structure or result in significant changes to local microclimates because clearing would be relatively narrow if linear or relatively small if associated with fixed-foundation facilities.

Wildlife

Clearing of vegetation can also result in fragmentation of habitats, which has potential to adversely affect some wildlife species sensitive to habitat patch size, and result in changes in wildlife community structure unrelated to changes in vegetation. For example, clearing of vegetation in a particular area might allow that area to become infested by red imported fire ants, with those ants then foraging so heavily in adjacent undisturbed and unchanged vegetation that the ants alter the local invertebrate community structure and adversely affect the availability of prey items for local lizards.

As noted above, installation of new facilities in existing ROWs would not be expected to result in significant indirect impacts to vegetation. Consequently, impacts to wildlife, including species of special interest, or to wetlands, are not expected as a result of such activities, because disturbances associated with installation of these facilities would not result in the creation of any new edges to the adjacent vegetation communities.

Because any changes in vegetation would be expected to be very localized and limited to the margins of any new clearings placed in denser woodlands, these changes are not expected to cause significant changes in overall wildlife habitat values or, as a result, significant impacts to wildlife in general. New clearing could allow densities of red imported fire ants to increase in very localized areas, but because fire ants undoubtedly occur throughout the permit area, any such increases would have very localized effects on invertebrates and other wildlife. Adherence to the BMPs (Section 6.1.2) should minimize the potential for the proposed activities to result in propagation or spreading of fire ants in the permit area.

Species of Special Interest

The potential for clearing of vegetation outside of existing ROWs to result in indirect impacts to Houston toads is largely discussed in Direct Impacts Section 5.1.1.3.2 because potential direct and indirect adverse habitat impacts are largely intertwined. The potential impact to Houston toads from increased densities of fire ants was not discussed in Section 5.1.1.3.2. Adherence to the BMPs by the Applicants will minimize disturbances in Houston toad habitat and minimize the potential for propagation or spreading of fire ants. However, some clearing of vegetation may occur in Houston toad habitat and some of that clearing may result in increased densities of fire ants in those areas. Whether any such increases would result in adverse impacts to Houston toads is unknown, although some potential may exist for localized increase in fire ant density to result in localized decrease in the availability of prey items to individual Houston toads or increased rates of predation on toadlets by fire ants. Quantification of such impacts is not possible, but they would be expected to occur rarely given adherence to the BMPs. Clearing of vegetation is not expected to result in any significant indirect impacts to bald eagles, whooping cranes, interior least terns, piping plovers, white-faced ibises, or loggerhead shrikes.

Wetlands

In general, installation of new facilities outside of existing ROWs would not be expected to result in indirect impacts to wetlands because wetlands in the permit area would largely be avoided through adherence to the BMPs. If canopy vegetation was cleared from over a wetland, it could result in changes to the composition of the plant community contained in that wetland, with reduction in the number and/or density of shade-dwelling plant species, and increases in number and/or density of plant species that require partial or full sun.

5.1.2.2 Indirect Growth-related Impacts

This section addresses the potential for the proposed activities to indirectly affect the environmental factors tracked in this document by causing growth and development inside and outside of the permit area. Again, indirect impacts are those effects caused by a proposed action that are later in time *and* are reasonably certain to occur. Hence, in order to assess indirect growth-related impacts of the proposed activities, it is first necessary to examine the issues of

causation and when, within the meaning of applicable ESA regulations, causal effects are considered reasonably certain to occur. These issues are examined below in Section 5.1.2.2.1. Following this section, connection between the proposed activities of the Applicants and future growth is tested for causation and reasonable certainty, both outside and inside of the permit area, in Section 5.1.2.2.1.1.

5.1.2.2.1 Causation and Reasonable Certainty

Causation

ESA regulations provide that assessment of a federal proposed action must consider the effects caused by that action, but do not provide guidance on the nature of causal inquiry to be conducted. ESA case law concerning indirect effects and causation is rare, and little guidance has issued from the courts over the past 15 years. Older ESA cases that addressed causation did not directly address what the test of causation should be or how it should be applied to complex factual situations of the type considered in this EA/HCP (see e.g., *National Wildlife Federation v. Coleman*, 529 F.2d 359 [5th Circuit], cert. denied, 429 U.S. 979 (1976) and *Riverside Irrigation District v. Andrews*, 758 F.2d 508 [10th Circuit 1985]).

Regulatory language that defines indirect impacts and incorporates the concept of causation under the ESA is the same framework used under the National Environmental Policy Act (NEPA). In both cases, the causal test is established only by the phrase “indirect effects are caused by the action” (40 CFR 1508.8[b] and 50 CFR 402.02). NEPA and the ESA thus appear to have the same test for causation. Under NEPA, recently issued judicial opinions have provided significant guidance on how to conduct causal analysis. These decisions address complex fact patterns comparable to the issues addressed in this section. The Applicants have reviewed the analysis provided in these cases as described below for use in developing the indirect impacts analysis provided later in this section.

The Ninth Circuit has held that an effect is caused by an action if the action is an “indispensable prerequisite” or an “essential catalyst” to the effects. *City of Davis v. Coleman*, 521 F.2d 661, 674 (9th Circuit 1975). However, it is not enough that the actions might be related or that each “might benefit from the other’s presence.” *Sylvester v. U.S. Army Corps of Engineers*, 884 F.2d 394 (9th Circuit 1989). Similarly, it is not enough if a proposed action “may induce limited additional development” when “the existing development necessitated the [action].” *City of Carmel by-the-Sea v. DOT*, 123 F.3d 1142 (9th Circuit 1997). In *City of Carmel by-the-Sea v. DOT*, the Ninth Circuit upheld an analysis that stated that the proposed project “had the potential to facilitate growth” but would not ultimately do so because of the development constraints imposed by local authorities. Similarly, in a case involving an airport expansion project designed to address existing levels of air traffic, the Ninth Circuit rejected the argument that airport expansion removed a constraint to growth because without the project, growth could not occur safely. The Ninth Circuit stated, “the fact that it might also facilitate further growth is insufficient to constitute a growth-inducing impact...” *Morongo Band of Mission Indians v. Federal Aviation Administration*, 161 F.3d 569 (9th Circuit 1998).

In a recent example of the application of the causal analysis to a complex fact pattern, the court in *Border Power Plant Working Group v. Dept. of Energy*, (2003 WL 21037927 [S.D. Cal.]), followed the analysis established by *Sylvester v. U.S. Army Corps of Engineers*, *City of Carmel*

by-the-Sea v. DOT, and *Morongo Band of Mission Indians v. Federal Aviation Administration*. The court found that authorization of a power transmission line on the U.S./Mexico border did not require analysis of emissions from a Mexican power plant that could use the new line to transmit power to the U.S. The court held that the turbines in the plant dedicated to production of power for Mexico were not causally linked to the new transmission line “in a way that makes the BPP line a necessary prerequisite or essential catalyst to their operation.” The court also noted that “because the line of causation is too attenuated between these turbines and the federal action permitting the BPP line, Ninth Circuit authority makes clear that the emissions of the non-export turbines were not effects of the BPP line and that the federal defendants were therefore under no NEPA obligation to analyze their emissions as effects of the action.” The court also found that because the turbine in the plant that was dedicated to the export of power had an alternate route, the BPP line could not be considered the but-for cause of the export turbine’s operation and effects from the operation of the turbine were therefore not indirect effects of the BPP line.

Based on existing judicial guidance, relevant factors in the causal analysis concerning growth-inducement include whether the action is the sole cause, whether the action has a useful purpose other than serving new growth, whether the action is intended to induce growth or to address existing levels of demand, and whether growth is being regulated at the local level. The test embraced by the courts demonstrates a pragmatic approach that recognizes a stopping point must exist in any causal analysis.

Reasonable Certainty

If it is determined that a proposed action has the potential to cause indirect impacts, then an analysis must be conducted to determine whether any of the potential indirect impacts are reasonably certain to occur. Under the ESA, use of the term “reasonably certain to occur” is narrower than the “reasonably foreseeable” standard used under NEPA. The term “reasonably certain to occur” was selected by the Service to eliminate speculation concerning future actions (51 FR 19926, 19933 [June 3, 1986]). In order for an action to be reasonably certain to occur, “there must exist more than a mere possibility that the action may proceed.” (*Id.*) Factors to be considered to determine whether a proposed action is reasonably certain to occur include the economic, administrative, and legal hurdles remaining, as evidenced by work plans, appropriations, and pending or issued permits. (Endangered Species Consultation Handbook, p. 4-28, U.S. Fish and Wildlife Service, 1998). According to the Service, “the more State, tribal or local administrative discretion remaining to be exercised before a proposed... action can proceed, the less there is reasonable certainty the project will be authorized.” (*Id.* at p. 4-30).

5.1.2.2.1.1 Test of Causation and Reasonable Certainty in Connection with the Proposed Activities and Future Growth

For the purposes of examining the issues of causation and reasonable certainty of occurrence with regard to the proposed activities and possibility of growth-related indirect impacts, the proposed activities of each of the four Applicants are reviewed briefly here again:

- AE operates and maintains above-ground electrical transmission lines that carry electricity outside of the permit area and do not provide local service.

- Aqua provides local water service and proposes to install, operate, repair, and/or maintain below-ground water lines, fixed foundation facilities, and water meters.
- BEC provides local electrical service through installation, operation, and/or maintenance of above-ground transmission and distribution lines.
- LCRA operates and maintains above-ground and below-ground utility (electric, water, and wastewater) lines, parklands, and fixed-foundation facilities related to its utilities and parklands. Most of the electricity carried by LCRA lines is transmitted outside the permit area, but the agency does provide some limited amount of local electric, water, and wastewater service. LCRA proposes to repair, maintain, upgrade, and/or operate existing facilities and to install new linear and fixed-foundation facilities.

Discussions of whether the proposed activities may cause indirect growth-related impacts outside or inside of the permit area within the framework established in Section 5.1.2.2.1 are provided below.

Indirect Growth-related Impacts Outside the Permit Area

This issue centers on whether any of the proposed activities of the Applicants has a causal link to future growth outside of the permit area, and whether such growth is reasonably certain to occur.

All of the proposed activities of the Applicants would occur inside the permit area. Activities that would be performed by Aqua and BE would occur only as a result of demand created from within the permit area. Therefore, no causal link appears to exist between the proposed activities of Aqua and BE and potential future growth outside of the permit area.

With regard to AE and LCRA, authorization of the proposed activities would permit maintenance of transmission lines used by these two entities to carry electricity outside of the permit area and, in the case of LCRA, to upgrade these lines. This electricity is primarily used by residents of the greater Austin metropolitan area, but may also be used by residents elsewhere within the LCRA service area. Both AE and LCRA also generate electricity or purchase electricity generated in many other locations from outside of the permit area. All of this electricity is fed into a grid system along with that generated from within the permit area such that it is impossible for a utility provider to trace a particular electron from point of generation to its end use.

Growth in the greater Austin metropolitan area is considered reasonably certain to occur, with many approved residential subdivisions and commercial developments under construction or in the final planning stages. It is also reasonable to assume that AE or LCRA will provide electricity to many of these new developments. However, because AE and LCRA generate electricity or purchase electricity generated in many locations outside of the permit area, future growth outside of the permit area does not appear to be causally linked to the proposed activities because that growth can occur in absence of authorization of the proposed activities. Consequently, the proposed activities are not considered to have potential to result in indirect growth-related impacts outside of the permit area.

Indirect Growth-related Impacts Inside the Permit Area

As discussed in Section 3.11 (Socioeconomic Environment), the populations of Bastrop and Lee counties showed steady growth through the 1990s, and, due to the relative proximity of the City

of Austin, this growth is expected to continue through the 21st century. However, expectation of continued population growth does not necessarily make that growth “reasonably certain to occur” as interpreted under the ESA or NEPA. Approved but as of yet un-built subdivisions within the permit area are considered to satisfy the definition of “reasonably certain to occur.” Other anticipated growth may or may not actually be realized depending on future socioeconomic conditions, and how much of this anticipated growth should be considered “reasonably certain to occur” is an issue that is not resolved herein.

Answering the question of whether a causal link exists between future growth in the permit area and the proposed activities of the Applicants requires individual examination of the types of activities proposed to be performed. These activities can generally be separated into three distinct categories: 1) maintenance and/or repair of existing facilities; 2) installation and maintenance of facilities related to parklands; and 3) installation and subsequent maintenance of new utility lines and utility-related fixed-foundation facilities.

Maintenance and repair of existing facilities, which are proposed activities of all four applicants, are not considered to have potential to result in any growth-related indirect impacts because the activities would not result in increased levels of utility service within the permit area. Similarly, installation and maintenance of parkland facilities are not considered to have potential to result in indirect growth-related indirect impacts because no causal link appears to exist between presence of parkland and future growth.

Installation and maintenance of new utility facilities would be required by any new residential or commercial development. Within the permit area, the Applicants respond to demands for service rather than constructing utilities with the hope of being able to sell service or create demand. Therefore, in general, providing utility service should not be interpreted as inducing growth, but instead as responding to that growth.

At the same time, the new facilities or upgraded existing facilities proposed by Aqua, BEC, and/or LCRA may be designed to carry greater capacity than that required by immediate demand in anticipation of increased future demand. Designing utility lines for future demand is more cost-effective in the long-term and allows the Applicants to provide the highest level of customer service while reducing direct and indirect impacts to the maximum extent practicable. However, designing utility lines to be capable of carrying anticipated future demand does create the question of whether that additional capacity ultimately can promote growth in a “build it and they will come” type of scenario or instead simply provides the Applicants with the ability to respond efficiently to increased demand in their service region.

Many landowners can and do choose to obtain water from wells rather than from Aqua. Permits to drill water wells can be obtained from the State of Texas without undergoing ESA review. Failure by Aqua to provide water service in a particular area would not necessarily preclude development in that area, although it might result in less intensive development than could occur with Aqua water service.

In the permit area outside of the City of Bastrop, electrical utility service can only be provided by BEC or, in some limited areas, by LCRA. Therefore, development within the permit area outside of the City of Bastrop cannot occur without the electrical services provided by BEC and, to a lesser degree, LCRA, apart from any development that relied on electricity obtained from solar

power, wind power, or gas-powered generators. Any such development would be expected to be of very low intensity.

While Aqua, BEC, and LCRA provide utilities only in response to requests for such service, a causal link may exist between any future development in the permit area and those utility services because that development could not occur, or could not occur at the same intensity, without those services. Therefore, a discussion of indirect growth-related impacts with potential to result from the Preferred Alternative is provided below.

5.1.2.2.2 Discussion of Potential Indirect Growth-related Impacts

The Service has issued a section 10(a) permit for 46 subdivisions in Bastrop County. Individual lot-owners within the 46 subdivisions can participate by paying money into a fund, which thereby authorizes incidental take of Houston toads during construction and occupation of single-family residences. This permit covers more than 9,200 residential lots on more than 6,600 acres, all occurring within the permit area of the Applicants. Accordingly, this plan allows for a significant amount of residential development to occur within the permit area, with that development then considered “immune” from discussions of indirect growth-related impacts in this EA/HCP because the impacts of that growth would have been addressed in the 46 subdivisions EA/HCP.

In addition, the Bastrop County Lost Pines HCP regional section 10(a) permit that is currently in the development phase seeks to provide a stream-lined method of authorizing incidental take of Houston toads during construction and occupation of some single-family, commercial, multi-family, and subdivision developments in an approximately 124,000-acre portion of Bastrop County. Should this plan be approved as currently conceived, ESA authorization of development, including authorization for those impacts expected to result from installation of utilities, would be achieved through purchase of “participation certificates” with monies raised used to fund Houston toad habitat creation or enhancement projects on privately held lands. Not only would this plan provide a mechanism for obtaining ESA authorization for much of the development expected to occur in Bastrop County over the next 30 years, it would be authorizing most of the development that would be served by the Applicants. Any development occurring through participation in the Bastrop County Lost Pines HCP would similarly be “immune” from discussions of indirect impacts in this EA/HCP.

As it cannot be known with certainty where any future development may occur in the permit area, potential indirect impacts of such development can only be discussed in general terms. Development occurring without participation in the 46-subdivision plan or the Lost Pines HCP would contribute to fragmentation of habitats, some of which could be habitat for the Houston toad. If that fragmentation were to occur in wooded habitat, that fragmentation could cause localized vegetative edge effects and localized modification to wildlife habitats. In those areas, wildlife species that prefer larger blocks of habitat or do not adapt well to human disturbances could experience population declines, while those species that prefer more open habitats or benefit from human presence could experience population increases.

Future growth would generally not be expected to result in significant disturbances to geology or soils. Individual landowners might occasionally fill smaller, isolated wetlands, and land use would convert from agricultural or undeveloped to residential or commercial development.

Depending on intensity, development could lead to localized decreases in air quality and quality of surface water. Because cultural resources are not protected in the State of Texas on private lands, future development could result in the occasional destruction of heretofore unknown archaeological sites. Development would lead to increased human presence in the permit area, with increased use of local roadways, increased demand for goods and services, and increased availability of jobs in the service industry sector.

It is important to note that, as discussed under the No Action Alternative (Section 4.4), it is considered likely that the Applicants would continue to conduct their activities in the permit area in absence of issuance of a Section 10(a) permit. Also, because of the very low chance that any particular activity would result in adverse impacts to Houston toads, with the exception of LCRA, it is considered likely that the Applicants would conduct their activities in a manner to avoid or minimize the potential to harm toads and without consultation with the Service. Consequently, the potential indirect growth-related impacts of the Proposed Alternative as described above have similar potential to occur under the No Action Alternative, but without the benefit of the mitigation measures proposed by the Applicants and, possibly, without incorporation of some of the BMPs.

The incorporation of BMPs and the mitigation measures proposed in this plan, in conjunction with other Houston toad conservation efforts in the region, will avoid, minimize, or mitigate indirect impacts to the Houston toad to the maximum extent practicable. In addition to the Applicants' proposed BMPs and mitigation measures, other existing and proposed conservation measures are in place or are being formulated within the plan area and include:

The 46-subdivision HCP covering 6,609 acres of the permit area (existing)

Bastrop State Park covering 5,800 acres of the permit area (existing)

Buescher State Park covering 1,017 acres of the permit area (existing)

Lost Pines HCP covering 124,000 of the permit area (proposed)

Boy Scouts of America EA/HCP for the Griffith League Ranch covering 4,848 acres of the permit area (existing)

The Robert K. Long Safe Harbors Agreement covering 540 acres of the permit area (existing)

The combination of the Applicants' proposed BMPs and mitigation measures combined with those of the entities listed above, will provide long-term protection and management for the Houston toad in Bastrop and Lee counties, and will allow for future development in the permit area while avoiding, minimizing, or mitigating impacts to the maximum extent practicable.

5.1.3 Cumulative Impacts

This section considers impact on the environment in Bastrop and Lee counties which results from the incremental impact of activities associated with the preferred alternative when added to other past, present, and reasonably foreseeable future activities regardless of what agency (federal or non-federal) or person undertakes such other actions.

5.1.3.1 Vegetation

As discussed in Section 3.11, the human population within the proposed permit area is expected to increase steadily throughout the life of the permit. Installation of new facilities by the Applicants generally would occur in response to demand for utility services. Covered activities, therefore, are expected to occur primarily in conjunction with residential and commercial land development activities. Increased development would also likely lead to increased building of roads within the proposed permit area. Development and road building activities would result in disturbance to native vegetation within the proposed permit area, both through direct removal of vegetation and by shifting vegetation community composition and structure through edge and fragmentation effects and introduction of exotic species. The Preferred Alternative would result in the disturbance of some vegetation within the proposed permit area; therefore, it would cumulatively contribute to the loss of native vegetation communities in Bastrop and Lee counties. The most abundant vegetation communities within the proposed permit area are Post Oak Savannah and the Lost Pines.

5.1.3.2 Wildlife

The Preferred Alternative would contribute to a cumulative reduction of habitat for some wildlife species intolerant of disturbance when added to impacts resulting from other development, road construction, and other types of land use projects in Bastrop and Lee counties. Wildlife species may be displaced from project areas to adjacent lands for those projects occurring outside of existing ROWs.

5.1.3.3 Species of Special Interest

5.1.3.3.1 Bald Eagle

With successful implementation of recovery programs for the bald eagle, the potential exists for bald eagle populations to expand. The conservation measures identified for both the toad and eagle would contribute to recovery efforts for the bald eagle by avoiding and minimizing the extent of on-site disturbances, limiting the use of pesticides, and protecting large areas of Lost Pines forest. Bald eagles are not known or expected to regularly nest within the proposed permit area. Therefore, the Preferred Alternative is not likely to contribute to the take of bald eagles within the proposed permit area.

5.1.3.3.2 Houston Toad

Direct impacts to Houston toads from covered activities are expected to be minor. However, when the proposed activities are considered in aggregate, it is probable that some number of Houston toads would be harmed eventually, based on the proposed number of projects, expected frequency of activities, and the length of time involved.

The Houston toad is believed to do best in large blocks of habitat with minimal disturbance and fragmentation. Over time the Preferred Alternative may result in very occasional death or harm to Houston toads and minor fragmentation of occupied habitat and thus, may contribute to the total cumulative take of Houston toads and/or loss of habitat viability in Bastrop and Lee counties. Cumulatively under this alternative, activities are expected to occur on approximately

6,792 acres of land, with much of that acreage (approximately 4,264.3 acres or 62.8 percent) contained within existing managed and maintained ROWs. Another approximately 2,000.4 acres (roughly 29.5 percent) consist of existing facilities located outside of managed and maintained ROWs.

As of June 2004, the Service had issued 232 section 10(a)(1)(B) permits for incidental take of Houston toads within the proposed permit area. Most (181) of these permits were issued under the “46-subdivision” HCP – participation in this plan is available to residents of 46 subdivisions in Bastrop County. The total area for all section 10(a)(1)(B) permits issued within the proposed permit area is approximately 5,985 acres, 376 acres of which are attributable to the “46-subdivision” HCP. The total acreage also includes a permit for incidental take of Houston toads during the development and operation of an approximately 4,848-acre high adventure Boy Scout camp in Bastrop County. These acreage totals reflect the total area of properties and not an estimate of “take” in terms in habitat.

The Preferred Alternative is expected to directly reduce the amount of available toad habitat in the approximately 526.9-acre area in which new facilities would be constructed. Loss of habitat and construction of new fixed-foundation facilities could contribute to further overall habitat fragmentation occurring within the proposed permit area. The Preferred Alternative will likely contribute to the total take of Houston toads and/or the destruction of their habitat in Bastrop and Lee counties when added to other endangered species permits that have been or will be issued by the Service. To date, the Service estimates that throughout Bastrop County approximately 60,500 acres (about 48 percent) of known and potential Houston toad habitat has been platted for or developed into single-family housing and/or degraded in some way (e.g., converted for agricultural uses, timber harvest, commercial development, roadways). Approximately 65,520 acres of relatively unaltered woodland remains in Bastrop County, and some of this occurs in small isolated patches. A preliminary analysis of the portion of Lee County in which the proposed permit area occurs indicates that at least 50 percent of the known and potential habitat has been degraded in some way, primarily by clearing for agriculture.

Unrestricted, uncontrolled development can cause habitat fragmentation and leave small, isolated woodlands that are partially or completely surrounded by roads, homes, and people. The best available information indicates that this increases the exposure and vulnerability of the Houston toad to development-related impacts such as cars, pets, construction activities, inter-specific competition, and predation. On- and off-site conservation measures within the proposed permit area will contribute to the preservation of large, contiguous blocks of habitat with connecting dispersal/movement corridors that are important for the long-term conservation, survival, and recovery of the Houston toad.

The Preferred Alternative includes an HCP that proposes mitigation to off-set potential impacts to Houston toads and their habitat. Mitigation would be determined on a project-by-project basis as described in Section 6.2. All mitigation funding generated by this alternative would be available for conservation of the Houston toad and its habitat in Bastrop and Lee counties.

5.1.3.4 Wetlands

Some small wetland areas in stream and river channels may be impacted by installation of new linear facilities, although projects will be designed to avoid wetlands to the maximum extent practicable. Any disturbance to wetlands would contribute to cumulative loss of wetlands within the proposed permit area.

5.1.3.5 Geology and Soils

Land development expected to occur concurrently with installation of new facilities will likely result in conversion of soils to those more typical of urban or suburban areas that are developed at high or moderate densities. Low-density development is unlikely to cause significant changes to soils except where impervious cover is constructed. The Preferred Alternative would result in construction of approximately 50.4 acres of fixed-foundation facilities, which would contribute to overall loss of native soils within the proposed permit area.

No impacts to geological resources are expected from the Preferred Alternative.

5.1.3.6 Land Use

As discussed in Section 3.11, the human population within the proposed permit area is expected to increase steadily throughout the life of the permit. Installation of new facilities by the Applicants generally would occur in response to the demand for utility services. Covered activities, therefore, are expected to occur primarily in conjunction with residential and commercial land development activities. Increased development would also likely lead to increased building of roads within the proposed permit area. Over the life of the permit, it is expected that land in much of the proposed permit area would be converted from native woodland or rural/agricultural land to urban, suburban, low-density, and very low-density residential development. Low-density and very low-density residential development could retain rural character and result in preservation of much of the native vegetation present in those areas. This development is expected to occur under all alternatives considered in this EA/HCP. Nonetheless, the Preferred Alternative would cumulatively contribute to the conversion of undeveloped, rural, and/or agricultural land to residential and commercial developments within the proposed permit area.

To date, the Service estimates that throughout Bastrop County approximately 60,500 acres of Houston toad habitat has been platted for single-family housing and/or degraded in some way (e.g., converted for agricultural uses, timber harvest, commercial development, roadways). Approximately 65,520 acres of relatively unaltered woodland remain, some of which are small isolated patches. A preliminary analysis of the portion of Lee County in which the proposed permit area occurs indicates that at least 50 percent of the known and potential habitat has been degraded in some way, primarily from agricultural clearing practices. As discussed in Section 3.11, from 1990 to 2000 the populations in Bastrop and Lee counties had grown approximately 51 percent and 22 percent, respectively, and it is likely that these populations will continue to grow over the life of the permit.

5.1.3.7 Water Resources

No surface water resources are expected to be disturbed as a result of the Preferred Alternative. Expected development within the proposed permit area over the life of the permit would increase local demand for water resources. The Preferred Alternative would allow this demand to be met, but it would also be met under the other alternatives considered in this EA/HCP, or through other activities not discussed in this document, such as the drilling of individual wells or the creation of municipal utility districts. Consequently, demand for ground water resources within the proposed permit area is expected to increase during the life of the permit. Dewatering operations at ALCOA's Three Oaks Mine and increased development within the permit area may result in draw-down of the aquifer in portions of the permit area. This draw-down could result in a reduction in ground water discharge to surface waters. The Preferred Alternative would not result in an incremental increase in ground water or surface water usage above that expected to occur in the absence of permit issuance. Therefore, no increase in cumulative impact to ground water resources is expected to result from the Preferred Alternative.

5.1.3.8 Air Quality

Use of vehicles and construction equipment during repair and maintenance activities, as well as during the installation of new facilities over the life of the permit would contribute to the degradation of air quality within the proposed permit area when added to vehicle emissions and other development-related impacts expected to result from increases in the human population. The contribution resulting from covered activities is expected to be negligible compared to that resulting from activities conducted by the increased population within the proposed permit area over the life of the permit (see Section 3.11).

5.1.3.9 Water Quality

Activities conducted under authorization of the permit generally would be expected to have little or no impact on water quality. Construction of new facilities could result in temporary, minor discharges of sediment and/or suspended solids in runoff from project areas. Such discharges could contribute very slightly to decreases in quality of water in local streams that would be expected to result from residential and commercial development within the proposed permit area over the life of the permit.

5.1.3.10 Cultural Resources

Given current regulations, residential and commercial development expected to occur within the proposed permit area over the life of the permit largely could be constructed without review by the THC. Therefore, this development could and would be expected to result in some indeterminable amount of adverse impact to cultural resources, both historic and prehistoric. The potential exists for covered activities to impact cultural resources on approximately 383.8 acres of the proposed permit area (see Section 5.1.1.11). If any significant cultural resources are disturbed in the 383.8 acres it would contribute to the cumulative loss of such resources within the proposed permit area.

5.1.3.11 Socioeconomic

The proposed activities are required for the Applicants to respond to existing and anticipated demands for utility services by the growing population within the proposed permit area. As discussed in Section 3.11, the population in and surrounding the proposed permit area is expected to at least double over the next 30 years. This growth would result in the conversion of much naturally vegetated or rural land within the proposed permit area to residential and commercial developments (Section 5.1.3.6). Consequently, the economy of the proposed permit area is expected to shift away from primarily agricultural toward a more diversified system that includes service and manufacturing industries and public employment. Facilities operated by the Applicants would be a component of the development infrastructure within the proposed permit area, but because facilities are constructed in response to demand, activities authorized by the requested permit generally would not be expected to contribute to increased growth and development within the proposed permit area. Activities conducted under this alternative would generally serve to benefit the socioeconomic environment within the proposed permit area by providing utilities to the populace.

5.2 ALTERNATIVE 2 - INDIVIDUAL SECTION 10(A)(1)(B) PERMITS

It is anticipated that this alternative would result in 270 or more applications to the Service for individual section 10(a)(1)(B) permits over the next 30 years. In general, the on-site environmental and socioeconomic impacts associated with this alternative would be similar if not identical to those expected under the Preferred Alternative because all of the projects performed under the Preferred Alternative would also likely be performed under this alternative. However, under this alternative, some of the projects would include application for a section 10(a)(1)(B) permit while those proposed to occur outside of potential toad habitat would not, nor would those where incidental take was otherwise not likely to occur.

Under this alternative, each project for which an incidental take permit was sought would take place within its own permit area. No construction would be necessary outside of these permit areas but, for those projects requiring significant opening of the woodland canopy, off-site impacts to vegetation, wildlife, and endangered species could possibly result from habitat “edge effects.” The potential for occurrence of such off-site impacts would be addressed in the individual section 10(a)(1)(B) permit applications.

Because this alternative is expected to result in disturbances equivalent to those of the Preferred Alternative, cumulative impacts resulting from this alternative are also generally expected to be similar to those discussed for the Preferred Alternative. However, these cumulative impacts would be more difficult to quantify on an individual basis.

This alternative is expected to result in environmental impacts similar to those of the Preferred Alternative. However, this alternative would not provide guaranteed mitigation in annual lump sums and the amount of mitigation would likely be less for new facilities as many of these projects would likely occur outside of Houston toad habitat. Other activities would not be likely to result in take and, therefore, would not require acquisition of individual section 10(a)(1)(B) permits. In addition, even with the assistance of the Service, the projected timeframe to assess and craft each project EA/HCP prior to review, approval, and permit issuance could take a minimum of 6 to 9 months. This would likely result in project delays and a decrease in the

quality of utility service provided to the residents of the proposed permit area. Preparation of multiple EA/HCPs and permit applications would increase costs incurred by the Applicants and the Service. It would also result in an irregular and non-guaranteed source of mitigation funding, which would hinder efforts to obtain, preserve, and protect Houston toad habitat and movement corridors within the proposed permit area in comparison to a more coordinated habitat protection effort that would be afforded by the Preferred Alternative.

The environmental impact of this alternative would be similar to that of the Preferred Alternative but it would not provide as great a conservation benefit to the Houston toad and it is likely to cause increased costs and project delays for the Applicants. Therefore, this alternative was rejected.

5.3 ALTERNATIVE 3 – BASTROP COUNTY SECTION 10(A)(1)(B) PERMIT

As with Alternative 2, the activities of the Applicants performed under this alternative would be identical to those performed under the Preferred Alternative and project-related environmental and socioeconomic impacts would be similar to those occurring under the previous two alternatives. Under this alternative, however, each of the Applicants would necessarily continue to conduct activities within the proposed permit area while waiting for implementation of a Bastrop County HCP and section 10(a)(1)(B) permit. Each utility project would have to undergo individual Service review and, if necessary, permitting.

Efforts to develop this HCP and permit are currently underway and the Applicants are participating in that stakeholder-based process. However, it is probable that the requested permit, if issued, will not authorize activities occurring outside of Bastrop County. Therefore, the Applicants would have to pursue other options for gaining incidental take authority in Lee County. The stakeholder process is not yet complete for the Bastrop County plan and the Applicants desire to be covered within a shorter timeframe in order to better serve existing utility customers.

This alternative was rejected in favor of The Preferred Alternative because of the timing and uncertainty associated with the Bastrop County planning effort. The Applicants own and operate facilities within the proposed permit area and have immediate need of authorization to conduct some of the activities described in Section 4.1. A permit for Bastrop County will not be issued in the near future. It could be years before a permit is issued to Bastrop County and it is possible that the HCP may never be completed. The Applicants are unable to postpone or otherwise defer conducting their activities while waiting for issuance of a Bastrop County permit. This alternative was also rejected because, to date, the planning effort has not included Lee County and, therefore, this alternative would not likely cover the Applicants' entire activity area.

5.4 ALTERNATIVE 4 - NO ACTION

Under the No Action alternative, the Applicants would not receive an incidental take permit covering their otherwise lawful activities under the ESA. The Applicants would continue to perform those activities within the proposed permit area that would not, or would not be expected to, result in violation of the ESA. However, it is likely that some activities required to fulfill their obligations to provide utility services could not be performed without undesirable risk and possible violation of the ESA. Therefore, not all needed and desired activities would be

performed, resulting in an overall decrease in quality of utility service within the proposed permit area and possibly a complete disruption of utility service in some areas.

Failure to perform all necessary activities could result in decreased maintenance and repairs, which could lead to power outages, downed or broken lines, pump/lift station malfunctions, unsafe public conditions, loss of revenue, and possible violations of applicable utility regulations. Decreased service quality due to perceived “toad limitations” could result in poor public opinion regarding the Houston toad and its impact on the daily lives of the citizens within the proposed permit area, thereby impacting the chances for community-based and supported recovery of the Houston toad. Facility degradation or malfunction could also cause other natural and cultural resource impacts associated with downed poles or broken lines such as wildfires, wastewater leaks, contaminated areas, and habitat degradation. Work might be conducted without adherence to the protective measures and additional BMPs prescribed in Section 6.0 of the HCP such that potential impacts to Houston toads would not necessarily be avoided or minimized. Work performed under this alternative would not provide the same mitigation benefits to the species as those provided under the Preferred Alternative and there would be no guaranteed provision for funding of Houston toad conservation activities in Bastrop and Lee counties. Therefore, this alternative was rejected as being non-practicable under current and foreseeable circumstances. No other feasible alternative exists that would avoid impacts to the Houston toad.

6.0 HABITAT CONSERVATION PLAN

The Applicants have voluntarily filed an application for a section 10(a)(1)(B) permit under the ESA to allow the incidental take of the endangered Houston toad during otherwise lawful activities to be conducted over a 30-year period in portions of Bastrop and Lee counties, Texas. The Applicants desire to be fully covered under the ESA for any incidental take of the Houston toad that may occur as a result of their activities. This HCP was developed to specify what steps the Applicants will take to reduce their risk of liability, avoid, minimize, and mitigate to the maximum extent practicable any impacts to the Houston toad. The Applicants and the Service fully understand that many of the activities that would be performed under the requested permit may not result in take. However, mitigation at the proposed rate would still occur.

This section contains the Applicants' specific conservation proposals for the Preferred Alternative. The biological goals and objectives of this HCP are to contribute to the long-term survival and recovery of the Houston toad. This would be accomplished, in part, by avoiding and minimizing potential impacts to Houston toads and their habitat. Also, mitigation funds shall be provided for additional Houston toad conservation projects. A committee comprised of representatives that may include, but are not limited to, the Applicants, Bastrop and Lee counties, the Service, the Texas Parks and Wildlife Department (TPWD), and members of the Houston toad recovery team will determine how mitigation funds generated by the requested permit will be expended for toad conservation. These conservation projects shall occur in Bastrop and Lee counties. Any habitat that is acquired either by fee-simple or conservation easement would be managed and protected for the benefit of the Houston toad in perpetuity. The broad application of the measures for avoiding, minimizing, and mitigating for potential adverse impacts to Houston toads, as set forth in this HCP, shall assist the Applicants in developing long-term business and budget plans, and will greatly contribute to the recovery and survival of the species.

The Applicants are requesting incidental take coverage so they have assurances that if there was actual take they would be exempt from prosecution. The Applicants desire to conduct covered activities with regulatory assurances through this Service-accepted process to benefit Houston toads and the Applicants' business practices. In order to achieve this, the Applicants propose to employ measures (described in Sections 6.1 and 6.2) to avoid, minimize and mitigate potential adverse impacts throughout the proposed permit area. If issued, the requested permit shall avoid the need to assess the potential impacts associated with each individual covered activity.

The Applicants and the Service do not believe the entire proposed permit area represents actual or potential habitat for Houston toads. Habitat and/or unsuitable habitat could occur within the project area of any given activity. The Applicants do not believe all activities would occur within occupied or potential habitat or that all activities would result in adverse impacts to Houston toads. Therefore, the Applicants reserve the right to assess on a project-by-project basis the potential for impacts to result from activities they may wish to perform that are not described in this EA/HCP based on factors particular to those activities. Such activities may or may not warrant consultation with the Service and may be outside of the scope of this HCP. In the event the Applicant(s) believe such activities warrant consultation with the Service, it shall be up to the Service to determine whether or not each activity is within the scope of this HCP and could be authorized under the requested permit, or if a separate permit is needed.

The Applicants' specific measures to avoid, minimize, and mitigate potential impacts to Houston toads are identified in the following discussion. The Applicants will avoid and minimize to insignificance the potential for impacts to the bald eagle (see Section 6.1.1) and therefore believe take coverage for the bald eagle is not necessary. No take authorization for the bald eagle is being requested or would be authorized by issuance of this permit. The Applicants have identified numerous BMPs that they believe would allow covered activities to be conducted in such a way as to protect sensitive areas (e.g., riparian areas, wetlands, large trees and other vegetative cover, other waterways), conserve Houston toad habitat, and minimize adverse effects to vegetation and wildlife for the benefit of the Lost Pines ecosystem. These BMPs are described in detail in Section 6.1.2. In addition, the Applicants will enact measures to mitigate for potential adverse impacts that may occur as a result of covered activities. These measures are identified in Section 6.2.

An Implementing Agreement between the Service and the Applicants will be developed and approved prior to issuance of the permit. This agreement shall specify all reporting and funding mechanisms for meeting the requirements identified in this HCP. A draft template of the Implementing Agreement will be available for public review and comment during the public comment period.

6.1 BEST MANAGEMENT PRACTICES FOR AVOIDING AND MINIMIZING POTENTIAL IMPACTS TO LISTED SPECIES

6.1.1 Best Management Practices for Avoiding Potential Impacts to Bald Eagles

The measures identified in the following discussion are BMPs common to all Applicants. These BMPs are designed to avoid and minimize to insignificance the potential for impacts to the bald eagle resulting from installation of new facilities and the repair and maintenance of existing

facilities within the proposed permit area. Activities covered under the requested permit are described in Section 4.1 and Tables 1 through 7.

The bald eagle is likely rare throughout most of the proposed permit area, but may be a regular transient in some areas and may occur occasionally at Lake Bastrop within the proposed permit area in late fall, winter, and early spring (Freeman 1996). No active nest sites are known to occur within the proposed permit area. However, one active bald eagle nest is located near the Colorado River and Wilbarger Creek confluence approximately 6 miles west of the proposed permit area. Mature forested riparian habitats associated with the Colorado River and Lake Bastrop have the greatest potential to provide nest sites or winter roost sites within the proposed permit area.

Prior to beginning work in these habitats, the Applicants shall survey proposed project areas to search for nest sites and shall review Texas Parks and Wildlife Department and Service records for known nest and roost sites within and adjacent to the proposed project area.

Nest and roost sites shall be avoided, and clearing for new construction outside of roadway ROWs shall not take place within 750 feet of a bald eagle nest during the eagle breeding season (1 October through 30 April).

An effort shall be made to retain as many trees as possible within ROWs as long as they do not compromise the safety or reliability of the facility. Trees that are to remain shall be clearly marked prior to initiating clearing. Tree protection (protection of trunks from damage by equipment) shall be employed when necessary. The removal of large trees, when necessary, shall be achieved using hand-held equipment to fell trees and separate them into pieces small enough to be removed from the ROW without using track equipment. All large trees shall be inspected for evidence of use by eagles. Any trees exhibiting evidence of use by eagles shall be avoided.

All BMPs listed for the Houston toad (Sections 6.1.2 and 6.2) will also help ensure possible impacts to the bald eagle are minimized to an insignificant level.

6.1.2 Best Management Practices for Avoiding and Minimizing Potential Impacts to Houston Toads

The measures identified in the following discussion are BMPs common to all Applicants. These BMPs are designed to avoid and minimize potential impacts to Houston toads during the installation of new facilities and the repair and maintenance of existing facilities within the proposed permit area. Pertinent to this HCP, activities covered under the requested permit are described in Section 4.1 and Tables 1 through 8.

(1) Training, education, and employee/contractor awareness:

- a. Each Applicant shall appoint a staff member to serve as the Houston toad point-of-contact for supplying information to and answering questions from employees, contract staff, contractors, and the Service.
- b. Houston toad awareness training shall be given to employees who may be involved in installation and construction projects within the proposed permit area. This training shall be required for project managers, internal contracts staff,

- engineers, utility foresters, construction and installation staff, construction and installation inspectors, patrollers, environmental staff, and safety personnel. In addition to the initial training course, employees shall be required to attend a refresher course every 5 years or sooner if significant changes in Houston toad-related status or regulations occur. Training shall be available at least once annually for first-time training, new-hires, and refresher training. Training shall be provided by LCRA Environmental Services (Community Services) for LCRA employees and designees, and by AE Environmental Services for AE staff and designees (or by equivalent LCRA and AE staff should either of these Applicants undergo reorganization). Bluebonnet and Aqua employees and designees shall obtain training from LCRA Environmental Services (Community Services), Austin Energy Environmental Services, or from some other appropriate Service-approved instructor.
- c. A Houston toad information brochure or other appropriate reference (approved by the Applicants and the Service) shall be provided to the Applicants' utility projects staff as well as contractors and landowners directly associated with the Applicants' utilities projects. Contract and negotiating staff, on-site staff, and contractors shall be made aware of the potential for project-related impacts to Houston toads and shall be provided with a list of the BMPs identified in this HCP. On-site staff and contractors shall be vigilant of field conditions and BMPs to minimize potential impacts to Houston toads.
 - d. Contracts covering work within the proposed permit area shall include language requiring the use of BMPs identified in this HCP and shall include language specifying consequences and liabilities for non-compliance on the part of contractors.
 - e. New customers receiving utility service shall be provided with a Houston toad information package and a Service contact number.
- (2) Selection of installation and construction sites:
- a. To the maximum extent practicable, lines shall be installed and new facilities shall be constructed in existing, maintained ROWs, or other similar disturbed areas.
 - b. To the maximum extent practicable, line installation and new construction activities shall avoid potential Houston toad habitat (forestlands with deep sands, and possible breeding sites).
 - c. Except when within ROWs in existence at the time of issuance of the requested permit, the Applicants shall not initiate new clearing or construction/installation on certain lands without prior discussion with and timely approval from the Service. These lands include Bastrop and Buescher state parks, the University of Texas M. D. Anderson Cancer Center Science Park-Research Division (UT Science Park), and any other lands recognized by the Service as being managed as a preserve for the Houston toad. The Service shall provide each Applicant with a list of such lands annually.
- (3) Minimization of potential impacts resulting from clearing and ground disturbance activities resulting from new installation and construction activity:
- a. The Applicants' senior on-site staff shall be thoroughly familiar with the BMPs identified in this HCP and shall monitor activities to ensure use of these BMPs. Monitoring shall include documentation of successful or non-successful implementation of BMPs. The reason(s) for any non-successful implementation of a

BMP will be clearly documented. On-site senior staff shall adaptively manage operations based on perceived potential impacts to Houston toads and their habitat.

- b. The use of herbicides can extend the period between maintenance cycles, thereby reducing the frequency, duration, and impact of mechanical maintenance activities within toad habitat. However, the use of herbicides, pesticides, and fungicides is acknowledged to have potential harmful effects on amphibians and some habitats. If it is determined that the use of pesticides is the most appropriate control for a particular project, as part of a scheduled vegetation and/or pest management plan, the following minimum precautions shall be followed:
- The Applicants shall avoid or minimize the use of herbicides and pesticides. If herbicides or pesticides are used, the Applicants shall seek guidance for pesticide use from Recommended Protection Measures for Pesticide Applications in Region 2 of the U.S. Fish and Wildlife Service (USFWS 2004) or more recent edition. When using pesticides identified in this manual in accordance with techniques described in the manual, the Applicants shall not be required to seek prior concurrence with the Service. Alternatively, the Applicants jointly or individually may develop Service-approved management plans for the use of herbicides and pesticides specific to the activities covered under the requested permit. For herbicides and pesticides and/or applications not addressed in USFWS (2004) or more recent edition, or in a permit-specific Service-approved plan, the Applicants shall contact the Service and obtain guidance by line of business relative to operations and applications. Service approval must be obtained prior to using pesticides and/or applications not identified in USFWS (2004) or more recent edition or in a permit-specific Service-approved plan.
 - Only the least-toxic, non-persistent herbicides shall be selected for use.
 - The Applicants shall require that their employees and contractors conducting covered activities comply with the conditions above and all pesticide label requirements for dilution, application, disposing of rinse water, and disposing of empty containers.
 - Each Applicant's point of contact shall maintain a copy of USFWS (2004) or more recent edition, a chemicals list, documentation on the proper use of these chemicals, and a list of licensed applicators for certain chemicals.
- c. To the maximum extent practicable, clearing and ground-disturbing activities shall be avoided from 1 January to 30 June, the period of Houston toad breeding activity. If clearing or ground-disturbing activities must be conducted between January 1 to June 30, the Applicant(s) shall provide written notice and justification requesting concurrence from the Service at least 30 days prior to initiation of these activities. It is possible an emergency may arise for which a 30-day prior notice cannot be given; in the event this happens, the Applicant(s) shall notify the Service within 72 hours of the clearing or ground disturbing activities.
- d. Where practicable, the Applicants will maintain a buffer greater than 150 feet from wetlands and potential breeding sites. Except in emergency situations, during the breeding season (1 January - 30 June), clearing and ground disturbances shall not occur within 150 feet of wetlands, creeks, ephemeral drainages, ponds, stock tanks, or other similar areas as indicated by on-site observations or from review of 7.5-minute

U.S. Department of the Interior, National Wetland Inventory maps. If an emergency situation dictates that clearing or ground-disturbing activities within 150 feet of any of these areas must be conducted between January 1 to June 30, the Applicant(s) shall provide written notice to the Service within 72 hours of clearing or ground disturbing activities.

- e. Each Applicant shall require someone, trained to recognize anurans and familiar with their biology, to be present on the site of a line installation or construction effort if the activity takes place between 1 January and 30 June and the activity would occur within 150 feet of a potential Houston toad breeding site. This individual would ensure that no toads were present in a project area while activities were being conducted and shall be responsible for surveying potential breeding sites immediately prior to any clearing or construction activity. These surveys shall be designed to determine the presence or absence of adult and juvenile anurans, tadpoles, and/or egg strands. If any anuran eggs or tadpoles are found to be present in or adjacent to a project area, the area containing the eggs/tadpoles will be marked with construction barrier fencing and avoided. Survey results shall be provided to the Service prior to the clearing or construction activity.
- f. In the event that crews cannot drive around wetlands, creeks, ephemeral drainages, ponds, or stock tanks, and crossings must be modified to allow vehicle access, the following activities may be acceptable if conducted outside of the breeding season:
- Stones may be placed along the bottom of a stream and its banks as long as natural hydrologic flow is unimpeded and all stormwater and jurisdictional waters of the United States protections are met under state and federal regulations; and
 - Non-vegetated, steep stream bank slopes may be graded for accessibility if: 1) stormwater and jurisdictional waters of the United States protection criteria are met under state and federal regulations; 2) the stream does not have wooded riparian borders; and 3) bare, graded stream banks are vegetated with native species following project completion.
- g. Clearing for all utility lines and other structures shall be limited to the minimum amount that allows for the safe completion of a particular project.
- h. Hand-clearing of vegetation shall be used when practical. The use of track equipment for clearing shall be minimized.
- i. Gasoline- and diesel-fueled field equipment shall be inspected daily for signs of fuel or hydraulic leaks; such leaks shall be repaired promptly and measures shall be taken to prevent soil contamination. All hazardous materials related to construction or maintenance activities shall be properly contained, used, and/or disposed of.
- j. An effort shall be made to retain as many trees as possible within ROWs as long as they do not compromise the safety or reliability of the facility. Trees that are to be retained shall be clearly marked prior to initiating clearing. Tree protection (protection of trunks from damage by equipment) shall be employed when necessary. The removal of large trees, when necessary, shall be achieved using hand-held equipment to fell trees and separate them into pieces small enough to be removed from the ROW without using track equipment.

- k. Prior to initiating installation and construction activities, best non-point source pollution controls shall be deployed to protect potential breeding sites from receiving run-off from installation/construction areas.
- l. Small excavations (e.g., trenches for sub-surface lines and holes for poles and standards) shall not remain open overnight. Large excavations that remain open overnight shall be appropriately fenced so as to prevent access by anurans, and shall be inspected in the morning prior to initiating installation/construction activities. Any toad encountered in an excavation shall be removed and placed outside of the activity area.
- m. For major construction projects, the Applicants will conduct vegetation and BMP monitoring for all areas disturbed during construction. Within 30 days of project completion, the Applicants will perform an inspection of all BMPs to evaluate their effectiveness and to make recommendations on which to base adaptive management decisions. Vegetation monitoring will be conducted within 6 months of construction completion to determine the effectiveness of the vegetation restoration efforts. The monitoring will determine whether native species are successfully becoming established in disturbed areas or whether non-native species are dominating revegetated sites. If revegetation efforts are determined to be unsuccessful or only partially successful, adaptive management strategies may be employed to ensure successful restoration of native species. Two years after construction is complete, a follow-up monitoring will be performed to evaluate the effectiveness of BMPs, vegetation restoration, and any adaptive management strategies that were employed following construction. It should be noted that there may be constraints concerning achievement of final restoration since the Applicants will be operating within easements crossing private property, and that the applicants can not be held responsible for the landowners' independent actions that affect the property.

(4) Repair, maintenance, and upgrades to existing facilities:

- a. The use of herbicides can extend the period between maintenance cycles, thereby reducing the frequency, duration, and impact of mechanical maintenance activities within toad habitat. However, the use of herbicides, pesticides, and fungicides are acknowledged to have potential harmful effects to amphibians and some habitats. If it is determined that use of pesticides is the most appropriate control for a particular project, as part of a scheduled vegetation and/or pest management plan, the following minimum precautions shall be followed:
 - The Applicants shall avoid or minimize the use of herbicides and pesticides. If herbicides or pesticides are used, the Applicants shall seek guidance for pesticide use from Recommended Protection Measures for Pesticide Applications in Region 2 of the U.S. Fish and Wildlife Service (USWFS 2004) or more recent edition. When using pesticides identified in this manual in accordance with techniques described in the manual, the Applicants shall not be required to seek prior concurrence with the Service. Alternatively, the Applicants jointly or individually may develop Service-approved management plans for the use of herbicides and pesticides specific to the activities covered under the requested permit. For herbicides and pesticides and/or applications not addressed in USFWS (2004) or

more recent edition, or in a permit-specific Service-approved plan, the Applicants shall contact the Service and obtain guidance by line of business relative to operations and applications. Service approval must be obtained prior to using pesticides and/or applications not identified in USFWS (2004) or more recent edition or in a permit-specific Service-approved plan.

- Only the least-toxic, non-persistent herbicides shall be selected for use.
 - The Applicants shall require that their employees and contractors conducting covered activities comply with the conditions above and all pesticide label requirements for dilution, application, disposing of rinse water, and disposing of empty containers.
 - Each Applicant's point of contact shall maintain a copy of USFWS (2004) or more recent edition, a chemicals list, documentation on the proper use of these chemicals, and a list of licensed applicators for certain chemicals.
- b. All non-emergency repair and maintenance work that requires more than minimal vegetation or ground disturbance shall not be conducted between 1 January and 30 June.
- c. When emergency repairs must occur between 1 January and 30 June and the potential for impacts is not avoidable, all actions taken during the course of the repair shall be documented and provided to the Service in the annual report.
- d. When applicable for repairs to sub-surface lines, technology and equipment shall be used to locate as accurately as possible the location of the leak, break, or service interruption prior to significantly disturbing any soils and vegetation.
- e. Any mowing equipment used for clearing grass, forbs, and small-diameter woody vegetation within ROWs will be set at a height of at least 5 inches above the ground to minimize the potential for striking toads. In cases where leaving woody stumps of 5 inches tall or greater would pose a risk of damage to equipment, the Applicants may mow vegetation at less than 5 inches above ground level. In such cases mowing shall be restricted to the minimum area necessary.
- f. To avoid disrupting potential breeding sites within ROWs, the Applicants will attempt to maintain their ROW in such a way that artificial breeding sites are not created within the area vehicles are likely to use (i.e. tire ruts). In the event artificial breeding sites are present during the breeding season (1 January to 30 June), and an employee or contractor must drive through the area, every reasonable effort will be made to avoid driving through or disturbing the possible breeding site. .
- n. For major repair, maintenance, and upgrades to existing facilities, the Applicants will conduct vegetation and BMP monitoring for all areas disturbed during construction. Within 30 days of project completion, the Applicants will perform an inspection of all BMPs to evaluate their effectiveness and to make recommendations on which to base adaptive management decisions. Vegetation monitoring will be conducted within 6 months of construction completion to determine the effectiveness of the vegetation restoration efforts. The monitoring will determine whether native species are successfully becoming established in disturbed areas or whether non-native species are dominating revegetated sites. If revegetation efforts are determined to be unsuccessful or only partially successful, adaptive management strategies may

be employed to ensure successful restoration of native species. Two years after construction is complete, a follow-up monitoring will be performed to evaluate the effectiveness of BMPs, vegetation restoration, and any adaptive management strategies that were employed following construction. It should be noted that there may be constraints concerning achievement of final restoration since the Applicants will be operating within easements crossing private property, and that the applicants can not be held responsible for the landowners' independent actions that affect the property.

(5) Restoration of disturbed areas:

- a. All disturbed areas shall be returned to approximate pre-construction contours where possible.
- b. Large disturbed areas shall be seeded with native, non-sod-forming species.
- c. Imported topsoil shall be used only in areas disturbed to the point that the use of topsoil local to the site is not practical. Imported topsoil will be inspected for evidence of fire ants. Any imported topsoil found to contain fire ants or their eggs shall be treated prior to use.
- d. Bare, graded stream banks shall be vegetated with native species following project completion.
- e. For major construction/maintenance projects, the Applicants will conduct vegetation and BMP monitoring for all areas disturbed during construction. Within 30 days of project completion, the Applicants will perform an inspection of all BMPs to evaluate their effectiveness and to make recommendations on which to base adaptive management decisions. Vegetation monitoring will be conducted within 6 months of construction completion to determine the effectiveness of the vegetation restoration efforts. The monitoring will determine whether native species are successfully becoming established in disturbed areas or whether non-native species are dominating revegetated sites. If revegetation efforts are determined to be unsuccessful or only partially successful, adaptive management strategies may be employed to ensure successful restoration of native species. Two years after construction is complete, a follow-up monitoring will be performed to evaluate the effectiveness of BMPs, vegetation restoration, and any adaptive management strategies that were employed following construction. It should be noted that there may be constraints concerning achievement of final restoration since the Applicants will be operating within easements crossing private property, and that the applicants can not be held responsible for the landowners' independent actions that affect the property.

Adherence to these BMPs would represent a significant departure from typical operating procedures employed by the Applicants. Each Applicant is dedicated to proper and responsible stewardship of lands under their control, and each Applicant employs BMPs for managing their lands. However, the BMPs currently used are not as comprehensive as those proposed under this plan. Adherence to the BMPs would require the Applicants to alter their existing management practices in the selection of sites, installation of facilities, management of lands, and training of staff, so that Houston toad conservation would be a significant factor in considering and

conducting activities within the proposed permit area. The training and public education component of the BMPs would provide accurate information to a large number of employees, contractors, and landowners. The Applicants are the four largest utility providers operating in the proposed permit area, and the modification of their operations in order to incorporate the BMPs is expected to provide direct benefits to Houston toads, in terms of avoidance and minimization of impacts, and would serve to illustrate to other businesses in the area that consideration of Houston toads can be successfully incorporated into standard operating procedures.

6.2 MITIGATION FOR POTENTIAL IMPACTS TO HOUSTON TOADS

It is anticipated that the BMPs described above will avoid and minimize adverse impacts to Houston toads resulting from proposed activities. However, it is possible that some activities, even with implementation of the BMPs, may cause adverse impacts to toads. Such activities can be assigned to one of two categories: (1) installation of new linear facilities and fixed-foundation facilities; and (2) routine and emergency repair and maintenance of linear and fixed-foundation facilities. The Applicants believe the potential for and magnitude of adverse impacts differ according to whether the activity is the installation of a new linear facility, the installation of new fixed-foundation facility, or the conduction of repair or maintenance activities. Accordingly, mitigation fees for each these types of activities vary, and are described below (Sections 6.3.1 and 6.3.2).

As discussed previously in this EA/HCP, the status of the Houston toad population within the proposed permit area is unknown, but it is extremely unlikely that toads are uniformly distributed throughout the proposed permit area. Not all of the 142,526-acre proposed permit area is Houston toad habitat. Covered activities would be conducted on only 6,791.6 acres (about 4.8 percent) of the proposed permit area, and the Applicants are not able to identify in advance all covered activities that would occur in toad habitat. Many covered activities would occur at existing facilities, or at new facilities constructed within existing maintained ROWs and as such is expected to pose little or no threat to the Houston toad. Covered activities in these areas would be unlikely to reduce the value as toad habitat beyond existing conditions. Some covered activities inherently pose little or no threat to Houston toads and adherence to the BMPs (see Section 6.1) would substantially reduce the likelihood of impacts to Houston toads and their habitat.

The Applicants and the Service do not believe that all covered activities would cause incidental take of Houston toads. However, the Applicants desire to avoid the necessity of assessing the potential for incidental take to result from individual projects and uncertain annual mitigation funding requirements. Such a program would severely restrict the Applicants' abilities to respond in a timely manner to requests for services, repairs, and maintenance, and would reduce the certainty of long-term budgeting and planning for business activities. Instead, the Applicants have developed a mitigation program that would allow them to mitigate for all potential incidental take, respond in a timely manner to their customers, and incorporate costs associated with mitigation into the budgeting and business planning processes. The Applicants would pay mitigation fees for all covered activities as outlined in the following paragraphs. The Applicants would not assess the potential for take associated with individual projects and instead would pay mitigation for each covered activity according to formulas provided below. This program would result in multiple positive benefits:

- the Applicants would mitigate for all incidental take of Houston toads associated with covered activities;
- the Applicants would spread the cost associated with mitigation among all covered activities and through the life of the permit, and thus avoid a scenario whereby a few projects could be excessively expensive;
- the Applicants would provide mitigation fees throughout the life of the permit and thus provide a substantial and dependable source of funds for toad conservation; this could result in approximately \$1,866,354 over the life of the permit, and this is likely an underestimate (see Sections 6.2.1.2, 6.2.1.3, and 6.2.2 for derivation of this estimate);
- the Applicants would be able to respond to customers in a timely manner without conducting time consuming and costly impact assessments for each covered activity; and
- the Applicants would be able to incorporate mitigation fees into planning and budgeting processes and thus better develop long-term budget and business plans.

6.2.1 Mitigation for the Installation of New Facilities

Mitigation fees for new installations would be based on the anticipated magnitude of potential adverse impacts associated with the activity, as described in this EA/HCP, and the cost of purchasing land within the proposed permit area. The Applicants believe that the potential for and magnitude of impacts to Houston toads resulting from the installation of linear facilities would differ from those resulting from the installation of fixed-foundation facilities. Accordingly, the calculation of mitigation fees for these activities would differ as described in Sections 6.2.1.1 and 6.2.1.2.

Mitigation fees for the installation of new facilities in Bastrop County would be based in part on the estimated value of a 100-acre tract in that portion of Bastrop County within the proposed permit area, and fees for facilities in Lee County would be based in part on the estimated value of a 100-acre tract in that portion of Lee County within the proposed permit area. Mitigation fees for the installation of new facilities occupying portions of each county would be based on the estimated value of land in the county containing more than 50 percent of the construction area of a given installation. Mitigation funds would be available for purchasing lands as Houston toad preserves, and typically large tracts are thought of as potential preserve sites. “Large” in this context is not well defined, and the Applicants believe that by basing mitigation fees for new installations on the value of 100-acre tracts that sufficient funds would be generated for assisting in the purchase of large tracts as Houston toad preserves and for other conservation efforts.

Based in part on analyses and interpretation of data and information provided by the Lee County Appraisal District and the Bastrop County Appraisal District in March 2003 (Appendix 1), the Applicants would use land value estimates of \$1,950/acre for Lee County and \$2,116/acre for Bastrop County when calculating mitigation during year 1 (2005) of the permit. These estimates would be compounded annually by 3.46 percent (Appendix 1) during permit years 2 through 5 (2006 through 2009) in order to adjust land value for possible increases due to inflation. Table 8 summarizes land value estimates used to calculate mitigation for the first 5 years of the project.

It is the Applicants' desire that to the maximum extent possible this EA/HPC provide them with sufficient information for developing budgets for projects well in advance of the date of installation/construction. However, the Applicants realize that land value and inflation rates will fluctuate over time and it may not be possible to predict now what these will be throughout the life of the permit. Therefore, during year 5 (2009) of the permit the Applicants and Service would evaluate trends in land values and inflation rates, and would adjust these values as necessary for use in year 6 through 10. In a similar manner, the Applicants and Service would evaluate land value and inflation trends during years 10, 15, 20, and 25 of the permit and would adjust each as needed for use during the five years following evaluation.

It is important to note that land value estimates presented above were derived from data for those regions of Bastrop and Lee counties within or partially within the proposed permit area (Appendix 1). The proposed permit area was delineated in cooperation with the Service and is believed to represent the sum of Applicants' service areas occupying parts of those counties that may contain occupied and potential Houston toad habitat. Therefore, the land value estimates were derived from data for lands that may contain potential toad habitat.

Table 8. Land values used to calculate mitigation for the installation of new facilities in Bastrop and Lee Counties during the first five years of the permit. Following year 1 (2005), land values are compounded annually by 3.46 percent to account for inflation. See Section 6.2.1 and Appendix 1 for more specific information on land values and inflation.

Permit Year (Calendar Year)	Bastrop County Land Value (\$/acre)	Lee County Land Value (\$/acre)
Year 1 (2005)	\$2,116	\$1,950
Year 2 (2006)	\$2,189	\$2,017
Year 3 (2007)	\$2,265	\$2,087
Year 4 (2008)	\$2,343	\$2,159
Year 5 (2009)	\$2,424	\$2,234

6.2.1.1 Development and Justification of Mitigation Ratios for the Installation of New Facilities

As required by section 10(a)(2)(B) of the ESA, a section 10(a)(1)(B) permit may not be issued unless certain criteria are met. One of which is the Applicant will to the maximum extent practicable mitigate the impacts of such taking. The following is provided to help describe how the Applicants are mitigating to the maximum extent practicable.

The Applicants propose to mitigate for potential impacts to Houston toads resulting from covered activities by providing funding for Houston toad conservation projects as determined by a committee comprised of representatives of the Applicants, Bastrop and Lee counties, the Service, TPWD, and /or members of the Houston toad recovery team. Mitigation would be provided both

for the installation of all new facilities and for the routine maintenance and repair of facilities regardless of their location within the proposed permit area. The latter is addressed in Section 6.2.2. The rates at which the Applicants provide mitigation funds for the potential impacts associated with the installation of new facilities are based on area (acres) of potential impact and biological value of the area following disturbance. The rationale used to develop these mitigation ratios are explained in the following discussion.

Covered activities would be conducted on up to approximately 6,791.6 acres. The installation of new facilities would occur on approximately 2,550.4 acres (37.6 percent, Table 7) of this area. Of the area occupied by new facilities, about 2,500.0 acres would be attributable to new linear facilities and 50.4 acres would be attributable to new fixed-foundation facilities. The Applicants believe that these different types of facilities have differing potentials for impact, and a separate mitigation ratio was developed for each.

New linear facilities would be installed on 2,500.0 acres. Not all of the 142,526-acre proposed permit area is Houston toad habitat, and it is reasonable to assume that not all of the 6,791.6-acre activity area would be toad habitat. It is therefore also reasonable to assume that not all of the new linear facilities would be installed within toad habitat, and those not within toad habitat would not impact Houston toads or their habitat.

Based on past experiences, current conditions, and utilization of the proposed BMP's the Applicants believe that most (2,023.5 acres, or about 81 percent) new linear facilities would be placed in existing ROWs – that is, maintained ROWs in existence prior to the installation of the new linear facility. Most typically these ROWs would be roadway ROWs. The Applicants believe that the placement of new facilities in existing ROW has very little potential to alter the condition of these ROWs in terms of their value as Houston toad habitat. Adherence to the BMPs would further reduce the potential for impacts. Even though little potential exists to impact the Houston toad mitigation at the proposed rate would occur within these areas.

The Applicants expect that the remaining approximately 19.0 percent of new linear facilities would occupy about 476.5 acres outside of existing ROWs. These facilities would initially result in cleared areas that would ultimately support vegetative cover. As stated previously, it is unlikely that all of the activity area is Houston toad habitat, and it is therefore also unlikely that all 476.5 acres of linear facilities would occur within toad habitat. Those that did not occur within toad habitat would not be expected to significantly impact toads. The Applicants believe that new linear facilities constructed within toad habitat would not permanently eliminate the potential of that habitat to meet the breeding, feeding, and sheltering needs of the Houston toad. Such areas would retain some biological value as toad habitat. This discussion is presented in detail in Section 5.1.1.3.2, and summarized here:

- toads have been observed breeding within maintained ROWs;
- clearing of vegetation associated with covered activities is not expected have long-term effects on Houston toad foraging;
- disturbance associated with covered activities is not expected to significantly alter the soil profiles such that toads would be unable to burrow for aestivation/hibernation;

- adherence to the BMPs (see Section 6.1) related to project location selection and ROW management would result in avoidance of Houston toad habitat areas, breeding seasons, and in some amount of natural succession of plant life providing surface cover for toads;
- not all new linear facilities would be placed within toad habitat, and those that were not would not impact Houston toads;
- most activities (6,264.7 acres, or about 92.2 percent) conducted under the requested permit would occur either at an existing facility or would be placed within existing ROWs where it would not further alter the condition of the land in terms of its value as toad habitat;
- land (476.5 acres) occupied by new linear facilities placed outside of existing ROWs would retain some biological value as toad habitat;
- new facilities, both fixed foundation and linear that are outside of existing ROWs would occupy approximately 526.9 acres. This represents only 0.37 percent of the proposed permit area; and
- mitigation would be provided for all installations regardless of their location within the proposed permit area and quality of habitat/unsuitable habitat.

The Applicants believe that though there is some potential for impacts to Houston toads resulting from the installation of some new linear facilities, for the reasons listed in the preceding paragraph it would be reasonable to assume that land occupied by such facilities would retain some value as toad habitat if indeed such value existed prior to construction of the facility. The Applicants would mitigate for potential impacts resulting from the construction of all new linear facilities at a ratio of 0.15 to 1; that is, the Applicants would contribute mitigation funds sufficient to purchase an area of land (according to land prices outlined in Table 8) equal to 15 percent of the construction area of the new linear facilities. This ratio was derived from the assumption that on average, considering all installations, take of Houston toads in terms of acres of habitat would be equivalent to 10 percent of the area occupied by new linear facilities, with an additional 5 percent for potential edge/indirect effects.

New fixed-foundation facilities would be installed on 50.4 acres. Again, not all of the 142,526-acre proposed permit area is Houston toad habitat, and it is reasonable to assume that not all of the 6,791.6-acre activity area would be toad habitat. It is therefore also reasonable to assume that not all of the new fixed-foundation facilities would be installed in toad habitat, and those not within toad habitat would not impact Houston toads or their habitat.

The installation of fixed foundation facilities would result in cleared areas permanently occupied by non-vegetative cover (e.g. building footprints, parking areas, road-fill) and cleared areas with vegetative cover (e.g. maintained grounds). The latter facilities would be mitigated at a ratio of 0.15 to 1 as described above for all linear facilities. Because fixed foundation facilities would not be expected to retain biological value as toad habitat, they would be mitigated for at a ratio of 1.05 to 1; that is, the Applicants would contribute mitigation funds sufficient to purchase an area of land (according to land prices outlined in Table 8) equal to 1.05 times the area permanently occupied by cover. This ratio was derived from the assumption that areas permanently occupied by non-vegetative cover would lose all (100 percent) value as toad habitat, and edge/indirect

effects would possibly impact an additional area equivalent to 5 percent of the area occupied by non-vegetative cover.

The Applicants believe the mitigation as proposed is commensurate with the level of impacts that are anticipated and represents the maximum extent practicable that would still allow for normal business practices to continue. Additionally, the measures as proposed for avoiding, minimizing, and mitigating for potential adverse impacts to Houston toads shall assist the Applicants in developing long-term business and budget plans, and is expected to contribute to the recovery and survival of the species.

6.2.1.2 Mitigation for the Installation of New Linear Facilities

Except when within ROWs in existence at the time of issuance of the requested permit, the Applicants would not initiate new clearing or construction/installation on certain lands without prior discussion with and timely approval from the Service. These lands include Bastrop and Buescher state parks, the University of Texas M. D. Anderson Cancer Center Science Park-Research Division (UT Science Park), and any other lands recognized by the Service as being managed as a preserve for the Houston toad. The Service shall provide each Applicant with a list of such lands annually.

To assure funding, mitigation fees would be calculated and provided on a project-by-project basis prior to the initiation of clearing or construction activities. Each Applicant shall be responsible for providing a quarterly report to the Service that identifies the projects completed and the amount of mitigation fees deposited. Mitigation fees for the installation of new linear facilities would be calculated based on the construction area for each new facility. The construction area would be calculated by multiplying the linear length of the project by the width of the construction ROW for the installation. Width of construction area would be equal to or greater than the width of the area cleared. The length of installation would vary according to the specific project. ROW width would vary depending on which Applicant was conducting the installation and would be based on needs specific to that Applicant; typically, Aqua would use a 30-foot construction ROW, BEC would use a 30-foot construction ROW, and LCRA would use a 70-foot construction ROW. It is not anticipated that AE would install new linear facilities. The anticipated disturbance of up to 106.7 acres associated with the upgrade of LCRA above-ground transmission lines (Table 2) would be mitigated for as a new linear installation. The reason for this is that the disturbance of this area would be associated with the creation of a temporary construction ROW, an activity similar to creating a temporary construction ROW for the installation of new linear facility.

The mitigation ratio for the installation of new linear facilities would be 0.15 (0.15 acres of mitigation for each 1 acre of construction area). The rationale for this mitigation ratio is described in detail in Section 6.2.1.1. The formula for calculating the mitigation for a linear facility would be:

$$\text{Mitigation Fee, \$} = (\text{Construction Area, acres}) \times (0.15 \text{ Mitigation Ratio}) \times (\text{price for land, \$/acre})$$

where :

$$\text{Construction Area, acre} = \frac{(\text{length of installation, feet}) \times (\text{width of construction ROW, feet})}{43,560 \text{ square - feet per acre}}$$

As an example, the mitigation for a 1-mile (5,280-foot) long waterline installed within a 30-foot wide construction ROW in Bastrop County during the fourth year of the permit would be:

$$\text{Construction Area, acre} = \frac{(5,280 \text{ feet}) \times (30 \text{ feet})}{43,560 \text{ square - feet per acre}} = 3.64 \text{ acres}$$

Price for Land, \$/acre, in Bastrop County during year 4 (see Table 9) = \$2,343 / acre

$$\text{Mitigation Fee, \$} = (3.64 \text{ acres}) \times (0.15 \text{ Mitigation Ratio}) \times (\$2,343) = \$1,279.28$$

The Applicants would apply this mitigation scenario to all new linear installation projects without regard to the presence or absence of toad habitat within project areas. The Applicants propose this so that the cost of mitigation could be spread over the life of the permit and all new linear installations, and so that costs associated with mitigation could be incorporated into long-term budgeting and planning. It is important to note that adherence to the BMPs would direct locations for new linear facilities away from toad habitat.

A substantial amount of mitigation funds would be generated if full build-out (2,500 acres) of linear facilities is achieved. Assuming that new facilities are constructed somewhat evenly throughout the proposed permit area so that 75 percent are in Bastrop County and 25 percent are in Lee County, and assuming that the land values for year 2005 (Table 8) are used throughout the life of the permit, approximately \$777,938 in mitigation funds would be provided for the construction of new linear facilities. This is extremely likely an underestimate since the land values used to calculate mitigation would increase during each of the first five years of the permit and most likely would increase annually throughout the life of the permit.

6.2.1.3 Mitigation for the Installation of New Fixed-foundation Facilities

Except when within ROWs in existence at the time of issuance of the requested permit, the Applicants would not initiate new clearing or construction/installation on certain lands without prior discussion with and timely approval from the Service. These lands include Bastrop and Buescher state parks, the University of Texas M. D. Anderson Cancer Center Science Park-Research Division (UT Science Park), and any other lands recognized by the Service as being managed as a preserve for the Houston toad. The Service shall annually provide each Applicant with a list of such lands.

To assure funding, mitigation fees would be calculated and provided on a project-by-project basis prior to the initiation of clearing or construction activities. Each Applicant shall be responsible for providing a quarterly report to the Service that identifies the projects completed and the amount of mitigation fees deposited.

Mitigation fees for the installation of new fixed-foundation facilities would be calculated based on the area permanently occupied by non-vegetative cover and the area cleared supporting vegetative cover. Area permanently occupied by non-vegetative cover would include all areas within a tract containing a fixed-foundation facility that, as a result of the installation of that facility, would be covered by building footprints, paved and/or base-filled roadways, walkways, and parking areas, and any other areas within the tract occupied by pavement, cement, or base-fill, as a result of the installation. Area cleared but not permanently occupied by cover would include all areas within a project area containing a fixed-foundation facility that, as a result of the installation of that facility, were cleared but remain free of permanent non-vegetative cover.

Mitigation for new fixed-foundation facilities would be paid at a ratio of 1.05 to 1 for areas permanently occupied by non-vegetative cover, and at 0.15 to 1 for areas cleared but supporting vegetative cover. The rationales for these mitigation ratios are described in detail in Section 6.2.1.1. The formula for calculating the mitigation for a new fixed-foundation facility would be:

$$\text{Mitigation Fee, \$} = \left[(\text{Area of Non - vegetative Cover, acres}) \times (1.05 \text{ Mitigation Ratio}) \times (\text{Price of Land, \$/acre}) \right] + \left[(\text{Area Cleared but Vegetated, acres}) \times (0.15 \text{ mitigation Ratio}) \times (\text{Price of Land, \$/acre}) \right]$$

where :

Area of Non - vegetative Cover = sum of all areas permanently occupied by cover

Area Cleared but Vegetated = sum of all areas cleared but not permanently occupied by cover

As an example, assume during the fifth year of the permit a fixed-foundation facility is installed on a 2-acre Bastrop County tract with the following characteristics: 0.2-acres building footprint, 0.15-acre parking and roadway footprint, and 0.5 acres of cleared construction ROW outside of the footprints of the building. The mitigation for this example would be:

$$\text{Area of Non - vegetative Cover} = 0.2 \text{ acres} + 0.15 \text{ acres} = 0.35 \text{ acres}$$

$$\text{Area Cleared but Vegetated} = 0.5 \text{ acres}$$

$$\text{Price for Land, \$/acre, in Bastrop County during year 5 (see Table 9)} = \$2,424 / \text{acre}$$

$$\text{Mitigation Fee, \$} = \left[(0.35 \text{ acres}) \times (1.05) \times (\$2,424/\text{acre}) \right] + \left[(0.5 \text{ acres}) \times (0.15) \times (\$2,424/\text{acre}) \right] = \$1,072.62$$

The Applicants would apply this mitigation scenario to all new fixed-foundation installation projects without regard to the presence or absence of toad habitat within project areas. The Applicants propose this so that the cost of mitigation could be spread over the life of the permit and all new fixed-foundation installations, and so that costs associated with mitigation could be

incorporated into long-term budgeting and planning. It is important to note that adherence to the BMPs would direct locations for fixed-foundation facilities away from toad habitat.

A substantial amount of mitigation funds would be generated if full build-out (50.4 acres) of fixed-foundation facilities is achieved. Assuming that new facilities are constructed somewhat evenly throughout the proposed permit area so that 75 percent are in Bastrop County and 25 percent are in Lee County, and assuming that the land values for year 2005 (Table 8) are used throughout the life of the permit, approximately \$25,093 would be provided if non-vegetated cleared areas were 10 percent of the area of new facilities. Approximately \$62,733 would be provided if non-vegetated areas were 50 percent of the area of new fixed-foundation facilities. Both of these estimates are based on the inaccurate assumption that land values used to calculate mitigation would stay at year 2005 levels throughout the life of the permit. In fact, land values would increase during each of the first five years of the permit and most likely would increase annually. Therefore, depending on the ratio of non-vegetated areas to cleared vegetated areas, the amount of mitigation funds provided for the construction of new fixed-foundation facilities would likely be greater than the estimates above.

6.2.2 Mitigation for Repair and Maintenance of Linear and Fixed-foundation Facilities

As defined for this HCP, routine and emergency repair and general maintenance generally consists of routine inspection of linear and fixed-foundation facilities; regularly scheduled maintenance of facilities, ROWs, and grounds; replacement and upgrades to existing facilities; and repair of facilities. Typical activities for each Applicant are described in Tables 1 through 4.

Inspection of linear facilities would most frequently consist of windshield-surveys of above ground linear lines and ROWs. In many cases, these inspections would be conducted from a vehicle operated on a maintained public roadway. In other cases, surveys would be conducted from a vehicle operated within the facility ROW. Inspection of fixed-foundation facilities would consist primarily of pedestrian surveys of buildings and equipment; the operation of vehicles within the installation areas would typically be limited to that required to provide access to the facilities.

Repair and maintenance of facilities would consist of a range of activities from minor repairs requiring no or very limited ground disturbances, regularly scheduled maintenance activities such as the replacement of power-line poles, vegetation management within some ROWs, maintenance associated with recreational facilities, routine repair of waterline leaks and the placement of meter sets, and unscheduled activities related to non-foreseeable repair and maintenance of lines and facilities. For the sake of this HCP, the anticipated disturbance of up to 106.7 acres associated with the upgrade of LCRA above-ground transmission lines would be mitigated for as a new linear installation (see Section 6.2.1.2).

Though the likelihood of potential adverse impacts to Houston toads resulting from repair and maintenance activities is believed to be very low, the Applicants have nevertheless included them in the list of covered activities. Despite the low potential for adverse impacts, the Applicants propose to annually contribute funds that would be available for Houston toad conservation projects. During the initial year of the permit, the Applicants would collectively contribute a total of \$20,000 as mitigation for potential impacts resulting from repair and maintenance activities. This amount would be compounded annually by 3.46 percent during years 2 through 5

as an adjustment for inflation (see Section 6.2.1 and Appendix 1 for more specific information on inflation). The amount of mitigation provided collectively by the Applicants for repair and maintenance of facilities during the first 5 years of the permit is summarized in Table 9.

Mitigation funds for routine maintenance and repair activities would be provided annually by 1 January and would cover activities occurring in the upcoming calendar year. Deposit of these funds would be documented in the respective quarterly report and annual report.

As discussed in Section 6.2.1, during year 5 (2009) of the permit the Applicants and Service would evaluate inflation rate trends, and would adjust the inflation estimate value as necessary for use in year 6 through 10. In a similar manner, the Applicants and Service would evaluate inflation trends during years 10, 15, 20, and 25 of the permit and would adjust the inflation estimate as needed for use during the five years following evaluation.

Table 9. Annual mitigation funds provided collectively by the Applicants for repair and maintenance of linear and fixed-foundation facilities within the proposed permit area during the first 5 years of the permit. Following year 1 (2005), the base amount of \$20,000 would be compounded annually by 3.46 percent to account for inflation. See Section 6.2.1 and Appendix 1 for more specific information on inflation.

Permit Year (Calendar Year)	Annual Mitigation Funds for Repair and Maintenance
Year 1 (2005)	\$20,000
Year 2 (2006)	\$20,692
Year 3 (2007)	\$21,408
Year 4 (2008)	\$22,149
Year 5 (2009)	\$22,915

A substantial amount of mitigation funds would be generated over the life of the permit to cover repair and maintenance activities. However, as the inflation estimate used to annually compound these funds would likely be recalculated every fifth year during the life of the permit it is not possible in advance to predict the exact amount funds provided under this scenario. The annual inflation estimate of 3.46 percent that would be used during years one through five is the average of the annual rate for the years 1914 to 2002. If this average was used throughout the life of the permit, mitigation funds provided to cover annual repair and maintenance during the final year of the permit (year 30) would be approximately \$53,633, and the total mitigation funds provided to cover annual repair and maintenance would be \$1,025,684.

6.2.2.1 Development and Justification of Mitigation for Repair and Maintenance of Linear and Fixed-Foundation Facilities

As required by section 10(a)(2)(B) of the ESA, a section 10(a)(1)(B) permit may not be issued unless certain criteria are met. One of which is the Applicant will to the maximum extent practicable mitigate the impacts of such taking. The following is provided to help describe how the Applicants are mitigating to the maximum extent practicable.

The Applicants and the Service believe that the potential for adverse impacts to Houston toads associated with repair and maintenance is very low. Repair and maintenance activities are frequently accomplished with minimal disturbance to habitats. These activities would not be conducted simultaneously or continuously on all facilities and the Applicants anticipate that at any given time only a small portion of the facilities would be under repair or maintenance. Many of the existing linear facilities occur in managed roadway ROWs and the Applicants anticipate that many of the covered installations would also occur within such ROWs; repair and maintenance of lines within managed roadway ROWs are not expected to significantly alter these habitats or alter their suitability for Houston toads beyond their current condition. Of the facilities not within roadway ROWs, some occupy or would occupy portions of the proposed permit area that are not suitable Houston toad habitat; repair and maintenance in these areas are not expected to impact Houston toads. Finally, the Applicants and the Service believe that adherence to the BMPs shall significantly reduce the possibility of adverse impacts to the toad.

6.2.3 Mitigation Funds

Mitigation funds generated by the requested permit would be used for Houston toad conservation projects that promote the recovery of the species. Examples of potential uses of mitigation funds include, but are not limited to, purchase of title or conservation easements on Houston toad land, land reclamation to benefit Houston toad conservation, purchase of conservation credits from a conservation bank or similar arrangement, or funding for Houston toad monitoring and research. A committee comprised of representatives that may include, but are not limited to, the Applicants, Bastrop and Lee counties, the Service, the TPWD, and members of the Houston toad recovery team would determine how mitigation funds generated by the requested permit would be expended for toad conservation. The mitigation funds would be deposited directly to an account approved of by the Applicants and Service.

For new facilities, and new construction (see Section 6.2.1.2 and 6.2.1.3), mitigation fees would be calculated and provided on a project-by-project basis prior to the initiation of clearing or construction activities. Mitigation funds for routine maintenance and repair activities would be provided annually by 1 January and would cover activities occurring in the upcoming calendar year. Additional funding assurances will be Applicant-specific, meet with Service approval, and will be incorporated into the Implementing Agreement. Deposit of all mitigation funds would be documented in the quarterly report covering the reporting period during which the deposit was made, and in the annual report summarizing permit-related activities during the year in which the deposits were made. Copies of receipts for deposit of mitigation funds generated by construction projects will be available for review at each project site and documented in the quarterly and annual reports.

6.3 CHANGED CIRCUMSTANCES

6.3.1 No Surprises

The current "No Surprises" policy of the Service provides that additional mitigation requirements for land, water, or financial obligations shall not be required of the Permittee or their successors or assigns beyond the level of mitigation provided for in this HCP and its associated permit, if fully and completely complied with and implemented. The Houston toad is considered adequately addressed under this HCP and is, therefore, covered by No Surprises rule assurances. In the event that it is demonstrated by the Service that Unforeseen Circumstances exist during the life of the Permit, and additional conservation and mitigation measures are deemed necessary to respond to Unforeseen Circumstances, the Service may require additional measures of the Permittees where the HCP is being properly implemented, but only if such measures are limited to modifications within the HCP and maintain the original terms of the HCP to the maximum extent possible.

6.3.2 Change in Circumstances

If during the tenure of the requested permit project designs and/or the extent of the habitat impact described in the HCP is altered such that there may be an increase in the anticipated take of the Houston toad, the Applicants are required to contact the Service and obtain authorization and/or amendment of the permit before commencing any construction or other activities that might result in take beyond that described in the EA/HCP.

If additional conservation and mitigation measures are deemed necessary to respond to changes in circumstances that are not provided for in the HCP, the Service shall not require any conservation and mitigation measures in addition to those provided for in the HCP without the consent of the Applicants, provided the HCP is being properly implemented.

If loggerhead shrike or Texas horned lizard become listed as threatened or endangered during the tenure of the requested permit, the Applicants shall consult with the Service regarding the potential for activities authorized under the requested permit to adversely affect the species and shall seek authorization for any expected impacts to these species as appropriate. If the white-faced ibis or any other species not identified in the EA/HCP that could occur within the proposed permit area become listed as threatened or endangered during the tenure of the requested permit, the Applicants shall assess the potential for their activities to adversely affect these species and shall consult with the Service regarding these species as necessary and appropriate.

6.3.3 Unforeseen Circumstances

With respect to unforeseen circumstances (as defined in 50 CFR § 17.3), the Service shall not require, without the consent of the Applicants, the commitment of additional financial compensation or additional restrictions on the use of land, water (including quantity and timing of delivery), or other natural resources beyond the level otherwise provided for the Houston toad in the HCP. If additional conservation and mitigation measures are deemed necessary to respond to unforeseen circumstances, the Service may request additional measures of the Applicants where the HCP is being properly implemented, but only if such measures are 1) limited to

modification of the BMPs or adjustment of mitigation fees, and 2) maintain the original terms of the HCP to the maximum extent possible, and 3) are consented to by the Applicants. Additional conservation and mitigation measures shall not involve the commitment of land, water, or additional financial compensation or restrictions on the use of land, water (including quantity and timing of delivery), or other natural resources otherwise available for use under the original terms of the HCP, without the consent of the Applicants. In determining unforeseen circumstances, the Service shall have the burden of demonstrating that such unforeseen circumstances exist using the best scientific and commercial data available. These findings must be clearly documented and based upon reliable technical information regarding the status and habitat requirements of the affected species in accordance with the requirements of the Service's No Surprises rule.

6.4 QUARTERLY REPORTING, ANNUAL REPORTING, AND ADAPTIVE MANAGEMENT

Each Applicant shall provide to the Service quarterly reports summarizing covered activities occurring during the preceding three months. Quarterly reports summarizing activities for the first quarter (1 January through 31 March) will be due on 30 April, quarterly reports summarizing activities for the second quarter (1 April through 30 June) will be due on 31 July, quarterly reports summarizing activities for the third quarter (1 July through 30 September) will be due on 1 October and can be incorporated into the annual report (see below), and quarterly reports summarizing activities for the fourth quarter (1 October through 31 December) will be due on 31 January. Each quarterly report should include copies of receipts for mitigation funds provided during the previous three months, and a brief summary of covered activities conducted during the previous quarter.

Each Applicant shall provide to the Service an annual report by October 1 of each year. Each report shall include descriptions and summaries of each new installation, repair, and maintenance activity conducted throughout the year. The location of all installation, maintenance, and repair activities will be identified on USGS 7.5-minute quadrangle maps. The annual report shall include an accounting of all mitigation fees paid, identified by activity, project, and county. Additionally, the annual report shall include summaries of any chemicals used, survey information, the successful implementation or non-implementation of BMPs, the results of post construction vegetation monitoring, any recommendations, as appropriate, for improving the implementation/successfulness of the BMPs or HCP, and any other pertinent information.

The Service shall annually provide to each Applicant on October 1 a list of lands within the proposed permit area that are recognized by the Service as being managed as preserves for Houston toads.

Unless deemed unnecessary by mutual consent, the Service shall meet with the Applicants no later than November 30 of each year to provide comments on the annual report, and, if necessary, to initiate discussions for re-evaluating and/or modifying BMPs. This annual review shall provide the Applicants and Service the opportunity to review and monitor the effectiveness of implementation of the BMPs, and to develop adaptive management actions should such be warranted. Given the incomplete state of knowledge on the Houston toad, adaptive management will allow the Service and the Applicants to use new information, when appropriate, to develop alternatives to existing BMPs that are acceptable to all parties. Adaptive management strategies

may be developed specific to the actions of one or more Applicant(s); in such a case, the Service and the appropriate Applicant(s) would agree on alterations to BMPs. The price per acre of land paid as mitigation as described in this HCP (Section 6.2.1.2 and 6.2.1.3, Table 8), and the annual mitigation fee paid for routine maintenance and repair (Section 6.2.3, Table 12) would only be eligible for change under adaptive management with the agreement of the Service and all Applicants.

The Applicants believe that because most of the installations will occur in existing ROWs or in areas immediately adjacent, long-term biological monitoring of their project areas will not provide useful information with regard to conservation of the Houston toad. However, the Applicants do believe that monitoring of the distribution and population of the toad are important for the long-term conservation of the species. Thus, funds generated by this HCP could be used in part for biological monitoring by other entities and would contribute to the overall monitoring of the status of the species within the proposed permit area.

6.5 AMENDMENT PROCEDURE

It is necessary to establish a procedure whereby the section 10(a)(1)(B) permit can be amended. However, it is important that the cumulative effect of the amendment shall not jeopardize any endangered species or other rare species. Amendments must be evaluated based on their effect on the species and habitat as a whole. The Service must be consulted on all proposed amendments to the permit. The following sections outline the types of proposed amendments and the applicable amendment procedures.

6.5.1 Minor Amendments to the HCP

Minor amendments involve routine administrative revisions or minor changes to concepts contained within this HCP, and which do not diminish the level or means of avoidance, minimization, and/or mitigation of potential adverse impacts to listed species. Such minor amendments do not materially alter the terms of the section 10(a)(1)(B) permit.

Upon the written request of the Applicants, the Service is authorized to approve minor amendments to the HCP, if the amendment does not conflict with the primary purpose of this HCP.

6.5.2 All Other Amendments

All other amendments to the permit, HCP, Implementing Agreement, and supporting agreements shall be considered non-minor amendments to the section 10(a)(1)(B) permit, subject to any other procedural requirements of federal law or regulation that may be applicable to amendment of such a permit.

6.6 DURATION

This HCP is written in anticipation of issuance of a section 10(a)(1)(B) permit for a period of 30 years. If, at the end of the 30-year period, the Service determines that it is prudent to extend or modify the HCP, additional opportunities for public review and comment shall be provided.

7.0 PUBLIC AND AGENCY COORDINATION

The following agencies, organizations, and individuals were consulted or coordinated with during the process of addressing endangered species concerns for this incidental take permit application:

James Yantis, Hearne, Texas
SWCA, Inc., Austin, Texas
U.S. Fish and Wildlife Service, Austin, Texas
U.S. Fish and Wildlife Service, Albuquerque, New Mexico
U.S. Fish and Wildlife Service, Clear Lake, Texas
Texas Historical Commission, Austin, Texas
Texas Parks and Wildlife Department, Austin, Texas
Bastrop County Officials

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**APPENDIX 1.
ESTIMATION OF LAND VALUES AND INFLATION RATE FOR CALCULATING
MITIGATION DURING THE FIRST 5 YEARS OF THE PERMIT.**

Introduction

As described in Section 6.2 of this EA/HCP, the Applicants would provide mitigation for the installation of new facilities within the proposed permit area. Mitigation for installation of new facilities in Bastrop County would be based in part on the estimated value of land in that portion of Bastrop County occupied by the proposed permit area, and mitigation for facilities in Lee County would be based in part on the estimated value of land in that portion of Lee County occupied by the proposed permit area. The mitigation fee for the installation of new facilities that occupy portions of both counties would be based on the estimated value of land in the county containing more than 50 percent of the construction area of a given installation.

As land value is a component of mitigation calculations, it was necessary for the Applicants to estimate land values within the proposed permit area. Land values typically change over time in response to many factors that are not always predictable. Inflation is one factor that can affect land values, and though inflation is not predictable, numerous data exist for estimating the average rate of inflation over time. Such an average does not provide a prediction of inflation for a specific year, but it does provide an estimate of the inflation over long periods.

The intent of this appendix is to identify the data and methodologies used by the Applicants to estimate land values and inflation. The estimates contained in this appendix are intended for use during the first five years (2005 through 2009) of the permit; during year five the Applicants and Service would evaluate land values and inflation for possible revision (see Section 6.2.1).

Data used to develop land value estimates were obtained in March 2003 from the Lee County Appraisal District (218 East Richmond, Giddings, Texas, 78942-4130) and the Bastrop County Appraisal District (209 Jackson Street, Bastrop, Texas, 78602). The estimates contained in this appendix were developed by the Applicants for the sole purpose of calculating mitigation in the context of this EA/HCP and should not be used for any other purposes. These estimates are based on the Applicants' review, understanding, and analyses, and are not intended to reflect or portray the views or opinions of the Lee County Appraisal District (LCAD) or the Bastrop County Appraisal District (BCAD).

Lee County Land Value Estimate

Tracts in Lee County are assigned range prices according to tract size; these data are summarized in Table A1. For the sake of estimating land value for this EA/HCP, the Applicants started with the range price for a 100-acre tract, or \$1,500/acre. The Applicants believe that using the value of 100-acre tracts is reasonable as mitigation funds may be used in part to purchase large tracts for Houston toad conservation.

The LCAD has designated at least 79 Neighborhood Codes throughout the county. Range prices within each Neighborhood Code are adjusted using a factor developed by LCAD. Ten

Neighborhood Codes occur within or partially within the proposed permit area; Table A2 identifies these codes and the adjustment factors assigned to each.

Table A1. **Range prices for Lee County tracts of 1 acre to 9,999 acres.** These data were obtained from the Lee County Appraisal District in March 2003.

Acres	Range Price (\$/acre)
1	3,500
5	3,200
10	3,000
15	2,800
25	2,250
50	2,000
75	1,800
100	1,500
200	1,300
400	1,250
1,000	1,100
9,999	800

Table A2. Adjustment factors for Lee County Neighborhood Codes within or partially within the proposed permit area. An adjustment factor is the percentage of range price at which tracts are valued in a Neighborhood Code. These data were obtained from the Lee County Appraisal District in March 2003.

Neighborhood Codes	Adjustment Factor (%)
1G1	110
1G2	105
2L2	115
2L3	130
5L2	115
5L3	125
6L1	130
6L2	105
7L1	108
7L4	108

The greatest adjustment factor assigned to a Lee County Neighborhood Code in or partially within the proposed permit area is 130 percent (Table A2). The Applicants chose to use this factor as the most conservative of the choices for adjusting Lee County land values when calculating mitigation. Therefore, during year 1 a value of \$1,950/acre (130 percent x \$1,500/acre) will be used to calculate mitigation for the installation of new facilities in Lee County.

Bastrop County Land Value Estimate

Data provided by the BCAD in March 2003 are from 2001 land tables. Based on comments made by BCAD, it is our understanding that these data are accurate for estimating land values in 2002 and into 2003, but that BCAD may produce updated values during this year.

The BCAD has designated 14 land regions in Bastrop County, and five of these regions appear to be within or partially within that portion of the proposed permit area occupying Bastrop County. Unit prices have been assigned to tracts within these land regions based on tract size, and these data are summarized in Table A3.

In order to estimate land value the BCAD uses property specific attributes to adjust the unit prices. Property specific attributes include (but are not limited to) frontage along a major road and floodplain designation, and could result in a negative or positive adjustment to unit price. The use of property specific attributes appears to be at the discretion of the individual appraiser.

As with the procedure previously described for valuing land in Lee County, the Applicants focused on the unit price of 100-acre tracts for valuing land in Bastrop County. Unit prices for 100-acre tracts are not identified in Table A3, but by comparing unit prices for 75- and 125-acre tracts it is estimated that Land Region T-9 would have the greatest unit price for a 100-acre tract. Based on statistical analysis of data for Land Region T-9, the Applicants estimate that a 100-acre in T-9 would be valued at approximately \$2,045/acre (Figure A1).

As previously stated, unit price data provided by BCAD were from 2001 tables. It is the Applicants' understanding that these data are accurate for estimating land values in 2002 and 2003, and BCAD may produced revised data during 2003. In an attempt to provide a more up-to-date estimate, the Applicants adjusted the estimated value of a 100-acre tract in Land Region T-9 by a factor of 3.45 percent (see discussion below on inflation). Therefore, during year 1 a value of \$2,116/acre ($\$2,045 + [3.45 \text{ percent} \times \$2,045]$) will be used to calculate mitigation for the installation of new facilities in Bastrop County.

Inflation Estimate

Inflation data used in developing mitigation formulas for the first five years of the project were obtained at InflationData.com (<http://www.inflationdata.com/inflation/>)¹. Not surprisingly, annual rates of inflation varied widely during most of the 1900's, ranging from -10.8 to 17.8 percent (Figure A2). Though analyses may shed light on factors that influence inflation and cause inflation to rise and fall, the inflation rate for a future year cannot be predicted with

¹ InflationData.com is an internet-based information source published by Financial Trend Forecaster®

certainty. The average annual rate of inflation for data graphed in Figure A2 is 3.46 percent ($N = 89$, range = -10.8 to 17.8 percent). The average rate of inflation over the previous decade (1993 through 2002) is only 2.52 percent, and the rate of inflation as of March 2003 is 3.02 percent (<http://www.inflationdata.com/inflation/>). Though the historical average (3.46 percent) is greater than the more recent average and the current rate of inflation, the Applicants believe that using the historical average is more reasonable than using more recent data that reflect short-term trends. Therefore, the Applicants would use an estimated inflation rate of 3.46 percent to adjust land prices for years 2, 3, 4, and 5 of the permit.

Table A3. Unit price (\$/acre) in Bastrop County land regions within or partially within the permit area. These unit prices were from 2001 land tables and were obtained from the Bastrop County Appraisal District in March 2003.

Maximum Acreage	Unit Price (\$/acre)				
	Land Region T-7	Land Region T-8	Land Region T-9	Land Region T-13	Land Region T-14
0.9999	\$7,000	\$10,000	\$10,000	\$10,000	\$8,000
1.9999	5,000	9,000	9,000	8,000	6,000
2.9999	4,000	8,000	8,000	6,500	5,000
4.9999	3,000	6,000	6,000	5,000	3,500
9.9999	2,500	3,500		3,000	3,250
10.9999			5,000		
14.9999		2,750	3,500		3,000
15.9999				2,500	
20.0000	2,250				
24.9999		2,000	2,500	2,000	2,500
49.9999	2,000	1,900	2,250	1,900	2,000
65.9999	1,500				
74.9999		1,800	2,000	1,800	1,900
124.9999	1,000	1,700	1,800	1,700	1,850
199.9999	955	1,600	1,600	1,250	
210.9999					1,800
299.9999	900	1,500	1,500	1,000	1,200
499.9999	850	1,250	1,250	950	1,100
799.9999	800	1,000	1,000	900	1,000
999.9999	750	950	950	850	900
1,499.9999	700	900	900	800	800
*	650	850	850	750	700

* Assumed to mean "greater than 1,499.999 acres."

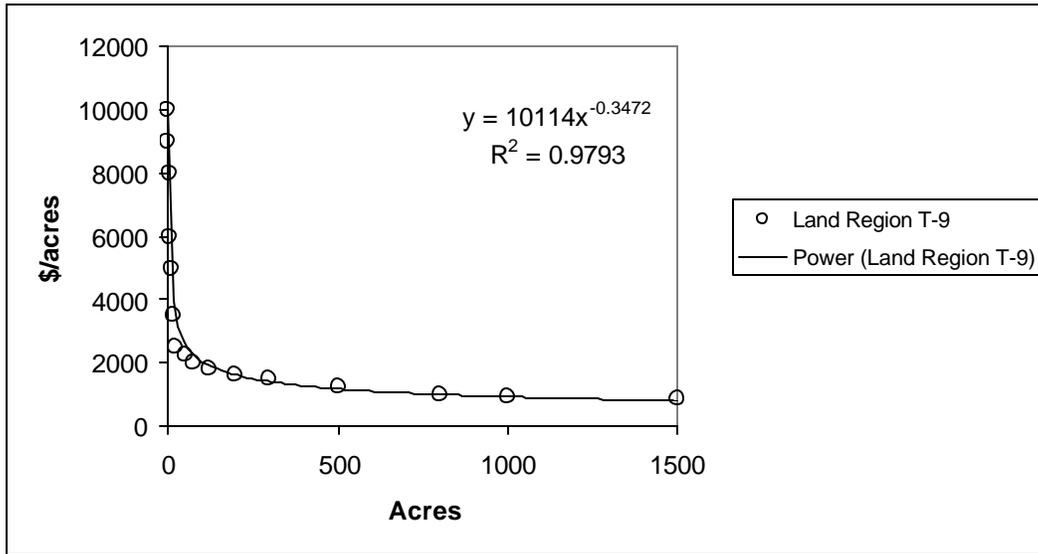


Figure A1. Unit prices for tracts in Bastrop County Land Region T-9. These data were obtained from the Bastrop County Appraisal District in March 2003 and are presented in Table A3. Based on the formula a 100-acre tract would be valued at approximately \$2,045/acre.

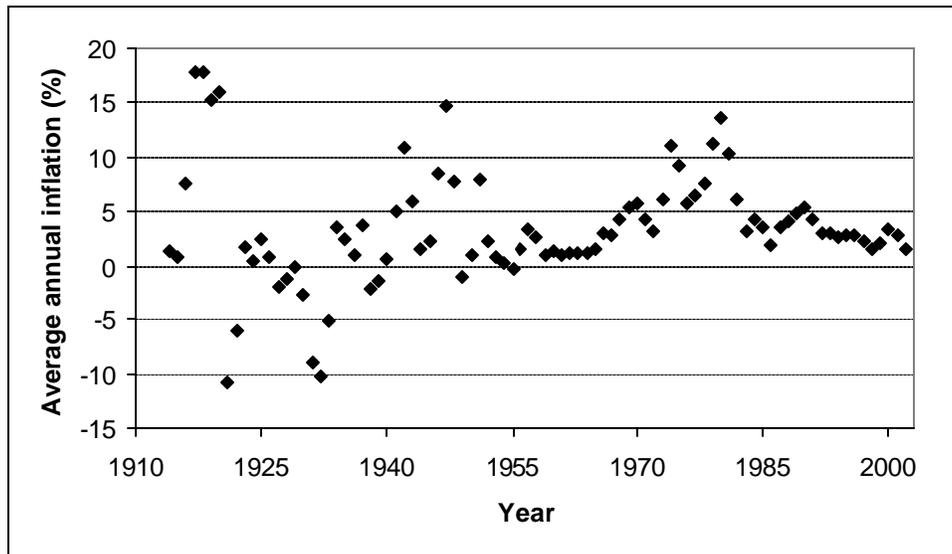


Figure A2. Average annual inflation for the years 1914 through 2002. These data were obtained from InflationData.com (<http://www.inflationdata.com/inflation>).

Addendum to the Utilities EA/HCP to include the Navasota ladies'-tresses (*Spiranthes parksii*)

Navasota ladies'-tresses (*Spiranthes parksii*)

The draft EA/HCP that was provided to the public did not consider possible impacts to the Navasota ladies'-tresses (*Spiranthes parksii*) (NLT) since its possible discovery in Bastrop and Lee counties were well after the draft EA/HCP was written and the public comment period had closed. Based solely on morphological identification, this species was recently discovered in Bastrop and Lee counties. The Service was notified of the Bastrop County population in September 2004. This population is located on property owned by the University of Texas (Stengl "Lost Pines" Biology Station). The Lee County population was identified in October 2004 along a county road near the Bastrop/Lee County line. After further examination by Service botanists, it appears the Lee County population is likely Nodding ladies'-tresses (*Spiranthes cernua*). Further genetic work is underway, and will confirm their true identification. This confirmation will likely occur after issuance of this permit.

To ensure the Utilities proposed actions do not jeopardize the continued existence of this species and, are adequately addressed under NEPA, the following addendum to the EA/HCP is being provided. However, this species will not be listed on the section 10(a) permit. This is because the take prohibition for federally listed plants under the Act is more limited than for listed animals. Section 9(a)(2)(B) prohibits the removal of listed plants or the malicious damage of such plants on areas under Federal jurisdiction, or the destruction of listed plants on non-Federal areas in violation of state law or regulation. Thus, the Act does not prohibit the incidental take of federally listed plants on private lands unless the take or the action resulting in the take is in violation of state law. This, generally, eliminates the need for an incidental take permit for plants. Since neither of these will occur, inclusion of this species is not necessary.

Species Description

The NLT is a relatively small, inconspicuous plant with a maximum height of roughly 12 inches. Leaves are elliptic to ovate, usually few in number and form a rosette. Flowers are white, approximately one-quarter-of-an-inch long, and are arranged spirally on a solitary stalk. Blooming occurs from mid-October to mid-November, but is dependent upon the plants having received sufficient moisture in preceding months. Adequate rainfall during the months of April/May and August/September may be especially critical in determining whether plants bloom in the autumn (Wilson, 1999).

NLT was designated an endangered species by the U.S. Fish and Wildlife Service (Service) pursuant to the Endangered Species Act of 1973 (50 CFR 17.12; P.L. 93-205, 87 Stat. 884; 16 U.S.C. 1531-1540), as amended. This designation occurred on 6 May 1982. Currently, no critical habitat has been designated for NLT. In addition, this species is protected by the Lacey Act (16 U.S.C. 371 et seq.) which makes it unlawful for any person to import, export, transport, sell, receive, acquire, or purchase in interstate or foreign commerce any plant taken, possessed,

transported, or sold in violation of state law. NLT has been designated as an endangered plant by the State of Texas pursuant to Chapter 88 of the Texas Parks & Wildlife Code (31 TAC Sec. 69.1-69.9).

b. Habitat Description and Life History

NLT is a perennial endemic orchid with verified occurrence records mainly from east-central Texas. It occurs in a variety of moist sandy or loamy soils near drainages, typically from the upper erodible drainage head, extending along the edges of temporary streams to the floodplain of permanent streams. Although the vast majority of the NLT occur within approximately 600 feet (183 meters) of these drainages, NLT have been found as far as 1,000 feet (305 meters) from any stream (James Thomas, HDR and Fred Smeins, TAMU, pers. comm. 2004).

NLT occurs in areas of upland post oak savanna at eroded stream heads and along the margins of minor tributaries within the Brazos River and Navasota River drainages (Service, 1984; Wilson, 1999). Typically, the species occurs in small gaps within woodlands that permit sunlight to reach the ground. The recovery plan states that areas supporting the highest number of individuals are lightly wooded and lightly grazed (Service, 1984). Trees and shrubs associated with occurrence of NLT include post oak (*Quercus stellata*), yaupon (*Ilex vomitoria*), blackjack oak (*Quercus marilandica*), water oak (*Quercus nigra*), tree blueberry (*Vaccinium arboreum*), American beautyberry (*Callicarpa americana*), winged elm (*Ulmus alata*), sugar hackberry (*Celtis laevigata*), forestiera (*Forestiera ligustrina*), possum-haw holly (*Ilex decidua*), St. Andrew's cross (*Hypericum hypericoides*), and hawthorn (*Crataegus spathulata*) (Service, 1984; Wilson, 1999). Wilson (1999) considers the herb *Bigelovia virgata* (= *nuttallii*) to be a fairly good indicator species for NLT in drainage head habitats; herbaceous species considered by Wilson to be indicator species in stream margin habitats in Grimes and Brazos counties include pink gayfeather (*Liatris elegans*), narrow leafed heterotheca (*Pityopsis graminifolia* = *Heterotheca graminifolia*), and sundew (*Drosera brevifolia* = *D. annua*).

Characteristic soils in occupied areas are sandy loams with high aluminum content. NLT plants are believed to be situated where subsurface flow or seepage of water occurs seasonally, a common feature in other species of the genus (Arft and Ranker 1995; Parker, pers. comm.). It is known that the occurrence of claypans beneath the sandy or loamy soils makes the subsurface areas resistant to water percolation, and hence, water tends to travel along these subsurface features toward the dissected drainages typical of the area, providing a relatively dependable moisture source for the orchids. This hydrologic feature, as well as edaphic factors such as high aluminum soil content, may also limit competing vegetation (TPCC 2003).

Although these plants are typically pollinated by insects, seeds can be produced without insect aid. As with all orchids, the seeds of NLT are dispersed by the wind. Germination occurs after the seed has been penetrated by fungal hyphae (Wells, 1981). Orchid seeds contain no endosperm and thus rely on fungus to provide nutrition for the growing seed. As a consequence of this symbiotic relationship with the fungus, these plants are extremely slow-growing. Orchids have been known to require more than one year of photosynthate storage to successfully send up

a bloom stalk (Wilson, 1999). The exact periods of dormancy and germination are unknown for NLT and are only described based on data from similar species.

NLTs are extremely slow-growing and long-lived, and individual plants depend on a symbiotic relationship with soil fungi that is established before the seed germinates. The seeds are microscopic and lack endosperm, so they are short-lived and the species does not maintain any appreciable soil seed bank. Rosette leaves support the formation of storage tubers between November and March that sequester resources in preparation for sending up a leafless bloom stalk at some future time. It is believed that plants often require more than one year of photosynthate storage to successfully send up a bloom stalk. Thus, if local conditions have not been favorable for forming sufficient below-ground reserves, the plant may not bloom (Wilson 1993).

NLT plants are very hard to discern vegetatively in their habitat, and therefore, surveys are not recommended except during the blooming season. In addition, this species is very similar to two other common orchid species that can occur in the same area, slender ladies'-tresses (*Spiranthes lacera* var. *gracilis*) and nodding ladies'-tresses (*Spiranthes cernua*). Positive identification can only be made during its flowering period, and blooming is strongly dependent on adequate moisture the previous April/May and again in August/September (Wilson 1993, Service 1984).

Population dynamics

Pavlik (1996) proposed a method for estimating minimum population sizes needed for viable plant populations by evaluating nine important biological characteristics of the species of interest. Evaluating NLT using this system, the biological characteristics would rank as needing moderate to high population sizes for three of the factors considered (breeding system, growth form, and ramete production), moderate population sizes for three other factors (survivorship, seed duration, and environmental variation), and low population sizes based on three other characters (longevity, fecundity, and successional status). Ranking the factors on a six point scale from low population size (50) to high population size (2,500), Texas Parks and Wildlife Department botanists and the Service estimated that viable populations for this species may be in the range of 1,000 mature reproducing individuals. However, few known population areas approach this number of individuals even when factoring in the plants that are likely present but not blooming. In fact, less than one quarter of the known occurrences of NLT ever documented more than 25 plants. Thus, because of the low numbers of reported individuals, the slow growing nature of the plants, their unusual habitat requirements, and their sensitivity to disturbance and transplanting attempts, the species is not regarded as being very resilient, and, following any disturbance to mature individuals of a population, recovery is expected to be very slow.

Status and Distribution

At the time of listing, the primary threat to NLT was destruction or modification of habitat from urbanization, clearing for agricultural production, and mining (47 FR 19539, Service 1984).

These factors remain the leading cause of threats to the plants, although new threats have been identified since then as also having the potential to limit the long term viability of populations of these plants. Surveyors have noted destruction of plants by feral pigs (*Sus scrofa*) and grazing by white-tailed deer (*Odocoileus virginianus*) and rabbits (*Sylvilagus sp.*) on the flowering stalks (TMPA 2001; Thomas, pers. comm.).

In the NLT Recovery Plan (Service 1984), the Service's goals were to establish and maintain two safe sites through cooperative agreements, purchases, easements, or other means of obtaining management rights in order to recover the NLT. Other needs of the species included the development of a baseline set of ecological data from sites where the species currently exists, and development of public awareness, appreciation, and support for protection and recovery of the NLT (Service 1984).

Work on the baseline ecological data has not progressed much since the recovery plan was last updated although some genetics work is being conducted by individuals at TAMU and TMPA is continuing to monitor population numbers at their five safe sites. Additional populations have been found throughout the range of the species; however, most of these are small and isolated. Several populations have been protected, but most of these sites do not have any management plans and the protections do not generally address potential impacts from off-site land use changes. Some of the protected areas are not protected in perpetuity.

In the areas mined by TMPA, the individual NLT plants were transplanted to sites not proposed for mining. These plants apparently do not transplant well. Plant survival was low at most sites (TMPA 1996). Similarly, in an experiment in Lick Creek Park near College Station, Dr. Hugh Wilson planted some seedlings, which survived into their second season, but died prior to the third growing season (Wilson 1993). Some of this work was hampered by lack of a good means of permanently marking individual plants and dry weather patterns. Thus, additional studies on this means of preserving plants, particularly those that would otherwise be destroyed, are likely still warranted.

Based on specimen records, NLT is currently known to occur in 7 counties in Texas, including Brazos, Burlison, Freestone, Grimes, Leon, Madison, and Robertson. Records of Texas Parks and Wildlife Department (TPWD) indicate the species also occurs in Fayette, Jasper, Washington, and Lee counties. Recently, an orchid resembling NLT has been discovered in Bastrop County on the Stengl "Lost Pines" Biology Station near Buescher State Park and at two sites in Lee County near the Bastrop/Lee county line. Three individual plants were located on the Stengl Biology Station in Bastrop County and approximately 51 plants were located at two separate sites in Lee County. However, after further examination of the Lee County population by the Service botanist it appears this population is likely nodding ladies-tresses. Collected specimens from Bastrop and Lee counties are currently undergoing genetics testing at Texas A&M University to determine their identity.

Currently, approximately 142 NLT population sites have been recorded, predominantly concentrated around southern Brazos County and central Grimes County (TXBCD 2001, HDR 2004). Between 5,000 and 6,000 plants have been documented at these sites over the past 20

years, however, between 700 and 1,000 of these plants have been destroyed in the intervening years and over 200 others were transplanted from areas scheduled to be destroyed.

Of the 142 known NLT population sites, as many as 41 have been destroyed, the plants have been transplanted from them, or no population information was ever recorded. In addition, plants formerly found occurring on at least 118 of the documented sites have not been seen on those sites in the last ten years and no plants have been seen on 21 of the historic sites for 20 years.

Environmental Consequences

a. Status of the species within the permit area

Currently, the status of NLT within the permit area is uncertain. Bastrop and Lee counties were previously not considered to be within the range of the species. Based on the latest findings of what appears to be NLT in Bastrop County and possibly Lee County, the post oak woodlands of the permit area may provide suitable habitat for NLT.

Actual impact of the Applicant's proposed activities on NLT is unknown because status of the species within the permit area is undetermined. If present, construction of new facilities could have potential adverse and beneficial impacts to local populations. Adverse impacts could include physical crushing or uprooting of plants during clearing, trenching, and other excavation activities; crushing by vehicular traffic, soil compaction; loss of habitat to impervious cover, and physical burial.

Not all potential impacts from new construction would necessarily be detrimental to the species. NLT habitat consists of lightly wooded areas that often form an ecological "edge" situation. Clearing of new ROWs, particularly through post oak woodlands, would create additional "edge" habitat that could potentially support NLT.

Incorporation of appropriate BMPs along facility ROWs would minimize potential adverse impacts from new construction and repair and maintenance activities. In addition to the BMP's listed in Section 6.1.2 of the EA/HCP, the following BMPs would be implemented to avoid or minimize impacts to NLTs, should their presence be confirmed in Bastrop or Lee counties. If NLTs are not confirmed in Bastrop or Lee counties, the Applicants may choose to implement the following BMPs at their discretion. No incidental take coverage for the NLT is being requested and none would be granted by issuance of the proposed permit.

Each Applicant shall require someone trained to recognize NLT to be present on the site of a line installation or construction effort if the activity takes place in potential NLT habitat between 1 October and 30 November. This individual would ensure that no NLT were present in a project area, and if present, they would be clearly marked and avoided to the maximum extent practicable.

Mowing will be restricted within 600 feet of streams from 1 October through 30 November.

To the extent that herbicide application is necessary within 600 feet of streams between the dates of September through December, herbicide application will be limited and applied in a way to avoid potentially adverse impacts to NLT to the maximum extent practicable.

b. Cumulative Effects

Cumulative effects could be considered significant if they resulted in reductions in core populations of NLT to the point that the continued existence of the species was jeopardized. The *Spiranthes* recently collected from Bastrop and Lee counties, should they be positively identified as NLT, likely represent small populations and are not part of the core population found in Brazos and Grimes counties. Implementation of the Preferred Alternative would not have adverse cumulative impacts to NLT since it would not impact core populations critical to the continued existence of the species.

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