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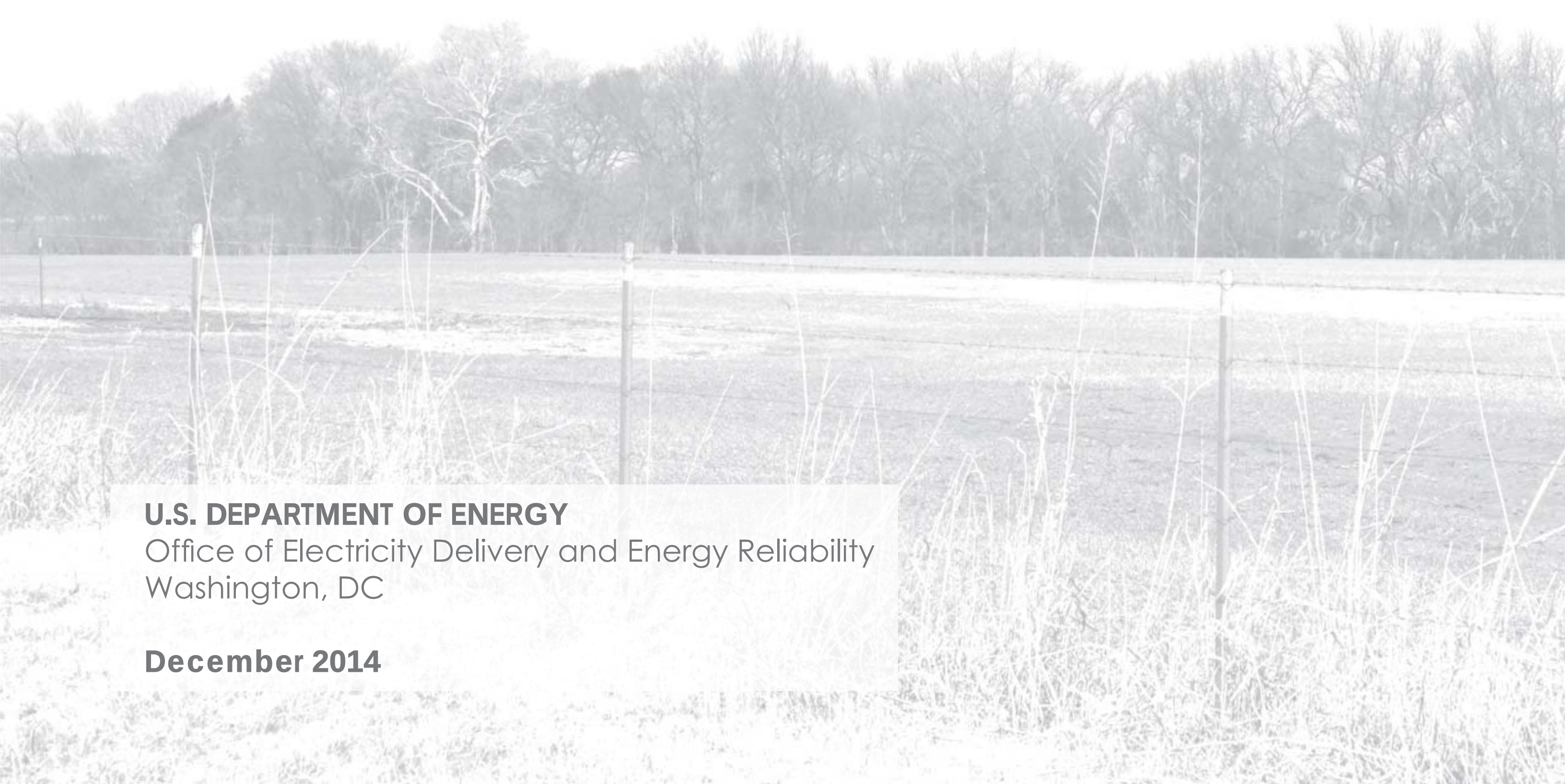
Draft

PLAINS & EASTERN CLEAN LINE TRANSMISSION PROJECT

ENVIRONMENTAL IMPACT STATEMENT

Volume II of V



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3.14 Special Status Wildlife, Fish, Aquatic Invertebrate, and Amphibian Species

3.14.1 Special Status Terrestrial Wildlife Species

3.14.1.1 Regulatory Background

Regulations that directly influence the evaluation of wildlife resources within the region of influence are primarily implemented by the USFWS and state wildlife agencies. The applicable state agencies in this area include the ODWC, the AGFC, Tennessee Wildlife Resources Agency (TWRA), and Texas Parks and Wildlife Department (TPWD). The wildlife regulations relevant to the Project are presented in Table 3.14.1-1.

Table 3.14.1-1:
Relevant Laws and Regulations for Wildlife Species

Regulation	Regulatory Agency	Summary
Endangered Species Act (ESA) (16 USC § 1531 et seq.; 50 CFR Part 402)	USFWS	Establishes lists of threatened or endangered species and their designated critical habitats; requires federal agencies to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of listed species or result in adverse modification to designated critical habitat.
Migratory Bird Treaty Act (MBTA) (16 USC §§ 703–712)	USFWS	Prohibits take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such a bird unless expressly permitted by federal regulations or authorized under a MBTA permit.
Executive Order 13186, “Responsibilities of Federal Agencies to Protect Migratory Birds”	USFWS	Directs executive departments and agencies to take certain actions to protect and conserve migratory birds. The Executive Order provides broad guidelines on conservation responsibilities and requires the development of more detailed guidance in Memoranda of Understanding (MOUs).
Bald and Golden Eagle Protection Act (BGEPA) (16 USC §§ 668-668d; 50 CFR Part 22)	USFWS	Prohibits the “take” of bald and golden eagles as defined: pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb without a BGEPA Permit.
Oklahoma Statutes 29-5-412.1	ODWC	Establishes list of threatened or endangered species within Oklahoma.
Texas Administrative Code 31-65.171–65.177	TPWD	Establishes list of threatened or endangered wildlife within Texas; prohibits the taking, possession, transportation, or sale of threatened or endangered species within the issuance of a permit.
Arkansas Code Annotated 15-45-301–306	AGFC[1]	Prohibits imports, transportation, sale, purchase, hunting, harassment, or possession of threatened or endangered wildlife or their parts.
Tennessee Administrative Code 70-1-101 et seq.	TWRA	Establishes a list of threatened or endangered wildlife within Tennessee; prohibits the take, attempt to take, possession, transportation, export, processing, selling, offering to sell, shipment of, or knowing receipt of shipment of threatened or endangered wildlife.

1 Arkansas does not have an endangered species law, but does maintain a list of Species of Special Concern.

3.14.1.2 Data Sources

Data sources included a desktop analysis of relevant information, research findings, reports available to the public, a database that includes GIS data from government agencies as well as non-governmental organizations, and information received from both regulatory agencies and stakeholders during the DOE scoping process. Data sources used for this analysis were open source and readily available to the public (i.e., the public may assess them without restrictions). Some specific state wildlife data is considered sensitive information and may not be disclosed at the discretion of wildlife agencies to prevent potential disturbances to specific wildlife species and their habitat. Examples include locations of wildlife breeding sites (e.g., LEPC leks), nesting areas (e.g., eagle nests or interior least tern colonies), and roosting sites (e.g., bald eagles and bats). If available, more general information on distribution and location of special status wildlife species and their habitat was used in this assessment. For example, location data on LEPC leks consisted of approximately 5 square mile circular areas with no information on the exact location of the lek within that area. General locations of interior least tern colonies were available in published reports. For species where no site specific information was available or was not disclosed to protect the species, it was assumed that the species were present if suitable habitats were present (i.e., a conservative estimate of species use was used). For example, information on bat roost trees or caves used for roosting or hibernation were either not available, were not disclosed to protect the resource, or only regional locations where caves are located were provided. Under CEQ regulations 40 CFR 1502.22 the lack of such information could be considered incomplete and unavailable. However, using available general distributional data and the conservative approach of assuming that species are present if suitable habitat exists in the ROI would assure that potential impacts to those species are considered and evaluated. Data sources are described in more detail in Table 3.14.1-2.

Table 3.14.1-2:
Summary of Data Sources Wildlife

Resource	Data Source	Exception within the ROI
Federal Special Status Terrestrial Wildlife		
Lesser Prairie-Chicken (LEPC)	LEPC Habitat—Southern Great Plains CHAT Agency Consultation[1] GIS Data Sources: KBS (2013a, 2013b, 2014)	A 3-mile buffer from each edge of the 1,000-foot-wide corridor was added to the ROI within or in proximity to the Estimated Occupied Range of the LEPC and the general location of LEPC leks, as identified through CHAT data.
Whooping crane	USFWS Cooperative Whooping Crane Tracking Project GIS Data Sources: USFWS (2014b, 2014e, 2014f)	A 15-mile buffer from each edge of the 1,000-foot-wide corridor was added to the ROI within the whooping crane migration corridor.
American burying beetle	USFWS (2008a); GIS Data Source: Jin et al. (2013)[2] Agency Consultation[1]	N/A
Ozark big-eared bat	Ozark Big-Eared Bat *(Corynorhinus townsendii ingens),* 5-Year Review: Summary and Evaluation (USFWS 2008b) Agency Consultation[1]	A 2-mile buffer from each edge of the 1,000-foot-wide corridor was added to the ROI in proximity to known occurrences of the species.
Indiana bat	Indiana Bat *(Myotis sodalis)* Draft Recovery Plan: First Revision, USFWS (2007a) Agency Consultation[1]	A 2-mile buffer from each edge of the 1,000-foot-wide corridor was added to the ROI in proximity to known occurrences of the species
Gray bat	Gray Bat *(Myotis grisescens)* 5-Year Review: Summary and Evaluation (USFWS 2009a) Agency Consultation[1]	A 2-mile buffer from each edge of the 1,000-foot-wide corridor was added to the ROI in proximity to known occurrences of the species
Northern long-eared bat	78 FR 61045, "Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition To List the Eastern Small-Footed Bat and the Northern Long-Eared Bat as Endangered or Threatened Species; Listing the Northern Long-Eared Bat as an Endangered Species; Proposed Rule."	A 2-mile buffer from each edge of the 1,000-foot-wide corridor was added to the ROI in proximity to known occurrences of the species
Interior least tern	Interior Population of the Least Tern (*Stemula antillarum athalassos*) Recovery Plan (USFWS 1990)	A 5-mile buffer from each edge of the 1,000-foot-wide corridor was added to the ROI based on potential foraging distance from nest colonies.

Table 3.14.1-2:
Summary of Data Sources Wildlife

Resource	Data Source	Exception within the ROI
Other terrestrial species protected by the Endangered Species Act (ESA), including: Florida panther Piping plover Red knot Sprague's pipit	USFWS Endangered Species Program Threatened and Endangered Species Range Maps (http://www.fws.gov/endangered/map/index.html) USFWS Recovery Plans USFWS Critical Habitat Portal (http://ecos.fws.gov/crithab/) Agency Consultation[1]	N/A. The Florida panther is not known to occur within the ROI but areas in Arkansas within the ROI are under review by the USFWS for possible re-introduction. No variation from the standard ROI was defined for the piping plover, red knot, and Sprague's pipit.
Bald and Golden Eagle Protection Act (BGEPA)	Agency Consultation1	A 1-mile buffer from each edge of the 1,000-foot-wide corridor was added to the ROI for known occurrences of bald eagle nests or bald and golden eagle roosting areas.
State Special Status Terrestrial Wildlife		
State protected species with potential habitat in the ROI	ODWC Threatened Endangered, and Rare Species List (ODWC 2013) AGFC Endangered Species List (http://www.agfc.com/species/Pages/SpeciesEndangered.aspx) Tennessee Natural Heritage Inventory Program Element Occurrence Polygons2 (http://www.tn.gov/environment/natural-areas/natural-heritage-inventory-program.shtml) TPWD Texas Natural Diversity Database (http://www.tpwd.state.tx.us/huntwild/wild/wildlife_diversity/txndd/) Agency Consultation[1]	N/A

1 Federal and state agencies often maintain non-public data files on species presence and occurrence. The Applicant consulted with federal and state resource agencies to identify and collect such non-public data. Non-public data were included in the analysis to the extent that the data were not confidential, available, and complete.

2 Clean Line created an American burying beetle potential occurrence area data layer by selecting certain categories from the NLCD 2006 data within the counties of occurrence based on habitat requirements identified by USFWS (2008a). Areas considered as potential occurrence areas included the following NLCD 2006 categories: Deciduous Forest, Evergreen Forest, Mixed Forest, Barren Land, Shrub/Scrub, Grassland/Herbaceous, and Pasture/Hay.

3.14.1.3 Region of Influence

3.14.1.3.1 Region of Influence for the Project

The general ROI considered for this Project is described in Section 3.1.1. The following subsection describes where the ROI used for special status wildlife species was expanded beyond the area described in Section 3.1.1. Many avian and bat species can range over a considerable distance, particularly migratory species. The expansion of the ROI does not mean that impacts would necessarily occur at that distance, but instead, it identifies whether species are in the vicinity and could possibly be affected by the Project.

3.14.1.3.2 Variations of the Region of Influence for Special Status Wildlife

The ROI for the following special status wildlife species was expanded to account for potential occurrence of each species and to assess the potential direct and indirect effects to the species as follows:

- LEPC: Winder et al. (2013) found that the strongest predictor of female greater prairie chicken space use for nesting was distance from leks. The Lesser Prairie Chicken Range-wide Conservation Plan recommends avoiding leks by 1.25 miles (Van Pelt et al. 2013). Hagen et al. (2004) state that most female LEPC select nest sites within approximately 2 miles of a lek. However, because of variation among individual prairie chickens and possibly the limited availability of suitable nesting habitat in the vicinity of some leks, a buffer distance of 1.25 miles probably represents an area containing only about 85 percent of the LEPC nests in the vicinity of a lek (Van Pelt et al. 2013). Therefore, to more fully account for potential LEPC in the vicinity of the APR to account for breeding, nesting, and brood rearing habitat, a 3-mile ROI was selected from each edge of the 1,000-foot-wide corridor for the Applicant Proposed Route and HVDC Alternative Routes (Pitman et al. 2005, Hagen et al. 2004).
- Whooping crane: Within the 200-mile-wide whooping crane migration corridor where approximately 95 percent of migrating whooping cranes are observed (95 percent migration corridor), the ROI was expanded to encompass a 15-mile buffer from each edge of the 1,000-foot-wide corridor (Applicant Proposed Route and HVDC alternative routes) to identify any known or potential whooping crane stopover locations in the vicinity of the Project. This distance was based on the known foraging distance from stopover locations and recommended BMPs for transmission lines within the whooping crane migratory corridor (USFWS 2009d).
- Protected bat species: The ROI was expanded for bat species designated as candidate, threatened, or endangered under the Endangered Species Act (ESA) to encompass a 2-mile buffer from each edge of the 1,000-foot-wide corridor (Applicant Proposed Route and HVDC alternative routes) in proximity of known occurrences of such species to evaluate potential roosting and hibernacula habitat[1], including the potential for karst or cave features that may serve as habitat for the species. This distance was based upon the recommended review distance for protected bat species habitats (USFWS 2014b, 2014c).
- Interior least tern: The ROI was expanded in proximity to known occurrences of interior least tern nesting to encompass a 5-mile buffer from each edge of the 1,000-foot-wide corridor so that potential impacts to interior least tern within the ROI could be identified and assessed. This distance was based on the known foraging distance for nesting interior least terns (USFWS 1990).

A summary of the data sources used is provided in Table 3.14.1-2.

3.14.1.3.3 Region of Influence for Connected Actions

The ROI for wind energy generation, the future Optima Substation, and TVA upgrades is described in Section 3.1.1.

3.14.1.4 Affected Environment for Terrestrial Special Status Wildlife Species

As discussed in Section 3.17, the ROI crosses multiple ecoregions that support diverse vegetation communities. Overall, the ROI is within the Great Plains and Eastern Temperate Forests Level I Ecoregions (EPA 2012). From the western edge of the ROI in the Oklahoma Panhandle and moving eastward across Oklahoma, Arkansas, and western Tennessee, the vegetation changes from arid to semi-arid grasslands to forests and river valleys as precipitation increases from west to east and elevation changes. Additional information regarding climate may be found in Section 3.3. As such, a variety of wildlife species, both terrestrial and aquatic, is expected to occur within the

[1] A bat hibernaculum is a site where bats hibernate over the winter. These sites are most often caves or abandoned mines.

habitats found within the ROI. The highest species diversity can be expected to occur in areas of greater habitat diversity such as transitional zones between forests and grasslands, wetlands, riparian zones, and open waters.

The following sections provide regional descriptions of special status species known to occur within the ROI or that have the potential to occur within the ROI based on habitat associations and known range information. Detailed descriptions of special status wildlife species in the ROI in Regions 1 through 7 are provided below.

Twenty-six federally proposed or listed animal species have been identified within the ROI; including both terrestrial and aquatic species (USFWS 2014a). Of these, 14 of the species are considered terrestrial species. Twelve are either candidates, proposed for listing, or listed as threatened or endangered under the ESA (Table 3.14.1-3), and two species, the golden and bald eagle, are protected by the BGEPA. Species discussions are presented below by species type (e.g. mammals, birds, etc.) and in increasing order of protection (e.g., proposed threatened, threatened, endangered, etc.). Of the 12 federally proposed or listed terrestrial wildlife species, the whooping crane and Interior least tern are also state protected species). An additional nine species of terrestrial wildlife are protected by state law or regulation, but are not federally protected under the ESA or BGEPA.

Table 3.14.1-3:
Federally Designated Threatened and Endangered Terrestrial Wildlife Potentially Occurring in the ROI

Common Name	Scientific Name	Federal Status	County[2]	Region
Oklahoma				
Mammals				
Northern long-eared bat	*Myotis septentrionalis*	Federally Proposed Endangered	Sequoyah	4
Ozark big-eared bat	*Corynorhinus townsendii ingens*	Federally Endangered	Sequoyah	4
Gray bat	Myotis grisescens	Federally Endangered	Muskogee and Sequoyah	4
Indiana bat	Myotis sodalis	Federally Endangered	Sequoyah	4
Birds				
Sprague's pipit	*Anthus spragueii*	Federal Candidate	Beaver, Payne, Sequoyah	1,3, 4
Red knot	*Calidris canutus rufa*	Federally Proposed Threatened	Occasional transient migrant across the state	1, 2, 3, 4
LEPC	*Tympanuchus pallidicinctus*	Federally Threatened	Beaver, Harper, Woodward, and Texas	1, 2
Piping plover	*Charadrius melodus*	Federally Threatened	Texas, Beaver, Harper, Woodward, Garfield, Kingfisher, Logan, Payne, Lincoln, Okmulgee, and Muskogee	1,2, 3
Whooping crane	*Grus Americana*	Federally Endangered	Beaver, Woodward, Major, Garfield, Kingfisher, Logan, Muskogee, and Sequoyah	1, 2, 3
Interior least tern	*Stemula antillarum athalassos*	Federally Endangered	Beaver, Harper, Woodward, Major, Kingfisher, Logan, Creek, Muskogee, and Sequoyah	1, 2, 3,
Terrestrial Invertebrate				
American burying beetle	*Nicrophorus americanus*	Federally Endangered	Creek, Okmulgee, Muskogee, and Sequoyah	3, 4

Table 3.14.1-3:
Federally Designated Threatened and Endangered Terrestrial Wildlife Potentially Occurring in the ROI

Common Name	Scientific Name	Federal Status	County[2]	Region
Arkansas				
Mammals				
Northern long-eared bat	*Myotis septentrionalis*	Federally Proposed Endangered	Cleburne, Crawford, Cross, Franklin, Jackson, Johnson, Mississippi, Poinsett, Pope, Van Buren, and White	4, 5, 6, 7
Ozark big-eared bat	*Corynorhinus townsendii ingens*	Federally Endangered	Crawford, Franklin, Johnson, and Pope	4, 5
Gray bat	*Myotis grisescens*	Federally Endangered	Crawford, Franklin, Johnson, Pope, Van Buren, Cleburne, White, and Jackson	4, 5
Indiana bat	*Myotis sodalis*	Federally Endangered	Cleburne, Crawford, Franklin, Jackson, Johnson, Pope, Van Buren, and White	4,5, 6
Florida panther	*Puma concolor coryi*	Federally Endangered	Conway and Johnson[1]	4
Birds				
Sprague's pipit	*Anthus spragueii*	Federal Candidate	Franklin	4
Red knot	*Calidris canutus rufa*	Federally Proposed Threatened	Occasional transient migrant across the state	4, 5, 6, 7
Piping plover	*Charadrius melodus*	Federally Threatened	Crawford, Johnson, Pope, Conway, Faulkner, White, and Mississippi	4, 5, 7
Interior least tern	*Stemula antillarum athalassos*	Federally Endangered	Crawford, Johnson, Pope, Conway, Faulkner, and Mississippi	4, 5, 7
Terrestrial Invertebrate				
American burying beetle	*Nicrophorus americanus*	Federally Endangered	Crawford, Franklin, and Johnson	4
Tennessee				
Mammals				
Northern long-eared bat	Myotis septentrionalis	Federally Proposed Endangered	Tipton and Shelby	7
Indiana bat	*Myotis sodalis*	Federally Endangered	Tipton and Shelby	7
Birds				
Red knot	*Calidris canutus rufa*	Federally Proposed Threatened	Occasional transient migrant across the state	7
Interior least tern	*Stemula antillarum athalassos*	Federally Endangered	Tipton and Shelby	7
Texas				
Birds				
Red knot	*Calidris canutus rufa*	Federally Proposed Threatened	Occasional Transient migrant across the state	AC collection system
LEPC	*Tympanuchus pallidicinctus*	Federally Threatened	Ochiltree	AC collection system

1 Although counties were identified by the USFWS (2014a) for potential reintroduction, the species is considered extinct in Arkansas.
2 No designated critical habitats are found within the Project's ROI or the various counties crossed by the project for listed terrestrial species or those species proposed for listing.
Source: USFWS (2014a)

3.14.1.4.1 Federally Proposed or Listed Terrestrial Mammals

3.14.1.4.1.1 Northern Long-eared Bat

The northern long-eared bat *(Myotis septentrionalis)* is a federally proposed endangered species (78 FR 61045, October 2, 2013). The northern long-eared bat ranges throughout much of the eastern and north-central United States (USFWS 2014a). Within this species' range in the ROI, it has been documented or has the potential to occur in the following counties within or near the ROI: Sequoyah County in east-central Oklahoma near the Arkansas border (Region 4); Crawford, Franklin, Johnson, Pope, Van Buren, Cleburne, White, Jackson, Poinsett, Mississippi, and Cross counties in northern Arkansas (Region 4-5); and Tipton and Shelby counties in southwestern Tennessee near the Arkansas border (Region 6–7; 78 FR 61045).

The northern long-eared bat is a migratory bat that uses two habitat types during different seasons of the year: caves for hibernacula in winter and dense forest stands that contain trees with exfoliating bark or cavities for maternity roosts in spring, summer, and fall. The northern long-eared bat does not appear dependent on a particular tree species but opportunistically uses those species that form cavities, crevices, or retain bark such as oaks, maples, black locust, American beech, and shortleaf pine (78 FR 61045). Hibernacula may occur within suitable caves and/or abandoned mines throughout its range, generally the eastern and north-central United States, and are established in October and begin to break up in March or April. This species has shown fidelity to particular hibernation caves from year to year; however, some bats may not use the same hibernacula in successive years (Caceres and Barclay 2000). Northern long-eared bats emerge from hibernacula in the spring and migrate to summer foraging areas. Movements between summer roosts and winter hibernacula in the late fall are typically short (35 to 55 miles); however, movements from hibernacula to summer maternity colonies have ranged up to 168 miles (78 FR 61045). Seven caves in the Ozark Plateau National Wildlife Refuge located in Adair County, Oklahoma, north of Sequoyah County, are known to be inhabited by northern long-eared bats (USFWS 2014d).

Northern long-eared bats are nocturnal insectivores and have a diverse diet including moths, flies, leafhoppers, caddisflies, and beetles (78 FR 61045, October 2, 2013). As insectivores, preferred forage habitat includes the forest interior in areas below the canopy but above the shrub layer where insects are most commonly found. This species also may occasionally forage in open areas, such as forest clearings, along waterways, and roads (78 FR 61045).

Historically, this species has been documented as common throughout its range and has not been considered at risk in the United States. The USFWS has proposed to list the northern long-eared bat as endangered based on the species' risk of extinction, which is predominately related to the threat of white-nose syndrome, a fungal infection that has reduced some bat populations in the eastern United States by 30 to 99 percent (USFWS 2014d). Additional threats to the northern long-eared bat include destruction or degradation of habitat through deforestation and loss of forest connectivity (i.e., habitat fragmentation) and disturbance (e.g., recreational caving and vandalism) of bat hibernacula (78 FR 61045).

3.14.1.4.1.2 Ozark Big-eared Bat

The Ozark big-eared bat *(Corynorhinus townsendii ingens)* is a federally endangered species. The range of the Ozark big-eared bat is limited to a small number of counties in Oklahoma and Arkansas, including documented occurrences in the following counties in Region 4 and 5: Sequoyah County in east-central Oklahoma near the Arkansas border and Crawford, Franklin, Johnson, and Pope counties in northern Arkansas near the Oklahoma border (78 FR 61045). Oklahoma has 10 caves of known use by Ozark big-eared bats in Adair County, one cave in

Sequoyah County, and one in Cherokee County identified as essential to the species. Fifty other caves in Oklahoma are known to be infrequently used by the Ozark big-eared bat. These caves may be used by small groups or solitary males during the maternity season. Arkansas has seven caves considered essential sites, of which none occurs in counties within the ROI (USFWS 2008b).

Ozark big-eared bats are a cave obligate species that rely on limestone and sandstone talus caves associated with karst topography for roosting and hibernation (USFWS 2008b). This species has shown fidelity to particular hibernation caves from year to year, but may occasionally move between caves (USFWS 2008b). Hibernation generally is initiated in October, when Ozark big-eared bats typically seek out the coldest regions of selected caves with temperatures ranging from 46 to 50 Fahrenheit (°F) and 86 to 93 percent humidity (USFWS 2008b). When bats come out of hibernation in April, maternity colonies begin forming in late April and early May with births occurring in May or June (USFWS 2008b).

This species forages over grasslands and forests for moths, their primary prey (USFWS 2008b). Open areas allow for easy foraging because bats are not obstructed by branches while pursuing prey and are able to discriminate insects at greater distances. Ozark big-eared bats have smaller home ranges compared to other bats and generally have a foraging distance of approximately 1.2 miles to a maximum of 5 miles and exhibit an avoidance of areas of human development and cropland (Graening et al. 2011). Current threats to the Ozark big-eared bat consist of human disturbance of occupied caves (i.e., recreational caving); loss and fragmentation of foraging habitat; and disturbance of talus slopes, abandoned buildings, and bridges that may be used by solitary roosting bats.

3.14.1.4.1.3 Gray Bat

The gray bat *(Myotis grisescens)* is a federally endangered species. The range of the gray bat includes the southeastern United States (USFWS 2014a). Within this species' range in the ROI, it has been documented or has the potential to occur in the following counties within, or near, the ROI: Adair, Muskogee, and Sequoyah counties in east-central Oklahoma near the Arkansas border (Region 3 and 4), and Crawford, Franklin, Johnson, Pope, Van Buren, Cleburne, White, and Johnson counties in northern Arkansas (Regions 4 and 5) (USFWS 2013b). Gray bats are cave obligate species using different caves for winter hibernation and summer roosting. Oklahoma is home to nine summer colonies of gray bats, though none stay through hibernation (Martin 2007). Two summer colonies are located in Adair County, Oklahoma. Six active gray bat hibernacula are in Arkansas counties crossed by, or near, the Project (Martin 2007).

Gray bats emerge from hibernacula in late March or early April and select summer caves near water sources for prime insect foraging locations. Gray bats are strictly insectivorous, feeding only on insects. River edges and reservoirs provide abundant supplies of insects for gray bats (Tuttle 1976).Colonies reside in multiple caves during different times of the year; however, the unifying factor is that gray bats are only found in limestone karst areas found in the southeastern United States (Tuttle 1975). Hibernacula caves are typically deep vertical caves selected in early October with females arriving prior to males (Martin 2007).

Historically, threats to gray bats have included pollutants that impact insect populations; alterations to caves that change temperature, airflow, humidity, or light, and cave flooding (USFWS 1997; Fremling and Johnson 1989). However, current threats have expanded to include white-nose syndrome that causes hibernation disruptions that, in turn, can deplete energy stores and may result in mortality from starvation (USFWS 2009a). Disturbance of caves, both those used for winter hibernation and for maternity roosts, are potential threats to the species.

3.14.1.4.1.4 Indiana Bat

The Indiana bat *(Myotis sodalis)* is a federally endangered species. The Indiana bat range includes the northeastern east-central, and Midwestern United States (USFWS 2014a). Within this species' range in the ROI, it has been documented or has the potential to occur in the following counties within the ROI: Sequoyah County in east-central Oklahoma near the Arkansas border; Crawford, Franklin, Johnson, Pope, Van Buren, Cleburne, White, and Jackson counties in northern Arkansas; and Tipton and Shelby counties in southwestern Tennessee near the Arkansas border (USFWS 2014a). An inhabited hibernaculum, known as Rosson Hollow Crevices, is located in Franklin County, Arkansas. Portions of the ROI pass through USFWS-recognized Karst Conservation Zones in which Indiana bat habitat may occur (USFWS 2013b). The Ozark Plateau Wildlife Refuge in Adair County, north of Sequoyah County in east-central Oklahoma, has been identified by the USFWS as important to the Indiana bat because of the availability of cave hibernacula.

The Indiana bat is a migratory bat that uses caves for hibernacula in winter and is found in dense forest stands using exfoliating bark or tree cavities for maternity roosts in spring, summer, and fall. Hibernacula may occur in suitable caves and/or abandoned mines throughout its range, generally the eastern and north-central United States, and are established in November and begin to break up in April. This species has shown fidelity to particular hibernation caves from year to year.

Indiana bats emerge from hibernacula in spring and migrate to summer foraging areas that can be up to 350 miles from hibernacula (USFWS 2007a). This species will use the sloughing bark of dead/dying trees, tree cavities, and exfoliating bark of live trees for maternity colonies and summer roosts. Primary roost trees are usually larger than the surrounding forest trees and are located in forest canopy openings, fence lines, or along wooded edges (USFWS 2007a). Common roost tree species used include ash, elm, oak, hickory, maple, and poplar. Maternity roost habitat includes riparian areas, bottomland hardwood forests, and other forested wetlands, as well as upland forests. Indiana bats are nocturnal insectivores that feed almost exclusively on flying insects. Preferred foraging areas include sites around water sources (e.g., rivers, streams, ponds, etc.) or open woodlands (USFWS 2007a). Foraging usually occurs within 2 miles of a primary roost tree but may occur up to 5 miles from the roost (USFWS 2007a).

Current threats to the Indiana bat include loss of habitat (i.e., roost sites and foraging areas) from deforestation and loss of forest connectivity (i.e., habitat fragmentation), degradation of hibernacula by human activities (recreational caving, vandalism, etc.), and white-nose syndrome (USFWS 2012b, 2009b).

3.14.1.4.1.5 Florida Panther

The Florida panther (*Puma concolor coryi*) is a federally endangered species. This species' range is limited to southern and south-central Florida and it is considered extinct in Arkansas (USFWS 2008c), and therefore is not present in the ROI. However, the USFWS has considered reintroducing the Florida panther into Arkansas. Areas being considered for reintroduction in proximity to the ROI include the Ozark National Forest and the Ouachita National Forest (USFWS 2008c).

The preferred habitat of the Florida panther includes cypress swamps, pinelands, hardwood swamps, and upland hardwood forests. Threats to the Florida panther in its current range include loss of habitat, urbanization encroachment, disease, intraspecific aggression, and collisions with vehicles (USFWS 2008c).

3.14.1.4.2 Federally Proposed or Listed Birds

3.14.1.4.2.1 Sprague's Pipit

Sprague's pipit *(Anthus spragueii)* is a candidate for federal ESA listing. Sprague's pipit is documented to occur in the ROI in Region 1 (Beaver County in the Oklahoma panhandle), in Region 3 (Payne County in north-central Oklahoma), in Region 4 (Sequoyah County in east-central Oklahoma near the Arkansas border, and Franklin County in northern Arkansas near the Oklahoma border [USFWS 2014a]). Sprague's pipit occurs as an uncommon migrant and rare winter resident in Oklahoma and Arkansas.

Sprague's pipit is a small grassland bird noted for its distinct high flights and secretive behaviors. The species is strongly tied to unplowed native prairie throughout its life cycle. Native prairie habitat used by Sprague's pipit includes short-grass prairie, mixed-grass prairie, alkaline meadows, and wet meadows. Its current breeding distribution includes portions of Montana, North Dakota, South Dakota, and Canada, and its current wintering distribution includes south-central and southeast Arizona, southern New Mexico, Texas, southern Oklahoma, southern Arkansas, northwestern Mississippi, southern Louisiana, and northern Mexico. The majority of sightings occur in Texas (78 FR 70103, November 22, 2013) but Sprague's pipit is assumed to pass through the states of Oklahoma and Arkansas. Sprague's pipit also may use stubble and fallow alfalfa, soybean, and wheat fields in the fall and winter.

Current threats to Sprague's pipit include loss, degradation, fragmentation of native grassland habitat, energy development, climate change, and drought (78 FR 70103).

3.14.1.4.2.2 Red Knot

The red knot *(Calidris canutus rufa)* is a federally proposed threatened species. This subspecies is a potential migrant in the interior United States and does not breed or winter in the vicinity of the ROI; however, the overall range of the red knot overlaps the vicinity of the ROI. Most *rufa* subspecies of the red knot migrate along the Atlantic Coast during spring and fall; however, every interior state has multiple documented migration records and recent research has shown that birds wintering along the Gulf of Mexico fly to and from breeding grounds via the Central Flyway (78 FR 60023, September 30, 2013). The ROI traverses both the Central and Mississippi Flyways, and potentially lies in the migratory path of the relatively small number of red knots that migrate through the interior United States. No critical habitat has been designated for the red knot.

The red knot is a medium-sized shorebird largely dependent upon high quality habitats that serve as staging areas for their long-distance migration (78 FR 60023). The conditions at these staging areas factor heavily in the annual cycle and survival of red knots. These staging areas, or stopover sites, are primarily along the Atlantic Coast; however, relatively small numbers occur annually across the interior United States (Harrington 2001; 78 FR 60023). Red knots use aquatic habitats with exposed sediments and abundant, readily accessible invertebrates. There are no known primary stopover sites in the vicinity of the ROI, and red knots migrating through the Central Flyway are believed to depart the Texas coast and stopover in the Northern Great Plains and Hudson Bay areas before reaching their Arctic breeding grounds (78 FR 60023). Red knots stopping over in the vicinity of the ROI are expected to be a rare occurrence with relatively few individuals.

Threats to the red knot include climate change, habitat loss, declining food availability at stopover sites, human disturbances at migration and wintering areas, wind energy development, pollution, and predation pressures. Climate change may be one of the more critical threats to red knots (Harrington 2001; 78 FR 60023). Habitat loss and modification also are a major threat to red knots.

3.14.1.4.2.3 Lesser Prairie-Chicken

The LEPC *(Tympanuchus pallidicinctus)* is a federally threatened species (79 FR 19974 and 79 FR 20074, April 10, 2014). The range for the LEPC overlaps with the ROI in Region 1 in Texas, Beaver, and Harper counties, and Woodward County in Region 2 in the Oklahoma panhandle, and with the AC collection system routes in Ochiltree County, Texas, in the Texas panhandle (USFWS 2014a) (Figures 3.14-1a and 3.14-1b (located in Appendix A). At the time of the final listing rule, no critical habitat had been proposed or designated for the LEPC (USFWS 2014a; 79 FR 19974, 79 FR 20074).

In Oklahoma and Texas, the LEPC occupies sand sagebrush habitat in the western and eastern Panhandle and mixed-grass habitat in the northwest region (Van Pelt et al. 2013). Courtship and breeding occurs on leks formed by groups of male birds, similar to other grouse or prairie-chicken groups. Leks typically occur on knolls or ridges with relatively short and/or sparse vegetation. Developed or manipulated areas may also be used for lek sites and include oil well pads, roads, reverted cropland, cultivated fields, areas treated with herbicides, and recently burned areas. However, LEPC cannot survive solely in landscapes with greater than 30 percent cultivated or disturbed land (Bidwell et al. 2003). Preferred nesting sites are in sand sagebrush or shinnery oak grasslands with high canopy cover and moderate vertical and horizontal cover (ODWC 2012). Brood rearing habitat is generally close to nesting habitat but may contain less grass and more forbs. The LEPC requires large contiguous blocks of habitat to maintain sustainable populations. The minimum size of contiguous grassland required is uncertain but may range from 1,200 to 25,000 acres (Van Pelt et al. 2013).

Through the Western Governors Association CHAT, crucial habitats and important corridors for the LEPC have been mapped in Region 1 and 2 (Figure 3.14-1 in Appendix A). CHAT category 1 (CHAT-1) are considered focal habitat areas for LEPC conservation and represent the best remaining areas of LEPC habitat. CHAT-2 areas comprise habitat connectivity areas that have been identified as those areas important for maintaining large-scale habitat connections between crucial LEPC habitats. Areas mapped as CHAT-3 include those sites modeled as LEPC habitat based on data such as locations of leks and nests, land in the Conservation Reserve Program, land cover type, and abiotic site conditions. CHAT-4 areas are estimated occupied LEPC range based on expert opinion. CHAT categories 1 through 4 represent the best known current potential range of the LEPC.

The primary threats to LEPC include habitat loss, degradation and fragmentation, and the subsequent displacement from or avoidance of remaining habitat patches. Threats to this species' sustainability are exacerbated by conservation challenges such as incompatible grazing management, tree encroachment, conversions of rangeland to crop and non-native forage production, energy development, and increased disturbance (79 FR 19974 and 79 FR 20074, April 10, 2014). Research indicates that LEPC will avoid certain human structures such as roads, wellheads, and vertical structures such as buildings and transmission structures and lines even if suitable habitat occurs in the immediate surroundings (USFWS 2014d). Transmission lines and structures may impact this species use of otherwise suitable habitats due to increased predation rates that can result from avian predators perching and roosting along the structures and line.

3.14.1.4.2.4 Piping Plover

The piping plover *(Charadrius melodus)* is a federally threatened species that has a large range across the Great Plains and East Coast of the United States (USFWS 2014a). The breeding range for the piping plover includes documented or potential for occurrences within the following counties within the ROI in Regions 1 through 7: Texas, Beaver, Harper in the Oklahoma panhandle; Woodward County in northwestern Oklahoma; Garfield, Kingfisher, Logan, Payne, Lincoln counties in north-central Oklahoma; Okmulgee and Muskogee counties in east-central Oklahoma near the Arkansas border; Crawford County, Arkansas, in northern Arkansas near the border with Oklahoma; Johnson, Pope, Conway, Faulkner, and White counties in north-central Arkansas and Mississippi County in northeastern Arkansas near the border with Tennessee (USFWS 2014a). Records of nesting piping plovers within the ROI and its vicinity are rare; only two nests are documented at Optima Lake in Texas County, Oklahoma (78 FR 61045, October 2, 2013). In relation to Optima Lake, the Applicant Proposed Route and ROI is about 7 miles south and HVDC alternative routes are approximately 3 to 5 miles south, and AC Collection System Routes E-1 and NE-2 are approximately 1.5 miles south and 5 miles west, respectively. No federally designated critical habitat is within the ROI.

The piping plover is a wide-ranging small shorebird typically observed as a migratory species within the ROI. The piping plovers within the ROI are individuals of the northern Great Lakes population of piping plovers which breed along open, sparsely vegetated sand or gravel beaches adjacent to alkali wetlands, and on beaches, sand bars, and dredged material islands of major river systems (USFWS 2009c). During migration, typically April and August, the species can be documented throughout Oklahoma at rivers, wetlands, and reservoirs using sandbars, beaches, and sparsely vegetated areas on their way to wintering grounds along the Gulf of Mexico. However, inland populations appear to migrate nonstop from northern breeding areas to winter grounds along the Gulf of Mexico contributing to fewer observations within the ROI (USFWS 2014d).

The primary threat to the piping plover is destruction and degradation of summer and winter habitat. The major threats in the northern Great Plains breeding range include predation, habitat alteration due to impoundments, river channelization and manipulation of water flows, sand and gravel mining, oil and gas production, and invasive species encroachment. All piping plover populations face increasing human disturbance during their coastal migration and in their wintering range. Human presence may inhibit courtship, incubation, and brooding, and impact nesting and foraging activities (USFWS 2009c). Because piping plovers occur primarily along rivers and wetlands, collisions with transmission lines and structures near crossings of rivers appear to be the greatest potential Project impact to the piping plover.

3.14.1.4.2.5 Whooping Crane

The whooping crane *(Grus americana)* is a federally endangered species with a range that extends from Canada through the Great Plains to the Texas Gulf Coast. The Project would cross the migration corridor for the Arkansas-Wood Buffalo population of the whooping crane (USFWS 2014d). The migration corridor range, based on documented occurrences of migrating whooping cranes includes the following Oklahoma counties within the ROI: Beaver County in the Oklahoma Panhandle (Region 1); Woodward and Major counties in northwestern Oklahoma (Region 1 through 2); Garfield, Kingfisher, and Logan counties in north-central Oklahoma (Region 3), and Okmulgee County near the border with Arkansas in east-central Oklahoma (Region 4; USFWS 2014a). The migration corridor is approximately 200 miles wide. No federally designated critical habitat for this species is currently located within the ROI.

The whooping crane is a large migratory crane that overwinters along the Gulf of Mexico. The Arkansas-Wood Buffalo population of whooping cranes migrates through the central United States and breeds in south-central Canada. Autumn migration normally begins in mid-September, with most birds arriving on the Gulf of Mexico wintering grounds between late October and mid-November. Spring migration departure dates are normally between late March and mid-April, with the last birds usually leaving by May 1 (USFWS 2014a). During the annual migration, whooping cranes use stopover areas for resting and foraging. Whooping cranes will feed in shallow waters along the margin of wetlands, harvested grain fields, pastures, grasslands, and burned upland fields (USFWS 2014d). Roosting habitat is usually shallow, seasonally, and semi-permanent flooded wetlands or wide, sandy rivers. Generally, this species prefers wetlands with less vegetation (USFWS 2009d). The USFWS Cooperative Whooping Crane Tracking Project maps observations of whooping cranes during migration and has identified a primary migration corridor within the central United States (Figure 3.14-2 in Appendix A) (Tacha et al. 2010). This migration corridor is further delineated into sections based upon the percentage of observations from the centerline. Approximately 95 percent of all whooping crane observations during migration occur within 200 miles of the centerline of the migration corridor. Known migration and stopover observations of whooping crane may occur outside the delineated migration corridor, but the migration corridor is indicative of 95 percent of the known migration and stopover observations reported to the USFWS Cooperative Whooping Crane Tracking Project. No whooping crane critical habitat has been designated in the ROI, but the Salt Plains National Wildlife Refuge is approximately 35 miles north of the Applicant Proposed Route and 20 miles north of the ROI in north-central Oklahoma in Alfalfa County and is an important migration stopover area (Figure 3.14.-3 in Appendix A).

Current threats to recovery of whooping cranes include ongoing loss and degradation of migratory stopover and coastal wintering habitats, and collisions with structures (e.g., fences, powerlines, and communication towers) (Stehn and Wassenich 2006; USFWS 2009d, 2014d). Climate change also may threaten this species' continued existence, reducing inflows of freshwater in wintering, migration, and breeding grounds (USFWS 2009d). Additionally, whooping cranes are sensitive to human disturbance, particularly to the presence of humans on foot (USFWS 2009d, 2014a). Transmission lines and structures bordering fields and wetlands where cranes forage and roost pose a greater collision risk and are of concern (USFWS 2009d).

3.14.1.4.2.6 Interior Least Tern

The interior least tern (*Sternula antillarum athalassos*) is a federally endangered species that ranges from the northern Great Plains through the Texas Gulf Coast in the United States (USFWS 2014a). The breeding range for the interior population of the least tern based on documented occurrences and potential for occurrences includes the following counties within the ROI: Beaver and Harper counties in the Oklahoma panhandle (Region 1); Woodward and Major counties in northwestern Oklahoma (Region 1 through 2); Kingfisher and Logan in north-central Oklahoma (Region 3); Creek, Muskogee, and Sequoyah counties in east-central Oklahoma near the border with Arkansas (Region 3 through 4); Crawford, Johnson, Pope, Conway, Faulkner, and Mississippi counties in northern Arkansas (Regions 4 through 6); and Tipton and Shelby counties in southwestern Tennessee near the border with Arkansas (Region 7: USFWS 2014a). No critical habitat has been designated for the interior least tern (USFWS 2014a).

The least tern is the smallest member of the gull family. The interior population of the least tern presently breeds in the Mississippi, Missouri, and Rio Grande River systems from Montana south to Texas and from eastern New Mexico and Colorado to Indiana and Louisiana. Nesting habitat for interior least tern occurs along the Cimarron (Major County in Oklahoma), Arkansas (Muskogee County in Oklahoma), and Mississippi Rivers (Mississippi County in Arkansas and Tipton County in Tennessee) (Lott et al. 2013). A nesting colony is known to occur 7 miles north of where the Project would cross suitable foraging and nesting habitat on the Arkansas River near the Robert S. Kerr Lock and Dam (USFWS 2014d). On the Mississippi River, the interior least tern nests on large sandbars primarily from the confluence with the Ohio River south to Louisiana. Nesting interior least terns have been observed along the Mississippi River in Shelby, Tipton, and Lauderdale counties in Tennessee (Lott et al. 2013). Arriving on breeding grounds from early April through early June, interior least terns breed colonially on bare or sparsely vegetated sandy or dried mud substrates often along rivers, but also on shores of impoundments, saline flats in salt marshes, and shell beaches. Colonies are typically situated near (less than 7.5 miles) a water resource (e.g., rivers, lakes, reservoirs) with a viable food supply of small fishes and crustaceans (Thompson et al. 1997; USFWS 2014a). Colonies disperse in late August when terns begin migration to wintering grounds along coastlines in Central and South America. Although migration routes are not well understood for the interior least tern, the least tern appears to follow major river basins to the confluence of the Mississippi River (USFWS 2014d). Least terns forage in shallow water and rest on sandbars, beaches, and docks during migration.

The primary threat to this species is loss of habitat from dam construction and river channelization on major rivers throughout the Mississippi, Missouri, and Rio Grande river systems. Dams alter river flows in a way that is not conducive to the creation and maintenance of sandbars with sparse vegetation. Other threats include human disturbance (e.g., degradation of habitat, disturbance at nest and roost sites) and cold-water temperatures in reservoirs, which affect biological activity and growth and, in turn, the quantity of forage fish available (USFWS 2014a; Thompson et al. 1997). Interior least terns may avoid nesting in the vicinity of structures that could serve as perches for avian predators (USFWS 2013a).

3.14.1.4.3 Federally Proposed or Listed Terrestrial Invertebrates

3.14.1.4.3.1 American Burying Beetle

The American burying beetle *(Nicrophorus americanus)* is a federally endangered species with a range that is generally restricted to the southeastern Great Plains (USFWS 2014a). The American burying beetle range within the ROI is based on documented occurrences and potential for occurrences and includes Creek, Okmulgee, Muskogee, and Sequoyah counties in east-central Oklahoma near the border with Arkansas (Regions 3-4); and Crawford, Franklin, and Johnson counties in northern Arkansas near the border with Oklahoma (Region 4; USFWS 2014a). No critical habitat has been designated for the American burying beetle (USFWS 2014a). The USFWS has identified conservation priority areas for the American burying beetle in Okmulgee, Muskogee, and Sequoyah counties in east-central Oklahoma that are crossed by the ROI of the Applicant Proposed Route and HVDC alternative routes (USFWS 2014e).

The American burying beetle is a habitat generalist that prefers areas that exhibit a high biomass of small mammals and birds suitable for scavenging (Holloway and Schnell 1997); however, American burying beetles do exhibit habitat selectivity with regard to areas conducive for carcass burial and breeding activities (Lomolino et al. 1995). During carcass burial and breeding, studies have suggested that American burying beetles have a preference for forested sites, likely due to an increase in leaf litter and deeper, less compacted soils found in forested sites (Lomolino and Creighton 1996). Distribution of burying beetles is limited by the availability of properly sized carrion (i.e., presence of small bird/mammal carrion), the number of competing scavengers, and the soil characteristics conducive to carcass burial (USFWS 2012a).

The USFWS has published impact assessment guidelines for the American burying beetle (USFWS 2014e). Sites considered unfavorable for the burying beetle exhibit the following characteristics:

- Land that has already been developed and no longer exhibits surficial topsoil, leaf litter, or vegetation.
- Land that is tilled on a regular basis, planted in monoculture, and does not contain native vegetation.
- Pasture or grassland that is maintained through frequent mowing or herbicide application at a height of 8 inches or less.
- Urban areas with maintained lawns, paved surfaces, or roadways.
- Stockpiled soil without vegetation.
- Wetlands with standing water or saturated soils (defined as sites exhibiting hydric soils and vegetation and/or wetland hydrology" (USFWS 2014e). It should be noted that areas adjacent to wetlands and/or riparian areas may be used by the burying beetle and not considered unfavorable. These areas may be important for burying beetles seeking moist soil during dry conditions.

The USFWS lists the majority of threats to the American burying beetle as related to habitat fragmentation. Fragmentation alters habitat by changing species composition and lowering the reproductive success of the beetles' targeted prey. Fragmentation also increases edge habitat that, in turn, supports a greater density of vertebrate predators and scavengers (e.g., crows, raccoons, foxes, opossums, etc.) that compete with American burying beetles for carrion. Other threats may include artificial lighting that decreases populations of nocturnal insects and the possibility of a genetic characteristic that reduces reproduction success (USFWS 2012b).

3.14.1.4.4 Other Federally Protected Wildlife

3.14.1.4.4.1 Bald Eagles

Bald eagles (*Haliaeetus leucocephalus)* are federally protected under the BGEPA. Bald eagles can occur throughout the ROI as year-round residents, breeders, winter residents, or migrants (Buehler 2000). Bald eagles are opportunistic foragers that prey primarily on fish, but also feed on other aquatic and terrestrial vertebrates as well as on carrion (Buehler 2000). Bald eagles nest in large trees or cliffs. Breeding areas are closely associated with aquatic habitats with forested shorelines or cliffs (Buehler 2000). Within the ROI, nesting generally occurs from April through July, although nest building can occur during the winter and spring (USFWS 2007b). Wintering locations are typically associated with open water areas (i.e., lakes, reservoirs, and rivers) used for foraging on fish. Wintering bald eagles roost (often communally) anywhere between 6 miles and 20 miles from foraging sites depending on abundance of prey.

The ODWC estimates that the statewide overwinter population of bald eagles in Oklahoma is between 800 and 2,000 (ODWC 2011a). The nesting range of the bald eagle has expanded and now includes western Oklahoma. However, the primary nesting area in Oklahoma is the Arkansas River and its main tributaries (USFWS 2014d). Typically, the population of bald eagles within the ROI will increase during the winter as migrants from more northern breeding grounds migrate to overwinter. Migrating bald eagles from more northern regions begin arriving in late November and December. In proximity to the ROI in eastern Oklahoma in Regions 4, known wintering concentrations of bald eagles can be located at Sequoyah State Park and Greenleaf State Park (ODWC 2011b). In Oklahoma, wintering bald eagle concentrations are highest at the following lakes: Kaw, Keystone, Texoma, Tenkiller, Ft. Gibson, Grand, Canton, Great Salt Plains Lakes, Tishomingo, and Spavinaw (ODWC 2011a).Village Creek State Park, Mt. Magazine State Park, and Lake Dardanelle in western Arkansas in Regions 4 and 5 have known wintering concentrations of bald eagles (Arkansas State Parks 2014). Greers Ferry Lake in central Arkansas and the Mississippi River between Arkansas and Tennessee also have populations of wintering bald eagles.

Current threats include collisions with transmission lines that can occur when the birds are distracted (i.e., actively engaged in territorial displays and fights or pursuing prey), during low visibility (i.e., dawn, dusk, or bad weather), and when fledglings have poorly developed flight skills. Electrocution from electric transmission lines is a possibility depending on the spacing of conductors and electrical grounding practices. Disturbances to nests or nesting territories may cause eagles to abandoned their nests and decrease annual productivity. Illegal shooting and lead poisoning are also known causes of bald eagle mortality.

3.14.1.4.4.2 Golden Eagles

Golden eagles (*Aquila chrysaetos)* are most common in the semi-arid western portions of the ROI in Regions 1 and 2, where they can occur as year-round residents, breeders, winter residents, or migrants (Kochert et al. 2002). In Oklahoma, only two to four pairs of golden eagles are known to nest in the state, typically in the far western panhandle in the vicinity of the Black Mesa (ODWC 2011c), outside the ROI; however, golden eagles may occur outside the nesting season as residents throughout the year. Golden eagles in the western United States are most commonly associated with open and semi-open habitats such as shrublands, grasslands, woodland-brushlands, and coniferous forests as well as in cropland and riparian habitats (Kochert et al. 2002). Golden eagles nest on cliff faces or in large trees and breeding areas vary by region, but are generally associated with mountainous canyon land, rimrock terrain of open desert, grassland areas, riparian habitats, and occasionally in forested areas (Kochert et al. 2002). Wintering habitat includes open areas with native vegetation such as sagebrush communities, riparian areas, grasslands, and rolling oak savanna (Kochert et al. 2002).

Golden eagles feed primarily on small mammals such as rabbits, ground squirrels, and prairie dogs, but they will consume birds, reptiles, and carrion. These food items are typically more abundant and accessible in open grasslands and shrub/scrub habitats found in semi-arid habitats in Region 1 and 2.

Golden eagles are more sensitive to human occupation than bald eagles, and disturbance impacts are a potential concern (USFWS 2014d). Current threats to golden eagles include mortality from collisions with transmission lines, wires, wind turbines, structures, and other vertical structures. Trapping and poisoning incidental to mammal control programs and lead poisoning from ammunition remain hazards for this species. Electrocution from electric transmission lines is a hazard, but generally from smaller distribution lines where the spacing of conductors is closer together compared to transmission lines and the eagles' wings can more easily contact more than one conductor. Disturbance to nests or nesting territories can also cause eagles to abandon nests and lower productivity.

3.14.1.4.5 State Designations for Wildlife

In addition to federal designations, there are 11 species of terrestrial wildlife with state level designations that occur within the ROI. Oklahoma and Arkansas do not maintain a state-level threatened or endangered terrestrial wildlife list. The state-designated wildlife of Tennessee and Texas that could potentially occur in the ROI are listed in Table 3.14.1-4.

Table 3.14.1-4:
State Designated Threatened and Endangered Terrestrial Wildlife Potentially Occurring in the ROI

Common Name	Scientific Name	State Status	County
Oklahoma			
The ODWC recognizes the federally designated threatened or endangered terrestrial wildlife. No additional state threatened or endangered terrestrial wildlife are found within the ROI.			
Arkansas			
The AGFC recognizes the federally designated threatened or endangered terrestrial wildlife. No additional state threatened or endangered terrestrial wildlife are found within the ROI.			
Tennessee			
Reptiles			
Northern pinesnake	*Pituophis melanoleucus melanoleucus*	State Threatened	Shelby
Birds			
Bewick's wren	*Thryomanes bewickii*	State Endangered	Shelby
Interior least tern[1]	*Sterna antillarum athalassos*	State Endangered	Tipton and Shelby
Lark sparrow	*Chondestes grammacus*	State Threatened	Shelby
Texas			
Mammals			
Black bear	*Ursus americanus*	State Threatened	Sherman
Gray wolf	*Canis lupus*	State Endangered	Sherman, Hansford, Ochiltree
Reptiles			
Texas horned lizard	*Phrynosoma cornutum*	State Threatened	Sherman, Hansford, Ochiltree
Birds			
American peregrine falcon	*Falco peregrinus anatum*	State Threatened	Sherman, Hansford, Ochiltree
Bald eagle	*Haliaeetus leucocephalus*	State Threatened	Sherman, Hansford, Ochiltree
Peregrine falcon	*Falco peregrinus*	State Threatened	Sherman, Hansford, Ochiltree
Whooping crane[1]	*Grus americana*	State Endangered	Sherman, Hansford, Ochiltree

1 Federally designated species (see Table 3.14.1-3).
Sources: ODWC (2013), ANHC (2013), TDEC (2014), TPWD (2013)

3.14.1.5 Regional Description

As discussed above, 12 terrestrial special status wildlife species are known to occur or have the potential to occur within the ROI. A summary of the terrestrial special status wildlife species and habitat occurrence by Project region is provided in the sections below. The highest diversity of special status wildlife species occurs in Regions 4 and 5, because the variability of habitats is high within these two regions.

3.14.1.5.1 Region 1

The ROI in Region 1 is referred to as the Oklahoma Panhandle Region and includes the Applicant Proposed Route, HVDC Alternative Routes I-A through I-D, Oklahoma converter station and AC interconnection, and the AC collection system.

No federally listed bat species are known to occur within the Region 1 ROI in Oklahoma.

Of the four federally listed bird species and two federally proposed bird species, three of the species are known to occur or to have the potential to occur within the ROI in Region 1. The piping plover has two historical nests at Optima Lake in Texas County, Oklahoma (USFWS 2014d). In relation to Optima Lake, the Applicant Proposed Route would be approximately 7 miles south at its nearest point to the lake, and the Oklahoma Converter Station Siting Area would be located approximately 10 miles southwest. As described in Section 3.10, the predominant land cover in the Region 1 ROI is grassland/herbaceous. Piping plovers are unlikely to use the grassland/herbaceous habitat that dominate the ROI in Region 1 for nesting habitat; however, the proximity to Optima Lake, and known nesting occurrences, near the western terminus of the Applicant Proposed Route suggests that piping plovers may occur during the nesting and breeding session. There are no known stopover locations of whooping crane within the overall ROI. The nearest known stopover location would be approximately 4 miles from HVDC Alternative Route 1-A; however, portions of the eastern edge of Region 1 ROI are within the 95 percent corridor of known whooping crane observations (USFWS 2009d) indicating that whooping cranes may occur within the overall ROI during migration (Figure 3.14-2 in Appendix A). In contrast to the piping plover, the whooping crane may use the grassland/herbaceous habitat that dominate the ROI in Region 1. Further, limited areas of open water, and woody wetlands occur along portions of the ROI in Region 1 (see Section 3.19 for additional discussion). The LEPC has the potential to occur throughout the ROI in Region1 based on documented occurrences within the Applicant Proposed Route and HVDC Alternative 1-A through 1-D (Van Pelt et al. 2013) (Figure 3.14-1a in Appendix A). The LEPC may occur within the grassland/herbaceous habitat that dominate the ROI; however, specific habitat use within the ROI is dependent upon the quality of habitats (Hagen et al. 2013).

Bald and golden eagles are known to winter around Optima Lake WMA in Texas County, Oklahoma, approximately 7 miles north of the Applicant Proposed Route and 10 miles northeast of the Oklahoma Converter Station Siting Area (ODWC 2014a). Bald eagles are less likely to occur within the ROI in Region 1 due to lack of suitable habitat within the ROI; however, proximity to known winter occurrences at Optima Lake WMA suggests that some occurrence during migration and during winter may occur. In contrast, golden eagles are more likely to occur year-round within the ROI of Region 1, due to suitability of habitat, namely grassland/herbaceous land cover suitable for foraging, and the proximity to both known wintering and nesting occurrences.

3.14.1.5.1.1 AC Collection System

The AC collection system routes are located entirely within Region 1.

No federally listed bat species are known to occur within the ROI for the AC collection system routes.

Of the four federally listed bird species and two federally proposed bird species, three of the birds are known to occur or to have the potential to occur within the ROI in Region 1. The piping plover has two historical nests at Optima Lake in Texas County, Oklahoma (USFWS 2014d). In relation to Optima Lake, the ROI for the AC collection system routes NE-1 and E-1 would be approximately 1.5 miles south and 3.8 miles west, respectively. As described in Section 3.10, the predominant land cover in the ROI for the AC collection system routes is grassland/herbaceous. Piping plovers are unlikely to use the grassland/herbaceous habitat that dominate the ROI of the AC collection system routes for nesting habitat; however, the proximity to Optima Lake and known nesting occurrences in the vicinity of the AC collection system routes suggests that piping plovers may occur in the area during the nesting and breeding session. There are no known stopover locations of whooping crane within the ROI for the AC collection system routes. The nearest known migratory and stopover locations are approximately 2.5 miles from AC Collection System Route E-1. Further, the AC collection system routes are outside the 95 percent corridor of known whooping crane observations

(USFWS 2009d), indicating that whooping cranes are unlikely to occur within the ROI for the AC collection system routes during migration (Figure 3.14-2 in Appendix A). Any whooping cranes that do migrate through the area may use the grassland/herbaceous habitat that dominates the ROI for the AC collection system routes. Further, limited areas of open water and woody wetlands occur along portions of the AC collection system routes (see Section 3.19 for additional discussion). The LEPC occurs within eight of the counties in the ROI for the AC collection system routes, including focal area habitat mapped within AC Collection System Route E-1 in Beaver County, Oklahoma (Kansas Biological Survey 2013; Van Pelt et al. 2013). The LEPC is likely to occur within the grassland/herbaceous habitat that dominates the ROI for the AC collection system routes; however, specific habitat use within the ROI is dependent upon the quality of habitats (Figure 3.14-1 in Appendix A).

The ODWC indicated that bald and golden eagles are known to winter around Optima Lake WMA in Texas County, Oklahoma (ODWC 2014a). The southern edges of the Optima NWR and WMA would be located within the ROI for AC Collection System Route E-1. Bald eagles have a low likelihood of occurring within the AC collection system routes during the breeding season given the lack of suitable habitat within the ROI; however, proximity to known winter occurrences at Optima Lake WMA suggests that some occurrence during migration and during winter may occur. In contrast, golden eagles are more likely to occur year-round within the AC collection system routes given the suitability of the habitat, namely grassland/herbaceous land cover suitable for foraging, and the proximity to both known wintering and nesting occurrences.

3.14.1.5.2 Region 2

The ROI in Region 2 is referred to as the Oklahoma Central Great Plains Region and includes the Applicant Proposed Route and HVDC Alternative Routes 2-A through 2-B.

No federally listed bat species are known to occur within the ROI in Region 2 in Oklahoma.

Of the four federally listed bird species and two federally proposed bird species, three of the birds have known occurrences or potential for occurrences within the ROI. The dominant land cover within the ROI in Region 2 is grassland/herbaceous followed by cropland (i.e., cultivated crops) (see Section 3.10). There are no known stopover locations of whooping crane within the ROI. As discussed above, whooping cranes will use grassland/herbaceous land cover when in proximity to wetlands. Limited wetlands occur within the ROI. Portions of the ROI are within the 95 percent to 75 percent corridor of known whooping crane observations (USFWS 2009c), which suggests that whooping cranes may occur within the ROI during migration even in limited habitats (Figure 3.14-2 in Appendix A). Furthermore, the nearest known migration and stopover location for migratory whooping cranes is approximately 1.8 miles from the Applicant Proposed Route. Interior least terns are known to nest along the Cimarron River, the closest occurrence (1 to 3 miles) of which is located near HVDC Alternative Route 2-A in Major County (Lott 2006, Lott et al. 2013). Although limited suitable nesting habitats for interior least terns occur within the ROI, the known nesting occurrences of interior least terns suggest that the species may occur during migration generally from April through June. The LEPC has the potential to occur within Woodward County within Region 2 (Van Pelt et al. 2013); however, specific habitat use within the ROI is dependent upon the quality of habitats (Figure 3.14-1b in Appendix A) (Hagen et al. 2013).

The ODWC indicates that bald eagles are known to winter around Canton Lake WMA in Blaine County, Oklahoma (ODWC 2014b), which is located approximately 3.5 miles south of the Applicant Proposed Route. Bald eagles are less likely to occur within the ROI in Region 2, given a lack of suitable habitat within the ROI; however, proximity to known winter occurrences at Canton Lake WMA suggests that some occurrence during migration and during winter may occur.

3.14.1.5.3 Region 3

Region 3 is referred to as the Oklahoma Cross Timbers Region and includes the Applicant Proposed Route and HVDC Alternative Routes 3-A through 3-E.

As discussed in Section 3.10, the ROI in Region 3 is more varied than in Regions 1 and 2. It primarily consists of grassland/herbaceous (33.9 percent), deciduous forest (27.7 percent), and pasture/hay (23.4 percent). Because of this increased variation in habitats, the diversity of special status wildlife species increases as well.

The (Biodiversity Information Serving Our Nation) (BISON) database did not contain any occurrences of these listed bat species within the ROI of Region 3. However, gray bats have been documented to occur within Muskogee County, Oklahoma (USFWS 2014d). Gray bats are limited in occurrence to cave and karst features within Region 3.

Of the four federally listed bird species and two federally proposed bird species, four of the birds have known occurrences or potential for occurrences within the ROI. The Sprague's pipit has been documented in Payne County, Oklahoma; however, the exact location of the documented occurrence is not provided by the USFWS (USFWS 2014d). Sprague's pipit is a grassland species, and occurrences are likely to be limited to portions of the ROI with the highest percentage of grasslands. The piping plover has been documented in numerous counties in the ROI (USFWS 2014d). However, piping plovers are limited to open areas, sparsely vegetated sand or gravel beaches adjacent to alkali wetlands, and on beaches, sand bars, and dredged material islands of major river systems. Within Region 3, these areas are limited to the Canadian and Cimarron rivers (see Section 3.20). The western edge of the ROI in Region 3 is within the 75 percent to 95 percent corridor of known whooping crane observations (USFWS 2009d) (Figure 3.14-2 in Appendix A). However, the nearest known migration or stopover observation is approximately 2.3 miles from the HVDC Alternative Route 3-A. As discussed above, whooping cranes will use grassland/herbaceous land cover when wetlands are nearby. Limited grassland/herbaceous land cover or wetlands occur within the ROI, suggesting that although no stopover locations were documented within the ROI, there is the potential for whooping crane to occur. Interior least terns have been documented along the Cimarron River within 1 to 2 miles of the proposed HVDC transmission line in Payne County, Oklahoma; and along the Arkansas River (within 3 to 4 miles), in Muskogee County, Oklahoma (Lott 2006, Lott et al. 2013). Although limited suitable nesting habitats for interior least terns occur within the ROI, the known nesting occurrences of interior least terns suggest that the species may occur during migration, which generally occurs from April through June.

The American burying beetle has the potential to occur in the ROI (USFWS 2014d). However, based on habitat characteristics considered unfavorable for the American burying beetle (USFWS 2014e), the American burying beetle is expected to most likely occur within undisturbed native vegetation types within the ROI (Section 3.17.5.3). It is most likely to occur within deciduous and coniferous forests and also possibly native grasslands, but not in cultivated, maintained pasture or grassland, or developed areas (USFWS 2014e).

Bald eagles are likely to occur within the ROI given the proximity to suitable habitat, specifically habitat along the Arkansas River, suggesting that some occurrence during migration and during winter may occur. The Tulsa Audubon Society has numerous documented occurrences of bald eagles at Greenleaf State Park, which is located approximately 3 miles north of the Applicant Proposed Route in Muskogee County, Oklahoma (Tulsa Audubon Society 2009).

3.14.1.5.4 Region 4

Region 4 is referred to as the Arkansas River Valley Region and includes the Applicant Proposed Route, including the Lee Creek Variation, and HVDC Alternative Routes 4-A through 4-E.

Publically available USFWS information shows documented occurrences of the four protected bat species in Region 4 (USFWS 2014d). All four bat species potentially occur at the Ozark Plateau NWR, which is located approximately 15.5 miles north of the Applicant Proposed Route. In addition, portions of the Area of Potential Bat Caves, as indicated by the USFWS (2014d), overlap portions of the ROI in Region 4 in Sequoyah County, Oklahoma. Rosson Hollow Crevices, a known hibernacula of Indiana bats, is located in Franklin County, Arkansas; however, the exact location of the entrance of the hibernacula is protected by the USFWS (USFWS 2007a). Protected bats may use suitable cave and karst features located within Region 4 ROI during winter hibernation. During the spring and summer, protected bats may use suitable deciduous and evergreen forest that can be found throughout the Region (see Section 3.10). Evergreen forests are predominantly found along the eastern portions of the Region. The BISON database did not contain any documented occurrences of these listed bat species within the ROI of Region 4 (USGS 2014). However, the Indiana bat and northern long-eared bat could occupy forested areas of the ROI that contain suitable maternity roost trees.

Of the four federally listed bird species and two federally proposed bird species, three of the birds have known occurrences or potential for occurrences within the ROI in Region 4. The Sprague's pipit has been documented in Franklin County, Arkansas; however, exact location of the occurrence in Franklin County is not provided by the USFWS. Sprague's pipit is a grassland species, and occurrences are likely to be limited because grasslands comprise a relatively small proportion of the ROI in Region 4. Interior least terns and piping plovers have been documented within three counties in the ROI in Region 4 in Arkansas (Lott 2006; USFWS 2014a; Lott et al. 2013). Interior least terns and piping plovers are likely to use suitable habitat along the Arkansas River, which would be crossed by the Applicant Proposed Route (USFWS 2014d). Although limited suitable nesting habitats for interior least terns and piping plover occur within the ROI, which is dominated by pasture/hay land cover, the known nesting occurrences of interior least terns and piping plover suggest that the species may occur during migration, which generally occurs from April to June.

The American burying beetle has the potential for occurrence along the ROI (USFWS 2014d). However, based on habitat characteristics considered unfavorable for the American burying beetle (USFWS 2014e), the American burying beetle is expected to most likely occur within undisturbed, native vegetation types within the ROI (Section 3.17.5.4) such as deciduous and coniferous forests and also possibly native grasslands, but not in cultivated, maintained pasture or grassland, or developed areas (USFWS 2014e).

There are documented occurrences of bald eagles along the Arkansas River in Sequoyah County, Oklahoma (Lish and Sherrod 1986). Bald eagles are likely to occur within the ROI in Region 4, due to the proximity of suitable habitat, specifically habitat along the Arkansas River and at Lake Dardanelle, suggesting that some occurrence during migration and during winter may occur. Furthermore, Lake Dardanelle (which is located approximately 6 to 10 miles south of Alternative Route 4-E and 7 to 14 miles south of the Applicant Proposed Route in Johnson and Pope counties, Arkansas) has documented high wintering concentrations of bald eagles (ANHC 2013). In contrast, golden eagles are not likely to occur within the ROI of Region 4 given a lack of suitable habitat, namely grassland/herbaceous land cover suitable for foraging. Although the OBS (2013, as cited in USFWS 2014d) has a documented occurrence of golden eagle in Sequoyah County, Oklahoma, the observation is limited and suggests that golden eagle occurrence may be limited to migration within the region.

3.14.1.5.5 Region 5

Region 5 is referred to as the Central Arkansas Region and includes the Applicant Proposed Route and HVDC Alternative Routes 5-A through 5-F.

All four protected bat species have documented occurrences in Region 5 based on publically available information on known occurrence from the USFWS (2014d). There are documented occurrences of northern long-eared bats, Ozark big-eared bats, gray bat, and Indiana bat occur in Pope County (USFWS 2014d). A hibernaculum for gray bat is documented in Pope County, which is located south-southwest of the proposed HVDC transmission line, as well as Independence County which is located north of the proposed HVDC transmission line (Martin 2007). Protected bats may use suitable cave and karst features located within Region 5 ROI during winter hibernation. During the spring and summer, protected bats may use suitable deciduous and evergreen forest that can be found throughout the Region. Evergreen forests are predominantly found along the eastern portions of the Region. No studies to document the occurrence of protected bat species within the ROI in Region 5 have been completed; however, the BISON database did contain two occurrences of gray bats within the ROI of Region 5.

Conway County has historical occurrences of Florida panther (USFWS 2014d); however, as discussed above, the Florida panther is currently considered extirpated in Arkansas.

Of the four federally listed bird species and two federally proposed bird species, two of the birds have known occurrences or potential for occurrences within the ROI in Region 5. Interior least terns and piping plovers have been documented within three counties in Region 5 in Arkansas. Interior least terns and piping plovers are likely to use suitable habitat along the Arkansas River located approximately 7 miles south from the Applicant Proposed Route at its nearest point (Lott 2006; Lott et al. 2013; USFWS 2014d). Although limited suitable nesting habitats for interior least terns occur within the ROI, which is dominated by deciduous forest and pasture/hay land cover, the known nesting occurrences of interior least terns suggest that the species may occur during migration, which generally occurs from April through June.

Bald eagles are likely to occur within the ROI in Region 5 given the proximity to suitable habitat, specifically habitat at Greers Ferry Lake, suggesting that some occurrence during migration and during winter may occur. Greers Ferry Lake (which is located approximately 6 to 10 miles north of the Applicant Proposed Route in Van Buren and Cleburne County, Arkansas) has documented high wintering concentrations of bald eagles (ANHC 2013). Bald eagles may migrate through the ROI for the HVDC transmission line routes to reach the Arkansas River approximately 10 to 18 miles to the south in Pope and Conway County.

3.14.1.5.6 Region 6

Region 6 is referred to as the Cache River and Crowley's Ridge Region and includes the Applicant Proposed Route and HVDC Alternative Routes 6-A through 6-D.

Of the four protected bat species, the northern long-eared bat, gray bat, and Indiana bat have may occur in Jackson County, Arkansas, in Region 6 based on publically available information on known occurrence from the USFWS (USFWS 2014d, 2014a). Protected bats are limited in occurrence to cave and karst features (see Section 3.6) within Region 6 during winter hibernation; however, occurrence during the spring through fall is likely to be limited given a lack of suitable foraging and roosting habitat. Region 6 is dominated by croplands, and little to no forested habitat occurs within the ROI except for about 3 miles that crosses Crowley's Ridge. No studies to document the occurrence of protected bat species within the ROI in Region 6 have been completed, and the BISON database did not contain any documented occurrences of these listed bat species within the ROI of Region 6 (USGS 2014).

Of the four federally listed bird species and two federally proposed bird species, two have known occurrences or potential for occurrences in the Region 6 ROI. Piping plovers have documented occurrences in Jackson County, Arkansas based on publically available information on known occurrences from the USFWS (2014a). Interior least terns and piping plovers have been documented within Cross and Crittenden counties in the ROI in Region 6 in Arkansas based on publically available information from the USFWS and published scientific studies (Lott 2006; Lott et al. 2013; USFWS 2014a). Piping plovers are limited to open sparsely vegetated sand or gravel beaches adjacent to alkali wetlands, and on beaches, sand bars, and dredged material islands of major river systems that do not occur in Region 6. Neither the piping plovers nor interior least terns are likely to use the croplands habitat that dominates Region 6 for nesting habitat. The Mississippi River is about 25 miles east of Region 6 where known nesting occurs and both piping plovers and interior least terns may occasionally occur in Region 6 during the nesting and breeding session.

Bald eagles have been documented throughout Region 6 in Jackson, Poinsett, Cross and Crittenden counties, Arkansas (ANHC 2013), and the Mississippi River in Region 7 is known to have a high wintering concentration of bald eagles. However, the ANHC (2013) does not indicate whether bald eagles are known to occur within the ROI in Region 6, rather the occurrences are provided on a county-level. Nevertheless, the available evidence indicates that bald eagles are likely to occasionally occur within the ROI in Region 6 because of nearby suitable habitat and known winter concentrations, specifically habitat along the Mississippi River, suggesting that some occurrence during migration and during winter may occur.

3.14.1.5.7 Region 7

Region 7 is referred to as the Arkansas Mississippi River Delta and Tennessee Region and includes the Applicant Proposed Route and HVDC Alternative Routes 7-A through 7-D.

Of the four protected bat species, the northern long-eared bat and Indiana bat potentially occur in Region 7 (USFWS 2014d, 2014a) based on publically available information on known occurrence from the USFWS. Protected bats are limited in occurrence to cave and karst features (see Section 3.6) within Region 7 during winter hibernation; however, occurrence during the spring through fall is likely to be limited given a lack of suitable foraging and roosting habitat. Region 7 is dominated by croplands, and little forested habitat, except in the vicinity of the Mississippi River, occurs within the ROI. The BISON database did not contain any documented occurrences of these listed bat species within the ROI of Region 7 (USGS 2014). However, forested areas in Tipton County, Tennessee, and bottomland forest in Mississippi County in Arkansas could potentially contain maternity roost habitat for the northern long-eared bat and Indiana bat.

Of the four federally listed bird species and two federally proposed bird species, two of the birds have known occurrences or potential for occurrences within in the ROI in Region 7. Interior least terns nest along the Mississippi River in Region 7 (TDEC 2014; Lott et al. 2013), and have been documented in Crittenden and Mississippi counties in Arkansas and Tipton and Shelby counties in Tennessee (Lott 2006). Interior least terns are unlikely to use the croplands habitat that dominates Region 7 for nesting habitat; however, the Mississippi River provides known nesting habitat in the ROI of the proposed HVDC transmission line (Lott et al. 2013). Piping plovers could potentially use sandbars and sparsely vegetated shore habitats along the Mississippi River and have been documented in Mississippi County in Arkansas.

Bald eagles are likely to occur within the ROI in Region 7 given the proximity of suitable habitat and known winter concentrations along the Mississippi River.

3.14.1.6 Connected Actions

3.14.1.6.1 Wind Energy Generation

Wind energy generation would likely occur within wind development zones (WDZs). The potential WDZs are identified in Section 3.1.1 and occur in the Oklahoma and Texas panhandles within a 40-mile radius of the Oklahoma converter station. The special status wildlife species that could potentially occur in the WDZs include Sprague's pipit, red knot, golden eagle, LEPC, and whooping crane. Within all of the WDZs there is a lack of suitable riverine habitat for piping plovers and the interior least tern and both species are unlikely to occur in the WDZs; however, there is the potential for piping plover and interior least tern to occur within the WDZs during migration, which generally occurs from April to June. Sprague's pipit could occur but is uncommon and likely migrates through the area. The red knot is a rare migrant and is unlikely to occur in the WDZs. The golden eagle is a wide-ranging species and could occur throughout the region, but would most likely occur in areas with native grasslands and shrub lands that support small mammal prey species. The LEPC is a resident species in the vicinity of the WDZs. Although LEPC will occasionally use developed or disturbed areas such as oil well pads, roads, and croplands for lek sites because they provide open visible areas for courtship displays, LEPC require large contiguous blocks of grassland or shrub/grasslands. Areas that contain 30% or more of cropland typically do not provide adequate habitat to sustain populations of LEPC (see Section 3.14.1.4.2.3). Croplands are predominant throughout the region of the WDZs, which would limit potential habitat for LEPC. Individual or small groups of whooping cranes could possibly migrate through the WDZs even though the WDZs are west of the primary migration corridor. Suitable whooping crane roosting habitats (i.e., semi-permanent shallow wetlands or open, sandy riverine habitat) have limited acreage in the region of the WDZs. However, whooping cranes will use any available habitat such as croplands if forced to descend unexpectedly during migration by inclement weather. Wetland areas that may potentially be used by special status wildlife species are described in more detail in Section 3.19. The dominant land cover for each WDZ is described in Section 3.10.

3.14.1.6.1.1 WDZ-A

The dominant land cover in WDZ-A is croplands. Other land cover types potentially used by special status wildlife species include grassland/herbaceous, and shrub/scrub. LEPC and whooping crane may use the croplands that are predominant within WDZ-A; however, whooping crane occurrence within WDZ-A is likely to be limited to migratory and stopover occurrences (e.g., Optima Lake). LEPC occurrence within WDZ-A is likely to be limited to more suitable grassland/herbaceous and shrub/scrub cover types that occur in limited areas of WDZ-A.

3.14.1.6.1.2 WDZ-B

The dominant land cover in WDZ-B is croplands. Other land cover types potentially used by special status wildlife species include grassland/herbaceous, and shrub/scrub. LEPC and whooping crane may use the croplands that are predominant within the WDZ-B; however, whooping crane occurrence within the WDZ-B is likely to be limited to migratory and stopover occurrences while LEPC occurrence within WDZ-B is likely to be limited based on lack of more suitable grassland/herbaceous and shrub/scrub habitats.

3.14.1.6.1.3 WDZ-C

The dominant land cover in WDZ-C is grassland/herbaceous. Other land cover types potentially used by special status wildlife species include croplands (primarily center-pivot irrigated with some dryland areas), and shrub/scrub. LEPC and whooping crane may use the grassland/herbaceous land cover that is predominant within WDZ-C; however, whooping crane occurrence within WDZ-C is likely to be limited to migratory and stopover occurrences. Occurrence of the LEPC is most likely in native grasslands.

3.14.1.6.1.4 WDZ-D

The dominant land cover in WDZ-D is grassland/herbaceous. Other land cover types potentially used by special status wildlife species include croplands (primarily center-pivot irrigated with some dryland areas), and shrub/scrub. LEPC and whooping crane may use the grassland/herbaceous land cover that is predominant within WDZ-D; however, whooping crane occurrence within WDZ-D is likely to be limited to migratory and stopover occurrences.

3.14.1.6.1.5 WDZ-E

The dominant land cover in WDZ-E is croplands (primarily center-pivot irrigated with some dryland areas). Other land cover types potentially used by special status wildlife species include grassland/herbaceous, and shrub/scrub. LEPC and whooping crane may use the croplands that are predominant within WDZ-E; however, whooping crane occurrence within WDZ-E is likely to be limited to migratory and stopover occurrences while LEPC occurrence within WDZ-E is likely to be limited due to lack of suitable grassland/herbaceous and shrub/scrub habitats.

3.14.1.6.1.6 WDZ-F

The dominant land cover in WDZ-F is grassland/herbaceous. Other land cover types potentially used by special status wildlife species include croplands (primarily center-pivot irrigated with some dryland areas), and shrub/scrub. LEPC and whooping crane may use the grassland/herbaceous that is predominant within WDZ-F; however, whooping crane occurrence within WDZ-F is likely to be limited to migratory and stopover occurrences.

3.14.1.6.1.7 WDZ-G

The dominant land cover in the WDZ-G is grassland/herbaceous. Other land cover types potentially used by special status wildlife species include croplands (primarily center-pivot irrigated with some dryland areas), and shrub/scrub. LEPC and whooping crane may use the grassland/herbaceous that is predominant within WDZ-G; however, whooping crane occurrence within WDZ-G is likely to be limited to migratory and stopover occurrences.

3.14.1.6.1.8 WDZ-H

The dominant land cover in WDZ-H is grassland/herbaceous. Other land cover types potentially used by special status wildlife species include croplands (primarily center-pivot irrigated with some dryland areas), and shrub/scrub.

LEPC and whooping crane may use the grassland/herbaceous that is predominant within WDZ-H; however, whooping crane occurrence within WDZ-H is likely to be limited to migratory and stopover occurrences.

3.14.1.6.1.9 WDZ-I

The dominant land cover in WDZ-I is croplands (primarily center-pivot irrigated with some dryland areas). Other land cover types potentially used by special status wildlife species include grassland/herbaceous, and shrub/scrub. LEPC and whooping crane may use the croplands that are predominant within the WDZ-I; however, whooping crane occurrence within WDZ-I is likely to be limited to migratory and stopover occurrences while LEPC occurrence within WDZ-I is likely to be limited due to lack of suitable grassland/herbaceous and shrub/scrub habitats.

3.14.1.6.1.10 WDZ-J

The dominant land cover in the WDZ-J is grassland/herbaceous. Other land cover types potentially used by special status wildlife species include croplands (primarily center-pivot irrigated with some dryland areas), and shrub/scrub. LEPC and whooping crane may use the grassland/herbaceous that is predominant within the WDZ-J; however, whooping crane occurrence within WDZ-J is likely to be limited to migratory and stopover occurrences. Because WDZ-J contains a higher proportion of grassland/herbaceous cover and is located adjacent to CHAT-1 LEPC habitat, LEPC may occur in greater abundance in this WDZ.

3.14.1.6.1.11 WDZ-K

The dominant land cover in the WDZ-K is croplands (primarily center-pivot irrigated with some dryland areas). Other land cover types potentially used by special status wildlife species include grassland/herbaceous, and shrub/scrub. LEPC and whooping crane may use the croplands that are predominant within WDZ-K; however, whooping crane occurrence within WDZ-K is likely to be limited to migratory and stopover occurrences. LEPC may have a higher probability of occurrence within WDZ-K in suitable grassland/herbaceous and shrub/scrub habitats because of the closer proximity of quality habitat (CHAT-1) to the east.

3.14.1.6.1.12 WDZ-L

The dominant land cover in the WDZ-L is croplands (primarily center-pivot irrigated with some dryland areas). Other land cover types potentially used by special status wildlife species include grassland/herbaceous, and shrub/scrub. LEPC and whooping crane may use the croplands that are predominant within WDZ-L; however, whooping crane occurrence within WDZ-L is likely to be limited to migratory and stopover occurrences. LEPC occurrence within WDZ-L is most likely on the east end of the WDZ near more suitable grassland/herbaceous and shrub/scrub habitats.

3.14.1.6.2 Optima Substation

The future Optima Substation would be constructed within a 160-acre site that is mostly grassland/herbaceous, with smaller areas of shrub/scrub and developed open space. The limited available potentially suitable habitat for piping plover, interior least tern, or bald eagle in the area suggests that none of these species are likely to occur within the future Optima Substation site. However, LEPC and whooping crane may use the grassland/herbaceous habitats that occur in the vicinity of the Optima Substation site. Whooping crane occurrence is likely to be limited to migratory and stopover occurrences. The future Optima Substation site is located west of the primary whooping crane migratory corridor in Oklahoma; however, some whooping cranes will migrate across the Oklahoma panhandle where the Substation may be located. The substation site is located west of areas mapped as high conservation priority habitat for the LEPC; however, existing roads, power poles, and croplands adjacent to the Optima Substation site decrease the potential quality of the habitat for LEPC. Golden eagles likely occur in the region, but no suitable nesting habitat occurs in the vicinity of the future Optima Substation.

3.14.1.6.3 TVA Upgrades

A ROI has not been identified for the TVA upgrades. Where possible, general impacts to special status terrestrial wildlife species that could occur from the required TVA upgrades are discussed in the impact sections that follow.

3.14.1.7 Impacts to Special Status Terrestrial Wildlife Species

3.14.1.7.1 Methodology

Within the ROI, Project activities were assessed that could potentially impact special status wildlife species and their habitats. Special status wildlife species and their habitats evaluated include species known to occur or to have the potential to occur within the ROI and are federally protected or proposed for federal protection under the ESA and state protected species. Potential impacts on special status wildlife resources and their habitats include the following and are discussed for each phase of the Project:

- Potential impacts from temporary or long-term displacement of special status wildlife species
- Fragmentation of special status wildlife habitat
- Potential disturbance to known populations and/or suitable habitat for species designated as candidate, threatened or endangered under the ESA
- Potential for avian collisions and/or electrocution

Species were considered at risk of experiencing these impacts if their range overlapped with the ROI and suitable habitat for the species occurred within the ROI.

The AC collection system consists of thirteen 2-mile-wide routes in Oklahoma (Beaver, Cimarron, and Texas counties) and Texas (Hansford, Ochiltree, and Sherman counties) within which an AC collection system transmission line could be sited and would connect wind energy facilities to the Project.

The Applicant has developed EPMs that would be implemented during design/engineering, construction, and operations and maintenance. The complete list of EPMs is provided in Appendix F. Implementation of these EPMs is assumed throughout the impact analysis that follows for the Project. During the initial construction phase of the Project, both general EPMs and those specific to wildlife resources would be implemented to avoid or minimize impacts to wildlife resources as described below.

General EPMs for the Project that relate to wildlife resources include the following:

- GE-1: Clean Line will train personnel on health, safety, and environmental matters. Training will include practices, techniques, and protocols required by federal and state regulations and applicable permits.
- GE-2: Clean Line will design, construct, maintain, and operate the Project following current Avian and Power Line Interaction Committee guidelines to minimize risk of avian mortality.
- GE-3: Clean Line will minimize clearing vegetation within the ROW, consistent with a Transmission Vegetation Management Plan filed with NERC, and applicable federal, state, and local regulations.
- GE-4: Vegetation removed during clearing will be disposed of according to federal, state, and local regulations.

- GE-5: Any herbicides used during construction and operations and maintenance will be applied according to label instructions and any federal, state, and local regulations.
- GE-6: Clean Line will restrict vehicular travel to the ROW and other established areas within the construction, access, or maintenance easement(s).
- GE-7: Roads not otherwise needed for maintenance and operations will be restored to preconstruction conditions. Restoration practices may include decompacting, recontouring, and re-seeding. Roads needed for maintenance and operations will be retained.
- GE-9: Clean Line will avoid and/or minimize damage to drainage features and other improvements such as ditches, culverts, levees, tiles, and terraces; however, if these features or improvements are inadvertently damaged, they will be repaired and or restored.
- GE-13: Emergency and spill response equipment will be kept on hand during construction.
- GE-14: Clean Line will restrict the refueling and maintenance of vehicles and the storage of fuels and hazardous chemicals within at least 100 feet from wetlands, surface waterbodies, and groundwater wells, or as otherwise required by federal, state, or local regulations.
- GE-20: Clean Line will conduct construction and scheduled maintenance activities on the facilities during daylight hours, except in rare circumstances that may include, for example, emergency or unsafe situations, to avoid adverse environmental effects, to minimize traffic disruptions, or to comply with regulatory or permit requirements.
- GE-21: Clean Line will maintain construction equipment in good working order. Equipment and vehicles that show excessive emissions of exhaust gasses and particulates due to poor engine adjustments or other inefficient operating conditions will be repaired or adjusted.
- GE-22: Clean Line will impose speed limits during construction for access roads (e.g., to reduce dust emissions, for safety reasons, and for protection of wildlife).
- GE-28: Hazardous materials and chemicals will be transported, stored, and disposed of according to federal, state, or local regulations or permit requirements.
- GE-30: Clean Line will minimize the amount of time that any excavations remain open.

Fish, vegetation, and wildlife specific EPMs for the Project that relate to wildlife resources include the following:

- FVW-1: Clean Line will identify environmentally sensitive vegetation (e.g., wetlands, protected plant species, riparian areas, and large contiguous tracts of native prairie) and avoid and/or minimize impacts to these areas.
- FVW-2: Clean Line will identify and implement measures to control and minimize the spread of non-native invasive species and noxious weeds.
- FVW-3: Clean Line will clearly demarcate boundaries of environmentally sensitive areas during construction to increase visibility to construction crews.
- FVW-4: If construction- and/or decommissioning-related activities occur during the migratory bird breeding season, Clean Line will work with USFWS to identify migratory species of concern and conduct pre-construction surveys for active nests for such species. Clean Line will consult with USFWS and/or other resource agencies for guidance on seasonal and/or spatial restrictions designed to avoid and/or minimize adverse effects.
- FVW-5: If construction occurs during important time periods (e.g., breeding, migration, etc.) or at close distances to environmentally sensitive areas with vegetation, wildlife, or aquatic resources, Clean Line will consult with USFWS and/or other resource agencies for guidance on seasonal and/or spatial restrictions designed to avoid and/or minimize adverse effects.

Additional site-specific EPMs may be developed as part of the ongoing consultation process between the Applicant and the federal and state agencies.

The following plans will be developed and implemented by the Applicant to avoid or minimize impacts:

- Blasting Plan: This plan will describe measures designed to minimize adverse effects due to blasting.
- Restoration Plan: This plan will describe post-construction activities to reclaim disturbed areas.
- Spill Prevention, Control and Countermeasures (SPCC) Plan: This plan will describe the measures designed to prevent, control, and clean up spills of hazardous materials.
- Storm Water Pollution Prevention Plan (SWPPP): This plan, consistent with federal and state regulations, will describe the practices, measures, and monitoring programs to control sedimentation, erosion, and runoff from disturbed areas.
- Transmission Vegetation Management Plan (TVMP): This plan, to be filed with the NERC, will describe how the Applicant will conduct work on its ROW to prevent outages due to vegetation.
- Avian Protection Plan (APP): This plan, consistent with Avian Power Line Interaction Committee (APLIC) guidelines, will describe a program of specific and comprehensive actions that, when implemented, reduce risk of avian mortality.

3.14.1.7.2 Impacts Associated with the Applicant Proposed Project

This section identifies the potential impacts on special status wildlife and their habitat based on three phases of the Project: (1) construction, (2) operations and maintenance, and (3) decommissioning. The Applicant would conduct each phase in compliance with applicable state and federal laws, regulations, and permits related to environmental protection. EPMs would be implemented as described in Section 3.14.1.7.1 to avoid or minimize impacts to special status wildlife. In addition, consultation with USFWS has been initiated pursuant to Section 7 of the ESA regarding the potential effects of the Project on listed species and any designated critical habitat. This consultation review is a parallel, but separate analysis conducted pursuant to the requirements of Section 7 of the ESA and the applicable implementing regulations. Through the consultation process, additional protection measures may be identified to avoid and/or minimize the impacts of the Project upon listed species and any designated critical habitat.

3.14.1.7.2.1 Construction Impacts

Mortality and Injury

Mortality, by definition, is a direct, permanent impact to an individual (i.e., the individual no-longer exists); however, the effect of an individual mortality on the larger population could vary depending on the dynamics and characteristics of the population. Smaller populations and those species with a low fecundity rate may be sensitive to individual mortalities (e.g., mortality of an individual whooping crane could have future impacts to population viability due to current low population size and a low reproductive rate). Species with larger populations or that have higher fecundity rates can more easily recover from mortalities of individuals. In general, many small mammals, small birds, and amphibians typically have higher average fecundity rates and are less sensitive to mortality. Bats are an exception because they typically bear only a single litter per year, produce one young at a time, and do not breed until their second year (Nagorsen and Brigham 1993). Large birds (e.g., raptors) typically have lower fecundity rates because of small clutch size and delayed sexual maturity. Populations of special status wildlife species may be more susceptible to mortalities because of low population size and lower average fecundity rates.

Construction of the Project could result in the direct mortality or injury of special status wildlife species. Of the construction activities, vegetation clearing and work site preparation would pose the greatest risk of mortality and injury. Most of the special status wildlife species are relatively mobile (i.e., birds and bats) and could avoid construction activities by moving to other areas. Sedentary species (e.g., American burying beetle, juvenile bats, and fledgling birds) would be most at risk for mortality because they are unable to move away from the disturbed area. Mortalities/injuries could be minimized by timing the construction activities to avoid sensitive periods (e.g., the breeding seasons) (see EPM FVW-5); however, some mortality events would occur even with the implementation of seasonal and spatial restriction. Other activities that could cause mortality or injury of special status wildlife species include exposure to hazardous materials (e.g., accidental spills and pesticides) (see Table 3.8-4). The Applicant would implement EMPs GE-1, GE-5, GE-13, GE-21, and GE-28, as well as the measures that would be outlined in the required SPCCP and SWPPP to minimize these risks.

Disturbance

A disturbance response is a behavioral response by wildlife species to a perturbation. The perturbation could be presence of human activity, noise, vibration, or other external stimulus that is sensed by wildlife species. Disturbance impacts could include physiological stress, habitat displacement, increase vulnerability to predation, and disruption of life history functions such foraging, breeding (e.g., leks), and parental care (e.g., nesting). Disturbance impacts from construction are expected to be relatively short term (e.g., limited to the construction phase), but they could last more than a year if disturbances cause reproductive failures (e.g., nest or breeding territory abandonment). Options that may be used to avoid or minimize disturbance impacts include adjusting construction schedules and the location of construction staging areas to avoid sensitive areas that are known or identified as breeding, nesting or roosting sites for special status species.

Habitat Loss and Modification

Special status wildlife species could also be impacted through either loss or modification of habitat. Habitat loss is often a major factor contributing to wildlife species being protected as either state or federal special status species. Loss of wildlife habitat could occur directly through clearing of vegetation or disturbance of non-vegetation habitats (e.g., caves, cliffs, rock outcrops) during construction. Habitat modification such as fragmentation (i.e., the breaking up of contiguous areas of vegetation/habitat into smaller patches) can reduce habitat quality and decrease species survival and reproduction. Some wildlife species require contiguous habitat of certain size and connectivity to carry out life history functions such as foraging, protective cover, breeding, parental care, and dispersal of young to adjacent suitable habitat. Habitat disturbances such as access roads could divide contiguous habitats into smaller patches that may be of lower quality or inadequate in size for some species. In addition, habitat modification includes altering the vegetation structure such as tree or shrub removal or application of herbicides. Although vegetation would remain on an area, the vegetation structure and wildlife habitat could be different and may no longer provide acceptable habitat components required by a particular species. Habitats can also be modified through the unintentional introduction or facilitation of the spread of invasive species that can alter the quality of the habitat or fire regimes (e.g., increase fire frequency). Clearing of vegetation and disturbance to soils could promote the spread and or establishment of invasive plant species. The Applicant would implement EPM FVW-2 to minimize the risk of spreading or creating new infestations of invasive plant species. Section 3.17 discusses in more detail the potential effects of invasive plants species as well as the measures that would be taken to minimize the risk of these effects.

3.14.1.7.2.2 Operations and Maintenance Impacts

Mortality and Injury

It is assumed that during the operations and maintenance phase of the Project that land disturbances and vegetation clearing would not occur as it would have during construction and these disturbances would not be a potential source of mortality and injury to special status wildlife. Some vegetation trimming would occur within the transmission line ROW to prevent regrowth of trees that could interfere with the conductors. Vegetation maintenance is not likely to be a source of mortality to special status wildlife species (e.g., bats) as large suitable roost trees for bats would not be present in the ROW during operations. American burying beetles could possibly be at risk during vegetation maintenance activities but impacts could be reduced if vehicle access was restricted to existing roads. Project structures (i.e., transmission lines and structures) present during operations and maintenance could pose a mortality and injury risk to special status avian species during migration and foraging. A variety of factors influence the rate of avian collisions with powerlines or other anthropogenic structures, including: configuration and location of powerlines; the tendency of specific species to collide with structures; and environmental factors such as weather, topography, and habitat (APLIC and USFWS 2005). Powerline placement with respect to other structures and topography can influence the collision rate of avian species. Because of sensory abilities unique to birds, birds may be susceptible to human structures not part of their normal environment (Martin 2014). Collisions usually occur near water or migration corridors, and occur more often during inclement weather. Less agile birds, such as large-bodied birds or birds that travel in flocks, are more likely to collide with overhead lines because they lack the ability to quickly negotiate obstacles. Among the avian special status species, the whooping crane, golden eagle, and bald eagle are the most likely species to be susceptible to collision because they are large birds with a wide wingspan (79 to 87 inches) and are less maneuverable than smaller species. The interior least tern is a small and agile flyer with a wingspan of about 20 inches that can readily avoid powerlines if they are visible (Dinan et al. 2012). Data regarding collision risk for the interior least terns are inconclusive; some studies report higher risk compared to other species (McNeil et al 1985) and other studies reporting a low risk for collisions (Henderson et al. 1996; Savereno et al. 1996, Dinan et al. 2012). The potential risk of piping plover, red knot, and Sprague's pipit colliding with structures is uncertain; however, it is likely low compared to other avian species as these species are not amongst those that are typically reported to collide with structures and are smaller bodied species that are more maneuverable. The LEPC is a ground-dwelling bird that flies low in short flights and is at lower risk for collisions with powerlines but higher risk for collisions with fences (Wolfe et al. 2007).

Avian species are also susceptible to electrocutions by powerlines. For a bird to become electrocuted it needs to come into contact with two energized conductors at the same time. As a result, multiple factors influence the risk of avian electrocutions including: the spacing between energized conductors, the tendency of a species to perch along powerlines or fly near conductors, as well as the avian species body-size and wing-length. Raptors (including eagles) have the highest probability of becoming electrocuted because these taxa will commonly perch along transmission lines and they have relatively large-bodies and wingspans compared to other taxa of birds. As described in Appendix F, the spacing for the conductors as currently proposed would minimize the risk of avian species coming into contact with two energized conductors and/or becoming electrocuted. To further minimize the risk of avian electrocutions, the Applicant would develop and implement an APP (as described in Section 3.20) consistent with APLIC guidelines.

During ROW maintenance, use of herbicides to manage vegetation and possibly control weeds and invasive species could pose a mortality risk to special status wildlife species; however, many herbicides are non-toxic to animals and use of these chemicals could be an option. Smaller, less mobile species such as the American burying beetle or juvenile individuals would be more susceptible.

Disturbance

Maintenance and repair work on the transmission system (i.e., structures and lines) would require access along the ROW. Because this activity would be periodic and short-term, disturbance impacts to special status wildlife species are not expected to be substantial unless the maintenance or repair work occurs during particular seasons when activities such as breeding (e.g., leks), nesting (e.g., eagles), roosting sites (e.g., bats, eagles, whooping cranes), and hibernation (i.e., bats) could be disrupted.

Habitat Loss and Modification

Impacts such as habitat loss and modification from construction would remain during operations and maintenance unless particular land disturbances were no longer needed and vegetation was restored. It is assumed that additional habitat loss from land clearing would not occur during the operations and maintenance phase of the Project (i.e., additional areas beyond those impacted during construction would not be directly affected during operations and maintenance). However, additional habitat loss could occur indirectly through habitat displacement (behavioral response). Some wildlife species avoid areas near human activities or structures even though the habitat has not been physically disturbed or altered. For example, transmission lines and structures may impact this species use of otherwise suitable habitats due to increased predation rates that can result from avian predators perching and roosting along the structures and line (USFWS 2014d). Recent research also suggests that avoidance of transmission lines may be linked to ultraviolet (UV) discharges on powerlines and the ability of birds and mammals to detect UV light (Tyler et al. 2014).

Both physical habitat disturbances from access roads and habitat loss from behavioral avoidance could contribute to fragmentation of habitat for particular special status wildlife species. Some species such as the LEPC require large contiguous areas of undisturbed habitat. Physical disturbances and presence of vertical structure could divide habitat into smaller blocks of habitat that could be less preferred or become unsuitable.

Land disturbances during construction could provide an opportunity for weed species and invasive plant species to become established along the ROW and possibly spread into adjacent areas. Section 3.17 discusses the potential effects of invasive plant species on native habitats as well as measures that could be taken to minimize this risk. The effects of invasive plant species on native habitats could occur slowly or rapidly depending on the invasive plant species involved. In some cases, invasive species may alter the natural fire regime, making an area more susceptible to fire and thereby changing the composition of the vegetation community.

3.14.1.7.2.3 Decommissioning Impacts

Decommissioning of the Project would involve methods similar to those that would be required to construct the Project. As a result, the impacts of decommissioning would be similar to those previously described for construction. The Applicant would follow the same general and resource-specific EPMs during decommissioning that would be implemented during construction. In addition, the Applicant would develop a Decommissioning Plan prior to any decommissioning actions for review and approval by the appropriate state and federal agencies.

Although decommissioning would have short-term adverse impacts to wildlife (similar to what was discussed for construction related impacts), it is assumed that decommissioning of the Project would have long-term beneficial impacts to wildlife species and their habitats, because it would remove the Project and its related impacts from the environment.

3.14.1.7.2.4 Converter Stations and AC Interconnection Siting Areas

A detailed description of the converter stations and other terminal facilities is provided in Section 2.1.2.1.

3.14.1.7.2.4.1 Oklahoma Converter Station Siting Area and AC Interconnection Siting Area

The Oklahoma Converter Station and AC Interconnection Siting Areas are located in Region 1 of the Project in the central part of the Oklahoma panhandle. The converter station would occupy an area of approximately 45 to 60 acres and the AC interconnection would consist of approximately 3 miles of transmission line. Region 1 is the driest area of the Project and contains vegetation adapted to semi-arid conditions (Section 3.17). Sprague's pipit, red knot, LEPC, piping plover, whooping crane, interior least tern, and golden eagle are believed to be present within Texas County in Region 1 where the Oklahoma converter station and associated AC interconnection system would be constructed (Table 3.14.1-3). Bald eagles have been documented in the area but are not common.

3.14.1.7.2.4.1.1 Construction Impacts

No mortality impacts to any of the special status species are expected from the construction of the Oklahoma converter station or the AC interconnection. Each of the special status species potential present in this area is mobile and would likely avoid construction activity. Construction would disturb approximately 60 acres of habitat, resulting in some habitat loss. Grasslands and croplands would be the dominant habitat type impacted by the Oklahoma converter station and associated AC interconnection (Sections 3.10 and 3.17). The habitat loss is unlikely to have substantial long-term direct impacts to special status wildlife populations in the area.

The only recorded occurrence of nesting piping plovers in the vicinity is at Optima Lake. No disturbance impacts or loss or modification of piping plover habitat is expected. The piping plover primarily uses riverine/lacustrine shorelines or sandbars which are not expected to be affected by construction of the Oklahoma converter station and AC interconnection. Construction would occur in Texas County, Oklahoma, west of the primary whooping crane migration corridor. It is possible that whooping cranes occasionally migrate through the Project area. No migration stopover areas occur near the siting areas for the converter station and the AC interconnection. The golden eagle occurs in the area as a resident and seasonal migrant. The golden eagle is a wide-ranging species and construction activity at the converter station and associated 3 mile AC interconnection is unlikely to cause disturbance or habitat impacts. The known existing range of the LEPC occurs east of the Oklahoma converter station and the AC interconnection (Figure 3.14-1 in Appendix A). Semi-arid grassland/herbaceous land cover is the predominant vegetation in this area. Depending on the specific quality of the habitat at the Project area, LEPC could possibly occur there. Impacts to LEPC habitats are not anticipated, but could be minimized or avoided by locating facilities in previously disturbed sites or habitat of lower quality. Suitable habitat for the interior least tern is not found within the affected area. Suitable habitat (i.e., native grasslands) for Sprague's pipit occurs in area. However, the species is an uncommon migrant and rare winter resident in Oklahoma. The low probability of occurrence would minimize impacts, and if native grasslands are avoided to the extent practicable, impacts would be low.

3.14.1.7.2.4.1.2 Operation and Maintenance Impacts

Potential impacts during operations and maintenance could include mortalities from collisions with transmission lines and building structures as well as habitat loss from potential avoidance of areas surrounding facility structures (CEC 2005). No impact to the piping plover is expected because suitable habitat does not occur in the vicinity of the Project area. The AC interconnection transmission lines and structures could pose a mortality risk to migrating whooping cranes; however, the transmission lines are only about 3 miles in length, which minimizes the potential risk. Also, the Project area is outside the whooping cranes primary migratory corridor, which is approximately 250 miles wide, and no migratory stopover areas exist in the area (Figure 3.14-2 in Appendix A). The expected risk of collision mortality is low. The golden eagle is a resident and seasonal migrant in the area. The relatively small size of the converter station (45 to 60 acres) and the AC interconnection system (3 miles) would minimize the potential collision hazard for golden eagles.

The Project area is west of the occupied range of the LEPC. If LEPC occur near the converter station and AC interconnection system, any avoidance of areas due to the potential for increased predation rates (due to consolidation of raptors and corvids along the AC lines) would constitute a loss of habitat. No impacts are expected during operations and maintenance to the Sprague's pipit, red knot, and interior least tern because of a low probability of occurring in the vicinity of the Project in Region 1. Either suitable habitat does not exist (interior least tern) or the species is an uncommon (Sprague's pipit) or rare migrant (red knot) through the Project area. Because the converter station area would be a developed site with approximately 45 acres fenced, the routine presence of operations and maintenance staff would not have any added disturbance impacts to any special status wildlife species.

3.14.1.7.2.4.1.3 Decommissioning Impacts

The type of potential impacts during Project decommissioning are expected to be similar to those during construction except areas of new land disturbance would be less than during initial construction. The Applicant would follow the same general and resource-specific EPMs during decommissioning that would be implemented during construction. In addition, the Applicant would develop a Decommissioning Plan prior to any decommissioning actions for review and approval by the appropriate state and federal agencies.

3.14.1.7.2.4.2 Tennessee Converter Station Siting Area and AC Interconnection Siting Area

The Tennessee Converter Station and AC Interconnection Siting Areas are located in Region 7 of the Project, located in Shelby and Tipton counties, Tennessee. The converter station would occupy an area of approximately 45 to 60 acres and the AC Interconnection would consist of approximately 1 mile of transmission line. Region 7 receives approximately 50 inches of precipitation annually and contains vegetation adapted to relatively moist conditions (Section 3.17). Vegetation in the Tennessee Converter Station and AC Interconnection Siting Areas is dominated by croplands (54 percent or 394 acres) and pasture/hay (27 percent or 195 acres). Some deciduous forest (11 percent or 77 acres) and woody wetlands (4 percent or 27 acres) also occur in the siting area. The northern long-eared bat, Indiana bat, interior least tern, and red knot are believed to be present within Shelby County in Region 7 where the Tennessee converter station and associated AC collection system would be constructed (Table 3.14.1-3). Suitable habitat for the interior least tern and red knot do not occur in the siting area and no impacts to those species are expected. Bald eagles occur along the Mississippi River and could occur near the converter station siting area; however, the croplands and pastureland habitat within the siting area is not preferred bald eagle habitat. As a result, the following impact assessment only considers the northern long-eared bat or Indiana bat.

3.14.1.7.2.4.2.1 Construction Impacts

No mortality impacts are expected during construction to either the northern long-eared bat or Indiana bat. No winter hibernacula (i.e., caves or man-made abandoned mines) that could be disturbed by construction activities are known to occur in the Project area. Both species use forested or wooded habitats. Forested areas (deciduous forests or woody wetlands) are limited on the Project area but either species could potentially occur in the area. Potential disturbance impacts could occur if construction occurred near the limited forested areas. However, potential impacts are expected to be very limited because the siting area is largely croplands and pasture land. No loss of bat habitat is expected so long as construction does not require removal of any potential roost trees that may occur in forested areas.

3.14.1.7.2.4.3 Operation and Maintenance Impacts

No impacts to either the northern long-eared bat or Indiana bat are expected during operations and maintenance of the Tennessee converter station and AC interconnection. No disturbance to any potential bat roost trees in the adjacent areas is expected. Bats are expected to avoid any vertical structures. Because bats typically forage at dusk or during the night, the presence of maintenance personnel and equipment would not impact any bat foraging activity. EPM GE-20 as described in Section 3.14.1.7.1 would be implemented to avoid or minimize operations related direct and indirect impacts to the northern long-eared and Indiana bats.

The potential impacts (e.g., collision with Project structures and transmission lines) to the interior least tern and red knot during operations and maintenance of the converter station and AC interconnection system are not expected. Suitable habitat for the interior least tern occurs west of the Project area along the Mississippi River but not in the converter station siting area. The red knot is an occasional transient migrant across the state of Tennessee, but is not commonly found in this area; indicating that the likelihood of this species being present within the affected area and being impacted is unlikely.

Because the converter station area would be a developed site with approximately 45 acres fenced, the routine presence of operations and maintenance staff would not have any added disturbance impacts to any special status wildlife species.

3.14.1.7.2.4.4 Decommissioning Impacts

The type of potential impacts during Project decommissioning are expected to be similar to those during construction except areas of new land disturbance would be less than during initial construction. The Applicant would follow the same general and resource-specific EPMs during decommissioning that would be implemented during construction. In addition, the Applicant would develop a Decommissioning Plan prior to any decommissioning actions for review and approval by the appropriate state and federal agencies.

3.14.1.7.2.5 AC Collection System

A description of the AC collection system is provided in Section 2.1.2.3.

Semi-arid grasslands/herbaceous and croplands comprise most of the wildlife habitat in the Project area. The habitats found along the AC collection system routes are similar among the routes with variation in the proportion of grasslands and agricultural crops being the primary difference. Of the seven special status wildlife species described in Section 3.14.1.5 that potentially occur in this area, no impacts are expected to three species: piping plover, red knot and interior least tern. Two documented nesting occurrences of piping plover have been reported at Optima Lake in Texas County, Oklahoma. Given the lack of suitable habitat within the ROI for the AC collection system, no impacts to the piping plover are expected. The red knot could occur as a rare migrant through the region. Impacts to the red knot are also not expected because of the lack of suitable habitat and low probability of occurrence. Although a documented occurrence of the least tern has been made in Texas County, Oklahoma, the primary occurrence of least terns in Oklahoma occurs along the Cimarron River in Region 2 of the Project. Therefore, impacts to the interior least tern also are not expected from the development of the AC Collection system.

The special status wildlife species potentially affected by construction and operations and maintenance of the AC collection system include Sprague's pipit, LEPC, whooping crane, and golden eagle.

3.14.1.7.2.5.1 Construction Impacts

No mortality impacts are expected to Sprague's pipit, LEPC, golden eagle, and the whooping crane during construction. Sprague's pipit is an uncommon migrant and rare winter resident in Oklahoma. The AC collection system is west of the primary whooping crane migration corridor, although some individuals are likely to occasionally migrate through the area (Figure 3.14-2 in Appendix A). Therefore, construction-related mortalities to either species are not expected. The LEPC is a resident prairie grouse in western Oklahoma that prefers grasslands with a mix of shrubs (e.g., shinnery oak or sand sage) for cover and nesting. The LEPC is a ground-dwelling gamebird that typically flies in low, short flights that could avoid construction activity, and; therefore mortality impacts are not expected.

LEPCs are susceptible to disturbance. Data suggest that prairie chickens avoid buildings, roads, and other human disturbances. Of particular concern are communal breeding leks in the spring. Construction activity in the vicinity of a lek could cause abandonment and reduce reproductive success. This potential impact could be mitigated by identifying known leks and avoiding construction in the area during the breeding season (March and April). Similar disturbance impacts could occur during the nesting season and cause abandonment of nests. Most of the current estimated occupied range of the LEPC and mapped habitat occurs on the eastern half or in the northwestern corner of the AC collection system (Figure 3.14-1 in Appendix A) (Van Pelt et al. 2013). Potential AC transmission routes in those areas (AC Collection System Routes E-1, E-2, E-3, NE-1, NE-2, SE-1, and SE-3) would have a higher probability of disturbance impacts. To the extent that the AC collection transmission lines follow existing roads, transmission lines, and other ROWs, potential disturbance impacts would be minimized.

Because the whooping crane and Sprague's pipit are seasonal migrants through the area and could be present in the area for a very short time, it is unlikely that construction activities would have a disturbance impact on either species. Golden eagles occur in the area as residents and seasonal migrants. The Applicant would coordinate with the USFWS to identify any potential nest sites that could be affected and develop procedures to avoid impacts (EPM FVW-5). Known golden eagle nests occur farther west in the Oklahoma panhandle outside of the ROI (USFWS 2014d).

Construction of the AC collection system would require land clearing for the construction of access roads and installation of transmission structures (Sections 2.1.2.3 and 2.1.2.4). Habitat loss and fragmentation of existing grassland habitat is one of the primary threats to the LEPC (79 FR 19974 and 79 FR 20074, April 10, 2014). The highest quality LEPC habitat (CHAT-1 and CHAT-2) occurs on the east side of the AC collection system area (Figure 3.14-1 in Appendix A). To the extent that the AC transmission lines and access roads cross contiguous areas of native grasslands, construction of the AC collection system may contribute to the loss of potential LEPC habitat. These impacts could be minimized with routes that follow existing ROWs, areas of cultivated fields, and grassland areas already fragmented by other activities that are areas of low quality prairie chicken habitat. The Sprague's pipit also uses native grasslands and could be similarly affected by loss of habitat and fragmentation.

3.14.1.7.2.5.2 Operations and Maintenance Impacts

Potential impacts to special status wildlife species during operations and maintenance of the AC collection system include mortalities from collisions with transmission lines and structures and possible electrocutions, disturbance impacts from routine maintenance activity, and loss of habitat by behavioral avoidance of areas surrounding vertical structures (i.e., transmission structures and lines). There is a potential risk of mortalities to whooping cranes from collisions with transmission lines and structures. The risk of collision mortality is expected to be low because the ROI is outside the primary whooping crane migration corridor reducing the probability of occurrence. However, whooping cranes could occasionally migrate through the area and some risk of collision mortality would exist. Golden eagles are also residents and winter migrants in western Oklahoma and transmission lines could be a potential collision and mortality risk. Transmission lines are unlikely to be a source of mortality for either the LEPC or Sprague's pipit. The prairie chicken is a low flier and typically avoids areas surrounding tall structures. Sprague's pipit occurs only as a winter migrant in low numbers and is a smaller, more maneuverable flier that could more likely avoid transmission lines. Routine maintenance and inspection work along the AC collection system transmission lines is unlikely to impact special status wildlife species other than a temporary displacement while work is performed. Additional loss of habitat is not expected during operations and maintenance. However, any avoidance of areas by the LEPC due to the potential for increased predation rates (due to consolidation or raptors and corvids along the AC collection lines) could constitute a potential impact to the LEPC.

3.14.1.7.2.5.3 Decommissioning Impacts

Potential impacts during Project decommissioning are expected to be similar to those during construction except areas of new land disturbance would be less than during initial construction. The Applicant would follow the same general and resource-specific EPMs during decommissioning that would be implemented during construction. In addition, the Applicant would develop a Decommissioning Plan prior to any decommissioning actions for review and approval by the appropriate state and federal agencies.

3.14.1.7.2.6 HVDC Applicant Proposed Route

The HVDC transmission line is described in Sections 2.1.2.2 and 2.4.2. The transmission line would extend approximately 700 miles from the semi-arid Oklahoma panhandle to western Tennessee which has a humid, continental climate. Because of the significant change in vegetation and available wildlife habitats that occurs along the Applicant Proposed Route, the special status wildlife species that could be affected by the construction and operations and maintenance of the Project also varies along the route (Table 3.14.1-3 and 3.14.1-4). For the purposes of analysis and discussion, the Project has been divided into seven regions from west to east. Potential impacts to special status wildlife species from construction and operations and maintenance are discussed for each region. Impacts from decommissioning would be common to the regions and would be the same as those identified in Section 3.14.1.7.2.

See Sections 3.10 and 3.17 for a list of the types of habitats that would be impacted by the Applicant Proposed Route in each region as well as the acres that would be impacted. Table 3.14.1-5 lists the approximate length of the Applicant Proposed Route in each region, how much of the route is parallel to existing infrastructure, the predominant habitat type that would be impacted (see Sections 3.10 and 3.17 for more details regarding the acres of impact that would occur), and the special status wildlife species potentially present along the Applicant Proposed Route by region.

Table 3.14.1-5:
Special Status Wildlife Species Summary Information Regarding the Applicant Proposed Route

Region	Total Length of APR (miles)	Length Parallel to Existing Infrastructure (miles)	Predominant Land Cover	Special Status Species Potentially Present in the Region
1	115	Approximately 20 miles, or 18 percent of the route	Grassland/herbaceous, croplands (grasslands and croplands likely used by whooping cranes for feeding habitat)	Sprague's pipit, red knot, whooping crane, LEPC, interior least tern, and piping plover, and golden and bald eagles
2	106	Approximately 27 miles, or 25 percent of the route	Grassland/herbaceous, croplands (grasslands and croplands likely used by whooping cranes and LEPC for feeding habitats)	Whooping crane, interior least tern, and LEPC, piping plover, red knot, golden eagle
3	162	Approximately 21 miles, or 13 percent of the route	Grassland/herbaceous, deciduous forest (grasslands likely used by whooping cranes for feeding habitat; forests likely used by gray bats for foraging)	Gray bat, Sprague's pipit, interior least tern, piping plover, whooping crane, and American burying beetle, red knot, golden eagle
4	126	Approximately 11 miles, or 9 percent of the route	Grassland/herbaceous, deciduous forest, pasture/hay (forests likely used by northern long-eared bat, Ozark big-eared bat, gray bat, and Indiana bat for foraging)	northern long-eared bat, Ozark big-eared bat, gray bat, Indiana bat, Sprague's pipit, interior least tern, piping plover, American burying beetle, and bald eagle
5	113	Approximately 15 miles, or 13 percent of the route	Deciduous forest, pasture/hay (forests likely used by northern long-eared bat, Ozark big-eared bat, gray bat, and Indiana bat for foraging habitat)	northern long-eared bat, gray bat, Ozark big-eared bat, Indiana bat, interior least tern, bald eagle, and piping plover
6	54	Approximately 11 miles, or 20 percent of the route	Croplands	northern long-eared bat, Indiana bat, and piping plover
7	43	Approximately 7 miles, or 17 percent of the route	Croplands, deciduous forest (forests likely used by northern long-eared bat, and Indiana bat for foraging habitat)	northern long-eared bat, Indiana bat, interior least tern, piping plover, and bald eagle

APR = Applicant Proposed Route

The following subsections discuss region-specific factors that would affect special status wildlife species; however, refer to Sections 3.14.1.7.1 for a discussion of general impacts that would occur, and Table 3.14.1-5 for a list of the special status wildlife species potentially present.

3.14.1.7.2.6.1.1 Region 1

The Applicant Proposed Route in Region 1 is approximately 115 miles long. Approximately 20 miles, or 18 percent of the route, is parallel to existing infrastructure (Table 3.14.1-5). Special status wildlife species that could occur in Region 1 are Sprague's pipit, red knot, interior least tern, LEPC, whooping crane, piping plover, and golden eagle. Two documented nesting occurrences of piping plover have been reported at Optima Lake in Texas County, Oklahoma. Because of the lack of suitable habitat within the ROI for the Applicant Proposed Route, no impacts to the piping plover are expected. The red knot could occur as a rare migrant through the region. Impacts to the red knot are also not expected because of the lack of suitable habitat and low probability of occurrence. Although a documented occurrence of the least tern has been made in Texas County, Oklahoma, the primary occurrence of least terns in Oklahoma occurs along the Cimarron River in Region 2 of the Project (Lott et al. 2013). Suitable habitat for the interior least tern does not occur in the ROI. Therefore, impacts to the interior least tern also are not expected from the development of the Applicant Proposed Route in Region 1.

3.14.1.7.2.6.1.1.1 Construction Impacts

Species that could potentially be affected during construction include the Sprague's pipit, LEPC, whooping crane, and golden eagle. Sprague's pipit is a migrant through the ROI and could be an occasional winter resident, although the primary wintering range for the species is farther south. No mortality impacts are expected as the pipit could avoid construction activity. Construction could temporarily displace individuals during the winter, if present, but no impacts to pipit populations are expected. Sprague's pipit primarily uses native prairie and habitat loss and fragmentation of remaining native prairie is of primary concern. Disturbance and clearing of prairie habitat for access roads and placement of transmission structures could affect Sprague's pipit. However, winter ranges for the Sprague's pipit include a broader array of habitats (e.g., stubble and fallow alfalfa, soybean, and wheat fields and pastures with non-native grasses) and alternative migration habitat would be available in the vicinity of the ROI (Robbins and Dale 1999; USFWS 2011). Because of the low probability of winter residents occurring in Region 1 and other migratory habitat would remain, measurable impacts to Sprague's pipit populations from construction of the HVDC transmission line in Region 1 is not expected.

The Applicant Proposed Route crosses the LEPC range in Region 1 (Figure 3.14-1 in Appendix A). The primary impacts that could occur during construction are disturbance and habitat loss and fragmentation. Disturbances to leks during the spring could disrupt and reduce reproduction. Similarly, construction disturbance near habitats used for nesting and brood rearing also could reduce reproduction. LEPC require large blocks of contiguous habitat (Van Pelt et al. 2013). Vegetation clearing for access roads and transmission structures would cause habitat loss but also could fragment remaining patches of habitat. Focal LEPC habitat areas and connectivity habitat areas have been mapped in Region 1 using an internet mapping tool (CHAT). Focal and connectivity habitats occur near or within the ROI in Region 1.

The whooping crane occurs as a spring and fall migrant through the region. No stopover areas have been identified in Region 1. The Applicant Proposed Route occurs on the western side of the primary whooping crane migratory corridor. No impacts to whooping cranes are expected during construction as occurrence in a construction area is unlikely and the whooping crane could avoid areas of construction.

Golden eagles occur as residents and migrants in Region 1. Golden eagles prefer the open semi-arid habitats such as grassland and shrub habitats for foraging and cliffs or ledges for nesting. Golden eagles are wide-ranging birds that could easily avoid construction and impacts are not expected. Of potential concern would be construction disturbances of nest sites in the late winter and spring that could prevent nesting or disrupt rearing of young. The preferred canyons and rocky cliff habitat occur farther west in the Oklahoma panhandle but the Applicant would work with wildlife agencies to identify and avoid any eagle nests (EPM FVW-5) that could occur near the Applicant Proposed Route. Bald eagles have expanded their range within Oklahoma and have been observed in the Region 1 (Optima Lake).

3.14.1.7.2.6.1.1.2 Operations and Maintenance

Operation and maintenance of the HVDC transmission line is not expected to have an impact on Sprague's pipit. Impacts to the LEPC could include avoidance of areas by the LEPC surrounding the transmission line because of increased predation rates (resulting from consolidation of raptors and corvids along the line). Research in Kansas suggests the avoidance of suitable habitat (potently due to increased predation rates along tall structures) could extend approximately 2000 feet from a transmission line (Robel et al. 2004). The Western Association of Fish and Wildlife Agencies adopted a 1,300-foot impact zone in the *The Lesser Prairie-Chicken Range-Wide Conservation Plan* for calculating impacts from transmission lines (>69kV) (Van Pelt et al. 2013). Such a zone could increase fragmentation of LEPC habitat.

Potential impacts to whooping cranes during operations and maintenance include potential mortalities from collisions with transmission lines. Although Region 1 of the Project lies west of the primary whooping crane migration corridor, some cranes migrate through the region in the spring and fall (Figure 3.14-2 in Appendix A). Although collision mortalities are possible, a lower probability of occurrence of whooping cranes and the lack of any stopover areas in the ROI would minimize the potential for mortalities in Region 1.

The transmission lines also pose a potential mortality risk to resident or migrant golden eagles. Electrocution risks to golden eagles would be lower if the transmission lines are spaced further apart than an eagle's wingspan (approximately 80 inches).

3.14.1.7.2.6.1.2 Region 2

The Applicant Proposed Route in Region 2 is approximately 106 miles long. Approximately 27 miles, or 25 percent of the route, is parallel to existing infrastructure. Special status wildlife species that occur in Region 2 are the red knot, interior least tern, LEPC, whooping crane, piping plover, golden eagle, and bald eagle. The piping plover is a shorebird species that is typically found along open, sandy rivers or reservoirs with sandy beaches. No documented occurrences of piping plover nests have been reported in Region 2 although the species could occur in the ROI where the Applicant Proposed Route crosses the Cimarron River. No impacts to the piping plover are expected from the construction or operations and maintenance of the Project. The red knot could occur as a rare migrant through the region. Impacts to the red knot are also not expected because of the lack of suitable habitat and low probability of occurrence.

3.14.1.7.2.6.1.2.1 Construction Impacts

There are documented occurrences of interior least terns along the Cimarron River in Region 2 (Lott et al. 2013). Nesting locations are not well documented near the ROI crossing of the Cimarron River, but least terns are known to forage and migrate through the area. Potential short-term disturbance impacts to interior least terns could occur if construction across the Cimarron River occurs in the spring (approximately April) or fall (approximately August to early September). No construction impacts to least tern habitat or mortality impacts are expected.

The Applicant Proposed Route crosses a portion of the estimated occupied range of the LEPC in Woodward County in the western end of Region 2 (Van Pelt et al. 2013). No focal LEPC habitat areas and connectivity habitat areas have been mapped in Region 2, although some suitable habitat could occur in the area (Figure 3.14-1 in Appendix A). The primary impacts that could occur during construction are disturbance and habitat loss and fragmentation. Disturbances to leks during the spring could disrupt and reduce reproduction success. Similarly, construction disturbance near habitats used for nesting and brood rearing also could reduce reproduction success. LEPCs require large blocks of contiguous habitat (Van Pelt et al. 2013). Vegetation clearing for access roads and transmission structures would cause habitat loss but also could fragment remaining patches of habitat. To the extent that the Applicant Proposed Route avoids larger contiguous blocks of native prairie and shrub grassland, impacts to LEPCs would be minimized.

The whooping crane occurs as a spring and fall migrant through Region 2. No stopover areas have been identified in the ROI in Region 2. The Applicant Proposed Route crosses the primary whooping crane migratory corridor (approximately 75 percent of the observations) (Figure 3.14-2 in Appendix A). Minimal direct impacts to whooping cranes are expected during construction because occurrence in a construction area is unlikely and the whooping crane could avoid areas of construction. Any disturbance impacts in foraging areas would be short-term and occur only if the construction activity coincided with migration.

Golden eagles occur as residents and migrants in Region 2. Golden eagles prefer the open semi-arid habitats such as grassland and shrub habitats for foraging and cliffs or ledges for nesting. Golden eagles are wide-ranging birds that could easily avoid construction and direct impacts are not expected. Golden eagle nests are unlikely in the ROI in Region 2 because of lack of suitable habitat, but the Applicant would work with wildlife agencies to identify and avoid any potential eagle nest sites that could occur near the Applicant Proposed Route.

Bald eagles occur in Region 2 as potential nesters and winter migrants. The closest bald eagle wintering habitat is found at Canton Lake (3.5 miles south of the ROI); therefore, construction impacts to bald eagles are not expected due to the lack of suitable habitat within the ROI.

3.14.1.7.2.6.1.2.2 Operations and Maintenance

Operation and maintenance of the transmission line along the Applicant Proposed Route in Region 2 could impact the interior least tern, whooping crane, golden eagle, and bald eagle (e.g., result in potential collisions). Interior least terns have been documented along the Cimarron River, suggesting that interior least terns may occur within the Applicant Proposed Route ROI from about April through June. However, the least tern is a small agile flier that forages along streams, rivers, and reservoirs and would likely avoid transmission lines and the potential for collision impacts is considered to be low.

Although no known migratory or stopover locations for whooping crane have been documented in the Applicant Proposed Route ROI, the route crosses the primary whooping crane migratory corridor and cranes would typically pass through the area in March through April and September through October (Figure 3.14-2 in Appendix A). The transmission lines could cause potential mortalities from collisions. Project locations near (e.g., approximately 1 mile) whooping crane feeding and resting sites would have the greatest potential for collisions as the birds would be flying at lower elevations.

Golden and bald eagles potentially occur in the vicinity of the ROI. Both species are wide ranging and could pass through the ROI. Each species could be at risk for potential collisions with the transmission lines, although the probability is expected to be low. The risk of electrocution for any of the large birds (eagles or cranes) would depend on the distance between wires. Wire spacing greater than the average eagle wingspan would reduce potential electrocution risk. The Applicant would develop and implement an APP, consistent with APLIC guidelines that describes a program of specific and comprehensive actions that when implemented, would reduce risk of avian mortality. Additionally, the Applicant would implement EPMs (FVW-1, FVW-2, and GE-2) to reduce risk of avian mortality.

3.14.1.7.2.6.1.3 Region 3

The Applicant Proposed Route in Region 3 is approximately 162 miles long. Approximately 21 miles, or 13 percent of the route, are parallel to existing infrastructure. Special status wildlife species that occur in Region 3 are the gray bat, Sprague's pipit, interior least tern, piping plover, whooping crane, American burying beetle, and red knot. The red knot could occur as a rare migrant through the region. Impacts to the red knot are not expected because of the lack of suitable habitat and low probability of occurrence. No documented occurrences of piping plover nesting have been reported in Region 3, although the species could occur in the ROI where the Applicant Proposed Route crosses the Cimarron River. Piping plovers are rarely seen at inland stopover locations as most individuals may migrate directly to wintering ranges. No impacts to the piping plover are expected from the construction or operations and maintenance of the Project. Region 3 represents a transition to more forested vegetation, which supports two special status wildlife species: the gray bat and American burying beetle.

3.14.1.7.2.6.1.3.1 Construction Impacts

Sprague's pipit is a migrant through the ROI and could be an occasional winter resident, although the primary wintering range for the species is farther south. Sprague's pipit has been documented in Payne County. No mortality impacts are expected as the pipit could avoid construction activity. Construction could temporarily displace individuals during the winter, if present, but no impacts to pipit populations are expected. Sprague's pipit primarily uses native prairie and habitat loss and fragmentation of remaining native prairie is of primary concern. Disturbance and clearing of prairie habitat for access roads and placement of transmission structures could affect Sprague's pipit. However, winter ranges for the Sprague's pipit include a broader array of habitats (e.g., stubble and fallow alfalfa, soybean, and wheat fields and pastures with non-native grasses) and alternative migration habitat would be available in the vicinity of the ROI (Robbins and Dale 1999; USFWS 2011). Because the probability of winter residents occurring in Region 3 is low and because other migratory habitat would remain, measurable impacts to Sprague's pipit populations from construction of the HVDC transmission line in Region 3 are not expected.

Documented occurrences of the least tern have been made along the Cimarron River in Region 3 of the Project (Lott et al. 2013). Nesting locations are not well documented near the ROI crossing of the Cimarron River in Payne County, but least terns are known to forage and migrate through the area (USFWS 2014d). Potential short-term disturbance impacts to least terns could occur if construction across the Cimarron River occurs in the spring (approximately April) or fall (approximately August to early September). No construction impacts to least tern habitat or mortality impacts are expected.

The whooping crane occurs as a spring and fall migrant through Region 3. No stopover areas have been identified in the ROI in Region 3. The Applicant Proposed Route crosses the eastern portion of whooping crane migratory corridor (≤ 25 percent of the migratory observations) (Figure 3.14-2 in Appendix A). No impacts to whooping cranes are expected during construction as occurrence in a construction area is unlikely and the whooping crane could avoid areas of construction. Any disturbance impacts in foraging areas would be short-term and occur only if the construction activity coincided with migration.

Golden eagles become less common along the Applicant Proposed Route as the route moves east into less semi-arid vegetation. Golden eagles prefer the more open semi-arid habitats in Regions 1 and 2 but both residents and migrants occur in Region 3. Golden eagles are wide-ranging birds that could easily avoid construction and impacts are not expected. Of potential concern would be construction disturbances of nest sites in the late winter and spring that could prevent nesting or disrupt rearing of young. The Applicant would work with wildlife agencies to identify and avoid any potential eagle nest sites that could occur near the proposed route. Bald eagles occur in Region 3 as potential nesters and winter migrants. Construction impacts to bald eagles are not expected because of lack of suitable habitat in the ROI.

Although the presence of the American burying beetle has not been documented in the ROI, it is suspected to occur within undisturbed forested and grassland habitats found in Region 3. The American burying beetle is relatively sedentary and is at risk of mortality during construction activities (especially during vegetation clearing) if it is present within the Project's ROI.

The gray bat is strictly insectivorous and inhabits caves though the year. The range of the gray bat includes Adair, Muskogee, and Sequoyah counties in Region 3 (USFWS 2014d). The gray bat has not been documented by previous studies in the ROI. Areas with known and potential caves for gray bats occur farther north in Adair County, Oklahoma and to the east in Region 4. Potential use of the ROI in Region 3 by the gray bat is likely restricted to spring through fall (USFWS 2014d). Implementation of seasonal restrictions if needed could minimize impacts to this species (see EPM FVW-5).

3.14.1.7.2.6.1.3.2 Operation and Maintenance

The Sprague's pipit has been observed in Payne County but the species uses grassland habitats and typically occurs near the ground and is very secretive. Empirical data that demonstrates that overhead transmission lines are a hazard to this species are lacking.

Operation and maintenance of the transmission line along the Applicant Proposed Route in Region 3 could impact the interior least tern, whooping crane, golden eagle, and bald eagle from potential collisions. Interior least terns have been documented along the Cimarron River, suggesting that interior least terns may occur within the Applicant Proposed Route from about April through June. However, the least tern is a small agile flier that forages along streams, rivers, and reservoirs and would likely avoid transmission lines and the potential for mortalities from collisions is considered to be low.

Although no known migratory or stopover locations for whooping crane have been documented in the Applicant Proposed Route and ROI, the route crosses the eastern side of whooping crane migratory corridor and cranes would typically pass through the area in March through April and September through October (Figure 3.14-2 in Appendix A). The transmission lines could cause potential mortalities from collisions. Project locations near (e.g., approximately 1 mile) whooping crane feeding and resting sites would have the greatest potential for collisions as the birds would be flying at low elevations.

Golden eagles become less common along the Applicant Proposed Route as the route moves east into less semi-arid vegetation. Golden eagles prefer the more open semi-arid habitats in Regions 1 and 2, but both residents and migrants occur in Region 3. Bald eagles are more common on the eastern end of Region 3 in Muskogee County as the Applicant Proposed Route approaches the Arkansas River. Each species could be at risk for potential collisions with the transmission lines, although the probability of collisions is difficult to predict. The ROI does not contain suitable habitat that would attract either species of eagle, so the risk could be low compared to locations near river crossings or areas where eagles concentrate. The risk of electrocution for any of the large birds (eagles or cranes) would depend on the spacing between transmission wires. Spacing transmission lines wider (approximately 80 inches) than an eagle's wingspan would reduce the risk. The Applicant would develop and implement an APP, consistent with APLIC guidelines that describes a program of specific and comprehensive actions that when implemented, would reduce risk of avian mortality. Additionally, the Applicant would implement EPMs (FVW-1, FVW-2, and GE-2) to reduce risk of avian mortality.

No impacts are expected to the American burying beetle or gray bat during operations and maintenance as additional land disturbances are not expected.

3.14.1.7.2.6.1.4 Region 4

The Applicant Proposed Route in Region 4 is approximately 126 miles long. Approximately 11 miles, or 9 percent of the route, is parallel to existing infrastructure. As the Applicant Proposed Route moves east into Region 4 (Arkansas River Valley Region), the vegetation changes to more forested types (deciduous hardwoods and evergreen). In addition to the gray bat that also occurred in Region 3, the northern long-eared bat, Ozark big-eared bat, and Indiana bat could potentially occupy the Project's ROI in Region 4. However, the occurrence and use of the ROI by these species has not been documented by previous studies. Further, the occurrence and use of the ROI by northern long-eared bat, Ozark big-eared bat, gray bat, and Indiana bat is likely to be restricted to the spring through fall time frame, and suitable habitat for these species is limited along the Applicant Proposed Route. Proper implementation of seasonal restrictions could minimize impacts to this species (see EPM FVW-5). Other special status wildlife species that could occur in the ROI for the Applicant Proposed Route include Sprague's pipit, interior least tern, piping plover, American burying beetle, and bald eagle.

The piping plover likely occurs in Region 4 as a migratory species and major rivers such as the Arkansas River could serve as migration pathways and stopover areas. However, the Project is not expected to affect the riverine or lacustrine shoreline and sandbar habitats of the piping plover as the transmission line would span the waterways. Therefore construction of the Applicant Proposed Route is not expected to impact the piping plover in Region 4.

3.14.1.7.2.6.1.4.1 Construction Impacts

Although the presence of the American burying beetle has not been documented in the areas that would be affected by the Applicant Proposed Route, it is suspected to occur within undisturbed forested and grassland habitats found in Region 4. Therefore, construction of Applicant Proposed Route could cause mortality of American burying beetle in suitable habitat areas that are disturbed for construction of access roads and transmission structures.

Sprague's pipit has been observed in Sequoyah County in Oklahoma and Franklin County in Arkansas. Sprague's pipit is a migrant through the ROI and could be an occasional winter resident. No mortality impacts are expected as the pipit could avoid construction activity. Construction could temporarily displace individuals during the winter, if present, but no impacts to pipit populations are expected. Sprague's pipit primarily uses native prairie and habitat loss and fragmentation of remaining native prairie is of primary concern. Disturbance and clearing of prairie habitat for access roads and placement of transmission structures could affect Sprague's pipit. However, winter ranges for the Sprague's pipit include a broader array of habitats (e.g., stubble and fallow alfalfa, soybean, and wheat fields and pastures with non-native grasses) and alternative migration habitat would be available in the vicinity of the ROI (Robbins and Dale 1999; USFWS 2011). Because of the low probability of winter residents occurring in Region 4 and other migratory habitat would remain, measurable impacts to Sprague's pipit populations from construction of the HVDC transmission line in Region 4 are not expected.

There are documented occurrences of the least tern along the Arkansas River in Region 4 (Lott et al. 2013). Nesting locations are not well documented near the ROI crossing of the Arkansas River in Sequoyah County, but least terns could forage and migrate through the area. No construction impacts to least tern habitat or mortality impacts are expected. Bald eagles are known to nest and winter along the Arkansas River and at Lake Dardanelle in Arkansas, which is located south of the Applicant Proposed Route. Construction activity could affect bald eagle nesting and winter roosting at the Arkansas River crossing depending on locations of nests or roosting sites with respect to construction. The Applicant would work with wildlife agencies to identify any nests or roosting sites and coordinate construction activity to avoid either nesting eagles or winter roosting areas (EPM FVW-5).

Of the four special status bat species, the gray bat and Ozark big-eared bat use caves for winter hibernacula and for roosting during the spring, summer, and fall, although the caves used for hibernating and roosting are different. The northern long-eared bat and Indiana bat use caves for winter hibernation but use roost trees and snags with loose barks, cavities, or crevices and occasionally man-made structures for roosting sites. Caves occur in the Ozark Plateau region north of the Applicant Proposed Route in Region 4, but not in the ROI. Construction is not expected to impact cave hibernacula for any of the bat species or roosting caves for the gray and Ozark big-eared bats. Trees may be removed to construct access roads and clear sites for structures on segments of the route that pass through either deciduous or evergreen forest. Trees also would be cut in the ROW to allow stringing of transmission lines and eliminate vegetation interference with overhead wires. The potential exists for the loss of bat roost trees and foraging areas during construction. Approximately 6,700 acres of forests (i.e., deciduous, evergreen, and mixed) occur within a 1,000-foot-wide corridor along the Applicant Proposed Route in Region 4 (Table 3.17-22), although the typical ROW width would range from 150 to 200 feet. Removal of roost trees could cause habitat loss and possibly mortality of bats. The Applicant would coordinate with the USFWS to minimize potential loss of bat habitat within the ROI (EPM FVW-5).

3.14.1.7.2.6.1.4.2 Operations and Maintenance

The Sprague's pipit has been observed in Franklin County but the species uses grassland habitats and typically occurs near the ground and is very secretive. There is a lack of empirical data that demonstrates that overhead transmission wires are a mortality hazard to this species. Impacts to Sprague's pipit are not expected from the operations and maintenance of the transmission line.

Operation and maintenance of the transmission line along the Applicant Proposed Route in Region 4 could impact the interior least tern, golden eagle, and bald eagle from potential collisions. Interior least terns have been documented along the Arkansas River, suggesting that interior least terns may occur within the Applicant Proposed Route from about April through June. However, the least tern is a small agile flier that forages along streams, rivers, and reservoirs and would likely avoid transmission lines and the potential for mortalities from collisions is considered to be low.

Bald eagles are common along the Arkansas River in Sequoyah County in Oklahoma and Crawford and Johnson counties in Arkansas. Bald eagles could be at risk for potential collisions with the transmission lines. The majority of the ROI in Region 4 does not contain suitable habitat that would attract eagles to the area, other than near the Arkansas River crossing; furthermore, the Applicant Proposed Route is north of the Arkansas River and Lake Dardanelle in Arkansas, both of which are bald eagle wintering areas. As a result, migrating bald eagles would have to cross the Applicant Proposed Route to reach their wintering areas. The risk of electrocution for eagles is expected to be low as the distance between transmission conductors is greater than the average wingspan of this species.

The Applicant would develop and implement an APP, consistent with APLIC guidelines that describes a program of specific and comprehensive actions that when implemented, would reduce risk of avian mortality. Additionally, the Applicant would implement EPMs (FVW-1, FVW-2, and GE-2) to reduce risk of avian mortality.

No additional impacts are expected to the American burying beetle or any of the four bat species during operations and maintenance as additional land disturbances are not expected. However, any bat roost trees removed during construction in the ROW underneath the transmission lines would not be allowed to regrow because of potential interference and damage to the electrical lines and would be habitat lost for the length of Project operations.

3.14.1.7.2.6.1.5 Region 5

The Applicant Proposed Route in Region 5 is approximately 113 miles long. Approximately 15 miles, or 13 percent of the route, is parallel to existing infrastructure. Special status wildlife species that could potentially occur in the ROI along the Applicant Proposed Route include the gray bat, northern long-eared bat, Ozark big-eared bat, and Indiana bat, interior least tern, piping plover, and bald eagle.

The piping plover likely occurs in Region 5 as a migratory species and major rivers such as the Arkansas River could serve as migration pathways and stopover areas. The Arkansas River occurs south of the Applicant Proposed Route (≥ 12 + miles at the closest location). Therefore the Applicant Proposed Route is not expected to affect riverine or lacustrine shorelines and sandbars which are suitable habitat for the piping plover; and the Applicant Proposed Route is not expected to impact the piping plover in Region 5.

Documented occurrence of the least tern has been made along the Arkansas River in Region 5 of the Project. The Arkansas River occurs south of the Applicant Proposed Route (≥ 12 + miles at the closest location) and the Project is not expected to affect bare or sparsely vegetated sandy or dried mud substrates along rivers or reservoirs preferred by least terns. Therefore, the Project is not expected to impact the interior least tern in Region 5.

3.14.1.7.2.6.1.5.1 Construction Impacts

No suitable nesting or winter roost habitat exist within the ROI and impacts to bald eagles during construction are not expected.

Of the four special status bat species, the gray bat and Ozark big-eared bat use caves for winter hibernacula and roosting during the spring, summer, and fall although the caves used for hibernating and roosting are different. The northern long-eared bat and Indiana bat use caves for winter hibernation but use roost trees or snags with loose barks, cavities, or crevices and occasionally man-made structures for roosting sites. Known caves used as winter hibernacula (all species) and summer roosts (gray bat and Ozark big-eared bat) occur in the Ozark Plateau region north of the Applicant Proposed Route in Region 5 but not in the ROI. Construction is not expected to impact cave hibernacula for any of the bat species or roosting caves for the gray and Ozark big-eared bats. The Applicant would implement EPM FVW-6 to ensure that caves are protected from potential disturbance impacts. Trees may be removed to construct access roads and clear sites for structures on segments of the route that pass through deciduous, evergreen, or mixed forest. Trees also could be cut in the ROW to allow stringing of transmission lines and eliminate vegetation interference with overhead wires. The potential exists for the loss of roost trees for the Indiana bat and northern long-eared bat and foraging areas during construction. Removal of roost trees could cause habitat loss and possibly mortality of bats. Approximately 7,500 acres of forests occur within a 1,000-foot-wide corridor in Region 5 (Table 3.10-9), although the typical ROW width would range from 150 to 200 feet. The Applicant would coordinate with USFWS to minimize potential loss of bat habitat within the ROI. Implementation of seasonal restrictions could minimize potential impacts to these species (see EPM FVW-5).

3.14.1.7.2.6.1.5.2 Operations and Maintenance

Bald eagles could be at risk for potential collisions with the transmission lines. However, the risk for collision mortality is likely low because the ROI in Region 5 does not contain suitable habitat that would attract eagles and the nearest points of water bodies frequented by bald eagles are approximately 6 to 10 miles from the Applicant Proposed Route. Migrating bald eagles could cross the Applicant Proposed Route to reach wintering areas along the Arkansas River and Lake Dardanelle; therefore, some potential risk of collision related mortalities would exist.

The Applicant would develop and implement an APP, consistent with APLIC guidelines that describes a program of specific and comprehensive actions that when implemented, would reduce risk of avian mortality. Additionally, the Applicant would implement EPMs (FVW-1, FVW-2, and GE-2) to reduce risk of avian mortality.

No additional impacts are expected to any of the four bat species during operations and maintenance as additional land disturbances are not expected. However, any bat roost trees removed during construction in the ROW underneath the transmission lines would not be allowed to regrow because of potential interference and damage to the electrical conductors and would be habitat lost for the length of Project operations.

3.14.1.7.2.6.1.6 Region 6

The Applicant Proposed Route in Region 6 is approximately 54 miles long. Approximately 11 miles, or 20 percent of the route, is parallel to existing infrastructure. Special status wildlife species that could occur in the ROI along the Applicant Proposed Route in Region 6 include the northern long-eared bat, gray bat, Indiana bat, piping plover, interior least tern, and bald eagle.

The vegetation along the Applicant Proposed Route in Region 6 is dominated by croplands (78 percent) with about 8 percent in forests. Because of the large amount of cultivated land, there is very little habitat available in the Region 6 ROI for special status wildlife species. The piping plover prefers riverine or lacustrine shorelines and sandbars. The interior least tern prefers bare or sparsely vegetated sandy or dried mud substrates along rivers or reservoirs. While both species may occasionally occur in the area, the ROI does not contain suitable habitat for either species and no impacts are expected from construction and operations and maintenance of the Project. Bald eagles have been observed in Poinsett and Cross counties in Region 6. However, suitable nesting and winter habitat for bald eagles is absent or very limited in the ROI and impacts are not expected, although the presence of the transmission lines would remain a potential hazard to migrating bald eagles.

The relatively flat topography and lack of large forested areas within the ROI limits the available habitat for the three species of special status bats that occur in Region 6. Because the gray bat uses caves for both summer roosts and for hibernation, the distribution of the gray bat is limited to the west end (Jackson County, Arkansas) of Region 6. Cave hibernacula or cave roosting sites do not occur in ROI and impacts to the gray bat are not expected in Region 6.

3.14.1.7.2.6.1.6.1 Construction Impacts

Impacts to the Indiana bat and the northern long-eared bat from construction of Applicant Proposed Route in Region 6 are not expected because of the absence of cave hibernacula and lack of forested habitat that could be used for summer roosting in this area. A forested ridge (i.e., Crowley's Ridge) that bisects Poinsett and Cross counties from north to south could provide potential roosting habitat, but this ridge is separated from other forested areas and cave hibernacula by expanses of croplands on both the west and east sides, potentially limiting its value as bat habitat.

3.14.1.7.2.6.1.6.2 Operations and Maintenance

Operations and maintenance of the Project is not expected to impact any of the three special status bat species that could occur in Region 6. The lack of quality habitat limits the potential for any of the three species to occur in the ROI. No additional habitat loss is expected during the operations and maintenance phase of the Project which would limit the possibility of impacts.

3.14.1.7.2.6.1.7 Region 7

The Applicant Proposed Route in Region 7 is approximately 43 miles long. Approximately 7 miles, or 17 percent of the route, is parallel to existing infrastructure. Special status wildlife species that could occur in the ROI along the Applicant Proposed Route in Region 7 include the northern long-eared bat, Indiana bat, piping plover, interior least tern, and bald eagle.

The vegetation along the Applicant Proposed Route in Region 7 is dominated by croplands (70 percent) with about 8 percent in deciduous forests and 7 percent in woody wetlands (Table 3.17-48). Because of the large amount of cultivated land, there is very little habitat available in the Region 7 ROI for special status wildlife species except for forested areas near the Mississippi River crossing and on the river bluffs on the east side of the river and riverine habitats (e.g., mudflats and sandbars) along the Mississippi River.

3.14.1.7.2.6.1.7.1 Construction Impacts

Construction of the Applicant Proposed Route could have some impact on Indiana and northern long-eared bat roosting habitat near the Mississippi River crossing from Mississippi County in Arkansas to Tipton County in Tennessee. Bats of both species could potentially use trees on either side of the river for roost sites. If trees are removed to allow stringing of lines and reduce interference with the transmission lines, potential bat habitat could be lost. No caves that could be used for hibernacula are known to occur in the ROI along the route in Region 7.

The interior least tern occurs along the Mississippi River using bare or sparsely vegetated sandy or dried mud substrates (Lott et al. 2013). Potential construction impacts would be limited to where Applicant Proposed Route crosses the Mississippi River. Although construction is not expected to physically disturb potential least tern habitat, construction activity could temporarily disturb least terns in the vicinity and cause nesting terns (June and July) to abandon their nests. Nesting locations are known to occur along the Mississippi River in Shelby and Tipton County, Tennessee.

The piping plover prefers open, sparsely vegetated sand and gravel beaches or islands with similar characteristics. It is possible that piping plovers could occur where the transmission line would cross the Mississippi River. Potential impacts during construction could be temporary disturbance (i.e., displacement). Measures taken to reduce potential impacts to interior least terns would likely help minimize any potential disturbances to piping plovers.

Construction activity could potentially impact both nesting and wintering bald eagles in the vicinity of the Mississippi River crossing. Although construction activity would be a temporary disturbance, nesting eagles, if present, could abandon their nests and wintering eagles could be displaced from roosting sites. The Applicant would coordinate with USFWS to identify any potential nest sites and roosting areas that would need to be avoided (EPMs FVW-4 and FVW-5).

3.14.1.7.2.6.1.7.2 Operations and Maintenance

No additional habitat disturbance is expected during operations and maintenance, so impacts to either the Indiana bat or northern long-eared bat during this phase are not expected. Any roost trees in the ROW underneath the transmission lines removed during construction would not be allowed to regrow because of interference with the lines and would remain as lost habitat during the life of the Project.

Mortalities from transmission line collisions and electrocution are potential impacts to the avian special status wildlife species. Of most concern is the area surrounding the Mississippi River crossing where habitat exists for the interior least tern, piping plover, and bald eagle. Most of the remaining area of the Applicant Proposed Route in Region 7 is croplands that lack suitable conditions for these species. The least tern and piping plover, species that both forage and/or nest along the Mississippi River, are both small and agile fliers that could likely avoid transmission lines (Dinan et al. 2012). The potential for mortalities from transmission line collisions for both species is considered to be low. The bald eagle is a much larger and less maneuverable species that frequently flies for foraging and movement between feeding and roosting locations and is more susceptible to potential collisions. Marking of the transmission lines near the Mississippi River to make the lines more visible could reduce the potential risk to all avian species. Risks of electrocution hazards to eagles would depend on the electrical line spacing and would decrease if the spacing is greater than the eagle's wingspan preventing contact between two or more electrical conductors. The Applicant would implement EPM GE-2 to minimize risk of avian mortality.

The Applicant would develop and implement an APP, consistent with APLIC guidelines that describes a program of specific and comprehensive actions that when implemented, would reduce risk of avian mortality. Additionally, the Applicant would implement EPMs (FVW-1, FVW-2, and GE-2) as described in Section 3.14.1.7 to reduce risk of avian mortality.

3.14.1.7.3 Impacts Associated with the DOE Alternatives

This section identifies the potential direct and indirect impacts on special status wildlife species related to the DOE alternatives.

3.14.1.7.3.1 Arkansas Converter Station Alternative and AC Interconnection Siting Areas

A detailed description of the Arkansas converter station and other terminal facilities is provided in Section 2.4.3.1. The Arkansas Converter Station Alternative and AC Interconnection Siting Areas are located near the western end of Region 5 in Pope County and Conway counties. The special status wildlife species that could occur in the Project ROI include the gray bat, northern long-eared bat, Ozark big-eared bat, and Indiana bat, interior least tern, piping plover, and bald eagle. Evergreen forest (40 percent), deciduous forest (25 percent), and pasture/hay (20 percent) comprise most of the vegetation in the siting area. Because of absence of suitable habitat for the interior least tern and piping plover within the siting area, impacts to either species are not expected.

3.14.1.7.3.1.1 Construction Impacts

Sections 3.10 and 3.17 list the types of habitats that would be affected and the acres that would be impacted by the Project. As discussed in Section 3.10, the exact location of the Arkansas converter station or AC interconnection has not been determined, although a siting area of approximately 20,000 acres has been proposed. Cave hibernacula for the four bat species and summer roosting caves for the gray bat and Ozark big-eared bat occur farther north in the karst region of the Ozark Plateau and not within the siting area. The siting area contains a high proportion of forested habitat that could potentially be used by the Indiana bat and northern long-eared bat for summer roosting and foraging. The occurrence and use of forested habitat by the northern long-eared bat and Indiana bat, and possibly by the Ozark big-eared bat and gray bat as foraging, within the Project ROI is likely restricted to the spring through fall. To the extent that construction of the converter station and associated AC interconnection transmission lines avoids forested areas, impacts to bat habitat (i.e., removable of roost trees or temporary disturbance of roost sites) would be minimized or avoided. Appropriate EPMs would be implemented (FVW-5, GE-6, GE-13, GE-20, and GE-22) to minimize potential impacts.

No bald eagle nesting or winter roost sites are known to exist within the siting area but any potential sites would be identified prior to construction and appropriate mitigation measures would be implemented to avoid potential impact to nests or winter roosts.

3.14.1.7.3.1.2 Operations and Maintenance Impacts

Once constructed, no additional land disturbance is expected to occur near the converter station or along the AC interconnection lines. No impacts to any of the special status bat species are expected from operations and maintenance of the facility. The vegetation in the ROW underneath the AC transmission lines would be maintained in a low stature to prevent interference with electrical conductors. Any trees removed during construction would not be allowed to regrow, including any trees that had been used as bat roost trees.

The transmission lines of the AC Interconnection could pose a risk to wintering bald eagles in the region. There is no suitable habitat within the siting area that would attract eagles to the area from surrounding wintering areas and the potential risk of collisions with the transmission lines is considered low.

3.14.1.7.3.1.3 Decommissioning Impacts

Decommissioning of the Project would involve methods similar to those that would be required to construct the Project. As a result, the impacts of decommissioning would be similar to those previously described for construction. The Applicant would follow the same general and resource-specific EPMs during decommissioning that would be implemented during construction. In addition, the Applicant would develop a Decommissioning Plan prior to any decommissioning actions for reviewed and approval by the appropriate state and federal agencies.

3.14.1.7.3.2 HVDC Alternative Routes

Descriptions of the HVDC alternative routes are provided in Section 2.4.3.2. The impacts that could occur to special status wildlife species from construction and operations and maintenance of the Applicant Proposed Route are discussed in Section 3.14.1.7.2. The expected types of impacts from construction and operations and maintenance of the HVDC alternative routes in each region would be similar to those for the Applicant Proposed Route. However, because of differences in routing (i.e., location) the potential for impacts may be slightly different (e.g., the route may be closer to or farther from an important habitat). The discussion in this section will focus on the differential impacts that could occur under each of the HVDC alternative routes compared to the Applicant Proposed Route. This discussion is broken out by construction and operational-related impacts.

3.14.1.7.3.2.1 Construction Impacts

Table 3.14.1-6 lists the approximate length of the HVDC alternative routes by region, the predominant habitat type that would be impacted (see Section 3.10 for more details regarding the acres of impact that would occur), and any significant differences in impacts by alternative compared to the Applicant Proposed Route. The difference in potential impacts to terrestrial special status wildlife species between the HVDC alternative routes and the Applicant Proposed Route each region is also discussed in Table 3.14.1-6.

HVDC Alternative Routes 1-A, 2-A, 3-C, 4-B, and 4-D could have potential for increased impacts to special status wildlife species compared to the Applicant Proposed Route (Table 3.14.1-6). HVDC Alternative Route 1-A has the potential to impact (habitat loss and fragmentation of existing habitat) more LEPC habitat mapped focal areas (CHAT-1) or connectivity zone habitat (CHAT-2) than Links 2, 3, 4, and 5 of the Applicant Proposed Route. HVDC Alternative Route 1-B also has the potential to impact (i.e., habitat disturbance or avoidance of habitat by LEPC) LEPC and their habitat but likely less so than HVDC Alternative Route 1-A.

HVDC Alternative Route 2-A is parallel to the Cimarron River for a portion of the route. This portion of the Cimarron River is known to be used by the interior least tern and the potential for construction impacts (disturbances) would be greater compared to Link 2 of the Applicant Proposed Route. HVDC Alternative Route 3-C has slightly more forested land and therefore could potentially impact the American burying beetle more than Links 3, 4, 5, and 6 of Applicant Proposed Route in Region 3 during construction.

HVDC Alternative Route 4-B runs north of Links 2 through 8 of the Applicant Proposed Route in Region 4. This area includes more forested lands and is closer to the Ozark Plateau region, which contains cave hibernacula for special status bat species. Because of increased forested areas, there is a potential for greater mortality impacts to the American burying beetle during construction. The increase in forested land in closer proximity to areas of caves known to be or potentially used by bats increases the potential impacts (e.g., disturbances to or loss of roost trees) to the special status bat species along this route compared to the Applicant Proposed Route. Similarly, HVDC Alternative Route 4-D also contains more forested land than corresponding Link 4 of the Applicant Proposed Route in Region 4. Therefore, construction impacts could also be greater to the American burying beetle and the special status bat species than along the corresponding Link 4.

3.14.1.7.3.2.2 Operations and Maintenance Impacts

It is expected that most of the HVDC alternative routes would have impacts during operations and maintenance similar to those of the Applicant Proposed Route because the habitat and species composition is similar. The presence of transmission lines in the alternative routes would have similar potential for collision mortalities for the same species as the Applicant Proposed Route. The potential impacts of HVDC Alternative Routes 1-A, 2-A, 3-C, 4-B, and 4-D could have potential for increased impacts to special status wildlife species compared to the Applicant Proposed Route for the reasons discussed in Table 3.14.1-6. HVDC Alternative Route 1-A has the potential to impact (behavioral avoidance and fragmentation of existing habitat) more LEPC habitat mapped as focal area (CHAT-1) or connectivity zone habitat (CHAT-2) than Links 2, 3, 4, and 5 of the Applicant Proposed Route. HVDC Alternative Route 1-B also has the potential to impact LEPC habitat but likely less so than HVDC Alternative Route 1-A.

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Table 3.14.1-6:
Special Status Wildlife Species Summary Information Regarding the HVDC Alternative Routes

Region	HVDC Alternative Route	Total Length of Route (miles)	Predominant Land Cover	Impacts to Wildlife that would Differ Compared to the Applicant Proposed Route
1	1-A	123	Grassland/herbaceous (approximately 2,265.4 acres or 75.4 percent)	This alternative compares to the Applicant Proposed Route Links 2, 3, 4, and 5. HVDC Alternative Route 1-A has intersects some CHAT 1 and 2 LEPC habitat, focal areas, and connectivity zones (Van Pelt et al. 2013) that the APR does not, indicating that construction of HVDC alternative transmission lines may have more impacts from habitat loss and modification, sensory disturbance and mortality and/or injuries than the APR.
	1-B	52	Grassland/herbaceous (approximately 886.6 acres or 69.9 percent)	This alternative compares to the Applicant Proposed Route Links 2 and 3. No significant impact differences are anticipated between the Applicant Proposed Route and this alternative.
	1-C	52	Grassland/herbaceous (approximately 892.3 acres or 70.1 percent)	This alternative compares to the Applicant Proposed Route Links 2 and 3. No significant impact differences are anticipated between the Applicant Proposed Route and this alternative.
	1-D	33.5	Grassland/herbaceous (approximately 568.9 acres or 69.4 percent)	This alternative compares to the Applicant Proposed Route Links 3 and 4. No significant impact differences are anticipated between the Applicant Proposed Route and this alternative.
2	2-A	57	Grassland/herbaceous (approximately 833.5 acres or 59.7 percent)	This alternative compares to the Applicant Proposed Route Link 2. HVDC Alternative 2-A has the potential to have greater construction impacts to interior least terns compared to the Applicant Proposed Route or Alternative Route 2-B, based on proximity of this route to known nesting occurrences along the Cimarron River (as this route is located closer to the river than Alternative Route 2-B or the Applicant Proposed Route).
	2-B	30	Croplands (approximately 440.3 acres or 60.5 percent) and grassland/herbaceous (approximately 240 acres or 33 percent)	This alternative compares to the Applicant Proposed Route Link 3. No significant impact differences are anticipated between the Applicant Proposed Route and this alternative.
3	3-A	38	Grassland/herbaceous (approximately 497.3 acres or 54.1 percent) and deciduous forest (187.7 acres or 20.4 percent)	This alternative compares to the Applicant Proposed Route Link 1. No significant impact differences are anticipated between the Applicant Proposed Route and this alternative.
	3-B	48	Grassland/herbaceous (approximately 645.2 acres or 55.3 percent) and deciduous forest (219 acres or 18.8 percent)	This alternative compares to the Applicant Proposed Route Links 1, 2, and 3. No significant impact differences are anticipated between the Applicant Proposed Route and this alternative.
	3-C	122	Grassland/herbaceous (approximately 1,061.2 acres or 358 percent), deciduous forest (869.2 acres or 29.3 percent), and pasture/hay (773.4 acres or 26.1 percent)	This alternative compares to the Applicant Proposed Route Links 3, 4, 5, and 6. Impacts to the American burying beetle may be higher compared to the Applicant Proposed Route due to slightly more forested areas that would be impacted, but less for the gray bat because less foraging areas near water would be impacted.

Table 3.14.1-6:
Special Status Wildlife Species Summary Information Regarding the HVDC Alternative Routes

Region	HVDC Alternative Route	Total Length of Route (miles)	Predominant Land Cover	Impacts to Wildlife that would Differ Compared to the Applicant Proposed Route
	3-D	39	Primarily pasture/hay (approximately 491.8 acres or 51.3 percent), grassland/herbaceous (188.9 acres or 19.7 percent), and deciduous forest (184.3 acres or 19.2 percent	This alternative compares to the Applicant Proposed Route Links 5 and 6. No significant impact differences are anticipated between the Applicant Proposed Route and this alternative.
	3-E	8.5	Pasture/hay (approximately 98.3 acres or 47.3 percent) and deciduous forest (74.1 acres or 35.7 percent)	This alternative compares to the Applicant Proposed Route Link 6. No significant impact differences are anticipated between the Applicant Proposed Route and this alternative.
4	4-A	58	Deciduous forest (approximately 624 acres or 43.8 percent) and pasture/hay (497.4 acres 34.9 percent)	This alternative compares to the Applicant Proposed Route Links 3, 4, 5, and 6. No significant impact differences are anticipated between the Applicant Proposed Route and this alternative.
	4-B	79	Deciduous forest (approximately 873.2 acres or 45.5 percent) and pasture/hay (459.6 acres or 23.9 percent)	This alternative compares to the Applicant Proposed Route Links 2–8. Approximately 102 acres of the federally owned land in the Ozark National Forest and an additional 157 acres of private land within the Ozark National Forest boundary (use unknown) are within the ROW for HVDC Alternative Route 4-B. HVDC Alternative Route 4-B would cross into the Ozark National Forest IBA, potentially indirectly impacting wildlife species during construction, as a result of mortality and/or injury, sensory disturbance, and habitat loss or modification. Furthermore, this route alternative would impact more forested areas compared to the Applicant Proposed Route, thereby increasing the risk of impacts to the American burying beetle. This alternative route also is closer to potential cave hibernacula in the Ozark Plateau and may have a higher potential for bat roosting and foraging in the forested areas.
	4-C	3	Deciduous forest (approximately 32.4 acres or 39.2 percent) and pasture/hay (19 acres or 23 percent)	This alternative compares to the Applicant Proposed Route Link 5. No significant impact differences are anticipated between the Applicant Proposed Route and this alternative.
	4-D	25	Pasture/hay (approximately 299.9 acres or 48.6 percent) and deciduous forest (179.6 acres or 29.1 percent)	This alternative compares to the Applicant Proposed Route Link 4. This route alternative would impact more forested areas compared to the Applicant Proposed Route, thereby increasing the risk of impacts to the American burying beetle. Because of additional forested habitat, there is potential for more impact to bat roosting and foraging habitat.
	4-E	37	Pasture/hay (approximately 395.5 acres or 44.1 percent) and evergreen forest (218.7 acres or 24.4 percent)	This alternative compares to the Applicant Proposed Route Links 8 and 9. No significant impact differences are anticipated between the Applicant Proposed Route and this alternative.
5	5-A	13	Evergreen forest (130.4 acres or 42.3 percent) and deciduous forest (78.8 acres or 25.5 percent)	This alternative compares to the Applicant Proposed Route Link 1. No significant impact differences are anticipated between the Applicant Proposed Route and this alternative.

Table 3.14.1-6:
Special Status Wildlife Species Summary Information Regarding the HVDC Alternative Routes

Region	HVDC Alternative Route	Total Length of Route (miles)	Predominant Land Cover	Impacts to Wildlife that would Differ Compared to the Applicant Proposed Route
	5-B	71	Pasture/hay (approximately 740.3 acres or 42.7 percent) and deciduous forest (479.5 acres or 27.7 percent)	This alternative compares to the Applicant Proposed Route Links 3, 4, 5, and 6. No significant impact differences are anticipated between the Applicant Proposed Route and this alternative.
	5-C	9	Deciduous forest (approximately 99.9 acres or 44.5 percent) and pasture/hay (70.9 acres or 31.6 percent)	This alternative compares to the Applicant Proposed Route Links 6 and 7. No significant impact differences are anticipated between the Applicant Proposed Route and this alternative.
	5-D	22	Deciduous forest (approximately 246.5 acres or 46.5 percent) and croplands (92 acres or 17.4 percent)	This alternative compares to the Applicant Proposed Route Link 9. No significant impact differences are anticipated between the Applicant Proposed Route and this alternative.
	5-E	36	Pasture/hay (approximately 383.5 acres or 43.3 percent) and deciduous forest (249.3 acres or 28.2 percent)	This alternative compares to the Applicant Proposed Route Links 4, 5, and 6. No significant impact differences are anticipated between the Applicant Proposed Route and this alternative.
	5-F	22	Pasture/hay (approximately 209.9 acres or 38.6 percent) and deciduous forest (153.2 acres or 28.1 percent)	This alternative compares to the Applicant Proposed Route Links 5 and 6. No significant impact differences are anticipated between the Applicant Proposed Route and this alternative.
6	6-A	16	Croplands (approximately 328.6 acres or 83 percent)	This alternative compares to the Applicant Proposed Route Links 2, 3, and 4. No significant impact differences are anticipated between the Applicant Proposed Route and this alternative.
	6-B	14	Croplands (approximately 272.1 acres or 79.2 percent) and woody wetlands (39 acres or 13 percent)	This alternative compares to the Applicant Proposed Route Link 3. No significant impact differences are anticipated between the Applicant Proposed Route and this alternative.
	6-C	23	Croplands (approximately 410.6 acres or 72.6 percent)	This alternative compares to the Applicant Proposed Route Links 6 and 7. No significant impact differences are anticipated between the Applicant Proposed Route and this alternative.
	6-D	9	Croplands (approximately 205.3 acres or 91.8 percent)	This alternative compares to the Applicant Proposed Route Link 7. No significant impact differences are anticipated between the Applicant Proposed Route and this alternative.
7	7-A	43	Croplands (approximately 827.8 acres or 78.7 percent) and woody wetlands (101 acres or 11 percent)	This alternative compares to the Applicant Proposed Route Link 1. No significant impact differences are anticipated between the Applicant Proposed Route and this alternative.

Table 3.14.1-6:
Special Status Wildlife Species Summary Information Regarding the HVDC Alternative Routes

Region	HVDC Alternative Route	Total Length of Route (miles)	Predominant Land Cover	Impacts to Wildlife that would Differ Compared to the Applicant Proposed Route
	7-B	9	Croplands (approximately 86.4 acres or 41.2 percent), deciduous forest (42.7 acres or 20.3 percent), pasture/hay (34 acres or 16.2 percent),and shrub/scrub (32.7 acres or 15.6 percent)	This alternative compares to the Applicant Proposed Route Links 3 and 4. No significant impact differences are anticipated between the Applicant Proposed Route and this alternative.
	7-C	24	Croplands (approximately 350.6 acres or 60.6 percent), pasture/hay (72.2 acres or 12.5 percent), and deciduous forest (58.4 acres or 10.1 percent)	This alternative compares to the Applicant Proposed Route Links 3, 4, and 5. No significant impact differences are anticipated between the Applicant Proposed Route and this alternative.
	7-D	7	Croplands (approximately 76.8 acres or 48.1 percent), pasture/hay (32.2 acres or 20.2 percent), and shrub/scrub (20.6 acres or 12.9 percent)	This alternative compares to the Applicant Proposed Route Links and 5. No significant impact differences are anticipated between the Applicant Proposed Route and this alternative.

GIS Data Source: Jin et al. 2013.

HVDC Alternative Route 2-A is closer to and parallels the Cimarron River for a portion of the route compared to Link 2 of the Applicant Proposed Route. The potential for collision mortalities from the transmission lines could be potentially greater with the closer proximity to known interior least tern habitat along the river. However, terns are agile fliers and the probability of mortality is considered low.

HVDC Alternative Route 3-C has slightly more forested land and therefore could potentially impact the American burying beetle more than Links 3, 4, 5, and 6 of the Applicant Proposed Route in Region 3; therefore, impacts to the American burying beetle from operations and maintenance likely would not be greater than those along the Applicant Proposed Route.

HVDC Alternative Route 4-B runs north of Links 2 through 8 of the Applicant Proposed Route in Region 4. This area includes more forested lands and is closer to the Ozark Plateau region that contains cave hibernacula for special status bat species; therefore, impacts to the American burying beetle from operations and maintenance likely would not be greater than those along the Applicant Proposed Route. The increase in forested land in closer proximity to areas of caves known to be or potentially used by bats increases the potential impacts (e.g., disturbances to or loss of roost trees) to the special status bat species along this route compared to the Applicant Proposed Route. Similarly, HVDC Alternative Route 4-D also contains more forested lands than the corresponding Link 4 of the Applicant Proposed Route in Region 4. Any bat roost trees or foraging habitat lost from clearing the ROW underneath the transmissions lines during construction would remain a long-term impact during operations and maintenance as the ROW would be maintained with low stature plants to avoid interference with electrical conductors.

3.14.1.7.3.2.3 Decommissioning Impacts

Potential impacts during decommissioning of the HVDC alternative routes would be similar to those of the construction phase. Once the decommissioning is complete, all land could return to the pre-construction land uses according to the Restoration Plan as described in Section 3.14.1.7. The Applicant would follow the same general and resource-specific EPMs during decommissioning that would be implemented during construction. In addition, the Applicant would develop a Decommissioning Plan prior to any decommissioning actions for reviewed and approval by the appropriate state and federal agencies.

3.14.1.7.4 Best Management Practices

The Applicant has developed a comprehensive list of EPMs intended to avoid or minimize impacts to wildlife resources. A complete list of EPMs for the Project is provided in Appendix F; those EPMs that would specifically minimize the potential for impacts to special status wildlife species are summarized in Section 3.14.1.7.1. DOE and the Applicant are preparing a Biological Assessment of potential impacts on special status species protected under the ESA as part of the Section 7 consultation between DOE and the USFWS. The Section 7 consultation review is a parallel but separate process conducted pursuant to the requirements of ESA and the applicable implementing regulations. Through this process, protective measures may be identified and adopted to avoid and/or minimize impacts to special status species.

3.14.1.7.5 Unavoidable Adverse Impacts

The Applicant would implement EPMs to avoid or minimize impacts. However, some adverse impacts may remain even with the implementation of these measures. Construction and operations and maintenance of the Project could result in the mortality of some special status wildlife species if they are present in the affected areas during construction or operations and maintenance, including, but not limited to, potential mortalities associated with the clearing of vegetation as well as avian collisions with Project structures during operations and maintenance. Potential mortalities would be highest if vegetation clearing was conducted during the breeding season. Construction-related disturbances to habitats could also result in degradation and loss of some wildlife habitats (through factors that include but are not limited to noise and visual disturbances, as well as the effects of fragmentation, edge effects, and invasive plant species). ROW maintenance in forested habitats as well as the footprint of Project structures would result in a permanent loss of mature forest habitat.

3.14.1.7.6 Irreversible and Irretrievable Commitment of Resources

The potential permanent loss or alteration of established trees in mature forests in the eastern portion of the Project (in Regions 3, 4, 5, and 7) would last throughout the life of the Project; however, gradual recovery of habitat may occur once the Project is decommissioned. Because the exact state of this recovery is not known (e.g., substantial changes related to climate, land-use, and/or weeds or pathogens may occur during the 80 year lifespan of the Project) and mature forests are subject to long-term climatic regimes, it is reasonable to assume that some portions of the habitat for special status wildlife species in these forests would be irreversibly and irretrievably impacted.

3.14.1.7.7 Relationship between Local Short-term Uses and Long-term Productivity

Both the Applicant Proposed Route and the DOE Alternatives may result in a short-term disturbance to special status wildlife; however, these impacts should not affect the long-term productivity of populations of special status wildlife.

3.14.1.7.8 Impacts from Connected Actions

3.14.1.7.8.1 Wind Energy Generation

Potential special status wildlife species that could occur within the six-county region in Texas and Oklahoma which contain the WDZs include LEPC, whooping crane, interior least tern, piping plover, Sprague's pipit, red knot, golden eagle, and bald eagle. Specific wind farm development locations are unknown in the 6-county area; therefore, impacts to specific special status species and their habitat could vary greatly depending on where wind farms are developed. Impacts could be reduced by locating wind farms on previously disturbed lands (e.g., croplands) that have little value has habitat for special status species.

Wind energy developers are expected to develop and construct wind energy projects based on guidance outlined by the USFWS Land-Based Wind Energy Guidance (USFWS 2012c) and the APLIC guidelines (APLIC 2012). These guidelines may include the development of conservation strategies and specific actions that, when implemented, could reduce the risk of impacts to special status wildlife species and their habitats. The estimated acreage of land that could be disturbed during construction and would remained disturbed during operation (e.g., permanent access roads, footprint of wind turbines and electrical stations) of the wind farms are listed in Table 3.14.1-7. These estimates assume a 30 percent build-out of the WDZs that would supply the electrical transmission capacity of the Applicant Proposed Project with an estimated 2 percent disturbance of land area during construction and a 1 percent land disturbance remaining during operation of the wind farms.

Table 3.14.1-7:
Description of the WDZ and the Potential Special Status Wildlife Species That May Occur In Area

WDZ Name	Potentially Suitable Area for Wind Development (acres)	Estimated Acres of Impact during Construction[1]	Estimated Acres of Impact during Operation[1]	Special Status Species Potentially Present in the WDZ
WDZ-A	101,000	606 acres of primarily croplands and grasslands	303 acres	Potentially suitable habitat for piping plover is limited; however, there is a potential for piping plover to occur during migration (which generally occurs from April to June). LEPC and whooping crane may feed within the croplands and grasslands that are common in WDZ-A; however, the whooping crane occurrence within the WDZ-A is likely to be limited to migratory stopover occurrences.
WDZ-B	108,000	648 acres of primarily croplands and grasslands	324 acres	Potentially suitable habitat for piping plover is limited; however, there is a potential for piping plover to occur during migration (which generally occurs from April to June). LEPC and whooping crane may feed within the croplands and grasslands that are common in WDZ-B; however, the whooping crane occurrence within the WDZ-B is likely to be limited to migratory and stopover occurrences.
WDZ-C	123,000	738 acres of primarily croplands and grasslands	369 acres	Potentially suitable habitat for piping plover is limited; however, there is a potential for piping plover to occur during migration (which generally occurs from April to June). LEPC and whooping crane may feed within the croplands and grasslands that are common in WDZ-C; however, the whooping crane occurrence within the WDZ-C is likely to be limited to migratory and stopover occurrences.
WDZ-D	43,000	258 acres of primarily grasslands	129 acres	Potentially suitable habitat for piping plover is limited; however, there is a potential for piping plover to occur during migration (which generally occurs from April to June). LEPC and whooping crane may feed within the grasslands that are common in WDZ-D; however, the whooping crane occurrence within the WDZ-D is likely to be limited to migratory and stopover occurrences.
WDZ-E	43,000	258 acres of primarily croplands and grasslands	129 acres	Potentially suitable habitat for piping plover is limited; however, there is a potential for piping plover to occur during migration (which generally occurs from April to June). LEPC and whooping crane may feed within the grasslands that are common in WDZ-E; however, the whooping crane occurrence within the WDZ-E is likely to be limited to migratory and stopover occurrences.
WDZ-F	82,000	492 acres of primarily grasslands and croplands	246 acres	Potentially suitable habitat for piping plover is limited; however, there is a potential for piping plover to occur during migration (which generally occurs from April to June). LEPC and whooping crane may feed within the croplands and grasslands that are common in WDZ-F; however, the whooping crane occurrence within the WDZ-F is likely to be limited to migratory and stopover occurrences.
WDZ-G	159,000	954 acres of primarily grasslands and croplands	477 acres	Potentially suitable habitat for piping plover is limited; however, there is a potential for piping plover to occur during migration (which generally occurs from April to June). LEPC and whooping crane may feed within the croplands and grasslands that are common in WDZ-G; however, the whooping crane occurrence within the WDZ-G is likely to be limited to migratory and stopover occurrences.

Table 3.14.1-7:
Description of the WDZ and the Potential Special Status Wildlife Species That May Occur In Area

WDZ Name	Potentially Suitable Area for Wind Development (acres)	Estimated Acres of Impact during Construction[1]	Estimated Acres of Impact during Operation[1]	Special Status Species Potentially Present in the WDZ
WDZ-H	67,000	402 acres of primarily grasslands and croplands	201 acres	Potentially suitable habitat for piping plover is limited; however, there is a potential for piping plover to occur during migration (which generally occurs from April to June). LEPC and whooping crane may feed within the croplands and grasslands that are common in WDZ-H; however, the whooping crane occurrence within the WDZ-H is likely to be limited to migratory and stopover occurrences.
WDZ-I	85,000	510 acres of primarily grasslands and croplands	255 acres	Potentially suitable habitat for piping plover and interior least tern is limited; however, there is a potential for both species to occur during migration (which generally occurs from April to June). LEPC and whooping crane may feed within the grasslands that are common in WDZ-I; however, the whooping crane occurrence within the WDZ-I is likely to be limited to migratory and stopover occurrences.
WDZ-J	44,000	264 acres of primarily grasslands	132 acres	Potentially suitable habitat for piping plover and interior least tern is limited; however, there is a potential for both species to occur during migration (which generally occurs from April to June). LEPC and whooping crane may feed within the grasslands that are common in WDZ-J; however, the whooping crane occurrence within the WDZ-J is likely to be limited to migratory and stopover occurrences. The LEPC habitat within WDZ-J is categorized as CHAT category 1 (i.e., focal area) suggesting that large areas of undeveloped, contiguous grassland/herbaceous land cover occur within the WDZ.
WDZ-K	84,000	504 acres of primarily grasslands and croplands	252 acres	Potentially suitable habitat for piping plover and interior least tern is limited; however, there is a potential for both species to occur during migration (which generally occurs from April to June). LEPC and whooping crane may feed within the grasslands that are common in WDZ-K; however, the whooping crane occurrence within the WDZ-K is likely to be limited to migratory and stopover occurrences.
WDZ-L	144,000	864 acres of primarily grasslands and croplands	432 acres	Potentially suitable habitat for piping plover is limited; however, there is a potential for piping plover to occur during migration (which generally occurs from April to June). LEPC and whooping crane may feed within the grasslands that are common in WDZ-L; however, the whooping crane occurrence within the WDZ-L is likely to be limited to migratory and stopover occurrences. The LEPC habitat within WDZ-L is categorized as CHAT category 1 (i.e., focal area) suggesting that large areas of undeveloped contiguous grassland/herbaceous land cover occur within the WDZ.

1 The estimated acres of impact assumes a 30 percent build-out with 2 percent of the land affected during construction and 1 percent affected during operations based on the potentially suitable area for wind development in each WDZ (Table 2.5-1).

Potential impacts during wind farm development could include short-term disturbances to species (i.e., displacement in the vicinity of construction activity) during construction, loss of habitat from land disturbance, and potential mortality from vehicle collisions. Impacts to the interior least tern, piping plover, and red knot are not expected during construction. These three species use sparsely vegetated shorelines, sandbars, mudflats, and islands of rivers, lakes, and reservoirs. These habitats are relatively uncommon in the WDZs and are not likely sites that would be developed for wind energy. The LEPC could be potentially impacted during construction of wind farms by clearing of grassland habitats for access roads, wind turbines, and electrical stations.

Although the proportion of land potentially disturbed during wind farm construction is relatively small (2 percent), construction in undisturbed grasslands could fragment LEPC habitat that could reduce overall LEPC habitat quality in a larger area surrounding a wind farm. The potential for construction impacts to the LEPC and its habitat is greater in WDZs D, I, J, K, and L. These WDZs occur in eastern Texas County and western Beaver County in Oklahoma and western Ochiltree County in Texas. These WDZs are closest to areas mapped as focal and connectivity habitat areas in the LEPC Range-Wide Conservation Plan (Van Pelt et al. 2013). Although impacts to LEPC could occur on land outside the identified focal and connectivity habitat areas, the focal areas represent high priority conservation areas to preserve larger more contiguous blocks of LEPC habitats and to encourage development in areas with less potential impact.

Sprague's pipit also is an occupant of grasslands, but it occurs as an uncommon migrant and rare winter resident in the vicinity of the WDZs and impacts to this species are expected to be minimal from construction activities (USFWS 2014d). Construction impacts to either golden eagles or bald eagles are not expected as both species are wide-ranging and nesting habitat for the golden eagle is limited in the WDZs. Once construction has been completed, temporary construction areas would revert to their previous use. Only turbines, access roads, generation tie-lines (if necessary), substations, and operations and maintenance buildings would remain. Existing land uses, primarily agriculture and grazing, would be expected to return to almost all areas of the facilities unless deemed incompatible with the operations of a wind energy development. During the operations and maintenance phase of wind energy developments, approximately 1 percent of the land could be affected (i.e., occupied by turbines, electrical stations, access roads). For the 12 WDZs, assuming 30 percent build-out, 3,249 acres could be impacted (Table 3.14.1-7).

Operation and maintenance of wind energy developments are known to have the potential to directly impact some special status wildlife species, specifically avian and bat species, due to collisions with wind turbine blades, collisions and electrocutions associated with generation tie-lines, barotrauma (physical tissue damage caused by air pressure differences) of bat species, and potential avoidance of otherwise suitable habitat surrounding vertical structures such as wind turbines and transmission structures. None of the four special status bat species (three listed as endangered, one proposed as endangered) that occurs on the Applicant Proposed Project occurs in Region 1, so none would be affected by potential wind energy development. Historically, the average number of avian species fatalities associated with operations of a wind energy facilities has varied among developments and is considered a function of a number of factors, including the proximity to known staging areas, winter ranges, nesting sites, migration stopovers or corridors, and leks or other areas of seasonal importance (USFWS 2012c).

Given the limited habitat for either the piping plover or interior least tern in the wind development zones, impacts to either species is not expected. Some whooping cranes migrate through the WDZ region, although the area is west of the primary whooping migration corridor. Because of their large size and lower maneuverability, whooping cranes could be at risk for collisions with wind turbines. Because Sprague's pipit is a relatively uncommon migrant through the region, potential collision mortalities are possible but probably unlikely. The preferred cliff and canyon nesting habitat of the golden eagle occurs west of the WDZs. However, migrant golden eagles, and some bald eagles, may occur in the WDZ region and could be at risk for mortality collisions. Occurrence of avian special status species within the WDZ and collision mortalities from wind energy facilities would likely be documented by wind energy developers under the Land-Based Wind Energy Guidelines (USFWS 2012c), in accordance with appropriate state and federal regulations.

Indirect impacts causing habitat loss and/or modification have been reported for some species of prairie-grouse; however, little is known about effects of wind farms on LEPC (Van Pelt et al. 2013). Behavioral avoidance by LEPC of otherwise suitable habitat surrounding wind turbine towers may increase the area of impact (Pruett et al. 2009, Winder et al. 2014). Empirical data on impact distances from vertical structures for LEPC is limited; however, appropriate buffer distances and restrictions near LEPC occupied habitat would be determined during any ESA consultation by the wind energy developer. The resulting habitat loss and/or modification may reduce the overall fitness of birds, reduce reproductive success, and inhibit movement and gene flow of birds (Van Pelt et al. 2013; 79 FR 20074, April 10, 2014). Although specific empirical data currently are not publically available, the suggestion that LEPC may avoid otherwise suitable habitat has led the USFWS to recommend the consideration of occupied prairie-grouse habitat (i.e., includes habitat used only periodically or temporarily during some portion of its life history) in locating wind farm facilities (USFWS 2012c).

Once the decommissioning phase has concluded, lands occupied by wind energy developments may be restored to their pre-construction conditions depending on specific contracts between the landowner and developer. Structures, including wind turbines and generation tie-lines, would be dismantled. Impacts associated with the construction, operations and maintenance of wind turbines, generation tie lines, and other permanent structures could therefore be reduced or eliminated as these areas are restored.

3.14.1.7.8.2 Optima Substation

No impacts to piping plovers, interior least terns, and bald eagles are expected from construction and operations and maintenance of the future Optima Substation because the site does not contain suitable habitat for any of these species. Because of the relatively small size (up to 160 acres) of the substation, potential collision mortalities to whooping cranes that migrate through the Oklahoma Panhandle region are unlikely to occur. The existing roads, power poles, and croplands that occur on and/or adjacent to the substation decrease the quality of the LEPC habitat. It is possible that some LEPC occur in grassland habitats in the vicinity of the future Optima Substation; however, potential impacts (loss of habitat and mortality) to LEPC and their habitat are expected to be minor. No leks are known to occur in the vicinity of the future Optima Substation and impacts to leks are not expected to occur (Figure 3.14-1a in Appendix A).

3.14.1.7.8.3 TVA Upgrades

A precise ROI has not been identified for the TVA upgrades. Where possible, general impacts associated with the required TVA upgrades are discussed below.

Potential impacts are expected to be lower in areas affected by upgrades to existing TVA facilities than in areas where the new electric transmission line would be constructed. Generally, construction of the new transmission line could involve mortalities or new disturbances of habitat used (e.g., for breeding, nesting, brood-rearing, wintering, or foraging) by special status wildlife species, similar to the Project. Impacts during new construction could include loss of habitat from land clearing, temporary disturbance displacement, and possible mortality or injury by vehicles and construction equipment. These impacts would be short term except for habitat loss on sites used for structures or access (i.e., roads) and any wildlife mortality. The new electric transmission line could result in mortality and injury of avian special status wildlife species from collisions and electrocutions during operations and maintenance. Existing TVA transmission lines would require fewer construction activities to complete upgrades than the new transmission line and would have proportionally fewer impacts as activities would occur primarily in previously disturbed areas. Upgrading and modifying existing substations would likely have no impact on special status wildlife.

TVA would consider potential impacts to special wildlife status species and their habitats during the siting of the new transmission line and while planning the upgrades to existing transmission facilities. TVA would avoid impacts to these species and their habitats to the extent practicable. Pursuant to section 7 of the ESA, TVA is required to consult with USFWS with respect to effects of its construction of any new or upgraded transmission facilities upon threatened, endangered or candidate species.

3.14.1.7.9 Impacts Associated with the No Action Alternative

Under the No Action Alternative, the Project would not be constructed or operated, and impacts to special status wildlife species and their habitats would be consistent with current levels of disturbance related to natural conditions in the environment, such as annual changes in climates, land use changes, and wildfires. No Project-related disturbances or impacts would occur to special status wildlife or their habitats under the No Action Alternative.

3.14.2 Special Status Fish, Aquatic Invertebrate, and Amphibian Species

3.14.2.1 Regulatory Background

Regulations that influence the evaluation of special status fish, aquatic invertebrate, and amphibian species within the region of influence are primarily implemented by the USFWS and state agencies. The applicable state agencies to the Project include the ODWC, AGFC, TWRA, and TPWD. The special status fish, aquatic invertebrate, and amphibian species regulations relevant to the Project are presented in Table 3.14.2-1.

Table 3.14.2-1:
Relevant Laws and Regulations for Fish, Aquatic Invertebrate and Amphibian Species

Regulation	Regulatory Agency	Summary
Endangered Species Act (ESA) (16 USC § 1531 *et seq*.; 50 CFR Part 402)	USFWS	Establishes lists of threatened or endangered species and their designated critical habitats; requires federal agencies to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of listed species or result in adverse modification to designated critical habitat.
Oklahoma Statutes 29-5-412.1 Oklahoma Administrative Code Title 800, "Department of Wildlife Conservation"	ODWC	Establishes list of threatened or endangered species within Oklahoma. Describes the function, organization, powers, and duties of the ODWC with respect to managing fish and wildlife resources.
Texas Administrative Code 31-65.171–65.177	TPWD	Establishes list of threatened or endangered wildlife within Texas; prohibits the taking, possession, transportation, or sale of threatened or endangered species within the issuance of a permit.
Arkansas Code Annotated 15-45-301–306	AGFC[1]	Prohibits imports, transportation, sale, purchase, hunting, harassment, or possession of threatened or endangered wildlife or their parts.
Tennessee Administrative Code 70-1-101 et seq.	TWRA	Establishes a list of threatened or endangered wildlife within Tennessee; prohibits the take, attempt to take, possession, transportation, export, processing, selling, offering to sell, shipment of, or knowing receipt of shipment of threatened or endangered wildlife.

1 Arkansas does not have an endangered species law, but does maintain a list of Species of Special Concern.

3.14.2.2 Data Sources

Data sources included a desktop analysis of relevant information; research findings; and reports available to the public; a database that includes GIS data from government agencies as well as and non-governmental organizations; and information received from both regulatory agencies and stakeholders during the DOE scoping process. All data sources used for this analysis were limited to those that were open source and readily available to the public (i.e., the public may assess them without restrictions). For special status fish, aquatic invertebrate, and amphibian species, the following data sources were reviewed:

- USFWS Endangered Species Program Threatened and Endangered Species Range Maps
- USFWS Critical Habitat Portal
- Arkansas Geographic Information Office Ecologically Sensitive Streams and Waterbodies
- ADEQ Extraordinary Resource Water
- TCEQ Stream Use and Quality Information

Table 3.14.2-2 lists additional data sources analyzed for the ROI. Information and data sources have been provided for areas with exceptions to the ROI in Section 3.14.2.3.1.

Table 3.14.2-2:
Summary of Data Sources for Fish and Aquatic Invertebrate Species

Resource	Data Sources
General fishery classifications in the ROI	EPA National Rivers and Streams Assessment (http://water.epa.gov/type/rsl/monitoring/riverssurvey/index.cfm) USGS National Hydrography Dataset (GIS Data Source: USGS 2014a) NPS Nationwide Rivers Inventory (GIS Data Source: USGS 1996)
Federal and state special status aquatic species: Arkansas darter (*Etheostoma cragini*) Arkansas river shiner (*Notropis girardi*) Ozark cavefish (*Amblyopsis rosea*) Yellowcheek darter (*Etheostoma moorei*) Pallid sturgeon (*Scaphirhynchus albus*) Spectaclecase (*Cumberlandia monodonta*) Pink mucket (*Lampsilis abrupta*) Neosho mucket (*Lampsilis rafinesqueana*) Speckled pocketbook (*Lampsilis streckeri*) Scaleshell mussel (*Leptodea leptodon*) Fat pocketbook (*Potamilus capax*) Rabbitsfoot (*Quadrula cylindrica cylindrical*) Curtis' pearlymussel (*Epioblasma florentina curtisii*) Fanshell (*Cyprogenia stegaria*) Snuffbox (*Epioblasma triquetra*) Ozark hellbender (*Cryptobranchus alleganiensis bishopi*)	USFWS Endangered Species Program Threatened and Endangered Species Range Maps (http://www.fws.gov/endangered/map/index.html) USFWS Critical Habitat Portal (http://ecos.fws.gov/crithab/) Arkansas Geographic Information Office Ecologically Sensitive Streams and Waterbodies (http://www.geostor.arkansas.gov/metadata/ENVIR.DBO.REG_2_ESW_WATERBODIES_ADEQ.xml) ADEQ Extraordinary Resource Water (http://www.adeq.state.ar.us/water/branch_planning/pdfs/wqs_extraordinary_resource_stream_designations_011001.pdf) TCEQ Stream Use and Quality Information (http://tceq4apmgwebp1.tceq.texas.gov:8080/swav/Controller/index.jsp?wtrsrc)

3.14.2.3 Region of Influence

The general ROI considered for the Project and connected actions is described in Section 3.1. The following subsection describes where the ROI used for special status fish, aquatic invertebrate, and amphibian species was expanded beyond the area described in Section 3.1. The expansion of the ROI does not mean that impacts would necessarily occur at that distance, but instead, it identifies whether species are in the vicinity and could possibly be affected by the Project.

3.14.2.3.1 Variations of the Region of Influence for Special Status Fish, Aquatic Invertebrate, and Amphibian Species

The ROI for special status fish, aquatic invertebrate, and amphibian species consists of multiple waterbodies (e.g., perennial, intermittent) traversed by the Project, including special interest waterbodies. The ROI covers aquatic habitats and potential fish, aquatic invertebrate, and amphibian species that may be present based on literature reviews and data provided by Clean Line (2013). To thoroughly identify and assess potential occurrences of special status fish, aquatic invertebrate, and amphibian species, the ROI described in Section 3.1 was expanded to include a 3-mile buffer both upstream (1.5 miles) and downstream (1.5 miles) of the Applicant Proposed Route and HVDC alternative routes. The assessment within the 3-mile buffer included identifying waterbodies within the buffer that have documented occurrences of special status fish, aquatic invertebrate, and amphibian species designated as candidate, threatened, or endangered under the ESA and state-designated threatened and endangered species. This addition of the 3-mile buffer was identified to appropriately take into consideration the mobility of special status fish, aquatic invertebrate, and amphibian species. The assessment entailed adding the 3-mile buffer to the 1,000-foot-wide corridor and conducting database searches within the 3-mile buffer for waterbodies with documented occurrences of both state and federally protected fish, aquatic invertebrate, and amphibian species. Considering the mobility of fish and larval mussels, the 3-mile buffer is necessary both upstream and downstream of stream crossings, and extensive enough, to account for the various ranges of special status fish and aquatic invertebrate species, including the unique and varied habitat that each species potentially occupies.

To quantify potential impacts to special status fish, aquatic invertebrate, and amphibian species associated with the Applicant Proposed Route and the HVDC alternative routes, a 3-mile buffer at crossing locations (i.e., 1.5-miles upstream and 1.5-miles downstream) and a 195-foot-wide USFWS polygon of designated critical habitat were used to calculate acres of critical habitat within the 1,000-foot-wide ROI and 200-foot-wide ROW. This calculation provided the acres of USFWS designated critical habitat crossed and within the 1,000-foot-wide ROI and 200-foot-wide ROW for the Applicant Proposed Route and the HVDC alternative routes.

In general, the converter stations and Oklahoma AC interconnection are not located close to waterbodies that would affect special status species; however, any potential waterbody that may contain one or more special status fish, aquatic invertebrate, and amphibian species would be subject to the same qualifications listed above.

3.14.2.4 Affected Environment for Special Status Fish, Aquatic Invertebrate, and Amphibian Species

The following sections provide descriptions of special status fish, aquatic invertebrate, and amphibian species known to occur within or in proximity to the ROI as described above in Section 3.14.2.3.1. Section 3.14.2.4.1 provides an overview of federally proposed or listed fish, aquatic invertebrate, and amphibian species. Sections 3.14.2.4.2 and 3.14.2.4.3 provide information specific to each of the federally proposed or listed fish or aquatic invertebrate species, respectively. Section 3.14.2.4.4 provides an overview of state designations for aquatic wildlife. Descriptions of special status fish, aquatic invertebrate, and amphibian species in the ROI by Regions 1 through 7 are provided in Section 3.14.2.5.

3.14.2.4.1 Federally Proposed or Listed Fish, Aquatic Invertebrate, and Amphibian Species

Seventeen listed, proposed or candidate fish, aquatic invertebrate, and amphibian species designated by the USFWS under the ESA are within or in proximity to the ROI. There are a few species found north of the ROI, but within tributaries of streams where the species occur, so there is a possibility that those species could travel to areas within the ROI. These 17 fish, aquatic invertebrate, and amphibian species are within the ROI, or close enough for a review, including 13 endangered species, 3 threatened species, and 1 candidate for listing species. Table 3.14.2-3 lists the federally listed fish, aquatic invertebrate, and amphibian species potentially occurring in the ROI by state.

Table 3.14.2-3:
Federally Designated Candidate, Threatened, and Endangered Fish, Aquatic Invertebrate, and Amphibian Species Potentially Occurring in the ROI by State

Common Name[1]	Scientific Name[1]	Federal Status	County	Region
Oklahoma: Fish				
Arkansas darter	*Etheostoma cragini*	Federal Candidate	Beaver, Harper, and Woodward	1, 2
Arkansas River shiner	*Notropis girardi*	Federally Threatened	Beaver, Harper, Woodward, Major[2], Kingfisher, and Logan	1, 2, 3
Arkansas: Fish				
Ozark Cavefish	*Amblyopsis rosea*	Federally Threatened	N/A[3]	4
Yellowcheek darter	*Etheostoma moorei*	Federally Endangered	Van Buren and Cleburne	5
Pallid sturgeon	*Scaphirhynchus albus*	Federally Endangered	Mississippi	7
Arkansas: Aquatic Invertebrates				
Spectaclecase	*Cumberlandia monodonta*	Federally Endangered	Johnson	4
Pink mucket	*Lampsilis abrupta*	Federally Endangered	White and Jackson	5, 6
Neosho mucket	*Lampsilis rafinesqueana*	Federally Endangered	N/A[3]	4
Speckled pocketbook	*Lampsilis streckeri*	Federally Endangered	Van Buren, Pope, Cleburne, and White	4, 5
Scaleshell mussel	*Leptodea leptodon*	Federally Endangered	Crawford, Franklin, White, and Jackson	4, 5, 6
Fat pocketbook	*Potamilus capax*	Federally Endangered	White, Poinsett, and Mississippi	5, 6, 7
Rabbitsfoot	*Quadrula cylindrica cylindrical*	Federally Threatened	Van Buren[4], White[4], and Jackson	5, 6
Curtis' pearlymussel	*Epioblasma florentina curtisii*	Federally Endangered	Jackson	5
Fanshell	*Cyprogenia stegaria*	Federally Endangered	N/A[3]	None
Snuffbox	*Epioblasma triquetra*	Federally Endangered	Polk, Cross, Poinsett, and Mississippi	4, 5, 6, 7
Arkansas: Amphibians				
Ozark hellbender	*Cryptobranchus alleganiensis bishopi*	Federally Endangered	Jackson	5
Tennessee: Fish				
Pallid sturgeon	*Scaphirhynchus albus*	Federally Endangered	N/A[5]	7
Texas: None[6]				

1 Does not include federally listed plant species or terrestrial wildlife species.
2 USFWS critical habitat occurs in this county.
3 Species not documented in counties crossed by the ROI.
4 USFWS proposed critical habitat occurs in this county.

5 No Tennessee counties specified by the USFWS, but species range encompass the Mississippi River, which the ROI crosses.

6 The USFWS identified the Arkansas River shiner as occurring in Hemphill, Roberts, Hutchinson, and Potter counties, Texas, all of which are outside the ROI.

Source: USFWS (2014c)

3.14.2.4.2 Federally Candidate, Proposed or Listed Fish Species

3.14.2.4.2.1 Arkansas Darter

The Arkansas darter (*Etheostoma cragini*) is a candidate species for ESA listing. The species habitat exists in the Cimarron, Neosho, and Spring rivers and associated tributaries, across northern Oklahoma (USFWS 2010a). Within the ROI, populations of the Arkansas darter may exist in Beaver, Harper, and Woodward counties in western Oklahoma (USFWS 2014c). In eastern Oklahoma and into Arkansas, the species occurs north of the ROI.

The Arkansas darter is a small (approximately 2 inch) stout-bodied member of the perch family (KDWPT 2011; Natureserve 2014a). Its preferred habitat is shallow, clear cool spring-fed tributaries or headwater streams with slow currents and sand or sandy-gravel substrates (Natureserve 2014a). They prefer areas with herbaceous aquatic broad-leaved vegetation such as watercress or other aquatic plants and are often found in pools or near-shore areas with low flow and sand, fine gravel, or organic detritus as substrate (Eberle and Stark 2000; Natureserve 2014a).

The largest threat to this species is groundwater depletion, which is a result of current and likely continuing agricultural irrigation (USFWS 2010a). Habitat can be impacted by alterations in stream flow from invasive vegetation, such as saltcedar (*Tamarix* spp.), through water withdrawals and transpiration, in addition to trapping of floodwater, which decreases water quality and quantity. Water quality is also impacted by waste products from confined-animal feeding operations. An additional threat includes the creation of dams and reservoirs, which can segment drainages, block upstream and downstream movements, and cause population fragmentation (USFWS 2010a).

3.14.2.4.2.2 Arkansas River Shiner

The Arkansas River shiner (*Notropis girardi*) is a threatened species under the ESA. Within the ROI, populations of the Arkansas River shiner may exist within the Cimarron River in Beaver, Harper, Woodward, Major, Kingfisher, and Logan counties in Oklahoma (USFWS 2014c). The Cimarron River throughout Logan and Major counties in Oklahoma is designated critical habitat for the species, subject to protection under the ESA, including a lateral distance of 300 feet on each side of the stream width at bankfull discharge (USFWS 2014c). Figure 3.14-3 in Appendix A shows critical habitat for the Arkansas River Shiner.

The Arkansas River shiner is a small species of minnow that reaches a maximum length of 3 inches (CRMWA 2005; Natureserve 2014b). Its preferred habitat is wide, shallow, unshaded channels of rivers or large streams in the Arkansas River basin with silt and shifting sand bottoms (GIS Data Source: USFWS 2014a; Natureserve 2014b). Adults inhabit areas downstream of sand ridges, and are uncommonly found in quiet pools or backwaters, and are even rarer in deeper tributaries with mud or stone substrates (CRMWA 2005; Natureserve 2014b). Juveniles and larvae inhabit backwater pools, side channels, and island habitat types (GIS Data Source: USFWS 2014a; Natureserve 2014b).

Threats to this species include stream channelization, reservoir construction, streamflow alteration and depletion (from dam construction or invasive species), and possibly water quality degradation. Additional threats include off-road or all-terrain vehicle activity in and near the Cimarron River, as well as predation by introduced game fish (CRMWA 2005).

3.14.2.4.2.3 Ozark Cavefish

The Ozark cavefish (*Amblyopsis rosea*) is a threatened species under the ESA. This species' range is limited to the Springfield Plateau of the Ozark Highlands ecoregion, stretching across southwestern Missouri, northwestern Arkansas, and northeastern Oklahoma. There are 41 active caves and wells found across 10 counties in this ecoregion (USFWS 2011a). Within the ROI, occurrences of this species have not been documented. Known occurrences are north of the ROI in Oklahoma and Arkansas.

The Ozark cavefish is a small, pale, eyeless fish with a low reproductive capacity (Natureserve 2014e). The Boone and Burlington limestone formations of the Springfield Plateau Aquifer are where this species is found (USFWS 2011a). Habitat is restricted to dark caves, sinkholes, springs, or sometimes wells in clear streams with gravel or chert rubble substrates, or pools with silt or sand bottoms (USFWS 2011a; MDC 2014a; Natureserve 2014e). The Ozark cavefish is typically found in areas with the water source upwelling from the groundwater table, and rarely found in cave streams with surface water sources (USFWS 2002). Preferred habitat includes caves where gray bats (*Myotis grisescens*) reside (AGFC 2011a). Bat guano is the main energy and nutrient source for cavefish prey (AGFC 2011a).

Threats to this species include agriculture, urbanization and development, and humans entering bat caves. Additional threats include reservoirs causing cave flooding, cave entrance closures that inhibit bat use, the introduction of predatory game fish, and diminished bat populations due to white-nose syndrome of bats (USFWS 2011a).

3.14.2.4.2.4 Yellowcheek Darter

The yellowcheek darter (*Etheostoma moorei*) is an endangered species under the ESA. Within the ROI, populations of this species may exist in Van Buren and Cleburne counties in Arkansas (77 FR 24468, October 16, 2012). The only currently known population of this species is approximately 10 miles north of the ROI. Although data on movement and dispersal are generally not available (Natureserve 2014l), it is unlikely that the yellowcheek darter occupy aquatic habitat within the ROI because the ROI is approximately 10 miles from the currently known population occurrence. Aquatic habitat that is not occupied and greater than 6 miles away from a known population suggests a low probability of occurrence by the known population (Natureserve 2014l). Fish and aquatic habitat field surveys that assess seasonal changes in habitat would be required to ascertain whether the yellowcheek darter has the potential to occupy habitat within the ROI.

The yellowcheek darter is a small darter with a compressed deep body and a sharp snout (Natureserve 2014l). This species is endemic to only four streams of the Little Red River (77 FR 24468, October 16, 2012). Its preferred habitat is small to medium high-gradient clear headwater streams with high dissolved oxygen levels and gravel, rubble, or boulder bottoms (77 FR 24468, October 16, 2012; Natureserve 2014l). They are typically found in high gradient riffle areas, with adults occurring at depths of 10 to 20 in and juveniles occurring in shallower riffles (Natureserve 2014l). They are rarely found in pools or water with slower velocity (USFWS 2007a). Spawning occurs in swift, turbulent, riffles under or around large substrate particles (Natureserve 2014l).

Much of the known habitat for this species within the ROI was destroyed in 1962 as a result of the construction of the Greers Ferry Dam, which resulted in a new reservoir, Greers Ferry Lake (USFWS 2008). This limited the species' range to four headwater streams of the Little Red River above Greers Ferry Lake, creating a habitat that is vulnerable to alterations in both physical habitat characteristics and water quality degradation, as a result of gravel mining, unrestricted cattle encroachment, agricultural and recreational water withdrawals, diminishing riparian buffers, road construction and maintenance, and non-point pollution (USFWS 2008). Downstream of the Greers Ferry Lake, the yellowcheek darter was extirpated from portions of the main stem Little Red River because of cold tailwater releases from the dam (77 FR 24468, October 16, 2012). Within two tributaries of the Little Red River below Greers Ferry Dam, extensive sampling resulted in no observations of yellowcheek darter (USFWS 2008). The lack of observations suggests a low probability of occurrence of yellowcheek darter within the portion of the ROI that crosses the Little Red River based on the distance from currently known population occurrence.

3.14.2.4.2.5 Pallid Sturgeon

The pallid sturgeon (*Scaphirhynchus albus*) is an endangered species under the ESA. Within the ROI, this species occurs in the Mississippi River in Arkansas (Mississippi County) and Tennessee (Lauderdale, Shelby, and Lake counties) (USFWS 2014c).

The pallid sturgeon is a large fish (up to 66 inches) with a flat, shovel-like snout that inhabits the Mississippi and Missouri river basins from Montana to Louisiana (USFWS 2014a; Natureserve 2014f). It is a large river obligate, occupying turbid free-flowing riverine habitat and occurring in strong currents over a substrate they select on a seasonal basis (EPA 2007; USFWS 2014a; Natureserve 2014f). Sand, gravel, and rocky bottoms are utilized during the winter and spring, while sand bottoms are utilized during the summer and fall (USFWS 2014a).

Threats to this species include river channelization, impoundments, and dam effluence causing altered hydrology, turbidity, and temperature (USFWS 2009a). Another threat is illegal commercial or recreational fishing, which can be a result of misidentification of the species as shovelnose sturgeon (USFWS 2009a). Additional threats include water quality degradation, dredging operations, irrigation diversions, flood control structures, and the potential for entrainment in hydroelectric dam intakes (USFWS 2013).

3.14.2.4.3 Federally Proposed or Listed Aquatic Invertebrates Species

3.14.2.4.3.1 Spectaclecase

The spectaclecase (*Cumberlandia monodonta*) is an endangered species under the ESA (USFWS 2014c). The Mulberry River, which flows generally westward through Johnson and Franklin counties, Arkansas, and is crossed by the ROI in Franklin County, is considered to harbor extant populations of the spectaclecase; however the current status of the species in the Mulberry River is unknown (77 FR 14914, March 13, 2012).

The spectaclecase is a freshwater mussel that occurs in large rivers, inhabiting riverine microhabitats that are sheltered from the current (Natureserve 2014k). In Arkansas, preferred habitat includes rocky microhabitats with ledges; large rocks with voids underneath in a moderate to fast current, on silt or fine gravel substrate; and possibly, large, sunken logs where they are adjacent to or underneath the log (Posey and Irwin 2012).

The most important threat to this species involves changes in hydrological regimes due to dam operations or other water diversion activities (Posey and Irwin 2012). Habitat destruction and modification are detrimental to this species, and may occur due to river channel alteration and maintenance, as well as pollution from municipal and industrial sources (USFWS 2012a). Other threats to this species include mining activities, oil and gas development, sedimentation, altered water temperatures, climate change, population fragmentation or isolation, and the establishment of exotic species (77 FR 14914, March 13, 2012).

3.14.2.4.3.2 Pink Mucket

The pink mucket (*Lampsilis abrupta*) is endangered under the ESA. Within the ROI, this species has been documented in tributaries of the White River in both White and Jackson counties in Arkansas (USFWS 2014c).

The pink mucket is a freshwater mussel that inhabits medium to large rivers with fast-flowing water, and can be found in both deep water and shallow riffles (MDC 2014c; USFWS 1997b; Natureserve 2014g). Preferred substrate includes sand, gravel, and rocky pockets in faster moving water, or sand and mud in slower moving water (Gordon and Layzer 1989).

The most important threat to this species is destruction and modification of habitat. Additional threats include river impoundments, gravel mining, channelization related to flood control and navigation, non-point source pollution, and erosion caused by mining, logging, farming, or road construction that adds silt to suitable habitat (MDC 2014c; USFWS 1997b). River impoundments can result in flooding of aquatic habitat, which reduces gravel substrate and limits distribution of fish hosts needed for larval development in the species (USFWS 1985; MDC 2014c). Pollution from agricultural or industrial runoff that contains chemicals and toxic metals that concentrate in body tissues of filter-feeding mussels can result in death (USFWS 1997b). Siltation builds up silt in rivers, which can prevent the mussel from feeding or bury it completely (USFWS 1997b).

3.14.2.4.3.3 Neosho Mucket

The Neosho mucket (*Lampsilis rafinesqueana*) is endangered under the ESA. This species occurs in the Illinois River in Adair County, Oklahoma; however, Adair County is not in the ROI. Within the ROI, it may exist within tributaries of the Illinois River (77 FR 24151, October 16, 2012).

The Neosho mucket is a freshwater mussel that occurs in a wide variety of habits in both small rivers and large streams (Natureserve 2014d). Within the Illinois River in Oklahoma, it is associated with shallow riffles or runs with gravel substrate, and moderate to swift river currents (USFWS 2010b; ODWC 2011a). It can also occur in near-shore areas or other areas outside of the main current in a larger tributary, and has been found in silty, backwater areas (ODWC 2011a; Natureserve 2014d).

The estimated population of this species has a wide range of 10,000 to 100,000 individuals, and within the ROI, the Lower Illinois River population was estimated to be 500 to 1,000 individuals as of 1997 (Vaughn 1997). This area includes from the Arkansas-Oklahoma state line to just above Lake Tenkiller Dam in Oklahoma (77 FR 24151, October 16, 2012). Proposed critical habitat for this species includes the Illinois River in Adair County, Oklahoma (77 FR 24151), as well as 482 river miles across Oklahoma, Kansas, Arkansas, and Missouri (77 FR 24151). The species has been extirpated from approximately 62 percent of its historic range (Vaughn 1997).

The most important threat to this species is destruction and modification of habitat. Habitat threats include waterbody impoundments, agricultural pollution, lead and zinc mining, channel instability, and sand and gravel mining (USFWS 2010b). Modifications to hydrology, sedimentation, accidental chemical releases, low-water crossings, or in-channel work could result in impacts to the habitat (USFWS 2010b). At least 11 dams have impounded large portions of the historical range of this species by fragmenting both populations and habitats (USFWS 2010b). Additional threats include the overutilization of the species for commercial, recreational, scientific, and educational reasons; disease; predation; and, the lack of regulatory mechanisms in place to protect this species, which leads to harm by construction, grazing, agriculture, silviculture, and public infrastructure works (USFWS 2010b).

3.14.2.4.3.4 Speckled Pocketbook

The speckled pocketbook (*Lampsilis streckeri*) is endangered under the ESA. It is endemic to the Little Red River system in north-central Arkansas (USFWS 2007a). Within the ROI, the species' range includes Van Buren, Pope, Cleburne, and White counties in Arkansas (USFWS 2014c).

The speckled pocketbook is a freshwater mussel that occupies sections of river with clear, constantly flowing water and a substrate ranging from coarse to muddy sand or gravel bottoms, in depths up to half a meter (USFWS 2007a; Natureserve 2014j). Another habitat type would be pools with crevices between large rocks or boulders with some accumulation of sand and gravel (USFWS 2007a).

The most important threat to this species is habitat degradation related to gravel mining, unrestricted cattle access in streams, water withdrawal for agricultural or recreational purposes, a paucity of riparian buffers, construction or maintenance of state and county roads, and non-point source pollution (USFWS 2007b). An additional threat could be drought, which can result in dried riffle habitats, thereby reducing habitat availability (USFWS 2014c). Drought can be exacerbated by both manmade changes to stream channels for flood control and stress caused by low stream flows increasing susceptibility to diseases and isolating gene pools (USFWS 2014b). This species is also preyed on by muskrats and turtles (USFWS 2007a). In addition, a more recent threat in the Little Red River system stems from the large amounts of water needed for fracturing shale during well drilling in the Fayetteville Shale, an unconventional natural gas reservoir on the Arkansas side of the Arkoma Basin (USFWS 2007b). The entire Little River watershed and nearly one-quarter of the state of Arkansas lie within the Arkoma Basin (USFWS 2007b).

3.14.2.4.3.5 Scaleshell Mussel

The scaleshell mussel (*Leptodea leptodon*) is endangered under the ESA. This species' range overlaps the ROI in Crawford, Franklin, White, and Jackson counties in Arkansas (USFWS 2014c).

The scaleshell mussel is a freshwater mussel occurring in medium to large rivers with low to medium gradients and good water quality, preferably in stretches with stable channels (75 FR 7849, April 7, 2010; Natureserve 2014i). Preferred habitat includes riffles or runs with a moderate current velocity and mud or gravel substrate (75 FR 7849).

Threats to this species include water quality degradation, sedimentation, habitat destruction, and channel destabilization (75 FR 7849). Introduction of an invasive species, the zebra mussel (*Dreissena polymorpha*), along with the short life span of this species, make it vulnerable to man-made changes in the environment (75 FR 7849). These man-made changes include habitat alteration due to dam construction, resource extraction activities, confined animal operations and grazing, non-point source pollution from agriculture, and sedimentation resulting from forestry practices and road construction activities (MDC 2014d).

3.14.2.4.3.6 Fat Pocketbook

The fat pocketbook (*Potamilus capax)* is endangered under the ESA. Within the ROI, this species occurs in tributaries and drainage ditches of the St. Francis River Basin in White, Poinsett, and Mississippi counties in

Arkansas (USFWS 2014c). The current distribution of the species includes that portion of the White River in White County, Arkansas, that is within the ROI (USFWS 2012b; Natureserve 2014c).

The fat pocketbook is a freshwater mussel found in fine-grained substrates such as sand, silt, and clay in large rivers with flowing water in a wide range of depths (USFWS 1989; Natureserve 2014c). It also inhabits slow-moving water in man-made ditches, bayous, sloughs, and streams, often found near the bank in mud or sand substrate in the St. Francis watershed (AGFC 2011b; Natureserve 2014c). Given the thin shell on this species, it can inhabit deep deposits of fine-grained silt, but not gravel substrate in highly erosive flow areas (Miller and Payne 2005).

The most important threat to this species is the destruction and modification of habitat (USFWS 2009b). Habitat threats include waterbody impoundments and channelization due to flood control and navigation practices (USFWS 2009b). In addition, habitat or population fragmentation as a result of human disturbance makes populations vulnerable to drought, non-point source pollution, and chemical spills (USFWS 2009b). Additional threats include construction and operation of hydropower generation facilities, siltation, turbidity, water quality degradation from both non-point and point pollution sources, competition from invasive species (e.g., zebra mussels), climate change, and the decline of host fish populations from channel dredging (USFWS 2012b).

3.14.2.4.3.7 Rabbitsfoot

The rabbitsfoot mussel (*Quadrula cylindrica cylindrica*) is threatened under the ESA. Within the ROI, this species exists in the White River and its tributaries in Van Buren, White, and Jackson counties in Arkansas (USFWS 2014c). The White River is proposed critical habitat for the species, specifically within the ROI (USFWS 2014c).

The rabbitsfoot mussel is a freshwater mussel that inhabits small to medium rivers with moderate to swift currents in sand or gravel substrate (Natureserve 2014h). Preferred habitat is the shallower water along banks and adjacent runs or shoals where flow rate is relatively low and substrate includes gravel or sand (77 FR 24151, October 16, 2012). It can also be found in smaller streams, inhabiting bars or gravel and cobble close to the current (Natureserve 2014h). It has been found in deeper water runs with depths of 3 meters (77 FR 24151; Natureserve 2014h).Threats to this species include activities related to habitat alteration (impoundments, dredging, channelization) and habitat degradation (chemical contamination, mining, sedimentation, oil and gas development) (77 FR 24151). The most important threat of these is the creation of impoundments or dams, which can alter river flow, increase or trap silt loads, alter the water quality or temperature, and cause isolation of populations (77 FR 24151). All of these potential alterations can affect the feeding and reproduction of this species as well.

3.14.2.4.3.8 Snuffbox

The snuffbox (*Epioblasma triquetra)* is listed as endangered under the ESA (77 FR 8632, February 14, 2012). No critical habitat has been designated. Within the ROI, this species occurs in perennial streams in Pope, Poinsett, Cross, and Mississippi counties, Arkansas. It potentially occurs in 25 counties in Arkansas but specific streams within the ROI have not been designated as containing this species. Some major rivers north of the project in Arkansas (e.g. Buffalo River, Strawberry River, and Spring River) have been documented to contain this species (77 FR 8632).

Typical habitat includes fast water riffles in small to medium size streams in water two inches to two feet deep in clear water systems. Substrate ranges from sandy to rocky bottoms. Other than during spawning adults burrow deep into the substrate (77 FR 8632).

The major important threat to this species is the destruction and modification of habitat (Bruenderman et al. 2002; 77 FR 8632). Specific habitat threats include poor water quality, channelization, sand and gravel mining, dredging, sedimentation and impoundments (Bruenderman et al. 2002; 77 FR 8632). Impoundments have effects on both substrate and temperature, which can adversely affect habitat suitability. Construction in or near streams may increase sedimentation, which may affect the suitability of habitat, affect feeding, and can including burial of individuals (Bruenderman et al. 2002; 77 FR 8632). Adverse modification of in-stream flow conditions (e.g., dewatering) may also occur from in-stream construction on a local basis (USFWS 2014d).

3.14.2.4.3.9 Curtis' Pearlymussel

The Curtis' pearlymussel (*Epioblasma florentina curtisii)* is listed as endangered under the ESA (41 FR 24062, June 14, 1976). No critical habitat has been designated. This species is not currently known to occur in the ROI but historically was in the White River drainages (e.g., White River, south Fork Spring River, Black River, Little Black River) (USFWS 2010c), which the Project crosses in Jackson County, Arkansas. In the last 30 years it was known to be present in Fulton County, Arkansas, north of the ROI (USFWS 1986, 1997a). But extensive surveys in Arkansas from 1996 to 2006 did not find any specimens in 11 streams sampled (Harris et al. 2007) and it is possible the species has been extirpated from Arkansas (NatureServe 2014p).

Suitable habitat within the basin locations of Curtis' pearlymussel is in silt free streams between headwaters and lowlands. Habitat is generally stream riffles or runs within this basin area, with preferred habitat of sand to gravel dominated substrate where individuals position themselves between cobbles and boulders in water 2 to 30 inches deep (USFWS 1986, 1997a). They remain buried in the substrate except during spring, when ripe females move to the substrate surface.

Because of their need for shallow fast-flowing water, the greatest threat to this species has been river impoundments, channelization and dredging (USFWS 1986, 2010c, 2007a; MDC 2000). These actions have caused direct mussel removal, habitat inundation and destabilization, and modified flow regime. Typical development induced water quality degradation, such as point and non-point pollution, are also hazards. Invasive non-native species (e.g., zebra mussels) may also cause limitations if they occur in their habitat.

3.14.2.4.4 Federally Proposed or Listed Amphibian Species

3.14.2.4.4.1 Ozark Hellbender

The Ozark hellbender (*Cryptobranchus alleganiensis bishopi)* is listed as endangered under the ESA (76 FR 61956, October 6, 2011). No critical habitat has been designated. This species is a large salamander native to the White River drainage in southern Missouri and northern Arkansas (USFWS 2012d, MDC 2014b). They are known to be present in the White River, with the only documented occurrences located in Baxter and Independence counties; both of which occur upstream of the ROI crossing of the White River (which is located in Jackson County). Viability of populations in the White River system is unknown because much of their habitat was modified by the construction of dams on the Upper White River and records of individuals in this system may be relics separated from North Fork White River populations by the Norfork Reservoir (76 FR 61956).

This salamander requires well oxygenated flowing water of cool temperatures to survive (76 FR 61956; 77 FR 8632). Because they acclimate slowly to temperature changes, they require consistent temperatures often in spring feed streams. Typical adult habitat includes deep (3 to 10 feet deep) fast flowing water where they reside under large flat limestone or dolomite rocks (Johnson 2000; USFWS 2011b; MDC 2014b; 76 FR 61956; 77 FR 8632). Large and small rocks may be used for cover by larvae and juveniles in gravel substrate streams (USFWS 2011b; 77 FR 8632). The territory they occupy in streams is small, and ranges from 92 to 266 square feet in size (Peterson and Wilkinson 1996; 76 FR 61956).

Because they are habitat specialists, the greatest threat to their survival is modification of flowing stream habitat primarily from dam construction and reservoir formation (76 FR 61956). Dam construction changes the water temperature regime and flowing water conditions required for their survival and the stream barrier fragments and isolates populations (76 FR 61956; 77 FR 8632). Because they are habitat specialists, even small modifications to water conditions may affect survival. Other impacts to this species include mine development, turbidity, bank erosion, siltation, and food source (e.g., crayfish) contamination from metals or other toxics. Typical water quality changes resulting from agricultural fertilizer use, and logging can also have adverse effects (76 FR 61956; 77 FR 8632). Recreational vehicle use in streams and active collection of this species (both permitted an unpermitted) also play a role in impacts to their survival (USFWS 2011b; 76 FR 61956; 77 FR 8632). Additional threats include disease (.e.g. chytrid fungus), and predation by non-native fish species, such as rainbow trout (USFWS 2011b; 76 FR 61956; 77 FR 8632).

3.14.2.4.5 State Designations for Aquatic Species

In addition to federally proposed or listed special status fish, aquatic invertebrate, and amphibian species, three species of aquatic wildlife with state-level designations have the potential to occur within the ROI. Oklahoma has two listed fish and Tennessee has one listed fish. Arkansas recognizes the federally listed species, but has no additional species with state level designations that have the potential to occur within the ROI. Texas has no state-designated aquatic wildlife. The state-designated aquatic wildlife of Oklahoma and Tennessee that could potentially occur in the ROI are summarized in Table 3.14.2-4.

Table 3.14.2-4:
State Designated Threatened and Endangered Aquatic Wildlife Species by State, County, and Region

Common Name	Scientific Name	State Status	County	Region
Oklahoma: Fish				
Black-sided darter	*Percina maculata*	State Threatened	Sequoyah	4
Long-nosed darter	*Percina nasuta*	State Endangered	Sequoyah	4
Arkansas: None[1]				
Tennessee: Fish				
Blue sucker	*Cycleptus elongatus*	State Threatened	Tipton and Shelby	7
Texas: None				

1 Arkansas recognizes the federally listed species, but no additional species are considered state listed within the ROI. Federally designated species are provided in Table 3.14.2-3.

Sources: ODWC (2014), ANHC (2014), TDEC (2014), TPWD (2014)

3.14.2.5 Regional Description

As discussed above, there are 16 federally proposed or listed fish, aquatic invertebrate, and amphibian species and three state designated aquatic wildlife species known to occur or have the potential to occur within the ROI. A summary of the federally proposed or listed fish, aquatic invertebrates, and amphibian species and USFWS-designated critical habitat occurrence by Project region is provided in the sections below. Information from ANHC

Natural Areas and Focal Areas and state natural heritage program species occurrence records, including related waterbodies found by Project region, are included in Table 3.14.2-5.

Table 3.14.2-5:
State Natural Heritage Occurrences within the ROI or Waterbodies Crossed by the ROI

Common Name	Scientific Name	State Rank[1] or Status[2]	Waterbody	Project Region
Oklahoma				
Fish				
Arkansas River shiner	*Notropis girardi*	ST	Beaver River, Palo Duro Creek, Kiowa Creek, Coldwater Creek, and Cimarron River	1, 2, 3
Long-nosed darter	*Percina nasuta*	SE	Lee Creek	4
Arkansas				
Fish				
Long-nosed darter	*Percina nasuta*	S2 / INV	Mulberry River[4], Lee Creek[5], Frog Bayou[5], Illinois Bayou[5]	4, 5
Aquatic Invertebrates				
Speckled pocketbook[3]	*Lampsilis streckeri*	S1 /SE	Big Creek	5
Fat pocketbook[3]	*Potamilus capax*	S1 / SE	St. Francis floodway ditch[4,5], St. Francis River[5] and Tyronza River[5]	6, 7
Pink mucket[3]	*Lampsilis abrupta*	S2 /SE	White River[4,5]	5
Rabbitsfoot[3]	*Quadrula cylindrica cylindrica*	S2 / ST	White River[4]	5
Scaleshell[3]	*Leptodea leptodon*	S1 / SE	Frog Bayou[5]	4
Snuffbox	*Epioblasma triquetra*	S1/SC	Perennial streams in designated counties	4, 5, 6, 7
Curtis' pearlymussel	*Epioblasma florentina curtisii*	S1/SE	White River[6]	5
Amphibians				
Ozark hellbender	*Cryptobranchus alleganiensis bishopi*	S2/SC	White River	5
Tennessee				
Fish				
Blue sucker	*Cycleptus elongatus*	S2 / ST	Mississippi River	7
Texas				
None				

1 State rank is a conservation rank used by State Heritage Programs and The Nature Conservancy that indicates the relative rarity of and element throughout the state. S1 = Critically imperiled; S2 = Imperiled; S3 = Vulnerable; S4 = Apparently secure; S5 = Secure in the state
2 State status: INV = Inventory Element; SC= Species of Concern, SE = State Endangered; ST = State Threatened.
3 Species has a federal designation, see *Federal Designations* within this section.
4 Occurrence element located within the ROI.
5 Occurrence element located outside the ROI, but within a waterbody that is crossed by the Project.
6 Historical occurrence in this river system

Sources: ODWC (2014), ANHC (2014), TDEC (2014), TPWD (2014),

3.14.2.5.1 Region 1

The ROI in Region 1 is referred to as the Oklahoma Panhandle Region and includes the Applicant Proposed Route, HVDC Alternative Routes I-A through I-D, Oklahoma converter station and AC interconnection, and the AC collection system. In the ROI in Region 1, there is one federally threatened fish (Arkansas River shiner) and one fish that is a candidate for listing (Arkansas darter). There are documented occurrences of both the Arkansas darter and the Arkansas River shiner within the Oklahoma portion of the ROI. There are no special status species found within the Texas portion of the ROI.

Populations of the Arkansas River shiner may exist within the ROI in the Cimarron River in Beaver, Harper, and Woodward counties in Region 1. Designated critical habitat for the Arkansas River shiner includes portions of the Cimarron River in Oklahoma (USFWS 2014c). Critical habitat units for this species are located in Beaver, Harper, and Woodward counties in Oklahoma, but these critical habitat units do not occur within the ROI (USFWS 2014c).

Populations of the Arkansas darter may exist within the ROI in the Cimarron River in Beaver, Harper, and Woodward counties in Region 1.

3.14.2.5.1.1 AC Collection System

The AC collection system consists of thirteen 2-mile-wide routes in Oklahoma (Beaver, Cimarron, and Texas counties) and Texas (Hansford, Ochiltree, and Sherman counties) within which an AC collection system transmission line could be sited. Within this area, the AC collection system routes cross the Beaver River, Palo Duro Creek, Dry Sand Draw, Coldwater (Frisco) Creek, North Frisco Creek, Dry Creek, Peacher Creek, and Hackberry Creek. Floodplains in the ROI are discussed in Section 3.19. Of these waterbodies that are crossed, the Beaver River and Palo Duro Creek may have populations of the Arkansas River shiner that may exist within the ROI for the AC collection system.

3.14.2.5.2 Region 2

Region 2 is referred to as the Oklahoma Central Great Plains Region and includes the Applicant Proposed Route and HVDC Alternative Routes 2-A and 2-B. In the ROI in Region 2, there is one federally threatened fish (Arkansas River shiner) and one fish that is a candidate for listing (Arkansas darter). There are documented occurrences of both the Arkansas darter and the Arkansas River shiner within the Oklahoma portion of the ROI.

Populations of the Arkansas River shiner may exist within the ROI in the Cimarron River in Woodward and Major counties in Region 2. Designated critical habitat for the Arkansas River shiner includes portions of the Canadian River and portions of the Cimarron River, both in Oklahoma within the ROI (USFWS 2014c). Critical habitat units for this species are located in Woodward and Major counties within the ROI in Oklahoma (USFWS 2014c).

Populations of the Arkansas darter may exist within the ROI in the Cimarron River in Woodward County of Region 2.

3.14.2.5.3 Region 3

Region 3 is referred to as the Oklahoma Cross Timbers Region and includes the Applicant Proposed Route and HVDC Alternative Routes 3-A through 3-E. In the ROI in Region 3, there is one federally threatened fish (Arkansas River shiner) and one fish found north of the ROI (Arkansas darter). There are documented occurrences of the Arkansas River shiner within the Oklahoma portion of the ROI.

Populations of the Arkansas River shiner may exist within the ROI in the Cimarron River in Kingfisher and Logan counties in Region 3. Designated critical habitat for the Arkansas River shiner includes portions of the Canadian River in Oklahoma and portions of the Cimarron River in Oklahoma (USFWS 2014c). Critical habitat units for this species are located in Kingfisher and Logan counties within the Oklahoma portion of the ROI (USFWS 2014c).

Habitat exists for the Arkansas Darter in the Neosho River, as well as associated tributaries, just north of the ROI in Region 3.

3.14.2.5.4 Region 4

Region 4 is referred to as the Arkansas River Valley Region and includes the Applicant Proposed Route, including the Lee Creek Variation, and HVDC Alternative Routes 4-A through 4-E. In the ROI for Region 4, there are five federally endangered species of aquatic invertebrates (Neosho mucket, spectaclecase, speckled pocketbook, scaleshell mussel, and snuffbox), one candidate fish (Arkansas darter), and one federally endangered fish (Ozark cavefish) found north of the ROI.

In Adair County, Oklahoma, the Neosho mucket is found north of the ROI where there is also proposed critical habitat for this species (USFWS 2014c). Although the ROI crosses just south of Adair County, tributaries of the Illinois River may flow within the ROI.

There are documented occurrences of the scaleshell mussel, the speckled pocketbook, spectaclecase, and the snuffbox within the Arkansas portion of Region 4. The scaleshell mussel has been documented in the ROI in Crawford and Franklin counties. The speckled pocketbook has a range that includes Van Buren, Pope, Cleburne, and White counties in the Little Red River basin in Arkansas. The spectaclecase has been documented in Johnson County, within the ROI. The snuffbox has been documented in streams of Pope County of region 4, and may occur in the ROI.

Habitat exists for the Arkansas Darter in the Neosho and Spring rivers, as well as associated tributaries, just north of the ROI in Region 4.

Known or potential occurrences of the Ozark cavefish occur north of Region 4 in Benton and Madison counties in Arkansas and Ottawa, Delaware, and Mayes counties in Oklahoma.

3.14.2.5.5 Region 5

Region 5 is referred to as the Central Arkansas Region and includes the Applicant Proposed Route and HVDC Alternative Routes 5-A through 5-F. In the ROI in Region 5, there are eight federally endangered species, the yellowcheek darter, the scaleshell mussel, the speckled pocketbook, the pink mucket, the fat pocketbook, the snuffbox, Curtis' pearlymussel, and the Ozark hellbender. Within the Arkansas portion of Region 5, all eight species occur or have the potential to occur. In addition, documented occurrences of the rabbitsfoot, a federally threatened species, occur within the ROI.

The yellowcheek darter's only currently known populations are located 10 miles to the north of ROI in Region 5, but populations may potentially occur in Van Buren and Cleburne counties in tributaries of the Little Red River. Much of their habitat was previously destroyed in these counties, but there is a potential that populations persist.

The scaleshell mussel range overlaps with the ROI in White and Jackson counties. The speckled pocketbook is only found in the Little Red River basin, which covers Pope, Van Buren, Cleburne, and White counties. The pink mucket is found within the ROI in Region 5, with documented occurrences in the tributaries of the White River in both White and Jackson counties in Arkansas. The fat pocketbook occurs within the ROI of the White River in White County in Arkansas. The snuffbox has been documented in streams of Pope County of Region 5, and may occur in the ROI. The Curtis' pearlymussel historically was in the White River system that is crossed by the Project in Jackson County. The salamander (Ozark hellbender) has been documented in the White River in Jackson County, and may occur in the ROI of the White River crossing.

The rabbitsfoot is also found within the ROI in Region 5, with known and potential occurrences in the tributaries of the White River in Van Buren, White, and Jackson counties in Arkansas. Proposed critical habitat for this species occurs in the White River in Van Buren, White, and Jackson counties (USFWS 2014c).

3.14.2.5.6 Region 6

Region 6 is referred to as the Cache River and Crowley's Ridge Region and includes the Applicant Proposed Route and HVDC Alternative Routes 6-A through 6-D. In the ROI in Region 6, there are four federally endangered species (pink mucket, scaleshell mussel, fat pocketbook, and the snuffbox) and one federally threatened species (rabbitsfoot).

The pink mucket is found within the ROI in Region 6, with documented occurrences in the tributaries of the White River in Jackson County in Arkansas. The scaleshell mussel has been documented within the ROI in Jackson County. The fat pocketbook occurs within the ROI in tributaries and drainage ditches of the St. Francis River in Poinsett County in Arkansas.

The rabbitsfoot is also found within the ROI in the Arkansas portion of Region 6, with documented occurrences in the White River in Jackson County. The snuffbox has been documented in streams of Poinsett and Cross counties of Region 6, and may occur in the ROI.

3.14.2.5.7 Region 7

Region 7 is referred to as the Arkansas Mississippi River Delta and Tennessee Region and includes the Applicant Proposed Route and HVDC Alternative Routes 7-A through 7-D. In the ROI in Region 7, there are three federally endangered species (the pallid sturgeon, pocketbook, and the snuffbox).

The pallid sturgeon occurs within the ROI along the Mississippi River in Mississippi County in Arkansas and three counties in Tennessee (Lauderdale, Shelby, and Tipton).

The fat pocketbook occurs within the ROI in tributaries and drainage ditches of the St. Francis River in Poinsett and Mississippi counties in Arkansas. The snuffbox has been documented in streams of Poinsett and Mississippi counties of Region 7, and may occur in the ROI.

3.14.2.6 Connected Actions

3.14.2.6.1 Wind Energy Generation

Wind energy generation would likely occur within WDZs. Two federally designated special status aquatic species potentially occur within the WDZs, the Arkansas darter (a candidate species) and the Arkansas River shiner (a threatened species). Both species occur in Beaver County, Oklahoma. USFWS-designated critical habitat for these species is not located within any WDZs. No aquatic wildlife species with state designations are known to occur within any WDZs.

The Arkansas darter may occur within WDZ-G. Habitat exists for this species in the Cimarron River and its tributaries. Section 3.14.2.4.2 includes a more detailed description of this species and its habitat.

The Arkansas River shiner may occur within WDZ-G. Habitat exists for this species in the Cimarron River and its tributaries. Section 3.14.2.4.2 includes a more detailed description of this species and its habitat.

No Oklahoma or Texas state-listed aquatic wildlife species are known to occur within the WDZs.

3.14.2.6.2 Optima Substation

The future Optima Substation would be constructed within a 160-acre site that is mostly grassland/herbaceous land cover with smaller areas of shrub/scrub and developed open space. Because there are no waterbodies within the future Optima Substation site, there are no likely occurrences of special status fish, aquatic invertebrate, and amphibian species.

3.14.2.6.3 TVA Upgrades

As described above under Section 3.1, a precise ROI has not been identified for the TVA upgrades. Where possible, general impacts associated with the required TVA upgrades are discussed in the impact sections that follow.

3.14.2.7 Impacts to Special Status Fish, Aquatic Invertebrate, and Amphibian Species

3.14.2.7.1 Methodology

The methodology for evaluating impacts on fish, aquatic invertebrate, and amphibian species included comparisons of impacts of the Applicant Proposed Route to impacts of the HVDC alternative routes. Within the ROI, Project activities were assessed that could potentially impact special status fish, aquatic invertebrate, and amphibian species and their habitats. Fish, aquatic invertebrate, and amphibian resources to be evaluated include river, stream, or creek crossings, as well as any perennial waterbodies that fall within the ROI. Potential impacts on fish, aquatic invertebrate, and amphibian resources include the following, and are further discussed for each phase of the Project:

- Potential impacts from permanent removal of vegetation, or temporary mechanical damage to vegetation
- Possible spread and/or introduction of invasive plants or listed noxious weed species
- Potential impacts associated with ROW vegetation maintenance, including the use of herbicides during operations and maintenance of the Project
- Potential disturbance to known populations and/or suitable habitat for species designated as candidate, threatened, or endangered under the ESA

- Potential disturbance to known populations of state-listed species of concern
- Potential impacts from construction and maintenance of roads and road crossings
- Potential for sediment loading and introduction of chemicals from spills in aquatic habitat

Sixteen federally listed fish, aquatic invertebrate, and amphibian species may occur in waterbodies located within the ROI or close enough that the warrant inclusion in the discussion on impacts. Two fish are listed as endangered under the ESA, two fish listed as threatened, and one fish that is a candidate for listing. Eight mussels are listed as endangered under the ESA and one mussel is listed as threatened. One salamander is listed as endangered under the ESA.

The Applicant has developed a comprehensive list of EPMs that would cover the protection measures intended to avoid or minimize impacts to special status fish, aquatic invertebrate, and amphibian species. Implementation of these EPMs is assumed throughout the impact analysis that follows for the Project. A complete list of EPMs for the Project is provided in Appendix F; those EPMs that would specifically minimize the potential for impacts on special status fish, aquatic invertebrate, and amphibian species are described below:

General EPMs for the Project that relate to fish and aquatic resources:

- GE-1: Clean Line will train personnel on health, safety, and environmental matters. Training will include practices, techniques, and protocols required by federal and state regulations and applicable permits.
- GE-5: Any herbicides used during construction and operations and maintenance will be applied according to label instructions and any federal, state, and local regulations.
- GE-14: Clean Line will restrict the refueling and maintenance of vehicles and the storage of fuels and hazardous chemicals within at least 100 feet from wetlands, surface waterbodies, and groundwater wells, or as otherwise required by federal, state, or local regulations.
- GE-21: Clean Line will maintain construction equipment in good working order. Equipment and vehicles that show excessive emissions of exhaust gasses and particulates due to poor engine adjustments or other inefficient operating conditions will be repaired or adjusted.

Fish, vegetation, and wildlife EPMs have been developed for the Project; the following EPMs relate specifically to fish and aquatic resources:

- FVW-1: Clean Line will identify environmentally sensitive vegetation (e.g., wetlands, protected plant species, riparian areas, large contiguous tracts of native prairie) and avoid and/or minimize impacts to these areas.
- FVW-2: Clean Line will identify and implement measures to control and minimize the spread of non-native invasive species and noxious weeds.
- FVW-3: Clean Line will clearly demarcate boundaries of environmentally sensitive areas during construction to increase visibility to construction crews.
- FVW-5: If construction occurs during important time periods (e.g., breeding, migration, etc.) or at close distances to environmentally sensitive areas with vegetation, wildlife, or aquatic resources, Clean Line will consult with USFWS and/or other resource agencies for guidance on seasonal and/or spatial restrictions designed to avoid and/or minimize adverse effects.

Water EPMs have been developed for the Project; the following EPMs relate specifically to fish and aquatic resources:

- W-1: Clean Line will avoid and/or minimize construction of access roads in special interest waters.
- W-2: Clean Line will identify, avoid, and/or minimize adverse effects to wetlands and waterbodies. Clean Line will not place structure foundations within the Ordinary High Water Mark of Waters of the United States.
- W-3: Clean Line will establish streamside management zones within 50 feet of both sides of intermittent and perennial streams and along margins of bodies of open water where removal of low-lying vegetation is minimized.
- W-4: If used, Clean Line will selectively apply herbicides within streamside management zones.
- W-6: Clean Line will not construct counterpoise or fiber optic cable trenches across waterbodies.
- W-7: Clean Line will locate spoil piles from foundation excavations and fiber optic cable trenches outside of streamside management zones.

One EPM that is specifically applicable to the Ozark cavefish:

- FVW-6: Clean Line will avoid and/or minimize construction within 300 feet of caves known to be occupied by threatened or endangered species.

In addition, the following plans will be developed and implemented by the Applicant to avoid or minimize impacts:

- Blasting Plan: This plan will describe measures designed to minimize adverse effects due to blasting.
- Restoration Plan: This plan will describe post-construction activities to reclaim disturbed areas.
- Spill Prevention, Control and Countermeasures (SPCC) Plan: This plan describes the measures designed to prevent, control, and clean up spills of hazardous materials.
- Storm Water Pollution Prevention Plan (SWPPP): This plan, consistent with federal and state regulations, will describe the practices, measures, and monitoring programs to control sedimentation, erosion, and runoff from disturbed areas.
- Transmission Vegetation Management Plan (TVMP): This plan, to be filed with the NERC, will describe how the Applicant will conduct work on its ROW to prevent outages due to vegetation.

3.14.2.7.2 Impacts Associated with the Applicant Proposed Project

The impacts discussed in the sections below are common to all aspects of the Applicant Proposed Project, which includes the Oklahoma Converter Station Siting Area and AC Interconnection Siting Area, the Tennessee Converter Station and AC Interconnection Area Siting Area, the Applicant Proposed Route, the AC collection system routes, access roads, multi-use construction yards and other temporary construction areas, and communications sites. The Applicant Proposed Project is described in Sections 2.1.2 through 2.1.7.

The sections below identify the potential impacts to special status fish, aquatic invertebrate, and amphibian species and their aquatic habitat based on the three phases of the Project: (1) construction, (2) operations and maintenance, and (3) decommissioning. The Applicant would conduct each phase of the Project in compliance with applicable state and federal laws, regulations, and permits related to environmental protection. EPMs would be implemented as described in Section 3.14.2.7.1 to avoid or minimize impacts to special status fish, aquatic invertebrate, and amphibian species and aquatic habitat. In addition, consultation with USFWS has been initiated pursuant to Section 7 of the ESA regarding the potential effects of the Project on listed species and any designated critical habitat. This consultation review is a parallel, but separate analysis conducted pursuant to the requirements of ESA, Section 7 and the applicable implementing regulations. Through the consultation process additional protection measures may be the identified to avoid and/or minimize the impacts of the Project upon listed species and any designated critical habitat.

3.14.2.7.2.1 Construction Impacts

During the construction phase of the Project, potential impacts to fish, aquatic invertebrate, and amphibian resources as a result of the Project can be divided into two categories: (1) temporary (short term or long term) and (2) permanent. In addition, impacts may have direct or indirect effects. Direct or indirect effects may be temporary or permanent depending on the type and short- or long-term need of the construction activity. Direct construction impacts that could potentially affect special status fish, aquatic invertebrate, and amphibian species and their habitats include vegetation clearing, grading, access roads, herbicide use, and handling of fuel and lubricants at stream and river crossings. Indirect construction impacts that could potentially affect special status fish, aquatic invertebrate, and amphibian species and their habitats include vegetation clearing, grading, access roads, herbicide use, and handling of fuel and lubricants at locations where construction activities would result in sedimentation or contaminant runoff. Vegetation clearing has the potential to increase sedimentation and decrease cover. Increased sedimentation can directly or indirectly suffocate, bury, or limit feeding of fish, aquatic invertebrate, and amphibian species. Grading and access roads have the potential to increase sedimentation, decrease cover, and increase runoff. Increased runoff can alter stream and river hydrology and provide a mechanism for delivery of sediment, herbicides, and fuel and lubricants to streams and rivers. Herbicide use and handling of fuel and lubricants have the potential to concentrate in body tissues of fish, amphibians, and filter-feeding mussels, which can result in death.

To avoid or minimize impacts during the construction phase of the Project, both general EPMs and those specific to fish and aquatic resources, as listed in Section 3.14.2.7.1, would be implemented. Specific to spills and chemical exposures associated with herbicide use and handling of fuel and lubricants, the Applicant would implement EMPs GE-1, GE-5, GE-13, GE-21, and GE-28, as well as the measures that would be outlined in the required SPCCP and SWPPP to minimize these risks. In addition, the USFWS and other resource agencies would be consulted if construction efforts occur during time periods that are important to a species (e.g., spawning) or near environmentally sensitive areas with important aquatic resources, to avoid or minimize impacts to species (EPM FVW-5). The Applicant would identify, avoid, and/or minimize adverse effects to wetlands and waterbodies (EPM W-2).

The following information provides an overview of construction related impacts associated for each of the special status fish, aquatic invertebrate, and amphibian species.

Special Status Fish Species

Arkansas Darter. The Arkansas darter, a candidate species for listing under the ESA, has populations that may exist in Beaver, Harper, and Woodward counties within the Cimarron River in Regions 1 and 2 (USFWS 2014c). Habitat for the species occurs within the Neosho and Spring rivers, and associated tributaries, north of the ROI in Regions 3 and 4 (USFWS 2010a). Construction impacts (i.e., vegetation clearing, grading, access roads, herbicide use, and handling of fuel and lubricants) to this species would be limited to very specific stream and river crossings or locations where construction could result in sedimentation or contaminant runoff to Arkansas Darter habitat within the ROI in Regions 1 and 2. Under EPM FVW-5, for construction in the vicinity of sensitive areas as well as during sensitive time periods (e.g., spawning), the Applicant would consult with the USFWS and/or ODWC for guidance on seasonal and/or spatial restrictions to avoid or minimize adverse effects.

Arkansas River Shiner. The Arkansas River shiner, a federally listed threatened species, has a population that may exist in the Cimarron River across Beaver, Harper, Woodward, Major, Kingfisher, and Logan counties in Oklahoma in Regions 1, 2, and 3 (USFWS 2014c. Construction impacts (i.e., vegetation clearing, grading, access roads, herbicide use, and handling of fuel and lubricants) to this species would be limited to very specific stream and river crossings or locations where construction would result in sedimentation or contaminant runoff to Arkansas River shiner habitat within the ROI in Regions 1, 2, and 3. In Region 2, the HVDC transmission line crosses critical habitat in the Cimarron River for the species within Logan and Major counties, including a lateral distance of 300 feet on each side of the stream width at bankfull discharge (Clean Line 2013). The Applicant has not proposed in-stream activities or installation of transmission structures within the critical habitat boundaries; however, clearing of riparian vegetation would likely be necessary to ensure operational safety and system reliability (Clean Line 2013). The Applicant would establish streamside management zones within 50 feet of both sides of intermittent and perennial streams and along margins of bodies of open water where removal of low-lying vegetation is minimized (EPM W-3). The Applicant would consult with the USFWS and/or ODWC for guidance on seasonal and/or spatial restrictions designed to avoid and/or minimize adverse effects (EPM FVW-5).

Ozark Cavefish. The Ozark cavefish, a federally listed threatened species, has a limited range, only occurring in the Springfield Plateau of the Ozark Highlands ecoregion, which covers southwestern Missouri, northwestern Arkansas, and northeastern Oklahoma (Natureserve 2014e). This species does not have any known occurrences that are in counties crossed by the ROI, so no impacts to this species or its habitat are expected to occur. The closest known occurrences are in caves located north of the ROI in Region 4.

Yellowcheek Darter. The yellowcheek darter, a federally listed endangered species, has populations that may exist in Van Buren and Cleburne counties in Arkansas, but the only currently known populations are located approximately 10 miles north of the ROI (USFWS 2014c). This species is endemic to four streams of the Little Red River, all located north of the ROI (77 FR 24468, October 16, 2012). Construction impacts (i.e., vegetation clearing, grading, access roads, herbicide use, and handling of fuel and lubricants) to this species are not expected, but would be limited to very specific stream and river crossings or locations where construction would result in sedimentation or contaminant runoff to yellow darter habitat within the ROI in Region 5.

Pallid Sturgeon. The pallid sturgeon, a federally listed endangered species, occurs in the Mississippi River across Mississippi County in Arkansas, and Lauderdale, Shelby, and Lake counties in Tennessee (USFWS 2014c). Construction impacts (i.e., vegetation clearing, grading, access roads, herbicide use, and handling of fuel and lubricants) may occur along the representative ROW near the Mississippi River crossing of the ROI within Region 7 (Clean Line 2013). These impacts are expected to be minimal because construction equipment would not enter the Mississippi River. The discharge of sediments or any contaminants into the river would be an unlikely occurrence due to the Applicants implementation of the SWPPP.

Special Status Aquatic Invertebrate Species

For aquatic invertebrates occurring or potentially occurring in the ROI, only mussel species have been given special status. Since freshwater mussels require a fish host to complete their reproductive cycle, all fish-related impacts are also pertinent to mussels, and could affect them as well (Jennings 1998). The Applicant would not place structure foundations within the Ordinary High Water Mark of Waters of the United States, and would minimize construction of access roads in special interest waters as much as possible (EPM W-2). In addition, the USFWS and other resource agencies would be consulted with for guidance on seasonal and/or spatial restrictions to avoid or minimize adverse effects (EPM FVW-5). The Applicant would identify, avoid, and/or minimize adverse effects to wetlands and waterbodies (EPM W-2). The Applicant does not anticipate impacts to mussels because impacts to waters containing these species can generally be avoided through implementation of the EPMs described in Section 3.14.2.7.1.

Spectaclecase. The spectaclecase, a federally listed endangered species, is found within the ROI in Johnson County, Arkansas (USFWS 2014c). There is limited spectaclecase habitat available within the ROI. Construction impacts (i.e., vegetation clearing, grading, access roads, herbicide use, and handling of fuel and lubricants) to this species would be limited to very specific stream and river crossings or locations where construction impacts would result in sedimentation or contaminant runoff to spectaclecase habitat within the ROI in Region 4.

Pink Mucket. The pink mucket, a federally listed endangered species, is found in tributaries associated with the White River in White and Jackson counties in Arkansas (USFWS 2014c). Construction impacts (i.e., vegetation clearing, grading, access roads, herbicide use, and handling of fuel and lubricants) to this species would be limited to crossings of the White River and associated tributaries, or locations where construction impacts would result in sedimentation or contaminant runoff to pink mucket habitat within the ROI in Regions 5 and 6.

Neosho Mucket. The Neosho mucket is a federally listed endangered species. This species occurs in the Illinois River in Adair County, Oklahoma; however, Adair County is not in the ROI. Within the ROI, the species may exist within tributaries of the Illinois River (77 FR 24151, October 16, 2012). Given the current known locations for this species, impacts are not likely to occur to this species or its habitat within the ROI in Region 4.

Speckled Pocketbook. The speckled pocketbook, a federally listed endangered species, is endemic to the Little Red River and its tributaries in Van Buren, Pope, Cleburne, and White counties in Arkansas (USFWS 2007a, 2014b). Construction impacts (i.e., vegetation clearing, grading, access roads, herbicide use, and handling of fuel and lubricants) to this species would be limited to crossings of and activities adjacent to, the Little Red River and associated tributaries, or locations where construction impacts would result in sedimentation or contaminant runoff to speckled pocketbook habitat within the ROI in Regions 4 and 5.

Scaleshell Mussel. The scaleshell mussel, a federally listed endangered species, has a range that overlaps with the ROI in Crawford, Franklin, White, and Jackson counties in Arkansas (USFWS 2014c). Construction impacts (i.e., vegetation clearing, grading, access roads, herbicide use, and handling of fuel and lubricants) to this species would be limited to very specific stream and river crossings or locations where construction impacts would result in sedimentation or contaminant runoff to scaleshell mussel habitat within the ROI in Regions 4, 5, and 6.

Fat Pocketbook. The fat pocketbook, a federally listed endangered species, occurs in tributaries and drainage ditches within the St. Francis River Basin in White, Poinsett, and Mississippi counties in Arkansas, as well as in the White River (USFWS 2014c; Natureserve 2014c). Construction impacts (i.e., vegetation clearing, grading, access roads, herbicide use, and handling of fuel and lubricants) to this species would be limited to very specific stream and river crossings or locations where construction impacts would result in sedimentation or contaminant runoff to fat pocketbook habitat within the ROI in Regions 5, 6, and 7.

Rabbitsfoot. The rabbitsfoot, a federally listed threatened species, occurs in tributaries of the White River in Van Buren, White, and Jackson counties in Arkansas, while the White River is proposed critical habitat for the species (USFWS 2014c; Natureserve 2014h). Construction impacts (i.e., vegetation clearing, grading, access roads, herbicide use, and handling of fuel and lubricants) to this species would be limited to crossings of the White River and associated tributaries, or locations where construction impacts would result in sedimentation or contaminant runoff to rabbitsfoot habitat within the ROI in Regions 5 and 6. The Applicant would consult with the USFWS and/or other resource agencies for guidance on seasonal and/or spatial restrictions designed to avoid and/or minimize adverse effects (EPM FVW-5) related to the proposed critical habitat associated with potential crossings of the White River.

Snuffbox. The snuffbox, a federally listed endangered species, has a range that overlaps with the ROI in Polk, Cross, Poinsett, and Mississippi. Construction impacts (i.e., vegetation clearing, grading, access roads, herbicide use, and handling of fuel and lubricants) to this species would be limited to very specific stream and river crossings or locations where construction impacts would result in sedimentation or contaminant runoff to snuffbox habitat within the ROI in Regions 4, 5, 6 and 7.

Curtis' Pearlymussel. The Curtis' pearlymussel, a federally listed endangered species, has an historical range that may overlap with the ROI in the White River drainage. Construction impacts (i.e., vegetation clearing, grading, access roads, herbicide use, and handling of fuel and lubricants) to this species would be limited to very specific stream and river crossings or locations where construction impacts would result in sedimentation or contaminant runoff to Curtis' pearlymussel habitat within the ROI in Region 5 if this species were present.

Special Status Amphibian Species

Ozark Hellbender. The Ozark hellbender salamander, a federally listed endangered species, and has a range that overlaps with the ROI in Republic County at the White River Crossing. Construction impacts (i.e., vegetation clearing, grading, access roads, herbicide use, and handling of fuel and lubricants) to this species would be limited to the White River crossing where construction could result in sedimentation or contaminant runoff to Ozark hellbender habitat within the ROI in Region 5.

3.14.2.7.2.2 Operations and Maintenance Impacts

The operations and maintenance phase of the Project could potentially impact special status fish, aquatic invertebrate, and amphibian resources. Potential impacts in the operations and maintenance phase of the Project would be similar to the potential impacts in the construction phase of the Project; however impacts would occur at a lesser extent than in the construction phase, but occur throughout the life of the Project. During the operations and maintenance phase, the use of both access roads and the ROW for repair and maintenance activities could result in both direct and indirect impacts. In addition, the maintenance of ROW clearing in forested riparian areas could result in both direct and indirect impacts to habitat for special status species. The potential application of herbicides during operations and maintenance of the Project could result in indirect impacts, and to a lesser extent, direct impacts.

Both general EPMs and those specific to fish and aquatic resources as listed in Section 3.14.2.7.1, would be implemented to avoid or minimize impacts to fish and aquatic resources during the operations and maintenance phase of the Project.

Special Status Fish Species

Operations and maintenance impacts of the Project on special status fish species would be similar to the potential impacts in the construction phase of the Project. Routine maintenance or unplanned repairs may require crews and/or machinery to visit an area for ROW maintenance in which a special status fish occurs. This disturbance would not be expected to result in greater impacts than those of construction activities, but it would occur throughout the life of the Project.

Special Status Aquatic Invertebrate Species

Similar to fish, special status aquatic invertebrate species (i.e., special status mussels) may experience direct or indirect impacts during operations and maintenance, though they would likely be less in extent than construction impacts. Crews and equipment may require access to habitat of special status mussels while performing routine maintenance or unplanned repairs within the ROW. This work, however, is not likely to impact special status aquatic invertebrates to a greater extent than construction activities.

Special Status Amphibian Species

Similar to fish, special status amphibian species (i.e., special status salamander) may experience direct or indirect impacts during operations and maintenance, though they would likely be less in extent than construction impacts. Crews and equipment may require access to habitat of special status salamanders while performing routine maintenance or unplanned repairs within the ROW. This work, however, is not likely to impact special status amphibians to a greater extent than construction activities.

3.14.2.7.2.3 Decommissioning Impacts

During the third phase of the Project, decommissioning of the Project could cause potential impacts to special status fish, aquatic invertebrate, and amphibian resources. Decommissioning impacts would be similar in nature to those described for construction phase of the Project. The Applicant would develop a Decommissioning Plan prior to the start of decommissioning that would be submitted for review and approval by the appropriate federal and state resources agencies.

During the decommissioning phase of the Project, all general EPMs and those specific to special status fish and aquatic resources that were implemented during the construction phase of the Project would continue to be implemented to avoid or minimize impacts to fish and aquatic resources (see Section 3.14.2.7.1 for relevant EPMs).

Long-term effects of decommissioning are likely to benefit special status species, as Project impacts would be removed and riparian vegetation and adjacent land use returns to a less disturbed state.

3.14.2.7.2.4 Converter Stations and AC Interconnection Siting Areas

A detailed description of the converter stations and other terminal facilities is provided in Section 2.1.2.1.

This section covers the data reviewed within the footprint of the converter station siting areas and associated AC interconnection siting areas. No impacts are expected to affect fish and aquatic resources due to construction or operations and maintenance activities related to these facilities.

3.14.2.7.2.4.1 Construction Impacts

3.14.2.7.2.4.1.1 Oklahoma Converter Station Siting Area and AC Interconnection Siting Area

The western portion of the Project would interconnect to the existing transmission system in Texas County, Oklahoma. The construction of the Oklahoma converter station and AC interconnection would not likely result in any direct or indirect impacts to special status fish, aquatic invertebrate and amphibian species or their habitat because no waterbodies are located within the footprint of the converter station. However upslope erosion associated site or access road construction or use may increase sediment runoff to streams if the station is constructed near a waterbody that contains special status fish, aquatic invertebrate, or amphibian species.

3.14.2.7.2.4.1.2 Tennessee Converter Station Siting Area and AC Interconnection Siting Area

The Tennessee converter station would interconnect to the existing transmission system in Shelby County, Tennessee. Since the exact location of the converter station is not known, impacts from construction would vary depending on where the station is located within the siting area. The only special status fish, aquatic invertebrate, or amphibian species identified near this portion of the Project include the pallid sturgeon (federally endangered) and blue sucker (state threatened), which occur within the Mississippi River. Although the Mississippi River is more than 10 miles from the siting area, construction activities could impact tributaries draining into the Mississippi River. Big Creek runs adjacent to the west edge of the siting area and the Bull Branch runs east-to-southwest through the converter station siting area. Construction activities occurring adjacent to Bull Branch or along the western edge of the siting area could introduce sediment, herbicides, and/or fuel and lubricants into the aquatic system that could travel to the Mississippi River due to construction activities such as road crossings.

3.14.2.7.2.4.2 Operations and Maintenance Impacts

3.14.2.7.2.4.2.1 Oklahoma Converter Station Siting Area and AC Interconnection Siting Area

The operations and maintenance of the Oklahoma converter station and AC interconnection likely not result in any direct or indirect impacts to special status fish, aquatic invertebrate and amphibian species or their habitat because no waterbodies are located within the footprint of the converter station. However upslope erosion associated site or access road construction or use may increase sediment runoff to streams if the station is constructed near a waterbody that contains special status fish, aquatic invertebrate, or amphibian species.

3.14.2.7.2.4.2.2 Tennessee Converter Station Siting Area and AC Interconnection Siting Area

The Tennessee converter station would interconnect to the existing transmission system in Shelby County, Tennessee. The operations and maintenance of the Tennessee converter station and AC interconnection should be less than during construction. The only special status fish, aquatic invertebrate, or amphibian species identified near this portion of the Project include the pallid sturgeon (federally endangered) and blue sucker (state threatened), which occur within the Mississippi River. Although the Mississippi River is more than 10 miles from the siting area, operations and maintenance activities could impact tributaries draining into the Mississippi River. If the converter station is built adjacent to Big Creek or Bull Branch, riparian clearing maintenance, road maintenance activities, and facilities operations could result in increased risk of chemical spills and contamination and increased sedimentation that could travel to the Mississippi River.

3.14.2.7.2.4.3 Decommissioning Impacts

The decommissioning of both converter stations and AC interconnection would result in short-term impacts, especially in the form of increased sedimentation during structure and road removal, and surface re-contouring activities. Long-term impacts would benefit special status fish, aquatic invertebrate, or amphibian species and their habitat, by removing effects from operations and maintenance activities, as well as removal of road and cleared areas that impact hydrology and sedimentation.

3.14.2.7.2.5 AC Collection System

This section covers the data reviewed within the 2-mile-wide ROI of the AC collection system routes. A description of the AC collection system is provided in Section 2.1.2.3. There is one special status fish, aquatic invertebrate, or amphibian species potentially occurring within the ROI for the AC collection system routes that might be affected: the Arkansas River shiner (federally threatened and state threatened in Oklahoma). The Beaver River and Palo Duro Creek, which are crossed by the ROI for the AC Collection System Routes E-1, E-2, E-3, SE-1, SE-3, NE-1, NE-2, and NW-1, may provide aquatic habitat where populations of the Arkansas River shiner could occur. No USFWS-designated critical habitat is present in the ROI for the AC collection system routes (USFWS 2014c).

3.14.2.7.2.5.1 Construction Impacts

Potential direct impacts to Arkansas River shiner include grading, access roads, herbicide use, and handling of fuel and lubricants where the Beaver River and Palo Duro Creek would be crossed by the AC collection system routes. Because semi-arid grasslands/herbaceous and croplands comprise most of the terrestrial habitats along the AC collection system routes, vegetation clearing is not likely to cause a direct impact. Potential indirect impacts include vegetation clearing, grading, access roads, herbicide use, and handling of fuel and lubricants at locations where construction activities would result in sedimentation or contaminant runoff into the Beaver River and Palo Duro Creek.

During the initial construction phase of the Project, both general EPMs and those specific to fish and aquatic resources as listed in Section 3.14.2.7.1, would be implemented to avoid or minimize impacts.

3.14.2.7.2.5.2 Operations and Maintenance Impacts

Potential impacts in the operations and maintenance phase of the Project would be similar to the potential impacts in the construction phase of the Project; however impacts would be at a lesser extent than in the construction phase, but occur throughout the life of the project. During the operations and maintenance phase, the use of both access roads and the ROW for repair and maintenance activities could result in both direct and indirect impacts to the Arkansas River shiner or its potential habitat in the Beaver River and Palo Duro Creek. In addition, the potential application of herbicides during operations and maintenance of the Project could result in indirect impacts, and to a lesser extent, direct impacts.

During the operations and maintenance phase of the Project, both general EPMs and those specific to fish and aquatic resources as listed in Section 3.14.2.7.1, would be implemented to avoid or minimize impacts to fish and aquatic resources.

3.14.2.7.2.5.3 Decommissioning Impacts

During the third phase of the Project, decommissioning of the AC transmission lines could cause potential direct and indirect impacts to the Arkansas River shiner or its potential habitat in the Beaver River and Palo Duro Creek. Decommissioning impacts would be similar in nature to those described for construction impacts. The Applicant would develop a Decommissioning Plan prior to the start of decommissioning that would be submitted for review and approval by the appropriate federal and state resources agencies.

During the decommissioning phase of the Project, all general EPMs and those specific to special status fish and aquatic resources that were implemented during the construction phase of the Project would continue to be enforced to avoid or minimize impacts to fish and aquatic resources (see Section 3.14.2.7.1 for relevant EPMs).

Long-term effects of decommissioning are likely to benefit the Arkansas River shiner or its potential habitat, as Project impacts would be removed and riparian vegetation and adjacent land use returns to a less disturbed state.

3.14.2.7.2.6 HVDC Applicant Proposed Route

The Applicant Proposed Route is described in Sections 2.1.2.2 and 2.4.2. This section identifies the potential impacts on special status fish, special status aquatic invertebrates, and special status amphibians, and these species aquatic habitat based on the three phases of the Project: construction, operations and maintenance, and decommissioning. Each phase of the Project would be conducted in such a way as to protect the quality of the environment. The Applicant would conduct each phase in compliance with applicable state and federal laws, regulations, and permits related to environmental protection. Specific EPMs developed to avoid or minimize impacts are described in Section 3.14.2.7.1.

3.14.2.7.2.6.1 Construction Impacts

This section covers the data reviewed for impacts to special status fish, aquatic invertebrate, and amphibian species during the construction phase of the Project. Specifically, impacts are assessed within the 1,000-foot-wide ROI of the Applicant Proposed Route and the expanded 3-mile buffer both upstream and downstream of the Applicant Proposed Route along waterbodies that have documented occurrences of special status fish, aquatic invertebrate, and amphibian species designated as candidate, threatened, or endangered under the ESA and state-designated threatened and endangered species. The expansion of the ROI that is specific to special status fish, aquatic invertebrate and amphibian species are described in Section 3.14.2.3.1. Species-specific descriptions are described in Section 3.14.2.4 and by region in Section 3.14.2.5.

Potential impacts to special status aquatic species during construction would be similar to those described in Section 3.14.2.7.2. Impacts to special status fish species would be reduced through implementation of EPMs described in Section 3.14.2.7.1.

3.14.2.7.2.6.1.1 Region 1

In the ROI in Region 1, one federally threatened fish (Arkansas River shiner) and one fish that is a candidate for listing (Arkansas darter) have the potential to be present. Populations of the Arkansas River shiner are known to occur within the ROI in the Cimarron River in Beaver, Harper, and Woodward counties in Region 1.

3.14.2.7.2.6.1.2 Region 2

In the ROI in Region 2, one federally threatened fish (Arkansas River shiner) and one fish that is a candidate for listing (Arkansas darter) have the potential to be present. Populations of the Arkansas River shiner are known to occur within the ROI in the Cimarron River in Woodward and Major counties of Oklahoma in Region 2.

3.14.2.7.2.6.1.3 Region 3

In the ROI in Region 3, one federally threatened fish (Arkansas River shiner) has the potential to be present. Populations of the Arkansas River shiner are known to occur within the ROI in the Cimarron River in Kingfisher and

Logan counties of Oklahoma in Region 3. One special status fish has the potential to occur north of Region 3, the candidate Arkansas darter; however, this fish potentially occurs just beyond the ROI.

3.14.2.7.2.6.1.4 Region 4

In the ROI in Region 4, there are five federally endangered species of aquatic invertebrates (Neosho mucket, spectaclecase, speckled pocketbook, scaleshell mussel and snuffbox) with the potential to occur. Two special status fish species potentially occur north of Region 4, the candidate Arkansas darter and the federally endangered Ozark cavefish. Note that these fish potentially occur just beyond the ROI.

3.14.2.7.2.6.1.5 Region 5

In the ROI in Region 5, there are seven federally endangered species, one fish (yellowcheek darter) and six mussels (scaleshell mussel, speckled pocketbook, pink mucket, fat pocketbook, snuffbox, and Curtis' pearlymussel), as well as one federally threatened species (rabbitsfoot) with the potential to occur. The yellowcheek darter potentially occurs north of the ROI, but has the potential to inhabit areas within the ROI as well. Also the Ozark hellbender salamander could occur at the White River Crossing in Republic County.

3.14.2.7.2.6.1.6 Region 6

In the ROI in Region 6, there are four federally endangered mussels (pink mucket, scaleshell, fat pocketbook and snuffbox) and one federally threatened mussel (rabbitsfoot) with the potential to occur.

3.14.2.7.2.6.1.7 Region 7

In the ROI in Region 7, three federally endangered species (one fish and two mussels) have the potential to be present (the pallid sturgeon the fat pocketbook, and snuffbox).

3.14.2.7.2.6.2 Operations and Maintenance Impacts

Impacts to special status fish species (as identified in Section 3.14.2.7.6.1 for each region) during operations and maintenance would be similar to those described in Section 3.14.2.7.2.2. During the operations and maintenance phase of the Project, both general EPMs and those specific to fish and aquatic resources as described in Section 3.14.2.7.1, would be implemented to avoid or minimize impacts to special status fish and aquatic resources.

3.14.2.7.2.6.3 Decommissioning Impacts

The short-term impacts during decommissioning of Applicant Proposed Route would be similar to the impacts that would occur during the construction phase. Structure removal, road decommissioning, and removal of road crossings is likely to have potential impacts to special status fish and aquatic resources due to increased sedimentation from runoff of disturbed areas and direct impact of removal of instream crossing structures. Following EPMs as described in Section 3.14.2.7.1 would help reduce the level of short-term impacts from decommissioning activities.

Long-term impacts of Project decommissioning would benefit special status fish, aquatic invertebrate, and amphibian species due to removal of impacts from Project components, such as roads and road maintenance activities, as well as allowing the vegetation in any cleared ROW areas to regrow.

3.14.2.7.3 Impacts Associated with the DOE Alternatives

This section identifies the potential direct and indirect impacts on special status fish species, special status aquatic invertebrate species, and special status amphibian species and their aquatic habitat related to the DOE alternatives.

3.14.2.7.3.1 Arkansas Converter Station Alternative Siting Area and AC Interconnection Siting Area

3.14.2.7.3.1.1 Construction Impacts

The construction of the Arkansas converter station and AC transmission line would not likely result in any direct impacts to special status fish, aquatic invertebrate and amphibian species or their habitat because no waterbodies are located within the footprint of the construction area or along the interconnection area. However upslope erosion associated site or access road construction or use may increase sediment runoff to streams if the station is constructed near a waterbody that contains special status fish, aquatic invertebrate, or amphibian species.

3.14.2.7.3.1.2 Operations and Maintenance Impacts

The operations and maintenance of the Arkansas converter station and AC transmission line would not likely result in any direct impacts to special status fish, aquatic invertebrate and amphibian species or their habitat because no waterbodies are located within the footprint of the construction area or along the interconnection area. However upslope erosion associated road use may increase sediment runoff to streams if the station was constructed near a waterbody that contains special status fish, aquatic invertebrate, or amphibian species.

3.14.2.7.3.1.3 Decommissioning Impacts

The impacts during decommissioning of the Arkansas converter station and AC transmission line would be similar to the impacts occurring during the construction phase. Decommissioning would not likely result in any direct impacts to special status fish, aquatic invertebrate and amphibian species or their habitat because no waterbodies are located within the footprint of the construction area or along the interconnection area. However upslope erosion associated road use may increase sediment runoff to streams if the station was constructed near a waterbody that contains special status fish, aquatic invertebrate, or amphibian species.

3.14.2.7.3.2 HVDC Alternative Routes

Descriptions of the HVDC alternative routes are provided in Section 2.4.3.2. The impacts that could occur to special status fish, aquatic invertebrate, and amphibian species from construction and operations and maintenance of the Applicant Proposed Route are discussed in Section 3.14.2.7.2.6. The expected types of impacts from construction and operations and maintenance of the HVDC alternative routes in each region would be similar to those for the Applicant Proposed Route. However, because of differences in routing (i.e., location) the potential for impacts may be different (e.g., the route may be closer to or farther from an important stream or river crossing). The discussion in this section focuses on the differential impacts that could occur under each of the HVDC alternative routes compared to the Applicant Proposed Route.

3.14.2.7.3.2.1 Construction Impacts

This section describes construction impacts associated with the 1,000-foot-wide ROI of the HVDC alternative routes and the expanded 3-mile buffer both upstream and downstream. Available data used in the impacts comparison include USWFS-designated critical habitat. Analyses are presented for the ROI in Regions 1 through 7. During the construction phase of the Project, all general EPMs and those specific to special status fish and aquatic resources would be implemented to avoid or minimize impacts to fish and aquatic resources (see Section 3.14.2.7.1 for relevant EPMs).

For all regions except Region 2, there would be no difference in impacts between the Applicant Proposed Route and the HVDC alternative routes. For Region 2, the following differences would exist between alternative routes:

- HVDC Alternative Route 2-A is approximately 57 miles long and corresponds to Applicant Proposed Route Link 2. HVDC Alternative Route 2-A has more acres of waters designated by the USFWS as critical habitat for the Arkansas River shiner within the ROI. Both the HVDC Alternative Route 2-A and the corresponding Link 2 of the Applicant Proposed Route cross the Cimarron River at separate locations where it is USFWS designated critical habitat, but HVDC Alternative Route 2-A is within the critical habitat for more acres.
- The Applicant Proposed Route Link 2 has 101 acres of critical habitat for the Arkansas River shiner within Region 2 of the HVDC transmission line 1,000-foot-wide ROI and 3-mile buffer, while HVDC Alternative Route 2-A has 635 acres of critical habitat for the Arkansas River shiner within the ROI and 3-mile buffer.
- The Applicant Proposed Route Link 2 has 95 acres of critical habitat for the Arkansas River shiner within Region 2 of the HVDC transmission line 200-foot-wide ROW and 3-mile buffer, while HVDC Alternative Route 2-A has 586 acres of critical habitat for the Arkansas River shiner within the ROW and 3-mile buffer.
- HVDC Alternative Route 2-B is approximately 30 miles long and corresponds to Applicant Proposed Route Link 3. HVDC Alternative Route 2-B has fewer acres of waters designated by the USFWS as critical habitat for the Arkansas River shiner within the ROI. Neither the HVDC Alternative Route 2-B or the corresponding Link 3 of the Applicant Proposed Route cross the Cimarron River where it is USFWS-designated critical habitat, but HVDC Alternative Route 2-B is within the critical habitat for fewer acres.
- The Applicant Proposed Route Link 3 has 71 acres of critical habitat for the Arkansas River shiner within Region 2 of the HVDC transmission line 1,000-foot-wide ROI and 3-mile buffer, while HVDC Alternative Route 2-B has 6 acres of critical habitat for the Arkansas River shiner within the ROI and 3-mile buffer.
- The Applicant Proposed Route Link 3 has 52 acres of critical habitat for the Arkansas River shiner within Region 2 of the HVDC transmission line 200-foot-wide ROW and 3-mile buffer, while HVDC Alternative Route 2-B has 2 acres of critical habitat for the Arkansas River shiner within the ROW and 3-mile buffer.

3.14.2.7.3.2.2 Operations and Maintenance Impacts

Impacts to special status fish species (as identified in Section 3.14.2.7.6.1 for each region) during operations and maintenance of the HVDC alternative routes would be similar to those described in Section 3.14.2.7.2.2. The amount of critical habitat for the Arkansas River shiner along HVDC Alternative Routes 2-A and 2-B (as mentioned above for construction) would be the only difference between the alternative routes and the Applicant Propose Route. During the operations and maintenance phase of the Project, both general EPMs and those specific to fish and aquatic resources as described in Section 3.14.2.7.1, would be implemented to avoid or minimize impacts to special status fish and aquatic resources.

3.14.2.7.3.2.3 Decommissioning Impacts

Decommissioning of the HVDC alternative routes could cause potential impacts to special status fish, aquatic invertebrate, and amphibian resources. Decommissioning impacts would be similar in nature to those described during construction. During the decommissioning phase of the Project, all general EPMs and those specific to special status fish and aquatic resources that were implemented during the construction phase of the Project would continue to be implemented to avoid or minimize impacts to fish and aquatic resources (see Section 3.14.2.7.1). The Applicant would develop a Decommissioning Plan prior to the start of decommissioning that would be submitted for review and approval by the appropriate federal and state resources agencies.

3.14.2.7.4 Best Management Practices

The Applicant has developed a list of EPMs intended to avoid or minimize impacts to special status fish, aquatic invertebrate, and amphibian species. A complete list of EPMs for the Project is provided in Appendix F; those EPMs that would specifically minimize the potential for impacting special status fish, aquatic invertebrate, and amphibian species are summarized in Section 3.14.2.7.1. In addition, DOE and the Applicant are preparing a Biological Assessment of potential impacts on special status species protected under the ESA as part of the Section 7 consultation between DOE and the USFWS. The Section 7 consultation review is a parallel but separate process conducted pursuant to the requirements of ESA and the applicable implementing regulations. Through this process, additional protective measures may be identified and adopted to avoid or minimize impacts to special status species.

3.14.2.7.5 Unavoidable Adverse Impacts

The Applicant would implement EPMs to avoid or minimize impacts; however, some adverse impacts may occur to special status fish, aquatic invertebrate, and amphibian species or their habitat even with the implementation of these measures. Construction and operations and maintenance of the Project could result in the mortality and injury of some special status fish, aquatic invertebrate, and amphibian species if they are present in the affected areas during construction or operations and maintenance. Construction mortalities and injuries could result from crushing during waterbody crossings with equipment, sedimentation, potential exposure to hazardous materials, and blasting. Operation mortalities and injuries could result from sedimentation and potential exposure to hazardous materials. Unavoidable impacts to special status fish, aquatic invertebrate, and amphibian species and their habitat include the potential loss or alteration of aquatic habitat in streams that may require culverts or vehicle crossings, potential loss or disturbance to riparian vegetation along streams on private or public lands where the ROW is parallel and adjacent to the stream, and potential short-term sedimentation effects on aquatic resources as a result of vehicular traffic causing disturbances within or adjacent to streams. Although these impacts have the potential to occur, the likelihood of occurrence would be limited through implementation of the EPMs.

3.14.2.7.6 Irreversible and Irretrievable Commitment of Resources

The potential permanent loss or alteration of aquatic habitat in smaller streams that may require road crossings would last throughout the life of the Project; however, gradual recovery of habitat may occur once the road crossing was removed. As the exact state of this recovery is not known (e.g., substantial changes related to climate, land-use, and/or watershed hydrology may occur during the 80 year lifespan of the Project), and aquatic habitat is subject to long-term climatic regimes and changes in land-use and watershed hydrology, it is reasonable to assume that some portions of the aquatic habitat for special status fish, aquatic invertebrate, and amphibian species in these smaller streams would be irreversibly and irretrievably impacted.

3.14.2.7.7 Relationship between Local Short-term Uses and Long-term Productivity

The Project may result in a short-term disturbance to special status fish, aquatic invertebrate, and amphibian resources; however, these impacts would not likely affect the long-term productivity of populations of special status fish and aquatic invertebrate species.

3.14.2.7.8 Impacts from Connected Actions

3.14.2.7.8.1 Wind Energy Generation

Two aquatic species listed under the ESA potentially occur within the WDZs, the Arkansas darter (a candidate species) and the Arkansas River shiner (a threatened species). Both species occur in Beaver County, Oklahoma. USFWS-designated critical habitat for these species is not located within the WDZs. Both species are located in close enough proximity to the WDZ to warrant inclusion here. Wind energy developers follow guidance outlined in the Land-based Wind Energy Guidance (USFWS 2012c) to develop, construct, and operate and maintain projects in a manner that would avoid and/or minimize adverse effects on both species.

The Arkansas darter and Arkansas River shiner may occur within the WDZs. Habitat exists for both species in the Cimarron River and its tributaries. WDZ-J and -K are both located in Beaver County, and would be the most likely to have appropriate habitat for both species of all the WDZs.

Potential construction impacts to these species would be similar to those defined in Section 3.14.2.7; however, the severity of impacts would be higher given these species' vulnerability due to reduced population numbers, restricted ranges, and any other limitations. Wind farm developers would need to consider developing site-specific EPMs that would be implemented as necessary after consultation with federal and state agencies regarding seasonal or spatial restrictions. Potential impacts due to operations and maintenance, as well as decommissioning, would be similar to those defined in Section 3.14.2.7.

3.14.2.7.8.2 Optima Substation

Because there are no waterbodies within the future Optima Substation site, occurrences of special status fish, aquatic invertebrate, and amphibian species are not likely. Accordingly, impacts associated with future Optima Substation site to fish, aquatic invertebrate, and amphibian species would not be likely.

3.14.2.7.8.3 TVA Upgrades

A precise ROI has not been identified for the TVA upgrades. Because a precise ROI has not been identified, the spatial and temporal (i.e., seasonal presence) distribution of special status fish, aquatic invertebrate, and amphibian species associated with the TVA upgrades has not been identified. Although the spatial and temporal distribution of special status fish, aquatic invertebrate, and amphibian species associated with the TVA upgrades has not been identified, where possible, general impacts associated with the required TVA upgrades are discussed as described below.

The construction, operation, and maintenance of the new 500kV transmission line, would have impacts similar to the Project, although on a smaller scale. These impacts may include mechanical damage and/or removal of vegetation by heavy machinery, introduction of invasive species from construction equipment or spread of existing invasive species, alteration of hydrology during road construction, which could affect special status fish, aquatic invertebrate, and amphibian species habitat, sedimentation from grading, access roads, and stream crossings, and contamination from herbicide drift or runoff or from accidental spills of fuels or lubricants that could cause mortality or injury of special status fish, aquatic invertebrate, and amphibian species.

The required TVA upgrades to existing facilities (including existing transmission lines and existing substations) would require fewer construction activities to complete than the new 500kV transmission line. Existing TVA facilities already experience operations and maintenance activities. As a result, potential impacts would be expected to be less substantial in areas affected by upgrades to existing TVA facilities than in areas where the new 500kV transmission line would be constructed.

Impacts of concern to special status fish, aquatic invertebrate, and amphibian species from the required TVA upgrades could include mortality of individuals, sensory disturbance, and aquatic habitat disturbance or modification by construction or operations and maintenance activities associated with the new transmission line. Because the locations of the required upgrades or new 500kV transmission line are unknown at this time, the spatial and temporal distribution of potentially affected fish, aquatic invertebrate, and amphibian species is also unknown.

Pursuant to section 7 of the ESA, TVA would be required to consult with the USFWS with respect to effects of its construction of any new or upgraded transmission facilities upon threatened, endangered or candidate species. TVA would consider potential impacts to special status fish, aquatic invertebrate, and amphibian species and their habitats during the siting of the new 500kV transmission line and while planning the upgrades to existing facilities.

3.14.2.7.9 Impacts Associated with the No Action Alternative

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not be constructed. No disturbances would occur due to the Project, including disturbances in waterbodies that could affect special status aquatic species and their habitats. No disturbances related to construction vehicles, equipment, or access roads would affect aquatic resources. No impacts related to the Project would occur due to vegetation removal or the use of herbicides.

Impacts to aquatic species and their habitats would be consistent with present levels of disturbance due to natural conditions in the environment, such as annual changes in stream flow, erosion, and wildfire.

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Contents

Tables

Figures Presented in Appendix A

3.15 Surface Water

3.15.1 Regulatory Background

Laws and regulations are associated with the management and protection of surface waters that could affect the Project or the manner in which it would be implemented. Key elements of select federal and state laws and regulations associated with surface water management are summarized in Table 3.15-1.

Table 3.15-1:
Federal and State Laws and Regulations Associated with Surface Water Management

Statute/Regulation	Key Elements
Clean Water Act (33 USC § 1251 *et seq.*)	CWA Section 404 establishes USACE as responsible for regulating the discharge or dredge of fill material to Waters of the U.S.
	CWA Section 401 stipulates that a federal agency (such as the USACE) issuing a permit or license for a discharge to waters of the U.S. must first have the applicable state or tribe grant or waive a Section 401 water quality certification indicating the discharge will comply with the state's water quality standards
	CWA Section 402 establishes the NPDES permit program to regulate discharges of pollutants into surface waters
	CWA Section 303(d) requires states to develop and submit to EPA, lists of impaired waters
	CWA Section 305(b) requires states to develop and periodically update an inventory of the water quality of all water bodies in the state
Rivers and Harbors Appropriation Act of 1899, Section 10 (33 USC § 403)	Section 10 of the Act prohibits obstruction or alteration of any navigable water of the U.S. without a permit from the USACE
Wild and Scenic Rivers Act (16 USC §§ 1271–1287)	Requires federal agencies proposing an action that could affect a Wild and Scenic River to consult with management agency on action and recommended measures to avoid adverse effects
	Per a 1980 CEQ memorandum, federal agencies must consult with the National Park Service on actions that could affect a river segment on the Nationwide Rivers Inventory
Oklahoma Administrative Codes 785:20 and 785:45	Requires a permit be applied for and obtained prior to diversion of surface water Establishes surface water protection measures through water classification, beneficial use designations, and numerical and narrative criteria to maintain and protect such classifications Establishes state policy to protect all waters of the state from degradation of water quality and three levels of protection: Tier 1—attainment and maintenance of an existing or designated beneficial use Tier 2—maintenance or protection of High Quality Waters and Sensitive Public and Private Water Supply Tier 3—no degradation of water quality allowed in Outstanding Resource Waters
Arkansas Natural Resources Commission, Title 3, Rules for the Utilization of Surface Water (ANRC 2009)	Requires anyone proposing to divert surface water for non-riparian use to submit an application to ANRC for determination that the water to be used is excess surface water, is intended for reasonable and beneficial use, and will cause no significant adverse environmental impact
Arkansas Act 81 of 1957	Requires diverters of surface water in excess of 1 acre-foot per year to register their diversion on an annual basis with the ANRC
Arkansas Pollution Control and Ecology Commission, Regulation No. 2, Regulation Establishing Water Quality Standards for Surface Waters of the State of Arkansas (APCEC 2011)	Establishes water quality standards for all surface waters of the State of Arkansas and assigns designated uses per ecoregion (Appendix A of Regulation Number 2).
	As its anti-degradation policy, requires existing in-stream water uses and water quality necessary to protect existing uses be maintained and protected, with High Quality Waters and Outstanding Resource Waters receiving additional protection (sections 2.201 to 2.203)
	Requires (in section 2.305) any work in waters of the state with potential to cause a violation of Water Quality Standards to have a STAA

Table 3.15-1:
Federal and State Laws and Regulations Associated with Surface Water Management

Statute/Regulation	Key Elements
Arkansas Code Annotated 23-3-5	Identifies the Arkansas Public Service Commission as having jurisdiction over crossing of navigable waterways by public service facilities, including electric power lines and specifies filing a petition with the Commission to request approval
Rules of Tennessee Department of Environment and Conservation Chapter 0400-40-03, General Water Quality Criteria (TDEC 2013a) Chapter 0400-45-08, Water Registration Requirements (TDEC 2012)	Establishes surface water classifications and numeric or narrative quality criteria
	Establishes an anti-degradation policy to fully protect existing uses of all surface waters and provides a process for authorizing degradation in waters under specific conditions including if it is in the public interest and there are no other reasonable options
	Requires users withdrawing water from either a surface or groundwater source at an average rate of 10,000 gallons or more per day to be pre-registered with the TDEC (agricultural, emergency and certain non-recurring withdrawals are exempt)
	Purchase of water from a utility is not considered withdrawal
Tennessee Administrative Code 69-3-108	Requires an Aquatic Resource Alteration Permit from the TDEC for alterations or withdrawals from streams, lakes, or wetlands of the state of Tennessee
Texas Water Code, Title 2, Chapter 11	Establishes requirements for temporary water use permits, which the Texas Commission on Environmental Quality may issue provided the temporary use does not interfere with or adversely affect prior appropriations or vested rights on the surface water.
Texas Administrative Code (TAC) 30-1-307	Establishes general water quality criteria applicable to all surface waters of the state unless exempt under TAC 30-307.8–9.
	Establishes Texas's anti-degradation policy and implementation procedures that apply to regulated actions that could increase pollution of water in the state. The policy sets three tiers of protection: (1) protect existing water uses and quality; (2) degradation of waters in excess of fishable/swimmable quality is not allowed unless TCEQ determines it is necessary for important economic or social development; and (3) the quality of Outstanding National Resource waters are to be maintained and protected.

3.15.2 Data Sources

Data were obtained from multiple publicly available sources. GIS datasets were used heavily to develop a picture of resources within the ROI. GIS datasets were obtained primarily from federal and state programs. For example, the USGS National Hydrography Dataset (GIS Data Resource: USGS 2014a) was used as part of the effort to characterize the affected environment. Surface waters of special interest were identified through federal and state listings of special designations as part of water quality or water resource protection efforts. For state designation waters, the listing information was found in state regulations, reports, or plans. Representatives of state agencies were contacted in some cases and information was obtained via conversations or electronic correspondence. Some information presented in this section was obtained from state webpages. References for specific sources of information are provided.

3.15.3 Region of Influence

For surface water, the ROI for the Project and connected actions is the same as described in Section 3.1.1.

3.15.4 Affected Environment

The affected environment for surface water, as described separately for each region below, addresses the following elements:

- Watersheds—This section describes the watersheds where the Project components would be located as a means of identifying the area's surface water drainage features. Watersheds presented here are as defined in the USGS methodology for defining and cataloging the nation's surface water drainage systems (Seaber et al. 1987; GIS Data Source USGS 2014a). The watersheds or hydrologic units are identified to the eight-digit Hydrologic Unit Code (HUC).
- Surface Water Features—This section characterizes the surface water features within the ROI for the Applicant Proposed Route, HVDC alternative routes, AC collection system routes, and three converter station siting areas. This includes identification of specific water features of special interest, which include the federal and state designations listed in Table 3.15-2. Not all surface water designations identified in the table were applicable to the ROI, but the analysis included a review to make that determination.
- Water Quality—Water quality information is presented primarily in terms of those surface water features that do not meet applicable water quality standards based on the surface water's designated uses and, as a result, have been identified as impaired waters in the states' most recent CWA Section 303(d) reports.
- Water Use—Water use is presented by county based on 2005 data published by the USGS. The USGS compiles water use data every 5 years, but data are not yet available for 2010 and are not expected to be available until late 2014. The USGS data are presented by use category and include whether a water's source is groundwater or surface water. A detailed summary of water use by county is provided in Section 3.7.

Surface Water Features

Perennial Stream—A stream that normally has water in its channel at all times.

Intermittent Stream—A stream that flows only when it receives water from rainfall runoff or springs, or from some surface source such as snowmelt.

Major Waterbody—For purposes of this evaluation, any surface water feature (perennial stream, lake, pond, etc.) for which a route crossing distance is 100 feet or more.

Feature of Special Interest—A surface water designated by a federal or state agency as having unique natural characteristics and/or requiring added protection.

Table 3.15-2:
Federal and State Surface Water Designations of Special Interest

Government Level	Surface Water Designations of Special Interest
Federal	Rivers listed in the National Park Service's Nationwide Rivers Inventory, a listing of free-flowing U.S. river segments believed to have "outstandingly remarkable" natural or cultural values of more than local or regional significance (GIS Data Source: USGS 1996)
	Rivers listed in the National Wild and Scenic Rivers System, created to preserve rivers with outstanding natural, cultural, and recreational values (National Wild and Scenic Rivers System 2014)
	Waters designated by the USFWS as critical habitat for federally listed threatened or endangered species
	Waters designated by the USACE as navigable waters of the U.S. per Section 10 of the Rivers and Harbors Act of 1899
State—Common to all	State-designated Source Water Protection Areas
	Surface water intakes for public water systems within 3 miles downstream of ROI
Oklahoma	Sensitive Public and Private Water Supplies, Outstanding Resource Waters, and High Quality Waters and their special provision watersheds as identified in Appendix A of OAC 785:45, Oklahoma's Water Quality Standards
	Scenic River Areas, Culturally Significant Waters, or Nutrient Limited Watersheds per Appendix A of OAC 785:45
	Waters of Recreational and/or Ecological Significance per Appendix B of OAC 785:45

Table 3.15-2:
Federal and State Surface Water Designations of Special Interest

Government Level	Surface Water Designations of Special Interest
Arkansas	Extraordinary Resource Waters or Natural and Scenic Waterways per Appendix A of APCEC Regulation No. 2 (APCEC 2014)
	Ecologically Sensitive Waterbodies or Trout Waters per Appendix A of APCEC Regulation No. 2 (APCEC 2014)
Tennessee	Exceptional Tennessee Waters or Outstanding National Resource Waters per Chapter 0400-40-03 of the TDEC Rules (TDEC 2013a)
	State Scenic Rivers pursuant to the Tennessee Scenic Rivers Act
Texas	Sole-source Surface Drinking Water Supplies and their protection zones per Appendix B of TAC 30-307
	Ecologically Unique River and Stream Segments per Texas Administrative Code Title 31, Chapter 357.43

Ephemeral streams, which are streams or segments of streams that flow briefly in direct response to precipitation in the immediate vicinity, are not addressed as unique surface water features in this section, but are considered to be a subset of the intermittent stream category. The USGS National Hydrography Dataset, which was used heavily in characterizing surface water features in the Project vicinity, does not distinguish between ephemeral and other intermittent streams. Where impacts to intermittent streams are discussed they would also apply to ephemeral streams.

3.15.5 Regional Description

The following sections provide detailed descriptions of watersheds, surface water features, water quality, and water use in the ROI for Regions 1 through 7. The regional descriptions in this section also identify surface water features and elements found within a representative ROW consisting of a 200-foot-wide corridor within the 1,000-foot-wide ROI of the HVDC transmission line routes. Information for the AC collection system (included in the Region 1 description) is similarly presented in terms of a 2-mile-wide ROI and a 200-foot-wide representative ROW. This information is used in evaluating potential impacts of the Project in Section 3.15.6. The ROW features and elements are included here in the affected environment to provide the reader an easy comparison between features in the ROI and what would be expected in a smaller ROW.

3.15.5.1 Region 1

Region 1 is referred to as the Oklahoma Panhandle Region and includes the Applicant Proposed Route, HVDC Alternative Routes 1-A through 1-D, and the Oklahoma converter station with its associated AC interconnection line. Although the AC collection system routes overlap with portions of the Applicant Proposed Route and HVDC alternative routes, they are addressed separately below because the AC collection system routes would also extend into areas well outside the HVDC transmission corridor.

3.15.5.1.1 Region 1 Watersheds

The ROI, including the AC collection system routes, is within the Arkansas-White-Red drainage system, which combines the drainage areas for the Arkansas, White, and Red rivers, representing a large portion of south-central United States and draining into the Mississippi River. Within that large drainage system, the ROI is primarily within the North Canadian subregion; a small portion of the eastern edge of the ROI is in the Lower Cimarron subregion. The Mississippi River is the end point for the overall drainage system, and the general direction of the primary flow within the Region 1 watersheds is from west to east. Local streams may flow in different directions, even north to south or south to north, but as they join larger streams, the overall progression is from west to east.

At USGS's eight-digit coding level, the ROI lies within eight different watersheds as shown in Figure 3.15-1a (located at Appendix A). A ninth watershed, the Lower Wolf (11100203), is just outside the ROI, but is shown in the figure because it lies between two of the eight. Table 3.15-3 lists the applicable watersheds in a general west-to-east order and provides additional detail, including the primary surface water or waters that drain the watershed. Surface waters for the ROI are shown on Figure 3.15-2 in Appendix A.

Table 3.15-3:
Watersheds Crossed by the Applicant Proposed Routes and HVDC Alternative Routes and the AC Collection System Routes—Region 1

USGS HUC Number and Watershed Name	Area Drained (square miles)	Description of Primary Surface Water Features
11100101, Upper Beaver	2,732	Beaver River drains the watershed that extends from the river's headwaters to its convergence with Goff Creek.
11100102, Middle Beaver	1,356	Beaver River drains the watershed that extends from its convergence with Goff Creek through Lake Optima and to the community of Beaver.
11100103, Coldwater[1]	1,962	Coldwater and Frisco creeks drain the watershed into Lake Optima.
11100104, Palo Duro	1,937	Palo Duro Creek drains the watershed into Beaver River.
11100201, Lower Beaver	1,781	Beaver River, which becomes the North Canadian River, drains the watershed. Several smaller streams converge with the Beaver River within the watershed.
11100202, Upper Wolf	833	Wolf Creek drains the watershed and after running through another watershed joins the Beaver River to form the North Canadian River.
11100301, Middle North Canadian	1,858	North Canadian River drains the watershed, which includes Canton Lake and Ramsey Lake, both on the North Canadian River
11050001, Lower Cimarron-Eagle Chief	2,422	Cimarron River and Eagle Chief Creek drain the watershed. The Cimarron is to the northeast and parallels the North Canadian.

1 The proposed Oklahoma converter station would be within the Coldwater watershed.

GIS Data Source: USGS (2014a)

As outlined in Table 3.15-3, the ROI follows along the Beaver River/North Canadian River drainage from west to east except at the eastern edge of the ROI, where the Applicant Proposed Route and HVDC alternative routes pass into a watershed of the Cimarron River. At this point, the Cimarron River basically flows parallel to the North Canadian River, but at a distance to the northeast.

3.15.5.1.2 Region 1 Surface Water Features

Surface water features are described below in terms of the compiled length of streams or acreage of lakes or reservoirs within the 1,000-foot corridors and 200-foot representative ROWs of the HVDC transmission line routes. Surface water features along the transmission line corridor that are of special interest or of impaired quality are identified individually in subsequent discussions.

Table 3.15-4 lists the total length of perennial streams, intermittent streams, and major waterbodies within the ROI and, in parentheses, the 200-foot-wide representative ROW. The table includes the total acreage of reservoirs, lakes, and ponds that occur within the ROI.

The analysis included an assumption when compiling the perennial and intermittent stream data shown in Table 3.15-4 and corresponding tables for the other regions. Stream data came from the USGS National Hydrography Dataset, which includes an "artificial path" category in addition to perennial and intermittent streams. The artificial paths are manually inserted flow lines in place of wide features (expanded river beds, ponds, reservoirs, etc.) in the flow paths of either perennial or intermittent streams. For ease of data compilation, the analysis summed artificial paths as if part of perennial streams. This assumption could make some perennial stream values slightly high and some intermittent stream values slightly low. If the feature is a wide river bed, however, the artificial paths are more often associated with perennial streams; and if the features are ponds or reservoirs that hold water all year even though fed by intermittent streams, it may be more appropriate to characterize them as perennial segments.

Table 3.15-4:
Miles and Acreage of Surface Water Features within the 1,000-Foot Corridors (and 200-Foot Representative ROWs) of the Applicant Proposed Route and HVDC Alternative Routes—Region-1

Route—Proposed and Alternatives[1, 2]	Link 1	Link 2	Link 3	Link 4	Link 5	Region 1 Total
Perennial Streams						
APR (miles)	0.07 (0)	2.01 (0.32)	0	1.22 (0.13)	2.15 (0.41)	5.45 (0.86)
With AR 1-A (miles)	0.07 (0)	3.69 (0.75)				3.76 (0.75)
With AR 1-B (miles)	0.07 (0)	0.64 (0.12)		1.22 (0.13)	2.15 (0.41)	4.08 (0.66)
With AR 1-C (miles)	0.07 (0)	0.95 (0.22)		1.22 (0.13)	2.15 (0.41)	4.39 (0.76)
With AR 1-D (miles)	0.07 (0)	2.01 (0.32)	1.01 (0.13)		2.15 (0.41)	5.24 (0.86)
Intermittent Streams						
APR (miles)	0.98 (0.19)	10.22 (2.37)	0	13.54 (2.57)	4.55 (0.79)	29.29 (5.92)
With AR 1-A (miles)	0.98 (0.19)	42.23 (8.42)				43.21 (8.61)
With AR 1-B (miles)	0.98 (0.19)	16.78 (2.96)		13.54 (2.57)	4.55 (0.79)	35.85 (6.51)
With AR 1-C (miles)	0.98 (0.19)	14.59 (2.59)		13.54 (2.57)	4.55 (0.79)	33.66 (6.14)
With AR 1-D (miles)	0.98 (0.19)	10.22 (2.37)	11.14 (2.24)		4.55 (0.79)	26.89 (5.59)
Major Waterbodies						
APR (miles)	0	0.01 (0.03)	0	0	0	0.01 (0.03)
With AR 1-A (miles)	0	0.02 (0.04)				0.02 (0.04)
With AR 1-B (miles)	0	0.01 (0.01)		0	0	0.01 (0.01)
With AR 1-C (miles)	0	0.02 (0.04)		0	0	0.02 (0.04)
With AR 1-D (miles)	0	0.01 (0.03)	0 (0)		0	0.01 (0.03)
Reservoirs, Lakes, and Ponds						
APR (acres)	0.6 (0)	31.2 (7.2)	0	8.5 (1.0)	8.7 (1.7)	49.0 (9.9)
With AR 1-A (acres)	0.6 (0)	26.4 (6.8)				27.0 (6.8)
With AR 1-B (acres)	0.6 (0)	3.3 (1.1)		8.5 (1.0)	8.7 (1.7)	21.1 (3.8)
With AR 1-C (acres)	0.6 (0)	3.4 (1.2)		8.5 (1.0)	8.7 (1.7)	21.2 (3.9)
With AR 1-D (acres)	0.6 (0)	31.2 (7.2)	6.6 (0.2)		8.7 (1.7)	47.1 (9.1)

1 Each region of the Applicant Proposed Route (APR) is divided into links that lie between points, or nodes, where the APR is intersected by alternative routes (ARs). ARs bypass specific links of the APR as shown in the table.

2 For the ARs, the unshaded portion of the rows provides the data for the length of the AR. The shaded portion of the rows provides the data for the balance of the APR, thereby providing perspective across the region.

GIS Data Source: USGS (2014a)

DOE also considered the surface water features that would be within the 2-mile-wide corridors and 200-foot-wide representative ROWs of the AC collection system routes. Using similar breakouts to those shown in Table 3.15-4, the lengths and areas of surface water features within the total AC collection system routes are shown in Table 3.15-5.

Table 3.15-5:
Surface Water Features within the 2-Mile-Wide Corridors (and 200-Foot-Wide ROWs) of the AC Collection System Routes

AC Route Designation	Perennial Streams (miles)	Intermittent Streams (miles)	Major Waterbodies (miles)	Reservoirs, Lakes, and Ponds (acres)
E-1	9.17 (0.23)	100.18 (1.61)	0	33.83 (0.45)
E-2	13.47 (0.37)	100.05 (2.18)	0.07 (0.07)	148.99 (0.99)
E-3	10.06 (0.12)	137.62 (2.39)	0.01 (0.01)	36.71 (0.31)
NE-1	24.11 (0.41)	32.97 (0.25)	0.12 (0.12)	141.04 (0)
NE-2	7.75 (0.20)	78.31 (1.33)	0.10 (0.10)	70.77 (1.95)
NW-1	13.05 (0.16)	110.93 (2.03)	0.09 (0.09)	167.26 (0)
NW-2	31.13 (0.51)	77.72 (0.95)	0.18 (0.18)	119.20 (0.04)
SE-1	21.52 (0.42)	75.70 (2.09)	0.04 (0.04)	677.83 (2.61)
SE-2	0.80 (0)	26.67 (0.30)	0	97.95 (0.38)
SE-3	14.47 (0.37)	98.54 (2.07)	0.07 (0.07)	768.03 (1.00)
SW-1	0.97 (0)	58.06 (0.86)	0	14.24 (0)
SW-2	7.98 (0.14)	125.14 (2.91)	0.08 (0.08)	57.42 (0.21)
W-1	6.16 (0.17)	45.09 (1.05)	0.08 (0.08)	9.27 (0.49)

GIS Data Source: USGS (2014a)

The above ROI numbers are large in comparison to the values shown in Table 3.15-4 for the Applicant Proposed Route and HVDC alternative routes primarily because the corridors evaluated for the AC collection system are 2 miles wide and the HVDC corridors are 1,000 feet wide.

The Oklahoma Converter Station and AC Interconnection Siting Areas include 1.6 miles of intermittent streams, no perennial streams, and no major waterbodies. A 200-foot-wide representative ROW for the AC Interconnection Siting Area encompasses 0.2 mile of intermittent streams.

3.15.5.1.2.1 Surface Water Features of Special Interest

Considering the entire HVDC transmission line route, Region 1 has fewer surface water features as compared to Regions 2 through 7. The most prominent water features within Region 1 are the Beaver River and several of its tributaries that are crossed by the Applicant Proposed Route and HVDC alternative routes or are within the area of the AC collection system routes. With the exception of Wolf Creek, DOE identified no surface waters in the ROI in Region 1 that have federal or state classifications of special interest other than the water quality designations addressed in the next section. Wolf Creek is a Texas stream in the Upper Wolf (11100202) watershed (Table 3.15-3) that is crossed by the AC Collection System Route SE-3. Per guidelines in Texas regulations (TAC 31-357.43), Wolf Creek is designated as an “ecologically unique river or stream segment.” It is identified as a reference stream for development of a regionalized index of biotic integrity for Texas and exhibiting high water quality and diverse benthic macroinvertebrate and fish communities (TPWD 2014).

3.15.5.1.3 Region 1 Water Quality

The CWA (33 USC § 1251 et seq.) establishes a framework for regulating quality standards for surface waters and discharges into those waters. Under that framework, the states evaluate their surface waters, determine applicable beneficial uses, set water quality criteria to support those uses, and implement rules and regulations to achieve or maintain water quality criteria. Section 305(b) of the CWA requires states to develop and periodically update an inventory of the water quality of all water bodies in the state. These inventories, provided to EPA and released to the public, indicate if the water quality supports the designated uses. Section 303(d) requires states to develop and periodically update an inventory of water bodies that do not meet water quality standards, which the states also provide to EPA and release to the public.

Table 3.15-6 identifies surface water features within the ROI that do not meet applicable water quality standards based on the surface water's designated uses and, as a result, have been identified as an impaired water in Oklahoma's most recent Section 303(d) list. All of the surface waters in the table cross the 200-foot-wide representative ROWs of the identified Project components as well as the wider ROI. The table identifies the specific water, the designated use that is impaired and what is causing the impairment. A primary element in the process of improving the water quality in impaired waters is the development of "total maximum daily loads" or TMDLs, which are the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards. Once TMDLs have been determined, discharge requirements can be developed that will bring a waterbody back into compliance. The table identifies the status of the TMDL development process, generally in the form of a date when the TMDL is expected to be developed and approved. In some instances, a TMDL has already been developed and approved by EPA and is noted as such in the table.

Table 3.15-6:
Waters with Impaired Quality within the 1,000-Foot Corridors of the Applicant Proposed Route and HVDC Alternative Routes and the 2-Mile Corridors of the AC Collection System Routes—Region 1

Water Segment and Watershed	Impaired Uses—Impairment	TMDL Status[1]	Project Components Crossing Impaired Segment
Beaver River (North Canadian), OK (OK720510000190_00) Upper Beaver watershed (HUC 11100101)	Fish and Wildlife Propagation/Warm Water Aquatic Community—dissolved oxygen impairment	Priority Date: 2020 Approved TMDLs for fecal coliform, E. Coli, *and Enterococcu*s	AC Collection System Route: NW-1
Palo Duro Creek, OK (OK720500020500_00) Palo Duro watershed (HUC 11100104)	Primary Body Contact Recreation—*Enterococcu*s, and *E. coli* impairments Fish and Wildlife Propagation/Warm Water Aquatic Community—dissolved oxygen and selenium impairments Agricultural—sulfates and total dissolved solids impairments	Priority Date: 2023 Approved TMDLs for fecal coliform and total suspended solids	HVDC: APR Link 2, ARs 1-A, 1-B, and 1-C AC Collection System Routes: E-1, E-2, E-3, SE-1, and SE-3
Kiowa Creek, OK (OK720500020130_00) Lower Beaver watershed (HUC 11100201)	Primary Body Contact Recreation—*E. coli* impairments	Priority Date: 2023 Approved TMDLs for fecal coliform *and Enterococcu*s	HVDC: APR Link 4, ARs 1-A and 1-D

Table 3.15-6:
Waters with Impaired Quality within the 1,000-Foot Corridors of the Applicant Proposed Route and HVDC Alternative Routes and the 2-Mile Corridors of the AC Collection System Routes—Region 1

Water Segment and Watershed	Impaired Uses—Impairment	TMDL Status[1]	Project Components Crossing Impaired Segment
Beaver River (North Canadian), OK (OK720500020010_00) Lower Beaver watershed (HUC 11100201)	Fish Consumption—lead impairment Primary Body Contact Recreation—*E. coli* impairment	Priority Date: 2020 Approved TMDLs for fecal coliform, *and Enterococcu*s	HVDC: APR Link 5, AR 1-A
Clear Creek, OK (OK720500020070_00) Lower Beaver watershed (HUC 11100201)	Fish and Wildlife Propagation/Warm Water Aquatic Community—benthic-macroinvertebrate bioassessments	Priority Date: 2020 Approved TMDLs for fecal coliform, *E. coli and Enterococcu*s	HVDC: APR Link 4, AR 1-D
Otter Creek. OK (OK720500020050_00) Lower Beaver watershed (HUC 11100201)	Fish and Wildlife Propagation/Warm Water Aquatic Community—benthic-macroinvertebrate bioassessments	Priority Date: 2020 Approved TMDLs for *E. coli and Enterococcu*s	HVDC: APR Link 5
Sand Creek, OK (OK620920050050_00) Lower Cimarron-Eagle Chief watershed (HUC 11050001)	Fish and Wildlife Propagation/Warm Water Aquatic Community—dissolved oxygen impairment Agriculture—sulfates impairment	Priority Date: 2023 Approved TMDLs for *E. coli and Enterococcu*s	HVDC: AR 1-A

1 TMDL = Total Maximum Daily Load—TMDLs are the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards. Once TMDLs have been determined, discharge requirements can be developed that will bring a waterbody back into compliance.

Sources: ODEQ (2014, 2013), EPA (2013b)

Because of the great area and number of surface waters crossed by the ROI, the analysis focuses only on those surface waters identified by the states as being out of compliance, or impaired. The list of surface waters in the table provides an indication of some of the water features that could be encountered along or within the ROIs of the various project components and the types of water pollutants of concern. Table 3.15-6 does not identify surface waters along or within the ROIs that have water quality good enough to meet all of their designated uses.

3.15.5.1.4 Region 1 Water Use

Water use—surface water and groundwater—was previously summarized in Table 3.7-5. The average use of surface water in the four-county area of Beaver, Harper, Texas, and Woodward counties in Oklahoma was about 7.4 million gallons per day in 2005 and all of that use was attributed to irrigation compared to the almost 226 million gallons per day of groundwater used in the same counties. Surface water, therefore, accounts for only about 3 percent of total water usage in the four-county area and none of the area’s public water supplies include water from surface sources. The scarcity of surface water also is evidenced in the greater abundance of intermittent streams in this area compared to perennial streams.

Table 3.7-6 summarizes water use in the five-county area of Beaver and Texas counties in Oklahoma and Hansford, Ochiltree, and Sherman counties in Texas that encompass the AC collection system routes. The predominant use of groundwater in the five-county area is even more apparent than for the Region 1 counties. In the five-county area, surface water use at about 1.2 million gallons per day is less than 0.2 percent of the area’s total water use of 834 million gallons per day. All of the surface water use in the five-county area is attributed to the categories of irrigation and livestock.

3.15.5.2 Region 2

Region 2 is referred to as the Oklahoma Central Great Plains Region and includes the Applicant Proposed Route and HVDC Alternative Routes 2-A and 2-B.

3.15.5.2.1 Region 2 Watersheds

Still within the large Arkansas-White-Red drainage system, the ROI in Region 2 is primarily within the Lower Cimarron subregion, but portions of the western end of the ROI are within the North Canadian subregion. Primary surface water flow in both of these subregions is from west to east, toward the Mississippi River. Local streams may flow in different directions, even north-south, but as they join larger streams the overall progression is from west to east.

At USGS's eight-digit coding level, the ROI lies within three different watersheds as shown in Figure 3.15-1 in Appendix A. Table 3.15-7 lists the applicable watersheds and provides additional detail, including the primary surface water or waters that drain the watershed. Surface waters for the ROI are shown on Figure 3.15-2 in Appendix A.

Table 3.15-7:
Watersheds Crossed by the Applicant Proposed Route and HVDC Alternative Routes—Region 2

USGS HUC Number and Watershed Name	Area Drained (square miles)	Description of Primary Surface Water Feature(s)
11100301, Middle North Canadian	1,858	North Canadian River drains the watershed, which includes Canton Lake and Ramsey Lake, both on the North Canadian River
11050001, Lower Cimarron-Eagle Chief	2,422	Cimarron River and Eagle Chief Creek drain the watershed. The Cimarron is to the northeast and parallels the North Canadian.
11050002, Lower Cimarron-Skeleton	3,236	Cimarron River is the primary drain for the watershed. Skeleton, Turkey, Kingfisher, and Cottonwood creeks also drain the watershed and are tributaries to the Cimarron River.

GIS Data Source: USGS (2014a)

The watersheds in the ROI in Region 2 are in two different river systems (the Cimarron and the North Canadian), but further downstream, both converge with the Arkansas River (although the North Canadian first joins the Canadian River).

3.15.5.2.2 Region 2 Surface Water Features

As presented and described for Region 1, Table 3.15-8 lists the total length of perennial streams, intermittent streams, and major waterbodies within the Applicant Proposed Route and HVDC alternative routes in Region 2. The table includes the total acreage of reservoirs, lakes, and ponds located within Applicant Proposed Route and HVDC alternative routes.

Table 3.15-8:
Miles and Acreage of Surface Water Features within the 1,000-Foot Corridors (and 200-Foot Representative ROWs) of the Applicant Proposed Route and HVDC Alternative Routes—Region 2

Route—Proposed and Alternatives[1, 2]	Link 1	Link 2	Link 3	Region 2 Total
Perennial Streams				
APR (miles)	0	6.47 (1.32)	0.85 (0.11)	7.32 (1.43)
With AR 2-A (miles)	0	16.90 (3.35)	0.85 (0.11)	17.75 (3.46)
With AR 2-B (miles)	0	6.47 (1.32)	2.47 (0.49)	8.94 (1.81)
Intermittent Streams				
APR (miles)	0	9.34 (1.81)	9.80 (1.94)	19.14 (3.75)
With AR 2-A (miles)	0	4.73 (0.59)	9.80 (1.94)	14.53 (2.53)
With AR 2-B (miles)	0	9.34 (1.81)	8.32 (1.34)	17.66 (3.15)
Major Waterbodies				
APR (miles)	0	0.01 (0.01)	0	0.01 (0.01)
With AR 2-A (miles)	0	0.05 (0.05)	0	0.05 (0.05)
With AR 2-B (miles)	0	0.01 (0.01)	0	0.01 (0.01)
Reservoirs, Lakes, and Ponds				
APR (acres)	1.1 (<0.1)	3.7 (0.8)	8.8 (1.1)	13.6 (1.9)
With AR 2-A (acres)	1.1 (<0.1)	25.2 (6.5)	8.8 (1.1)	35.0 (7.6)
With AR 2-B (acres)	1.1 (<0.1)	3.7 (0.8)	19.4 (1.6)	24.2 (2.4)

1 Each region of the Applicant Proposed Route (APR) is divided into links that lie between points, or nodes, where the APR is intersected by alternative routes (ARs). ARs bypass specific links of the APR as shown in the table.
2 For the ARs, the unshaded portion of the rows provides the data for the length of the AR. The shaded portion of the rows provides the data for the balance of the APR, thereby providing perspective across the region.
GIS Data Source: USGS (2014a)

3.15.5.2.2.1 Surface Water Features of Special Interest

As described for the watersheds in the ROI for Region 2, the North Canadian and Cimarron rivers are important surface water features in the area from a drainage system standpoint and the Cimarron River would be crossed by the Applicant Proposed Route as well as Alternative Route 2-A. Table 3.15-9 identifies surface waters within the ROI that have specific federal or state designations of special interest beyond significance as drainage features. The surface water identified in the table is crossed by the 200-foot representative ROW as well as the 1,000-foot corridor of the ROI.

Table 3.15-9:
Surface Waters of Special Interest within the 1,000-Foot Corridor of the Applicant Proposed Route and HVDC Alternative Routes—Region 2

Surface Water and Watershed	Designation(s)	Basis for Designation	Route/Alternative Affected		
			APR	2-A	2-B
Cimarron River, OK Lower Cimarron-Skeleton watershed (HUC 11050002)	USFWS critical habitat	Critical habitat for federally listed threatened Arkansas River shiner (*Notropis girardi*)	X	X	
	Oklahoma Water of Recreational and/or Ecological Significance	State protected water due to federally listed species (above)	X	X	

Sources: USFWS (2014), Appendix B of OAC 785:45

3.15.5.2.3 Region 2 Water Quality

Table 3.15-10 identifies surface water features within the ROI in Region 2 that do not meet applicable water quality standards based on the surface water's designated uses and, as a result, have been identified as an impaired water in the state's most recent Section 303(d) list. All of the water segments identified in the table would cross the 200-foot-wide representative ROWs of the identified Project components as well as the wider ROI.

Table 3.15-10:
Waters with Impaired Quality within the 1,000-Foot Corridors of the Applicant Proposed Route and HVDC Alternative Routes—Region 2

Water Segment and Watershed	Impaired Uses—Impairment	TMDL Status[1]	Project Components Crossing Impaired Segment
Main Creek, OK (OK620920010180_00) Lower Cimarron-Eagle Chief watershed (HUC 11050001)	Fish and Wildlife Propagation/Warm Water Aquatic Community—fishes bioassessments impairment Agriculture—sulfates impairment	Priority Date: 2023 Approved TMDLs for *Enterococcus*, *E. coli*, and total suspended solids	AR 2-A
Griever Creek, OK (OK620920010130_00) Lower Cimarron-Eagle Chief watershed (HUC 11050001)	Fish and Wildlife Propagation/Warm Water Aquatic Community—benthic-macroinvertebrate bioassessments impairment Primary Body Contact Recreation—*E. coli* impairment	Priority Date: 2020 Approved TMDL for *Enterococcus*	AR 2-A
East Griever Creek, OK (OK620920010140_00) Lower Cimarron-Eagle Chief watershed (HUC 11050001)	Primary Body Contact Recreation—*Enterococcus* impairment Agriculture—sulfates impairment	Priority Date: 2020	APR Link 2, AR 2-A
Cottonwood Creek, OK (OK620920010080_00) Lower Cimarron-Eagle Chief watershed (HUC 11050001)	Primary Body Contact Recreation—*E. coli* and *Enterococcus* impairments Fish and Wildlife Propagation/Warm Water Aquatic Community—pH impairment	Priority Date: 2023 Approved TMDLs for fecal coliform, and total suspended solids	AR 2-A
Cimarron River, OK (OK620910020010_10) Lower Cimarron-Skeleton watershed (HUC 11050002)	Fish and Wildlife Propagation/Warm Water Aquatic Community—selenium impairment Agriculture—sulfates, total dissolved solids, and chloride impairments	Priority Date: 2020 Approved TMDLs for *Enterococcus* and *E. coli*	APR Link 2, AR 2-A
Turkey Creek, OK (OK620910060010_00) Lower Cimarron-Skeleton watershed (HUC 11050002)	Primary Body Contact Recreation—*E. coli* impairment	Priority Date: 2023 Approved TMDLs for fecal coliform and turbidity	APR Link 3, AR 2-B
Buffalo Creek, OK (OK620910060030_00) Lower Cimarron-Skeleton watershed (HUC 11050002)	Fish and Wildlife Propagation/Warm Water Aquatic Community—dissolved oxygen impairment	Priority Date: 2023 Approved TMDLs for fecal coliform and turbidity	APR Link 3, AR 2-B

1 TMDL = Total Maximum Daily Load—TMDLs are the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards. Once TMDLs have been determined, discharge requirements can be developed that will bring a waterbody back into compliance.

Sources: ODEQ (2014, 2013), EPA (2013b)

3.15.5.2.4 Region 2 Water Use

As described for Region 1 (Section 3.15.5.1.4), groundwater accounts for the majority of the total water use in the three counties (Garfield, Major, and Woodward counties, Oklahoma) that encompass Region 2. Table 3.7-9 shows that the average use of surface water was about 3.1 million gallons per day in 2005 compared to the almost 42 million gallons per day of groundwater used in the same area. Surface water, therefore, accounts for only about 7 percent of area's total water usage; none of the three counties' public water supplies include water from surface sources. Total water use (groundwater and surface water) is described in more detail in Section 3.7.5.2.4.

3.15.5.3 Region 3

Region 3 is referred to as the Oklahoma Cross Timbers Region and includes the Applicant Proposed Route and HVDC Alternative Routes 3-A through 3-E.

3.15.5.3.1 Region 3 Watersheds

The ROI in Region 3 remains within the large Arkansas-White-Red drainage system, but passes through five watersheds in three subregions: the Lower Cimarron (1105), the North Canadian (1110), and the Lower Arkansas (1111). The Lower Arkansas subregion begins where the Cimarron and Arkansas rivers converge, so the downstream watershed in the Lower Cimarron subregion transitions directly into the watershed of the Lower Arkansas subregion. The western portion of the ROI in Region 3 is primarily within the Lower Cimarron subregion, the central portion is within the North Canadian subregion, and the eastern end is within the Lower Arkansas subregion. Primary surface water flow in these subregions is still from west to east, possibly southeast, toward the Mississippi River. Local streams may flow in different directions, but as they join larger streams the overall progression is from west to east/southeast.

At USGS's eight-digit coding level, the ROI lies within five different watersheds as shown in Figure 3.15-1 in Appendix A. Table 3.15-11 lists the applicable watersheds and provides additional detail, including the primary surface water or waters that drain the watershed. Surface waters for the ROI are shown on Figure 3.15-2 in Appendix A.

Table 3.15-11:
Watersheds Crossed by the Applicant Proposed Route and HVDC Alternative Routes—Region 3

USGS HUC Number and Watershed Name	Area Drained (square miles)	Description of Primary Surface Water Feature(s)
11050002, Lower Cimarron-Skeleton	3,236	Cimarron River is the primary drain for the watershed. Skeleton, Turkey, Kingfisher, and Cottonwood creeks also drain the watershed and are tributaries to the Cimarron River.
11050003, Lower Cimarron	1,385	Cimarron River is the primary drain for the watershed, which extends from the Cimarron's confluence with Skeleton Creek to Keystone Lake. Beaver, Drought, Stillwater, Euchee, and Lagoon creeks also drain the watershed and are tributaries to the Cimarron River. Lake Carl Blackwell is also in this watershed.
11100303, Deep Fork	2,536	Deep Fork River is the primary drain for the watershed, which passes through Deep Fork National Wildlife Refuge and drains into Eufaula Lake in the southeast portion of the watershed.
11110101, Polecat-Snake	1,322	Arkansas River is the primary drain for the watershed. Polecat Creek and Snake Creek also drain portions of the watershed and are tributaries to the Arkansas River.
11110102, Dirty-Greenleaf	797	Arkansas River is the primary drain for the watershed. Dirty Creek and Greenleaf Creek also drain portions of the watershed and are tributaries to the Arkansas River. Greenleaf Lake is on Greenleaf Creek.

GIS Data Source: USGS (2014a)

3.15.5.3.2 Region 3 Surface Water Features

Table 3.15-12 lists the total length of perennial streams, intermittent streams, major waterbodies present within the ROI and the 200-foot-wide representative ROW in Region 3. The table includes the total acreage for reservoirs, lakes, and ponds that occur within the ROI.

Table 3.15-12:
Miles and Acreage of Surface Water Features within the 1,000-Foot Corridors (and 200-Foot Representative ROWs) of the Applicant Proposed Route and HVDC Alternative Routes—Region 3

Route—Proposed and Alternatives[1, 2]	Link 1	Link 2	Link 3	Link 4	Link 5	Link 6	Region 3 Total
Perennial Streams							
APR (miles)	14.62 (2.71)	2.40 (0.53)	4.03 (0.82)	23.45 (4.43)	10.78 (1.96)	0.02 (0)	55.30 (10.45)
With AR 3-A (miles)	17.33 (3.58)	2.40 (0.53)	4.03 (0.82)	23.45 (4.43)	10.78 (1.96)	0.02 (0)	58.01 (11.32)
With AR 3-B (miles)	21.35 (4.68)			23.45 (4.43)	10.78 (1.96)	0.02 (0)	55.60 (11.07)
With AR 3-C (miles)	14.62 (2.71)	2.40 (0.53)	31.30 (5.55)				48.32 (8.79)
With AR 3-D (miles)	14.62 (2.71)	2.40 (0.53)	4.03 (0.82)	23.45 (4.43)	5.91 (0.83)		50.41 (9.32)
With AR 3-E (miles)	14.62 (2.71)	2.40 (0.53)	4.03 (0.82)	23.45 (4.43)	10.78 (1.96)	0.77 (0.06)	56.05 (10.51)
Intermittent Streams							
APR (miles)	9.71 (2.09)	0	0	18.11 (3.76)	5.29 (1.13)	3.72 (0.77)	36.83 (7.75)
With AR 3-A (miles)	6.51 (1.33)	0	0	18.11 (3.76)	5.29 (1.13)	3.72 (0.77)	33.61 (6.99)
With AR 3-B (miles)	6.51 (1.33)			18.11 (3.76)	5.29 (1.13)	3.72 (0.77)	33.61 (6.99)
With AR 3-C (miles)	9.71 (2.09)	0	42.19 (8.84)				51.90 (10.93)
With AR 3-D (miles)	9.71 (2.09)	0	0	18.11 (3.76)	17.77 (4.17)		45.59 (10.02)
With AR 3-E (miles)	9.71 (2.09)	0	0	18.11 (3.76)	5.29 (1.13)	5.35 (1.51)	38.46 (8.49)
Major Waterbodies							
APR (miles)	0.02 (0.02)	0	0.02 (0.02)	0.10 (0.10)	0.01 (0.01)	0	0.15 (0.15)
With AR 3-A (miles)	0	0	0.02 (0.02)	0.10 (0.10)	0.01 (0.01)	0	0.13 (0.13)
With AR 3-B (miles)	0.01 (0.01)			0.10 (0.10)	0.01 (0.01)	0	0.12 (0.12)
With AR 3-C (miles)	0.02 (0.02)	0	0.12 (0.11)				0.14 (0.13)
With AR 3-D (miles)	0.02 (0.02)	0	0.02 (0.02)	0.10 (0.10)	0		0.14 (0.14)
With AR 3-E (miles)	0.02 (0.02)	0	0.02 (0.02)	0.10 (0.10)	0.01 (0.01)	0	0.15 (0.15)
Reservoirs, Lakes, and Ponds							
APR (acres)	34.0 (4.0)	12.5 (3.2)	4.6 (<0.1)	120.3 (25.2)	39.0 (5.6)	4.4 (1.5)	214.8 (39.5)
With AR 3-A (acres)	53.2 (9.6)	12.5 (3.2)	4.6 (<0.1)	120.3 (25.2)	39.0 (5.6)	4.4 (1.5)	234.0 (45.1)
With AR 3-B (acres)	80.2 (13.2)			120.3 (25.2)	39.0 (5.6)	4.4 (1.5)	243.9 (45.5)
With AR 3-C (acres)	34.0 (4.0)	12.5 (3.2)	137.6 (20.4)				184.1 (27.6)
With AR 3-D (acres)	34.0 (4.0)	12.5 (3.2)	4.6 (<0.1)	120.3 (25.2)	52.3 (9.1)		223.7 (41.5)
With AR 3-E (acres)	34.0 (4.0)	12.5 (3.2)	4.6 (<0.1)	120.3 (25.2)	39.0 (5.6)	6.4 (1.3)	216.8 (39.3)

1 Each region of the Applicant Proposed Route (APR) is divided into links that lie between points, or nodes, where the APR is intersected by alternative routes (ARs). ARs bypass specific links of the APR as shown in the table.
2 For the ARs, the unshaded portion of the rows provides the data for the length of the AR. The shaded portion of the rows provides the data for the balance of the APR, thereby providing perspective across the region.
GIS Data Source: USGS (2014a)

Region 3, particularly the areas of the Applicant Proposed Route Link 4 and the corresponding portion of Alternative Route 3-C, passes through an area of Oklahoma where there are many small dams and reservoirs constructed by NRCS for flood prevention, management of soil erosion, and irrigation. The Applicant Proposed Route Link 4 contains all or portions of the following:

- Little Deep Fork 12—The dam and part of the small reservoir is inside the 1,000-foot corridor, but outside the 200-foot ROW.
- Little Deep Fork 44—The dam and most of the reservoir is inside the corridor; the southeast end of the dam and a small corner of the reservoir would be inside the 200-foot ROW.
- Little Deep Fork 45—The dam and most of the reservoir is inside the corridor and would be crossed by the 200-foot ROW.
- Little Deep Fork 51r—The dam is to the south and the reservoir extends into the corridor, but not as far as the 200-foot ROW.

3.15.5.3.2.1 Surface Water Features of Special Interest

As described for the watersheds in the ROI for Region 3, the Cimarron, Deep Fork, and Arkansas rivers are important surface water features in the area from a drainage system standpoint. Lake Carl Blackwell, Eufaula Lake, and Greenleaf Lake are notable surface water impoundments within the watersheds. This portion of the ROI has many streams and impoundments throughout its course. Table 3.15-13 identifies surface waters within the ROI in Region 3 that have specific federal or state designations of special interest beyond significance as drainage features. Each of the water features and designations identified in the table is applicable to the 200-foot-wide representative ROWs as well as the wider ROI.

Table 3.15-13:
Surface Waters of Special Interest within the 1,000-Foot Corridor of the Applicant Proposed Route and HVDC Alternative Routes—Region 3

Surface Water and Watershed	Designation(s)	Basis for Designation	Route/Alternative Affected					
			APR	3-A	3-B	3-C	3-D	3-E
Lake Carl Blackwell, OK Lower Cimarron watershed (HUC 11050003)	Oklahoma Source Water Protection Area	The lake and drainage areas in close proximity are designated for protection because the lake is a drinking water source. ARs 3-A and 3-B cross protected drainage area, but not the lake.		X	X			
	Oklahoma Special Provision Watershed for Sensitive Public and Private Water Supply	The lake is a protected water supply source. ARs 3-A and 3-B cross five protected streams flowing into the lake.		X	X			
Cushing Lake, OK Lower Cimarron watershed (HUC 11050003)	Oklahoma Special Provision Watershed for Sensitive Public and Private Water Supply	The lake is a protected water supply source. The APR and AR 3-C cross two and four protected streams, respectively, that flow into the lake.	X L4			X		

Source: OWRB (2011d)

3.15.5.3.3 Region 3 Water Quality

Table 3.15-14 identifies surface water features within the ROI in Region 3 that do not meet applicable water quality standards based on the surface water's designated uses and, as a result, have been identified as an impaired water in the state's most recent Section 303(d) list. As noted by a table footnote, Dirty Creek would be within the 1,000-foot corridor of the ROI, but not the 200-foot-wide representative ROW. Link 3 of the Applicant Proposed Route would cross Stillwater Creek and the creek would be encompassed by the 1,000-foot corridor of Link 4, but it would be avoided by the 200-foot-wide ROW of Link 4. All of the other segments would cross both the ROI and the ROW.

Table 3.15-14:
Waters with Impaired Quality within the 1,000-Foot Corridors of the Applicant Proposed Route and HVDC Alternative Routes—Region 3

Water Segment and Watershed	Impaired Uses—Impairment	TMDL Status[1]	Project Components Crossing Impaired Segment
Skeleton Creek, OK (OK620910030010_00) Lower Cimarron-Skeleton watershed (HUC 11050002)	Fish and Wildlife Propagation/Warm Water Aquatic Community—selenium impairment	Priority Date: 2023 Approved TMDLs for *Enterococcus*, *E. coli*, fecal coliform, and total suspended solids	APR Link 1
West Beaver Creek, OK (OK620900030260_00) Lower Cimarron watershed (HUC 11050003)	Primary Body Contact Recreation—*E. coli* and *Enterococcus* impairments	Priority Date: 2023 Approved TMDL for turbidity	ARs 3-A and 3-B
Stillwater Creek, OK (OK620900040040_00) Lower Cimarron watershed (HUC 11050003)	Fish and Wildlife Propagation/Warm Water Aquatic Community—dissolved oxygen impairment	Priority Date: 2017 Approved TMDLs for *Enterococcus*, *E. coli*, and turbidity	APR Link 3 and Link 4[2], AR 3-B
Little Stillwater Creek, OK (OK620900040050_00) Lower Cimarron watershed (HUC 11050003)	Public and Private Water Supply—nitrates impairment	Priority Date: 2017	AR 3-B
Cimarron River, OK (OK620900030010_00) Lower Cimarron watershed (HUC 11050003)	Fish Consumption—lead impairment	Priority Date: 2017 Approved TMDLs for *Enterococcus* and turbidity	APR Link 4, AR 3-C
Little Deep Fork Creek, OK (OK520700060130_10) Deep Fork watershed (HUC 11100303)	Primary Body Contact Recreation—*E. coli* and *Enterococcus* impairments	Priority Date: 2018	AR 3-C
West Spring Creek, OK (OK520700060210_00 Deep Fork watershed (HUC 11100303)	Agriculture—chloride and total dissolved solids impairments	Priority Date: 2020	APR Link 4
Browns Creek, OK (OK520700060050_00) Deep Fork watershed (HUC 11100303)	Fish and Wildlife Propagation/Warm Water Aquatic Community—dissolved oxygen impairment	Priority Date: 2020	APR Link 4, AR 3-C
Begger Creek, OK (OK520700020155_00) Deep Fork watershed (HUC 11100303)	Agriculture—chloride and total dissolved solids impairments	Priority Date: 2023	APR Link 4

Table 3.15-14:
Waters with Impaired Quality within the 1,000-Foot Corridors of the Applicant Proposed Route and HVDC Alternative Routes—Region 3

Water Segment and Watershed	Impaired Uses—Impairment	TMDL Status[1]	Project Components Crossing Impaired Segment
Salt Creek, OK (OK520700020150_00) Deep Fork watershed (HUC 11100303)	Agriculture—chloride impairment Fish and Wildlife Propagation/Warm Water Aquatic Community—dissolved oxygen impairment	Priority Date: 2023	APR Link 4, AR 3-C
Adams Creek, OK (OK520700020080_00) Deep Fork watershed (HUC 11100303)	Fish and Wildlife Propagation/Warm Water Aquatic Community—dissolved oxygen impairment	Priority Date: 2023	APR Link 4, AR 3-C
Butler Creek, OK (OK120400020160_00) Dirty-Greenleaf watershed (HUC 11110102)	Fish and Wildlife Propagation/Warm Water Aquatic Community—dissolved oxygen impairment	Priority Date: 2023 Approved TMDLs for *Enterococcus*, *E. coli*, and turbidity	ARs 3-C and 3-D
Dirty Creek, OK (OK120400020010_00) Dirty-Greenleaf watershed (HUC 11110102)	Fish and Wildlife Propagation/Warm Water Aquatic Community—dissolved oxygen impairment	Priority Date: 2020 Approved TMDLs for *Enterococcus* and turbidity	ARs 3-C[2], 3-D[2], and 3-E[2]

1 TMDL = Total Maximum Daily Load—TMDLs are the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards. Once TMDLs have been determined, discharge requirements can be developed that will bring a waterbody back into compliance.

2 The 1,000-foot-wide ROI corridor of this route component would encompass the water segment, but the corresponding 200-foot-wide ROW would not.

Sources: ODEQ (2014, 2013), EPA (2013b)

3.15.5.3.4 Region 3 Water Use

The predominant water use demonstrably shifts to surface water from groundwater in the eight counties (Creek, Garfield, Kingfisher, Lincoln, Logan, Muskogee, Okmulgee, and Payne counties, Oklahoma) that encompass Region 3 as compared to Regions 1 and 2. Table 3.7-12 shows that the average use of surface water was about 144 million gallons per day in 2005 compared to about 56 million gallons per day of groundwater. Surface water, therefore, accounts for almost 72 percent of area's total water usage. Total water use (groundwater and surface water) is described in more detail in Section 3.7.5.3.4.

3.15.5.4 Region 4

Region 4 is referred to as the Arkansas River Valley Region and includes the Applicant Proposed Route and HVDC Alternative Routes 4-A through 4-E as well as the Lee Creek Variation.

3.15.5.4.1 Region 4 Watersheds

The ROI in Region 4 is entirely within the Lower Arkansas subregion (1111) of the larger Arkansas-White-Red drainage system. Primary drainage of this subregion is provided by the Arkansas River and, consistent with the Arkansas River flow in this area, the predominant flow direction is to the southeast toward the Mississippi River. Local streams may flow in different directions, but as they join larger streams and eventually the Arkansas River, the overall progression is to the southeast.

At USGS's eight-digit coding level, the ROI lies within five different watersheds as shown in Figure 3.15-1 in Appendix A. Table 3.15-15 lists the applicable watersheds and provides additional detail, including the primary surface water or waters that drain the watershed. Surface waters for the ROI are shown on Figure 3.15-2 in Appendix A.

Table 3.15-15:
Watersheds Crossed by the Applicant Proposed Route and HVDC Alternative Routes—Region 4

USGS HUC Number and Watershed Name	Area Drained (square miles)	Description of Primary Surface Water Feature(s)
11110102, Dirty-Greenleaf	797	Arkansas River is the primary drain for the watershed. Dirty Creek and Greenleaf Creek also drain portions of the watershed and are tributaries to the Arkansas River. Greenleaf Lake is on Greenleaf Creek.
11110103, Illinois	1,654	Illinois River is the primary drain for the watershed. The Illinois River converges with the Arkansas River just downstream of the watershed's south border. Tenkiller Ferry Lake is a major water body in the watershed.
11110104, Robert S. Kerr Reservoir	1,762	Arkansas River is the primary drain for the watershed and the Robert S. Kerr Reservoir, formed by a dam on the Arkansas River is a primary waterbody in the watershed. Sans Bois, Sallisaw, Negro, and Little Vian creeks are some of the streams draining portions of the watershed and flowing into the reservoir. The Canadian River also joins the Arkansas River system at the reservoir. Lee Creek, flowing south from the Ozark National Forest, converges with the Arkansas River near the eastern edge of the watershed.
11110201, Frog-Mulberry	1,286	Arkansas River is the primary drain for the watershed. Frog Bayou and the Mulberry River flow through the Ozark National Forest in the northern portion of the watershed and then flow south into the Arkansas River.
11110202, Dardanelle Reservoir	1,865	Arkansas River is the primary drain for the watershed and the Dardanelle Reservoir, formed by a dam on the Arkansas River is a primary waterbody in the watershed. Big Piney Creek and the Illinois Bayou flow through the Ozark National Forest in the northern portion of the watershed and then flow south into the Arkansas River.

GIS Data Source: USGS (2014a)

3.15.5.4.2 Region 4 Surface Water Features

Table 3.15-16 lists the total length of perennial streams, intermittent streams, and major waterbodies within the ROI and the 200-foot-wide representative ROW in Region 4. The table includes the total acreage for reservoirs, lakes, and ponds that occur within the ROI.

Table 3.15-16:
Miles and Acreage of Surface Water Features within the 1,000-Foot Corridors (and the 200-Foot Representative ROW) of the Applicant Proposed Route and HVDC Alternative Routes—Region 4

Route—Proposed and Alternatives[1, 2]	Link 1	Link 2	Link 3	Link 4	Link 5	Link 6	Link 7	Link 8	Link 9	Region 4 Total
Perennial Streams										
APR (miles)	0.47 (0.08)	0.02 (0)	2.60 (0.40)	0	0.12 (0.03)	6.85 (1.28)	3.91 (0.77)	0	4.79 (0.94)	18.76 (3.50)
With AR 4-A (miles)	0.47 (0.08)	0.02 (0)	7.95 (1.35)				3.91 (0.77)	0	4.79 (0.94)	17.14 (3.14)
With AR 4-B (miles)	0.47 (0.08)	8.03 (1.56)							4.79 (0.94)	13.29 (2.58)
With AR 4-C (miles)	0.47 (0.08)	0.02 (0)	2.60 (0.40)	0	0.58 (0.19)	6.85 (1.28)	3.91 (0.77)	0	4.79 (0.94)	19.22 (3.66)
With AR 4-D (miles)	0.47 (0.08)	0.02 (0)	2.60 (0.40)	3.75 (0.69)			3.91 (0.77)	0	4.79 (0.94)	15.54 (2.88)
With AR 4-E (miles)	0.47 (0.08)	0.02 (0)	2.60 (0.40)	0	0.12 (0.03)	6.85 (1.28)	3.91 (0.77)	2.68 (0.57)		16.65 (3.13)
Intermittent Streams										
APR (miles)	4.23 (1.38)	1.16 (0.19)	12.29 (2.59)	0.60 (0.13)	1.53 (0.24)	2.52 (0.93)	3.37 (0.63)	0.95 (0.05)	15.23 (2.82)	41.88 (8.96)
With AR 4-A (miles)	4.23 (1.38)	1.16 (0.19)	16.15 (4.29)				3.37 (0.63)	0.95 (0.05)	15.23 (2.82)	41.09 (9.36)
With AR 4-B (miles)	4.23 (1.38)	26.63 (5.93)							15.23 (2.82)	46.09 (10.13)
With AR 4-C (miles)	4.23 (1.38)	1.16 (0.19)	12.29 (2.59)	0.60 (0.13)	0.55 (0.08)	2.52 (0.93)	3.37 (0.63)	0.95 (0.05)	15.23 (2.82)	40.90 (8.80)
With AR 4-D (miles)	4.23 (1.38)	1.16 (0.19)	12.29 (2.59)	7.16 (2.14)			3.37 (0.63)	0.95 (0.05)	15.23 (2.82)	44.39 (9.80)
With AR 4-E (miles)	4.23 (1.38)	1.16 (0.19)	12.29 (2.59)	0.60 (0.13)	1.53 (0.24)	2.52 (0.93)	3.37 (0.63)	14.80 (3.79)		40.50 (9.88)
Major Waterbodies										
APR (miles)	0.03 (0.03)	0	0.23 (0.03)	0	0	0.16 (0.12)	0	0	0.07 (0.06)	0.49 (0.24)
With AR 4-A (miles)	0.03 (0.03)	0	0.09 (0.10)				0	0	0.07 (0.06)	0.19 (0.19)
With AR 4-B (miles)	0.03 (0.03)	0.10 (0.09)							0.07 (0.06)	0.20 (0.18)
With AR 4-C (miles)	0.03 (0.03)	0	0.23 (0.03)	0	0	0.16 (0.12)	0	0	0.07 (0.06)	0.49 (0.24)
With AR 4-D (miles)	0.03 (0.03)	0	0.23 (0.03)	0.04 (0.04)			0	0	0.07 (0.06)	0.37 (0.16)
With AR 4-E (miles)	0.03 (0.03)	0	0.23 (0.03)	0	0	0.16 (0.12)	0	0.06 (0.14)		0.48 (0.32)
Reservoirs, Lakes, and Ponds										
APR (acres)	29.5 (5.5)	1.2 (<0.1)	23.0 (1.5)	0.6 (0.1)	0.8 (0.3)	9.6 (2.5)	11.0 (3.0)	0.5 (0.2)	17.5 (3.0)	93.7 (16.1)
With AR 4-A (acres)	29.5 (5.5)	1.2 (<0.1)	30.2 (5.5)				11.0 (3.0)	0.5 (0.2)	17.5 (3.0)	89.9 (17.2)

Table 3.15-16:
Miles and Acreage of Surface Water Features within the 1,000-Foot Corridors (and the 200-Foot Representative ROW) of the Applicant Proposed Route and HVDC Alternative Routes—Region 4

<table>
<tr><th>Route—Proposed and Alternatives[1, 2]</th><th>Link 1</th><th>Link 2</th><th>Link 3</th><th>Link 4</th><th>Link 5</th><th>Link 6</th><th>Link 7</th><th>Link 8</th><th>Link 9</th><th>Region 4 Total</th></tr>
<tr><td>With AR 4-B (acres)</td><td>29.5 (5.5)</td><td colspan="7">27.6 (5.0)</td><td>17.5 (3.0)</td><td>74.6 (13.5)</td></tr>
<tr><td>With AR 4-C (acres)</td><td>29.5 (5.5)</td><td>1.2 (<0.1)</td><td>23.0 (1.5)</td><td>0.6 (0.1)</td><td>2.5 (0.8)</td><td>9.6 (2.5)</td><td>11.0 (3.0)</td><td>0.5 (0.2)</td><td>17.5 (3.0)</td><td>95.4 (16.6)</td></tr>
<tr><td>With AR 4-D (acres)</td><td>29.5 (5.5)</td><td>1.2 (<0.1)</td><td>23.0 (1.5)</td><td colspan="3">22.1 (3.1)</td><td>11.0 (3.0)</td><td>0.5 (0.2)</td><td>17.5 (3.0)</td><td>104.8 (16.3)</td></tr>
<tr><td>With AR 4-E (acres)</td><td>29.5 (5.5)</td><td>1.2 (<0.1)</td><td>23.0 (1.5)</td><td>0.6 (0.1)</td><td>0.8 (0.3)</td><td>9.6 (2.5)</td><td>11.0 (3.0)</td><td colspan="2">45.2 (7.5)</td><td>120.9 (20.4)</td></tr>
</table>

1 Each region of the Applicant Proposed Route (APR) is divided into links that lie between points, or nodes, where the APR is intersected by alternative routes (ARs). ARs bypass specific links of the APR as shown in the table.
2 For the ARs, the unshaded portion of the rows provides the data for the length of the AR. The shaded portion of the rows provides the data for the balance of the APR, thereby providing perspective across the region.
GIS Data Source: USGS (2014a)

The Applicant has proposed a route variation in Region 4, the Lee Creek Variation, that is not included in Table 3.15-16. The Lee Creek Variation would move the Applicant Proposed Route slightly to the north in the area of the Lee Creek Reservoir, which is roughly on the Oklahoma-Arkansas border. Within this small variation in Link 3 of the route, surface water features are summarized as follows (GIS Data Source: USGS 2014a):

- Perennial streams—0.25 mile in the 1,000-foot-wide corridor of the ROI and 0.04 mile in the 200-foot-wide ROW
- Intermittent streams—0.79 mile in the 1,000-foot-wide corridor of the ROI and 0.29 mile in the 200-foot-wide ROW
- Major waterbodies—0.01 mile in both the 1,000-foot-wide corridor of the ROI and the 200-foot-wide ROW
- Reservoirs, lakes, and ponds—Neither the ROI nor the ROW include reservoirs, lakes, or ponds

The western end of the ROI in Region 4 passes through the same area of Oklahoma described for the ROI in Region 3 where the NRCS has constructed many small dams and reservoirs for flood prevention, management of soil erosion, and irrigation. The ROI for HVDC Alternative Routes 4-A and 4-B (in a segment where the routes overlap) contains the dam and a small strip of the reservoir named Sallisaw Creek 6, presumably because it is located in a small drainage that drains to the east to Sallisaw Creek (Table 3.15-17 below). The 200-foot ROW for HVDC Alternative Routes 4-A and 4-B would pass roughly 200 feet to the south of the dam and the reservoir.

3.15.5.4.2.1 Surface Water Features of Special Interest

As described in the discussion of watersheds in the ROI in Region 4, the Arkansas and Illinois rivers are important surface water features in the area from a drainage system standpoint, but Mulberry River and Big Piney Creek are identified as being of particular value based on several designations. This portion of the proposed transmission line route passes through or by several Oklahoma and Arkansas communities as well as numerous surface water features. Consistent with the presence of communities in the area, the HVDC transmission line routes also pass through several areas that are protected as waters and drainage areas associated with drinking water supplies. Table 3.15-17 identifies surface waters within the ROI in Region 4 that have specific federal or state designations of special interest beyond significance as drainage features. The surface waters are presented in a rough west-to-east order. Each of the water features and designations identified in the table is applicable to the 200-foot-wide representative ROWs as well as the wider ROI.

Table 3.15-17:
Surface Waters of Special Interest within the 1,000-Foot Corridors of the Applicant Proposed Route and HVDC Alternative Routes—Region 4

Surface Water and Watershed	Designation(s)	Basis/Description	Route/Alternative Affected					
			APR	4-A	4-B	4-C	4-D	4-E
Arkansas River, OK Dirty-Greenleaf watershed (HUC 11110202)	Section 10 Navigable Waters of the U.S	Any action that would obstruct or alter a navigable water is prohibited without a USACE permit. APR Link 1 crosses the river.	X L1					
Lower Illinois River, OK Illinois watershed (HUC 11110103)	Section 10 Navigable Waters of the U.S	Any action that would obstruct or alter a navigable water is prohibited without a USACE permit. APR Link 1 crosses the river.	X L1					
	Oklahoma High Quality Water	APR Link 1 crosses the river and its special provision watershed.	X L1					
Sallisaw Creek, OK Robert S. Kerr Reservoir watershed (HUC 11110104)	Oklahoma High Quality Water	APR Link 3, AR 4-A, and AR 4-B cross the river and its special provision watershed.	X L3	X	X			
Brushy Creek, OK Robert S. Kerr Reservoir watershed (HUC 11110104)	Oklahoma Sensitive Public and Private Water Supply	AR 4-A and AR 4-B cross the special provision watershed of Brushy Creek Reservoir, including two streams with the water supply designation.		X	X			
Little Lee Creek, OK Robert S. Kerr Reservoir watershed (HUC 11110104)	Oklahoma Outstanding Resource Water	AR 4-A and AR 4-B cross the creek and its special provision watershed.		X	X			
	Oklahoma Scenic River Area	AR 4-A and AR 4-B cross the creek		X	X			
Lee Creek, OK Robert S. Kerr Reservoir watershed (HUC 11110104)	National Park Service Nationwide Rivers Inventory	APR Link 3, AR 4-A, and AR 4-B cross the creek	X L3	X	X			
	Oklahoma Outstanding Resource Water	APR Link 3, AR 4-A, and AR 4-B cross the creek and its special provision watershed	X L3	X	X			
	Oklahoma Scenic River Area	AR 4-A and AR 4-B cross the creek where it is designated a Scenic River. (The APR crosses outside of the designated area.)		X	X			
	Arkansas Extraordinary Resource Water	AR 4-B crosses the creek in Crawford County, AR			X			
Briar Creek (Bear Creek), OK Robert S. Kerr Reservoir watershed (HUC 11110104)	Oklahoma Outstanding Resource Water	The creek lies between the APR and AR 4-B, but APR Link 3 crosses the creek's special provision watershed	X L3					

Table 3.15-17:
Surface Waters of Special Interest within the 1,000-Foot Corridors of the Applicant Proposed Route and HVDC Alternative Routes—Region 4

Surface Water and Watershed	Designation(s)	Basis/Description	Route/Alternative Affected					
			APR	4-A	4-B	4-C	4-D	4-E
Webbers Creek, OK Robert S. Kerr Reservoir watershed (HUC 11110104)	Oklahoma Outstanding Resource Water	The creek lies south of AR 4-A, but AR 4-A crosses the creek's special provision watershed		X				
Lee Creek Reservoir, OK and AR Robert S. Kerr Reservoir watershed (HUC 11110104)	Lee Creek Reservoir Buffer Zone	The city of Fort Smith manages a 300-foot, restrictive buffer zone around the reservoir. APR Link 3 crosses the buffer zone in both states.	X L3			X	X	X
Not publicly available location (APR Link 3), AR Robert S. Kerr Reservoir watershed (HUC 11110104)	Arkansas Source Water Protection Area (and public water intakes)[1]	APR Link 3, AR 4-A, and AR 4-D cross the area and APR Link 3 is less than 3 miles upstream of the associated source water intake.	X L3	X			X	
Mulberry River, AR Frog-Mulberry watershed (HUC 11110201)	Section 10 Navigable Waters of the U.S	Any action that would obstruct or alter a navigable water is prohibited without a USACE permit. APR Link 6, AR 4-A, AR 4-B, and AR 4-D cross the river	X L6	X	X		X	
	Arkansas Extraordinary Resource Water	APR Link 6, AR 4-A, AR 4-B, and AR 4-D cross the river	X L6	X	X		X	
	Arkansas Natural and Scenic Waterway	Same as above	X L6	X	X		X	
Not publicly available location, AR Frog-Mulberry watershed (HUC 11110201)	Arkansas Source Water Protection Area (and public water intakes)[1]	AR 4-A, AR 4-B, and AR 4-D cross the area, but each is greater than 3 miles upstream of the associated source water intake.		X	X		X	
Not publicly available location, AR Frog-Mulberry watershed (HUC 11110201)	Arkansas Source Water Protection Area (and public water intakes)[1]	AR 4-A, AR 4-B, and AR 4-D cross the area. AR 4-B is about 3 miles upstream of the associated source water intake; AR 4-A and AR 4-D are downstream of the intake.		X	X		X	
Not publicly available location (APR Link 7), AR Frog-Mulberry watershed (HUC 11110201)	Arkansas Source Water Protection Area (and public water intakes)[1]	APR Link 7 and AR 4-B cross the area. AR 4-B is just over 3 miles upstream of the associated source water intake; APR Link 7 is downstream of the intake.	X L7		X			
Big Piney Creek, AR Dardanelle reservoir watershed (HUC 11110202)	National Park Service Nationwide Rivers Inventory	APR Link 9 and AR 4-E cross the creek.	X L9					X
	Arkansas Extraordinary Resource Water	Same as above	X L9					X
	Arkansas Natural and Scenic Waterway	Same as above	X L9					

Table 3.15-17:
Surface Waters of Special Interest within the 1,000-Foot Corridors of the Applicant Proposed Route and HVDC Alternative Routes—Region 4

Surface Water and Watershed	Designation(s)	Basis/Description	Route/Alternative Affected					
			APR	4-A	4-B	4-C	4-D	4-E
Not publicly available location (APR Link 9, AR 4-E) Dardanelle reservoir watershed (HUC 11110202)	Arkansas Source Water Protection Area (and public water intakes)[1]	APR Link 9 and AR 4-E cross the area. APR Link 9 is over 3 miles upstream of the associated source water intake; AR 4-E is less than 3 miles upstream of the intake.	X L9					

L3 (for example) = Link 3 of the Applicant Proposed Route in Region 4

1 Confidential data are excluded to avoid privacy/security concerns.

Sources: USACE (2014b), USACE (2004), NPS (2010, 2004), NWSRS (2012), OWRB (2011a, 2011b, 2011c, 2011d), APCEC (2011), Clean Line (2013)

It is worth noting that the Mulberry River and Big Piney Creek, both listed in Table 3.15-17, are designated as National Wild and Scenic Rivers. However, in both cases, the designations end when the streams exit the National Forest, which is to the north of the Project components and, as a result, those designations are not shown in the table.

The Lee Creek Variation mentioned above is not included in Table 3.15-17, but this variation would avoid the 300-foot buffer zone established around the reservoir by the city of Fort Smith. The applicable portion of the Applicant Proposed Route (with or without the variation) would be within the area designated as the Lee Creek Outstanding Water Resource special provision watershed (OWRB 2011b) as well as the area established as a Source Water Protection Area.

3.15.5.4.3 Region 4 Water Quality

Table 3.15-18 identifies surface water features within the ROI in Region 4 that do not meet applicable water quality standards based on the surface water's designated uses and, as a result, have been identified as an impaired water in the states' most recent Section 303(d) lists. Each of the water segments identified in the table is applicable to the 200-foot-wide representative ROWs as well as the wider ROI.

Table 3.15-18:
Waters with Impaired Quality within the 1,000-Foot Corridors of the Applicant Proposed Route and HVDC Alternative Routes—Region 4

Water Segment and Watershed	Impaired Uses—Impairment	TMDL Status[1]	Project Components Crossing Impaired Segment
Sallisaw Creek, OK (OK220200030010_10) Robert S. Kerr Reservoir watershed (HUC 11110104)	Primary Body Contact Recreation—*Enterococcus* impairment	Priority Date: 2017	APR Link 3
Sallisaw Creek, OK (OK220200030010_20) Robert S. Kerr Reservoir watershed (HUC 11110104)	Primary Body Contact Recreation—*Enterococcus* impairment	Priority Date: 2017	ARs 4-A and 4-B

Table 3.15-18:
Waters with Impaired Quality within the 1,000-Foot Corridors of the Applicant Proposed Route and HVDC Alternative Routes—Region 4

Water Segment and Watershed	Impaired Uses—Impairment	TMDL Status[1]	Project Components Crossing Impaired Segment
Little Sallisaw Creek, OK (OK220200020040_00) Robert S. Kerr Reservoir watershed (HUC 11110104)	Fish and Wildlife Propagation/Warm Water Aquatic Community—copper impairment	Priority Date: 2017	APR Link 3, ARs 4-A, and 4-B
Little Lee Creek, OK (OK220200050040_00) Robert S. Kerr Reservoir watershed (HUC 11110104)	Primary Body Contact Recreation—*Enterococcus* impairment	Priority Date: 2017	ARs 4-A and 4-B
Lee Creek, OK (OK220200050010_00) Robert S. Kerr Reservoir watershed (HUC 11110104)	Primary Body Contact Recreation—*Enterococcus* impairment Fish and Wildlife Propagation/Cool Water Aquatic Community—lead impairment	Priority Date: 2017	APR Link 3
Lee Creek, OK (OK220200050010_10 Robert S. Kerr Reservoir watershed (HUC 11110104)	Fish and Wildlife Propagation/Cool Water Aquatic Community—copper and lead impairments	Priority Date: 2017	ARs 4-A and 4-B

1 TMDL = Total Maximum Daily Load—TMDLs are the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards. Once TMDLs have been determined, discharge requirements can be developed that will bring a waterbody back into compliance.

Sources: ODEQ (2014, 2013), EPA (2013b), ADEQ (2014a, 2014b, 2014c)

3.15.5.4.4 Region 4 Water Use

Water use in the six counties (Muskogee and Sequoyah counties, Oklahoma, and Crawford, Franklin, Johnson, and Pope counties, Arkansas) that encompass Region 4 has shifted even further in favor of surface water than described in Region 3. Table 3.7-15 shows that average use of surface water was almost 1,300 million gallons per day in 2005 and average use of groundwater was 8.6 million gallons per day. Surface water, therefore, accounts for 99 percent of area's total water usage. Total water use (groundwater and surface water) is described in greater detail in Section 3.7.5.4.4.

3.15.5.5 Region 5

Region 5 is referred to as the Central Arkansas Region and includes the Applicant Proposed Route and HVDC Alternative Routes 5-A through 5-F.

3.15.5.5.1 Region 5 Watersheds

The ROI in Region 5 is primarily within the Lower Arkansas (1111) and Upper White (1101) subregions of the larger Arkansas-White-Red drainage system. The only exception is in the eastern portion of Region 5 where several of the alternative routes drop southward and cross through the Lower Mississippi-St. Francis subregion (0802) of the larger Lower Mississippi drainage system. The Lower Mississippi drainage system incorporates drainage areas along the Mississippi River downstream of the confluence of the Mississippi and Ohio rivers. Both drainage systems still flow toward the Mississippi River, but the flow routes can be different. By the USGS methodology, as the larger river systems, such as the Arkansas, White, and Red rivers, approach the Mississippi River, they move out of their own subregion and into subregions of the Lower Mississippi drainage system.

At USGS's eight-digit coding level, the ROI lies within six different watersheds as shown in Figure 3.15-1 in Appendix A. Table 3.15-19 lists the applicable watersheds and provides additional detail, including the primary surface water or waters that drain the watershed. Surface waters for the ROI are shown on Figure 3.15-2 in Appendix A.

Table 3.15-19:
Watersheds Crossed by the Applicant Proposed Route and HVDC Alternative Routes—Region 5

USGS HUC Number and Watershed Name	Area Drained (square miles)	Description of Primary Surface Water Feature(s)
11110202, Dardanelle Reservoir	1,865	Arkansas River is the primary drain for the watershed and the Dardanelle Reservoir, formed by a dam on the Arkansas River is a primary waterbody. Big Piney Creek and the Illinois Bayou flow through the Ozark National Forest in the northern portion of the watershed and then flow south into the Arkansas River.
11110203, Lake Conway-Point Remove[1]	1,139	Arkansas River is the primary drain for the watershed. Lake Conway (Greens Lake) connects to the Arkansas River through Palarm Creek. Point Remove Creek is also a tributary to the Arkansas River and its upstream branches, West and East Point Remove creeks, are dammed at multiple points to create reservoirs.
11110205, Cadron	757	Cadron Creek is the primary drain for the watershed and flows into the Arkansas River at the southern boundary of the watershed. Other waterbodies of note in this watershed are East Fork Cadron Creek and Beaver Fork Lake.
11010014, Little Red	1,801	Little Red River is the primary drain for this watershed and drains into the White River at the southeastern end of the watershed. Archery Creek, South Fork Little Red River, Beech Fork, and Big Creek are tributaries to the Little Red River. Greer Ferry Lake is located on the Little Red River.
08020301, Lower White-Bayou Des Arc	1,136	White River is the primary drain for this watershed. Cypress Bayou, fed by creeks such as Bayou Des Arc, Bull Creek, and Fourmile Creek, flows into the White River. Wattensaw Bayou also flows into the White River.
11010013, Upper White-Village	740	White River and its tributary Village Creek are primary drains for this watershed. The Black River also drains a portion of the watershed before it converges with the White River. Departee and Glaise creeks are also tributaries of note to the White River.

1 The proposed Arkansas converter station alternative would be within the Lake Conway–Point Remove watershed.

GIS Data Source: USGS (2014a)

As summarized in Table 3.15-19, the Arkansas River is the primary drain for western portion of the ROI in Region 5, but the primary drain changes to the White River in the eastern portion of the region. The White River flows into the Mississippi River just north of where the Arkansas River meets the Mississippi, but in the ROI the White River's flow is primarily to the south.

3.15.5.5.2 Region 5 Surface Water Features

Table 3.15-20 lists the total length of perennial streams, intermittent streams, and major waterbodies within the ROI and the 200-foot-wide representative ROW in Region 5. The table includes the total acreage for reservoirs, lakes, and ponds that occur within the ROI.

Table 3.15-20:
Miles and Acreage of Surface Water Features within the 1,000-Foot Corridors (and 200-Foot Representative ROW) of the Applicant Proposed Route and HVDC Alternative Routes—Region 5

Route—Proposed and Alternatives[1, 2]	Link 1	Link 2	Link 3	Link 4	Link 5	Link 6	Link 7	Link 8	Link 9	Region 5 Total
Perennial Streams										
APR (miles)	1.26 (0.31)	0.30 (0.06)	3.15 (0.61)	1.00 (0.11)	1.00 (0.09)	0.97 (0.18)	1.42 (0.32)	0.79 (0.15)	1.78 (0.33)	11.67 (2.16)
With AR 5-A (miles)	0.71 (0.13)	0.30 (0.06)	3.15 (0.61)	1.00 (0.11)	1.00 (0.09)	0.97 (0.18)	1.42 (0.32)	0.79 (0.15)	1.78 (0.33)	11.12 (1.98)
With AR 5-B (miles)	1.26 (0.31)	0.30 (0.06)	7.78 (1.17)				1.42 (0.32)	0.79 (0.15)	1.78 (0.33)	13.33 (2.34)
With AR 5-C (miles)	1.26 (0.31)	0.30 (0.06)	3.15 (0.61)	1.00 (0.11)	1.00 (0.09)	1.32 (0.42)		0.79 (0.15)	1.78 (0.33)	10.60 (2.08)
With AR 5-D (miles)	1.26 (0.31)	0.30 (0.06)	3.15 (0.61)	1.00 (0.11)	1.00 (0.09)	0.97 (0.18)	1.42 (0.32)	0.79 (0.15)	2.09 (0.35)	11.98 (2.18)
With AR 5-E (miles)	1.26 (0.31)	0.30 (0.06)	3.15 (0.61)	3.83 (0.47)			1.42 (0.32)	0.79 (0.15)	1.78 (0.33)	12.53 (2.25)
With AR 5-F (miles)	1.26 (0.31)	0.30 (0.06)	3.15 (0.61)	1.00 (0.11)	2.95 (0.26)		1.42 (0.32)	0.79 (0.15)	1.78 (0.33)	12.65 (2.15)
Intermittent Streams										
APR (miles)	2.82 (0.59)	2.42 (0.35)	15.45 (3.28)	6.73 (1.16)	8.21 (1.76)	2.39 (0.36)	0.77 (0.29)	0.59 (0.17)	7.21 (1.36)	46.59 (9.32)
With AR 5-A (miles)	5.59 (0.92)	2.42 (0.35)	15.45 (3.28)	6.73 (1.16)	8.21 (1.76)	2.39 (0.36)	0.77 (0.29)	0.59 (0.17)	7.21 (1.36)	49.36 (9.65)
With AR 5-B (miles)	2.82 (0.59)	2.42 (0.35)	41.08 (8.56)				0.77 (0.29)	0.59 (0.17)	7.21 (1.36)	54.89 (11.32)
With AR 5-C (miles)	2.82 (0.59)	2.42 (0.35)	15.45 (3.28)	6.73 (1.16)	8.21 (1.76)	2.73 (0.51)		0.59 (0.17)	7.21 (1.36)	46.16 (9.18)
With AR 5-D (miles)	2.82 (0.59)	2.42 (0.35)	15.45 (3.28)	6.73 (1.16)	8.21 (1.76)	2.39 (0.36)	0.77 (0.29)	0.59 (0.17)	7.74 (1.66)	47.12 (9.62)
With AR 5-E (miles)	2.82 (0.59)	2.42 (0.35)	15.45 (3.28)	22.67 (4.27)			0.77 (0.29)	0.59 (0.17)	7.21 (1.36)	51.93 (10.31)
With AR 5-F (miles)	2.82 (0.59)	2.42 (0.35)	15.45 (3.28)	6.73 (1.16)	13.32 (2.58)		0.77 (0.29)	0.59 (0.17)	7.21 (1.36)	49.31 (9.78)
Major Waterbodies										
APR (miles)	0.02 (0.02)	0	0.04 (0.05)	0.02 (0.02)	<0.01 (0)	0.01 (0.01)	0.02 (0.02)	0	0.12 (0.12)	0.23 (0.24)
With AR 5-A (miles)	0.02 (0.02)	0	0.04 (0.05)	0.02 (0.02)	<0.01 (0)	0.01 (0.01)	0.02 (0.02)	0	0.12 (0.12)	0.23 (0.24)
With AR 5-B (miles)	0.02 (0.02)		0.09 (0.10)				0.02 (0.02)	0	0.12 (0.12)	0.25 (0.26)
With AR 5-C (miles)	0.02 (0.02)	0	0.04 (0.05)	0.02 (0.02)	<0.01 (0)	0.05 (0.04)		0	0.12 (0.12)	0.25 (0.25)
With AR 5-D (miles)	0.02 (0.02)	0	0.04 (0.05)	0.02 (0.02)	<0.01 (0)	0.01 (0.01)	0.02 (0.02)	0	0.12 (0.12)	0.23 (0.23)
With AR 5-E (miles)	0.02 (0.02)	0	0.04 (0.05)	0.03 (0.03)			0.02 (0.02)	0	0.12 (0.12)	0.23 (0.24)
With AR 5-F (miles)	0.02 (0.02)	0	0.04 (0.05)	0.02 (0.02)	0.01 (0.01)		0.02 (0.02)	0	0.12 (0.12)	0.23 (0.24)

Table 3.15-20:
Miles and Acreage of Surface Water Features within the 1,000-Foot Corridors (and 200-Foot Representative ROW) of the Applicant Proposed Route and HVDC Alternative Routes—Region 5

Route—Proposed and Alternatives[1, 2]	Link 1	Link 2	Link 3	Link 4	Link 5	Link 6	Link 7	Link 8	Link 9	Region 5 Total
Reservoirs, Lakes, and Ponds										
APR (acres)	5.7 (0.9)	0.8 (0)	21.8 (6.8)	18.5 (3.6)	13.3 (2.1)	3.5 (1.3)	0.2 (0.1)	0.5 (0.5)	6.4 (2.0)	70.7 (17.3)
With AR 5-A (acres)	4.4 (0.5)	0.8 (0)	21.8 (6.8)	18.5 (3.6)	13.3 (2.1)	3.5 (1.3)	0.2 (0.1)	0.5 (0.5)	6.4 (2.0)	69.4 (16.9)
With AR 5-B (acres)	5.7 (0.9)	0.8 (0)	60.1 (10.4)				0.2 (0.1)	0.5 (0.5)	6.4 (2.0)	73.7 (13.9)
With AR 5-C (acres)	5.7 (0.9)	0.8 (0)	21.8 (6.8)	18.5 (3.6)	13.3 (2.1)	4.8 (0.4)		0.5 (0.5)	6.4 (2.0)	71.8 (16.3)
With AR 5-D (acres)	5.68 (0.9)	0.8 (0)	21.8 (6.8)	18.5 (3.6)	13.3 (2.1)	3.5 (1.3)	0.2 (0.1)	0.5 (0.5)	9.6 (1.6)	73.9 (16.9)
With AR 5-E (acres)	5.68 (0.9)	0.8 (0)	21.8 (6.8)	21.8 (3.2)			0.2 (0.1)	0.5 (0.5)	6.4 (2.0)	57.2 (13.5)
With AR 5-F (acres)	5.68 (0.9)	0.8 (0)	21.8 (6.8)	18.5 (3.6)	10.4 (0.7)		0.2 (0.1)	0.5 (0.5)	6.4 (2.0)	64.3 (14.6)

1 Each region of the Applicant Proposed Route (APR) is divided into links that lie between points, or nodes, where the APR is intersected by alternative routes (ARs). ARs bypass specific links of the APR as shown in the table.
2 For the ARs, the unshaded portion of the rows provides the data for the length of the AR. The shaded portion of the rows provides the data for the balance of the APR, thereby providing perspective across the region.
GIS Data Source: USGS (2014a)

The siting area for the Arkansas converter station alternative would include 12.82 miles of perennial streams, 57.88 miles of intermittent streams, and no major waterbodies. The 200-foot-wide ROW for the AC interconnection siting area would encompass 0.04 mile of perennial streams and 0.3 mile of intermittent streams (GIS Data Source: USGS 2014a).

3.15.5.5.2.1 Surface Water Features of Special Interest

As described in the discussion of watershed in the ROI in Region 5, the Arkansas, Little Red, and White rivers along with Cadron Creek are important surface water features in the area from a drainage system standpoint. Table 3.15-21 identifies surface waters within the ROI that have specific federal or state designations of special interest beyond significance as drainage features. The surface waters are presented in a roughly west-to-east order. The ROI for the Arkansas converter station alternative contains no significant surface waters. Each of the water features and designations identified in the table is applicable to the 200-foot-wide representative ROWs as well as the wider ROI.

Table 3.15-21:
Surface Waters of Special Interest within the 1,000-Foot Corridors of the Applicant Proposed Route and HVDC Alternative Routes—Region 5

Surface Water and Watershed	Designation(s)	Basis/Description	Route/Alternative Affected						
			APR	5-A	5-B	5-C	5-D	5-E	5-F
Illinois Bayou, AR Dardanelle Reservoir watershed (HUC 11110202)	Arkansas Extraordinary Resource Water	APR Link 1 and AR 5-A cross the bayou.	X L1	X					
Not publicly available location (APR Link 3), AR Cadron watershed (HUC 11110205)	Arkansas Source Water Protection Area (and public water intakes)[1]	APR Link 3 and AR 5-B cross the area and both are greater than 3 miles upstream of the associated source water intake.	X L3		X				
Cadron Creek, AR Cadron watershed (HUC 11110205)	National Park Service Nationwide Rivers Inventory	APR Links 3 and 4, AR 5-B, and AR 5-E cross or abut the creek.	X L3 L4		X			X	
	Arkansas Extraordinary Resource Water	Same as above.	X L3 L4		X			X	
East Fork Cadron Creek, AR Cadron watershed (HUC 11110205)	National Park Service Nationwide Rivers Inventory	AR 5-B, AR 5-E, and AR 5-F cross the creek.			X			X	X
Not publicly available location (APR Links 5 to 9), AR Little Red watershed (HUC 11010014)	Arkansas Source Water Protection Area (and public water intakes)[1]	APR Links 5 to 9 and ARs 5-B to 5-F cross; all are greater than 3 miles upstream of the associated source water intake.	X L5 to L9		X	X	X	X	X
Little Red River, AR Little Red watershed (HUC 11010014)	Arkansas Trout Water	APR Link 7 and AR 5-C cross the reach of the river (from below Greers Ferry Dam to Searcy) with this designation.	X L7			X			
Departee Creek, AR Upper White-Village watershed (HUC 11010013)	Arkansas Ecologically Sensitive Waterbody	AR 5-D crosses the reach of the creek with this designation, which is due to the presence of the flat floater mussel (*Anodonta suborbiculata*).					X		
White River, AR Upper White-Village watershed (HUC 11010013)	Section 10 Navigable Waters of the U.S	Any action that would obstruct or alter a navigable water is prohibited without a USACE permit. APR Link 9 and AR 5-D cross the river.	X L9				X		

L1 (for example) = Link 1 of the Applicant Proposed Route in Region 5
1 Confidential data are excluded to avoid privacy/security concerns.
Sources: APCEC (2011), NPS (2004), USACE (2004), Clean Line (2013)

3.15.5.5.3 Region 5 Water Quality

Table 3.15-22 identifies surface water features within the ROI in Region 5 that do not meet applicable water quality standards based on the surface water's designated uses and, as a result, have been identified as an impaired water in Arkansas' most recent Section 303(d) list. The table identifies the specific water, the designated use that is impaired and what is causing the impairment. The table identifies the status of the TMDL development process. This status is in the form of the priority the state has placed on the TMDL process or that a TMDL has already been developed and approved by EPA. Finally, the table identifies the project elements that would cross the identified surface water. Each of the water segments identified in the table is applicable to the 200-foot-wide representative ROWs as well as the wider ROI.

Table 3.15-22:
Waters with Impaired Quality within the 1,000-Foot Corridors of the Applicant Proposed Route and HVDC Alternative Routes—Region 5

Water Segment and Watershed	Impaired Uses—Impairment	TMDL Status[1]	Project Components Crossing Impaired Segment
West Fork Point Remove Creek, AR (Reach 016) Lake Conway-Point Remove watershed (HUC 11110203)	Turbidity impairment	Priority: Not Assigned	AR 5-B
West Fork Point Remove Creek, AR (Reach 017) Lake Conway-Point Remove watershed (HUC 11110203)	Turbidity impairment	Priority: Not Assigned	APR Link 3
East Fork Point Remove Creek, AR (Reach 014) Lake Conway-Point Remove watershed (HUC 11110203)	Turbidity impairment	Priority: Not Assigned	APR Link 3, AR 5-B
Cypress Creek, AR (Reach 917) Cadron watershed (HUC 11110205)	Fisheries—copper and zinc impairments	Priority: Low	AR 5-B
Little Red River, AR (Reach 008) Little Red water shed (HUC 11010014)	Pathogens impairment	Completed	APR Link 7
Little Red River, AR (Reach 010) Little Red watershed (HUC 11010014)	Pathogens impairment	Completed	AR 5-C
Ten Mile Creek, AR (Reach 009) Little Red watershed (HUC 11010014)	Turbidity and pathogens impairments	Completed	APR Links 7 and 8, AR 5-C
Glaise Creek, AR (Reach 021) Upper White-Village watershed (HUC 11010013)	Aquatic Life—dissolved oxygen and zinc impairments	Priority: Low	APR Link 9, AR 5-D
Departee Creek, AR Upper White-Village watershed (HUC 11010013)	Fisheries—dissolved oxygen and turbidity impairments	Priority: Low	APR Link 9, AR 5-D

1 TMDL (Total Maximum Daily Load): TMDLs are the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards. Once TMDLs have been determined, discharge requirements can be developed that will bring a waterbody back into compliance.

Sources: ADEQ (2014a, 2014b, 2014c), EPA (2013b)

3.15.5.5.4 Region 5 Water Use

Water use in the seven counties (Cleburne, Conway, Faulkner, Jackson, Pope, Van Buren, and White counties, Oklahoma) that encompass this region is more even in terms surface water versus groundwater than was described for the ROI in Region 4, but surface water is still the predominant source. As shown in Table 3.7-17, the average use of surface water was about 1,270 million gallons per day in 2005 compared to about 440 million gallons per day of groundwater. Surface water, therefore, accounts for about 74 percent of area's total water usage. Total water use (groundwater and surface water) is described in more detail in Section 3.7.5.5.4.

3.15.5.6 Region 6

Region 6 is referred to as the Cache River and Crowley's Ridge Region and includes the Applicant Proposed Route and HVDC Alternative Routes 6-A through 6-D.

3.15.5.6.1 Region 6 Watersheds

The ROI in Region 6 begins at the western end in the Upper White subregion (1101) of the larger Arkansas-White-Red drainage system, but to the east it quickly moves into the Lower Mississippi-St. Francis subregion (0802) of the larger Lower Mississippi drainage system. As noted previously, under USGS's methodology, as the larger river systems, such as the Arkansas, White, and Red rivers approach the Mississippi River, they move out of their own subregion and into subregions of the Lower Mississippi drainage system.

At USGS's eight-digit coding level, the ROI lies within four different watersheds as shown in Figure 3.15-1 in Appendix A. Table 3.15-23 lists the applicable watersheds and provides additional detail, including the primary surface water or waters that drain the watershed. Surface waters for the ROI are shown on Figure 3.15-2 in Appendix A.

Table 3.15-23:
Watersheds Crossed by the Applicant Proposed Route and HVDC Alternative Routes—Region 6

USGS HUC Number and Watershed Name	Area Drained (square miles)	Description of Primary Surface Water Feature(s)
11010013, Upper White-Village	740	White River and its tributary Village Creek are primary drains for this watershed. The Black River also drains a portion of the watershed before it converges with the White River. Departee and Glaise creeks are also tributaries of note to the White River.
08020302, Cache	2,007	Cache River is the primary drain for this watershed and it flows into the White River at the watershed's downstream boundary. The watershed also includes Bayou DeView as a tributary to the Cache River.
08020205, L'Anguille	955	L'Anguille River is the primary drain for this watershed and it converges with the Madison-Marianna Diversion in the southern portion of the watershed. Brushy, First, and Second creeks are noted tributaries to the L'Anguille River.
08020203, Lower St. Francis	3,579	St. Francis River is the primary drain for this watershed, which stretches from Lake Wappepello (in Missouri) south to where the St. Francis River flows into the Mississippi River.

GIS Data Source: USGS (2014a)

In the ROI in Region 6, the rivers that are the primary drains for the watersheds are generally oriented north-south with flow to the south toward the Mississippi River.

3.15.5.6.2 Region 6 Surface Water Features

As described for the watersheds in the ROI for Region 6, the White, Cache, L'Anguille, and St. Francis rivers are important surface water features in the area from a drainage system standpoint. Table 3.15-24 lists the total length of perennial streams, intermittent streams, and major waterbodies within the ROI and the 200-foot-wide representative ROW in Region 6. The table includes the total acreage for reservoirs, lakes, and ponds that occur within the ROI and the ROW.

Table 3.15-24:
Miles and Acreage of Surface Water Features within the 1,000-Foot Corridors (and 200-Foot Representative ROW) of the Applicant Proposed Route and HVDC Alternative Routes—Region 6

Route—Proposed and Alternatives[1, 2]	Link 1	Link 2	Link 3	Link 4	Link 5	Link 6	Link 7	Link 8	Region 6 Total
Perennial Streams									
APR (miles)	1.10 (0.18)	0.23 (0.05)	0.71 (0.14)	0.75 (0.12)	0	1.27 (0.16)	8.20 (0.12)	0.26 (0.06)	12.52 (0.83)
With AR 6-A (miles)	1.10 (0.18)	1.10 (0.25)			0	1.27 (0.16)	8.20 (0.12)	0.26 (0.06)	11.93 (0.77)
With AR 6-B (miles)	1.10 (0.18)	0.23 (0.05)	0.48 (0.16)	0.75 (0.12)	0	1.27 (0.16)	8.20 (0.12)	0.26 (0.06)	12.29 (0.85)
With AR 6-C (miles)	1.10 (0.18)	0.23 (0.05)	0.71 (0.14)	0.75 (0.12)	0	6.08 (0.38)		0.26 (0.06)	9.13 (0.93)
With AR 6-D (miles)	1.10 (0.18)	0.23 (0.05)	0.71 (0.14)	0.75 (0.12)	0	1.27 (0.16)	10.05 (0.25)	0.26 (0.06)	14.37 (0.96)
Intermittent Streams									
APR (miles)	0.80 (0.15)	0.58 (0.08)	4.36 (1.93)	1.30 (0.17)	0	4.45 (0.88)	0.75 (0.15)	1.12 (0.12)	13.36 (3.48)
With AR 6-A (miles)	0.80 (0.15)	5.75 (2.18)			0	4.35 (0.88)	0.75 (0.15)	1.12 (0.12)	12.87 (3.48)
With AR 6-B (miles)	0.80 (0.15)	0.58 (0.08)	4.75 (1.48)	1.30 (0.17)	0	4.35 (0.88)	0.75 (0.15)	1.12 (0.12)	13.75 (3.03)
With AR 6-C (miles)	0.80 (0.15)	0.58 (0.08)	4.36 (1.93)	1.30 (0.17)	0	3.88 (1.05)		1.12 (0.12)	12.04 (3.50)
With AR 6-D (miles)	0.80 (0.15)	0.58 (0.08)	4.36 (1.93)	1.30 (0.17)	0	4.35 (0.88)	1.29 (0.29)	1.12 (0.12)	13.90 (3.62)
Major Waterbodies									
APR (miles)	0	0	0.02 (0.02)	0 (0.01)	0	0.02 (0.01)	0.02 (0.12)	0 (0.04)	0.06 (0.20)
With AR 6-A (miles)	0	0.01 (0.03)			0	0.02 (0.01)	0.02 (0.12)	0 (0.04)	0.05 (0.20)
With AR 6-B (miles)	0	0	0	0 (0.01)	0	0.02 (0.01)	0.02 (0.12)	0 (0.04)	0.04 (0.18)
With AR 6-C (miles)	0	0	0.02 (0.02)	0 (0.01)	0	0 (0.08)		0 (0.04)	0.02 (0.15)
With AR 6-D (miles)	0	0	0.02 (0.02)	0 (0.01)	0	0.02 (0.01)	0 (0.08)	0 (0.04)	0.04 (0.16)

Table 3.15-24:
Miles and Acreage of Surface Water Features within the 1,000-Foot Corridors (and 200-Foot Representative ROW) of the Applicant Proposed Route and HVDC Alternative Routes—Region 6

Route—Proposed and Alternatives[1, 2]	Link 1	Link 2	Link 3	Link 4	Link 5	Link 6	Link 7	Link 8	Region 6 Total
Reservoirs, Lakes, and Ponds									
APR (acres)	14.3 (3.0)	0	2.7 (0.9)	6.4 (1.0)	0	4.7 (0.1)	0	0.5 (0.2)	28.6 (5.2)
With AR 6-A (acres)	14.3 (3.0)	1.7 (0.4)			0	4.7 (0.1)	0	0.5 (0.2)	21.2 (3.7)
With AR 6-B (acres)	14.3 (3.0)	0	12.4 (2.4)	6.4 (1.0)	0	4.7 (0.1)	0	0.5 (0.2)	38.3 (6.7)
With AR 6-C (acres)	14.3 (3.0)	0	2. 7 (0.9)	6.4 (1.0)	0	9.3 (1.6)		0.5 (0.2)	33.2 (6.7)
With AR 6-D (acres)	14.3 (3.0)	0	2.7 (0.9)	6.4 (1.0)	0	4.7 (0.1)	0	0.5 (0.2)	28.6 (5.2)

1 Each region of the Applicant Proposed Route (APR) is divided into links that lie between points, or nodes, where the APR is intersected by alternative routes (ARs). ARs bypass specific links of the APR as shown in the table.

2 For the ARs, the unshaded portion of the rows provides the data for the length of the AR. The shaded portion of the rows provides the data for the balance of the APR, thereby providing perspective across the region.

GIS Data Source: USGS (2014a)

3.15.5.6.2.1 Surface Water Features of Special Interest

As described for the watersheds in the ROI for Region 6, the White, Cache, L'Anguille, and St. Francis rivers are important surface water features in the area from a drainage system standpoint. Table 3.15-25 identifies surface waters within the ROI that have specific federal or state designations of special interest beyond significance as drainage features. The water feature and designation identified in the table are applicable to the 200-foot-wide representative ROW as well as the wider ROI.

Table 3.15-25:
Surface Waters of Special Interest within the 1,000-Foot Corridors of the Applicant Proposed Route and HVDC Alternative Routes—Region 6

Surface Water and Watershed	Designation(s)	Basis/Description	Route/Alternative Affected				
			APR	6-A	6-B	6-C	6-D
L'Anguille River, AR L'Anguille watershed (HUC 08020205)	National Park Service Nationwide Rivers Inventory	APR Link 6 crosses the reach of the river that the Park Service lists on the inventory. (AR 6-C does not cross that reach.)	X L6				

L6 = Link 6 of the Applicant Proposed Route in Region 6
Sources: NPS (2004), APCEC (2011)

3.15.5.6.3 Region 6 Water Quality

Table 3.15-26 identifies surface water features within the ROI that do not meet applicable water quality standards based on the surface water's designated uses and, as a result, have been identified as an impaired water in the state's most recent Section 303(d) list. Each of the water segments identified in the table is applicable to the 200-foot-wide representative ROWs as well as the wider ROI.

Table 3.15-26:
Waters with Impaired Quality within the 1,000-Foot Corridors of the Applicant Proposed Route and HVDC Alternative Routes—Region 6

Water Segment and Watershed	Impaired Uses—Impairment	TMDL Status[1]	Project Components Crossing Impaired Segment
Cache River, AR (Reach 019) Cache watershed (HUC 08020302)	Fisheries—lead impairment	Priority: Low	APR Link 3, ARs 6-A and 6-B
Bayou DeView, AR (Reaches 006 and 007) Cache watershed (HUC 08020302)	Fisheries—sulfate and lead impairments	Priority: Low	APR Link 4, AR 6-A
L'Anguille River, AR (Reach 005) L'Anguille watershed (HUC 08020205)	Fisheries—turbidity, dissolved oxygen, chloride, sulfate, and total dissolved solids impairment Primary Contact—pathogens impairment	Priority: Low Approved TMDL for siltation/turbidity	APR Link 6, AR 6-C

1 TMDL = Total Maximum Daily Load—TMDLs are the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards. Once TMDLs have been determined, discharge requirements can be developed that will bring a waterbody back into compliance.

Sources: ADEQ (2014a, 2014b, 2014c), EPA (2013b)

3.15.5.6.4 Region 6 Water Use

In the three counties (Cross, Jackson, and Poinsett counties, Arkansas) that encompass Region 6, groundwater again accounts for the majority of the total water use. Table 3.7-20 shows that the average use of surface water was just over 158 million gallons per day in 2005 compared to about 1,660 million gallons per day of groundwater. Surface water, therefore, accounts for about 9 percent of area's total water usage. Total water use (groundwater and surface water) is described in more detail in Section 3.7.5.6.4.

3.15.5.7 Region 7

Region 7 is referred to as the Arkansas Mississippi River Delta and Tennessee Region and includes the Applicant Proposed Route and HVDC Alternative Routes 7-A through 7-D.

3.15.5.7.1 Region 7 Watersheds

The ROI in Region 7 lies within two subregions of the larger Lower Mississippi drainage system: the Lower Mississippi-St. Francis subregion (0802) and the Lower Mississippi-Hatchie subregion (0801). The ROI crosses the Mississippi River and includes a crossing location for the Applicant Proposed Route and a separate crossing location for HVDC Alternative Route 7-A.

At USGS's eight-digit coding level, the ROI lies within three different watersheds as shown in Figure 3.15-1 in Appendix A. Table 3.15-27 lists the applicable watersheds and provides additional detail, including the primary surface water or waters that drain the watershed. Surface waters for the ROI are shown on Figure 3.15-2 in Appendix A.

Table 3.15-27:
Watersheds Crossed by the Applicant Proposed Route and HVDC Alternative Routes—Region 7

USGS HUC Number and Watershed Name	Area Drained (square miles)	Description of Primary Surface Water Feature(s)
08020203, Lower St. Francis	3,579	St. Francis River is the primary drain for this watershed, which stretches from Lake Wappepello (in Missouri) south to where the St. Francis River flows into the Mississippi River.
08010100, Lower Mississippi-Memphis	1,097	Mississippi River is the primary drain for this watershed, which is a narrow watershed running on either side of the river from the Mississippi River's confluence with the Ohio River downstream to the river's convergence with Horn Lake Pass south of Memphis, TN.
08010209, Loosahatchie[1]	742	Loosahatchie River is the primary drain for this water shed. Other creeks drain portions of the watershed and ultimately flow into the Loosahatchie River, which flows into the Mississippi River at the southwestern end of the watershed.

1 The proposed Tennessee converter station would be within the Loosahatchie watershed.
GIS Data Source: USGS (2014a)

As shown in Figure 3.15-1 in Appendix A and described in Table 3.15-27, the ROI crosses three watersheds in Region 7, one is on the western side of the Mississippi River, one is on the eastern side of the river, and the center one straddles the river. The predominant rivers in the first two watersheds (i.e., Lower Mississippi-St. Francis and Lower Mississippi-Memphis) flow toward the south. The Loosahatchie River in the third watershed of the same name flows primarily to the southwest.

3.15.5.7.2 Region 7 Surface Water Features

Table 3.15-28 lists the total length of perennial streams, intermittent streams, and major waterbodies within the ROI and the 200-foot-wide ROW in Region 7. The table includes the total acreage for reservoirs, lakes, and ponds that occur within the ROI and ROW.

Table 3.15-28:
Miles and Acreage of Surface Water Features within the 1,000-Foot Corridors (and 200-Foot Representative ROWs) of the Applicant Proposed Route and HVDC Alternative Routes—Region 7

Route—Proposed and Alternatives[1, 2]	Link 1	Link 2	Link 3	Link 4	Link 5	Region 7 Total
Perennial Streams						
APR (miles)	2.00 (0.34)	0	1.49 (0.13)	0.25 (0)	0.58 (0.07)	4.32 (0.54)
With AR 7-A (miles)	8.95 (1.81)	0	1.49 (0.13)	0.25 (0)	0.58 (0.07)	11.27 (2.01)
With AR 7-B (miles)	2.00 (0.34)	0	0.84 (0.12)		0.58 (0.07)	3.42 (0.53)
With AR 7-C (miles)	2.00 (0.34)	0	2.08 (0.35)			4.08 (0.69)
With AR 7-D (miles)	2.00 (0.34)	0	1.49 (0.13)	1.42 (0.29)		4.91 (0.76)
Intermittent Streams						
APR (miles)	11.52 (2.69)	0.05 (0)	2.35 (0.63)	0.80 (0.15)	3.58 (0.83)	18.30 (4.30)
With AR 7-A (miles)	14.11 (4.69)	0.05 (0)	2.35 (0.63)	0.80 (0.15)	3.58 (0.83)	20.89 (6.30)
With AR 7-B (miles)	11.52 (2.69)	0.05 (0)	2.51 (0.57)		3.58 (0.83)	17.66 (4.09)
With AR 7-C (miles)	11.52 (2.69)	0.05 (0)	9.07 (1.93)			20.64 (4.62)
With AR 7-D (miles)	11.52 (2.69)	0.05 (0)	2.35 (0.63)	4.10 (0.90)		18.02 (4.22)

Table 3.15-28:
Miles and Acreage of Surface Water Features within the 1,000-Foot Corridors (and 200-Foot Representative ROWs) of the Applicant Proposed Route and HVDC Alternative Routes—Region 7

<table>
<tr><th>Route—Proposed and Alternatives[1, 2]</th><th>Link 1</th><th>Link 2</th><th>Link 3</th><th>Link 4</th><th>Link 5</th><th>Region 7 Total</th></tr>
<tr><td colspan="7">Major Waterbodies</td></tr>
<tr><td>APR</td><td>0.62 (0.64)</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0.62 (0.64)</td></tr>
<tr><td>With AR 7-A (miles)</td><td>0.68 (0.90)</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0.68 (0.90)</td></tr>
<tr><td>With AR 7-B (miles)</td><td>0.62 (0.64)</td><td>0</td><td colspan="2">0</td><td>0</td><td>0.62 (0.64)</td></tr>
<tr><td>With AR 7-C (miles)</td><td>0.62 (0.64)</td><td>0</td><td colspan="3">0 (0.01)</td><td>0.62 (0.65)</td></tr>
<tr><td>With AR 7-D (miles)</td><td>0.62 (0.64)</td><td>0</td><td>0</td><td colspan="2">0</td><td>0.62 (0.64)</td></tr>
<tr><td colspan="7">Reservoirs, Lakes, and Ponds</td></tr>
<tr><td>APR (acres)</td><td>14.4 (1.5)</td><td>0</td><td>1.6 (0.1)</td><td>0</td><td>5.5 (0.8)</td><td>21.5 (2.4)</td></tr>
<tr><td>With AR 7-A (acres</td><td>27.8 (2.4)</td><td>0</td><td>1.6 (0.1)</td><td>0</td><td>5.5 (0.8)</td><td>34.9 (3.3)</td></tr>
<tr><td>With AR 7-B (acres</td><td>14.4 (1.5))</td><td>0</td><td colspan="2">0.7 (0)</td><td>5.5 (0.8)</td><td>20.6 (2.3)</td></tr>
<tr><td>With AR 7-C (acres</td><td>14.4 (1.5)</td><td>0</td><td colspan="3">2.2 (0.9)</td><td>16.6 (2.4)</td></tr>
<tr><td>With AR 7-D (acres</td><td>14.4 (1.5)</td><td>0</td><td>1.6 (0.1)</td><td colspan="2">2.7 (0)</td><td>18.7 (1.6)</td></tr>
</table>

1 Each region of the Applicant Proposed Route (APR) is divided into links that lie between points, or nodes, where the APR is intersected by alternative routes (ARs). ARs bypass specific links of the APR as shown in the table.
2 For the ARs, the unshaded portion of the rows provides the data for the length of the AR. The shaded portion of the rows provides the data for the balance of the APR, thereby providing perspective across the region.
GIS Data Source: USGS (2014a)

The Tennessee Converter Station Siting Area would include 0.25 miles of perennial streams, 4.41 miles of intermittent streams, and no major waterbodies. The 200-foot-wide ROW for the AC interconnection would encompass no perennial or intermittent streams (GIS Data Source: USGS 2014a).

3.15.5.7.2.1 Surface Water Features of Special Interest

As described for the watersheds in the ROI for Region 7, the St. Francis, Mississippi, and Loosahatchie rivers are important surface water features in the area from a drainage system standpoint. Table 3.15-29 identifies surface waters within the ROI that have specific federal or state designations of special interest beyond significance as drainage features. The surface waters are presented in a roughly west-to-east order. The water features and designations identified in the table are applicable to the 200-foot-wide ROW as well as the wider ROI.

Table 3.15-29:
Surface Waters of Special Interest within the 1,000-Foot Corridors of the Applicant Proposed Route and HVDC Alternative Routes—Region 7

Surface Water and Watershed	Designation(s)	Basis/Description	Route/Alternative Affected				
			APR	7-A	7-B	7-C	7-D
St. Francis River, AR Lower St. Francis watershed (HUC 08020203)	Section 10 Navigable Waters of the U.S	Any action that would obstruct or alter a navigable water is prohibited without a USACE permit. APR Link 1 and AR 7-A cross the river.	X L1	X			
Mississippi River, TN Lower Mississippi-Memphis watershed (HUC 08010100)	Section 10 Navigable Waters of the U.S	Any action that would obstruct or alter a navigable water is prohibited without a USACE permit. APR Link 1 and AR 7-A cross the river.	X L1	X			
	Exceptional Tennessee Water	APR Link 1 and AR 7-A cross the river. The river has this designation due to the presence of the federally and state-listed endangered pallid sturgeon (*Scaphirhynchus albusnot*) and the state-listed threatened blue sucker (*Cycleptus elongatus*).	X L1	X			

L1 = Link 1 of the Applicant Proposed Route in Region 7
Sources: USACE (2014a), TDEC (2013c)

3.15.5.7.3 Region 7 Water Quality

Table 3.15-30 identifies surface water features within the ROI in Region 7 that do not meet applicable water quality standards based on the surface water's designated uses and, as a result, have been identified as an impaired water in the states' most recent Section 303(d) lists. Each of the water segments identified in the table is applicable to the 200-foot-wide representative ROWs as well as the wider ROI.

Table 3.15-30:
Waters with Impaired Quality within the 1,000-Foot Corridors of the Applicant Proposed Route and HVDC Alternative Routes—Region 7

Water Segment and Watershed	Impairment Cause—TMDL[1] Priority	Approved TMDLs	Project Components Crossing Impaired Segment
Tyronza River, AR (Reach 909) Lower St. Francis watershed (HUC 08020203)	Turbidity impairment—NA	None	APR Link 1, AR 7-A
Mississippi River, TN (TN08010100001-2000) Lower Mississippi-Memphis watershed (HUC 08010100)	Physical substrate habitat alternations—Low PCBs, dioxin, and chlordane—Not applicable	Approved TMDLs for chlordane, chlordane in fish tissue, dioxin in fish tissue, and PCBs	APR Link 1, AR 7-A
Royster Creek, TN (TN08010209021-0200) Loosahatchie watershed (HUC 08010209)	Total phosphorus—Medium Low dissolved oxygen, physical substrate habitat alternations, loss of biological integrity due to siltation—Low *E. coli*—Not applicable	Approved TMDL for *E. coli*	APR Link 3, ARs 7-B and 7-C
North Fork Creek, TN (TN08010209021-0300 Loosahatchie watershed (HUC 08010209)	Total phosphorus—Medium Low dissolved oxygen, physical substrate habitat alternations, loss of biological integrity due to siltation—Low *E. coli*—Not applicable	Approved TMDL for *E. coli*	APR Links 3 and 4, ARs 7-B and 7-D

Table 3.15-30:
Waters with Impaired Quality within the 1,000-Foot Corridors of the Applicant Proposed Route and HVDC Alternative Routes—Region 7

Water Segment and Watershed	Impairment Cause—TMDL[1] Priority	Approved TMDLs	Project Components Crossing Impaired Segment
Big Creek, TN (TN08010209021-1000) Loosahatchie watershed (HUC 08010209)	Low dissolved oxygen, physical substrate habitat alternations, and loss of biological integrity due to siltation—Low Nitrate + nitrite and total phosphorus—Medium *E. coli*—Not applicable	Approved TMDL for *E. coli*	AR 7-C
Big Creek, TN (TN08010209021-2000) Loosahatchie watershed (HUC 08010209)	Low dissolved oxygen, physical substrate habitat alternations, and loss of biological integrity due to siltation—Low Total phosphorus—Medium *E. coli*—Not applicable	Approved TMDL for *E. coli*	AR 7-C
Big Creek, TN (TN08010209021-3000) Loosahatchie watershed (HUC 08010209)	Low dissolved oxygen, physical substrate habitat alternations, and loss of biological integrity due to siltation—Low Total phosphorus—Medium *E. coli*—Not applicable	Approved TMDL for *E. coli*	APR Link 5, ARs 7-C and 7-D Tennessee Converter Station Siting Area
Big Creek, TN (TN08010209021-4000) Loosahatchie watershed (HUC 08010209)	*E. coli*—High	Approved TMDL for *E. coli*	AR 7-D

1 TMDL = Total Maximum Daily Load—TMDLs are the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards. Once TMDLs have been determined, discharge requirements can be developed that will bring a waterbody back into compliance.
APR = Applicant Proposed Route; AR = HVDC Alternative Routes
Sources: ADEQ (2014a, 2014b, 2014c), EPA (2013b), TDEC (2014, 2013b)

3.15.5.7.4 Region 7 Water Use

The distribution of water use in the four counties (Mississippi and Poinsett counties in Arkansas and Shelby and Tipton counties in Tennessee) that encompass Region 7 again shows groundwater as the predominant source. Table 3.7-22 shows that the average use of surface water was 501 million gallons per day in 2005 compared to 1,184 million gallons per day of groundwater. Surface water, therefore, accounts for about 30 percent of area's total water usage. Total water use (groundwater and surface water) is described in more detail in Section 3.7.5.7.4.

3.15.5.8 Connected Actions

3.15.5.8.1 Wind Energy Generation

Wind energy generation would likely occur within WDZs. The WDZs are shown in Figure 3.15-1 in Appendix A with the designations of Zones A through L. Also shown in the figure are the watersheds in which the WDZs are located and the notable surface waters of the vicinity. Surface waters for the ROI are shown on Figure 3.15-2 in Appendix A.

3.15.5.8.1.1 Watersheds

Because the WDZs are basically located at the western end of the proposed HVDC transmission line, the zones are within many of the same watersheds described for Region 1 in Section 3.15.5.1. All of the zones are within the Lower Cimarron (1104) and North Canadian (1110) subsystems of the larger Arkansas-White-Red drainage system (11).

Only the northernmost edge of WDZ-G is within the Lower Cimarron subsystem; the remainder of WDZ-G and the other WDZs are within the North Canadian subsystem. At USGS's eight-digit coding level, the 12 WDZs lie within eight different watersheds as shown in Figure 3.15-1 in Appendix A. Table 3.15-31 lists the applicable watersheds in the order of their HUC numbers, which is roughly in a northwest-to-southeast order. The table provides the land area drained, the primary surface water or waters that drain the watershed, and the WDZs that lie within, or partially within, each of the watersheds (even if only a small portion of the zone is within the watershed). Surface waters for the ROI are shown on Figure 3.15-2 in Appendix A.

Table 3.15-31:
Watersheds Containing Wind Development Zones

USGS HUC Number and Watershed Name	Area Drained (square miles)	Description of Primary Surface Water Features	WDZs within Watershed
11040002, Upper Cimarron	1,750	Cimarron River drains the watershed that extends from the northwest corner of Oklahoma to the northeast into Kansas and its convergence with the North Fork Cimarron River.	G
11040006, Upper Cimarron–Liberal	1,720	Cimarron River drains the watershed that extends from its convergence with the North Fork Cimarron River to the southeast to its convergence with Crooked Creek just inside the north border of Oklahoma.	G
11100101, Upper Beaver	2,732	Beaver (or North Canadian) River drains the watershed that extends from the river's headwaters to its convergence with Goff Creek.	F, G, H
11100102, Middle Beaver	1,356	Beaver River drains the watershed that extends from its convergence with Goff Creek, through Lake Optima, and to the community of Beaver.	A, D, E, F, I, J, K
11100103, Coldwater	1,962	Coldwater and Frisco creeks drain the watershed into Lake Optima.	B, C, D, E, F
11100104, Palo Duro	1,937	Palo Duro Creek drains the watershed into Beaver River.	A, B, D, J, L
11100201, Lower Beaver	1,781	Beaver River, which becomes the North Canadian River, drains the watershed. Several smaller streams converge with the Beaver River within the watershed.	A, J, K
11100202, Upper Wolf	833	Wolf Creek drains the watershed and after running through another watershed joins the Beaver River to form the North Canadian River.	A, L

GIS Data Source: USGS (2014a)

3.15.5.8.1.2 Surface Water Features

Table 3.15-32 lists the total length of perennial streams and intermittent streams and acreage of reservoirs, lakes, and ponds within each of the WDZs. The USGS National Hydrography Dataset used to determine the values in the table also designates an "intermittent" category for reservoirs, lakes, and ponds and, in this instance, the intermittent category was routinely larger than the perennial group. Accordingly, the table provides a breakout for both perennial and intermittent reservoirs, lakes, and ponds. The total area of each WDZ is provided in the table to allow a comparison with the area represented by the water features. A category of "major waterbodies," as included in the preceding descriptions of Regions 1 through 7, is not included in Table 3.15-32. The definition used in this document for a major waterbody (i.e., a surface water with a crossing distance of 100 feet or more—see Section 3.15.4—is not applicable to an area with no specific route or direction.

Table 3.15-32:
Surface Water Features within the Wind Development Zones

Wind Development Zone Designation	Total Acreage of Zone	Streams (miles)		Reservoirs, Lakes, and Ponds (acres)	
		Perennial	Intermittent	Perennial	Intermittent
Zone A	109,747	4.9	103.4	38	1,330
Zone B	125,479	8.0	124.1	164	812
Zone C	161,048	6.4	204.4	125	198
Zone D	69,189	12.7	134.9	57	109
Zone E	47,092	2.6	43.6	25	8
Zone F	112,461	13.0	207.1	24	28
Zone G	187,315	6.8	191.7	12	269
Zone H	116,226	19.9	205.4	8	203
Zone I	105,203	1.7	17.5	17	688
Zone J	92,567	26.2	285.0	123	41
Zone K	92,894	6.3	220.2	60	427
Zone L	165,848	31.6	190.6	650	3,218
Totals		140.1	1,927.8	1,303	8,634

GIS Data Source: USGS (2014a)

It can be seen in Table 3.15-32 that the lengths of intermittent streams far outdistance those of perennial streams in every WDZ. The same can be said with regard to the acres of reservoirs, lakes, and ponds with the exception of WDZs E, F, and J. In each of those three zones, the area of perennial reservoirs, lakes, and ponds is greater than the area of the intermittent features.

3.15.5.8.1.3 Surface Water Features of Special Interest

Surface water features of special interest considered for the WDZs are the same as considered for the region evaluations; that is, the federal, Oklahoma, and Texas surface water designations described in Table 3.15-2. As was described for the watersheds in Table 3.15-31, the Cimarron and Beaver rivers, along with Coldwater, Frisco, Palo Duro, and Wolf creeks are the important surface water features in the area from a drainage system standpoint. Table 3.15-33 identifies surface waters within the WDZs that have specific federal or state designations of special interest beyond significance as drainage features.

Table 3.15-33:
Surface Waters of Special Interest within the Wind Development Zones

Surface Water and Watershed	Designation(s)	Basis for Designation	Affected Wind Development Zone
Beaver River[1], OK Middle Beaver watershed (HUC 11100102) Coldwater Creek[1], OK Coldwater watershed (HUC 11100103)	Area with water of recreational or ecological significance	Optima Wildlife Management Area	Zone D
Wolf Creek, TX Upper Wolf watershed (HUC 11100202)	Ecologically significant river and stream segment	High water quality, exceptional aquatic life, high aesthetic value stream; diverse benthic macroinvertebrate and fish communities	Zone L

1 The portions of Beaver River and Coldwater Creek with this designation are limited to those segments of the streams within the Optima Wildlife Management Area.

Sources: TPWD (2014), Appendix B, Table 1 of OAC 785:45

The designations of surface water of special interest in Table 3.15-33 are both state designations; there are no applicable federal designations. With respect to the Oklahoma designation, only the northern edge of WDZ D extends into the Optima Wildlife Management Area and in Texas, Wolf Creek passes through a relatively small portion of WDZ L, near the zone's northeast limit. In Cimarron County, Oklahoma, the Cimarron and Beaver rivers are both designated Oklahoma High Quality Streams with associated areas of special provision watershed (OWRB 2011a). WDZ G, the only zone in Cimarron County, is located to the east, just outside of the watershed areas for these two high quality streams.

3.15.5.8.1.4 Water Quality

Table 3.15-34 identifies the surface water features within the WDZs that do not meet applicable water quality standards based on the surface water's designated uses and, as a result, have been identified as impaired waters in the states' most recent Section 303(d) lists. As noted in the table, the WDZs in Texas are not located over any impaired surface waters. In Texas, the closest impaired surface water is the Canadian River (TCEQ 2013a, 2013b), which is in a separate watershed to the south of the WDZs, so stormwater runoff from the WDZs would not be expected to flow in the direction of the Texas section of the Canadian River.

Table 3.15-34:
Waters with Impaired Quality within the Wind Development Zones

Water Segment and Watershed	Impaired Uses—Impairment	TMDL Status[1]	Affected WDZ
Beaver River (North Canadian), OK (OK720510000190_00) Upper Beaver watershed (HUC 11100101)	Fish and Wildlife Propagation/Warm Water Aquatic Community—dissolved oxygen impairment	Priority Date: 2020 Approved TMDLs for fecal coliform, E. Coli, and *Enterococcu*s	WDZ-F
Beaver River (North Canadian), OK (OK720500020450_00) Middle Beaver watershed (HUC 11100102)	Agricultural—sulfates, total dissolved solids, and chloride impairments Fish and Wildlife Propagation/Warm Water Aquatic Community—sedimentation/siltation and fishes bioassessments impairments	Priority Date: 2023 Approved TMDLs for fecal coliform, E. Coli, and *Enterococcu*s	WDZ-J
Palo Duro Creek, OK (OK720500020500_00) Palo Duro watershed (HUC 11100104)	Primary Body Contact Recreation—*Enterococcu*s, and *E. coli* impairments Fish and Wildlife Propagation/Warm Water Aquatic Community—dissolved oxygen and selenium impairments Agricultural—sulfates and total dissolved solids impairments	Priority Date: 2023 Approved TMDLs for fecal coliform and total suspended solids	WDZ-J
No Texas impaired waters are within the Wind Development Zones.			

1 TMDL = Total Maximum Daily Load—TMDLs are the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards. Once TMDLs have been determined, discharge requirements can be developed that will bring a waterbody back into compliance.

Sources: ODEQ (2014, 2013), EPA (2013b), TCEQ (2013a, 2013b)

3.15.5.8.1.5 Water Use

Table 3.7-26 summarizes the 2005 water use in the six-county area of Beaver, Cimarron, and Texas counties in Oklahoma and Hansford, Ochiltree, and Sherman counties in Texas that encompass the WDZs. As described in the Region 1 discussion (Section 3.15.5.1.4), by far the predominant source of water in the six-county area is groundwater. The average surface water use of about 1.4 million gallons per day is less than 0.2 percent of the area's total water use of 886 million gallons per day. All of the surface water use in the six-county area is attributed to the categories of irrigation and livestock. Correspondingly, surface water is not used as a source of drinking water in the area, either for public systems or private domestic systems.

3.15.5.8.2 Optima Substation

The future Optima substation would be on a 160-acres site located just east of the Oklahoma Converter Station and partially within the AC Interconnection Siting Areas. Surface water features in the ROI for the future Optima substation would be as described in the Region 1 discussion above (Section 3.15.5.1) for the Oklahoma Converter Station and AC Interconnection. There is an intermittent stream channel, or channels, in the area of the AC interconnection, but no perennial streams or other waterbodies, including no special interest surface waters or impaired waters.

3.15.5.8.1 TVA Upgrades

A precise ROI has not been identified for the TVA upgrades. Where possible, general impacts associated with the required TVA upgrades are discussed in the impact sections that follow.

3.15.6 Impacts to Surface Water

3.15.6.1 Methodology

This section addresses potential impacts to surface waters that would be expected from typical construction actions, whether those actions were for construction of converter stations or transmission lines for the Project. The primary areas of concern with regard to surface waters are:

- Potential for runoff or other discharges from construction or support areas to carry sediments or other contaminants to receiving waters
- Changes to runoff rates
- Direct impacts or disturbances to surface water or drainage channels
- Effects on water availability

3.15.6.1.1 Potential for Surface Water Contamination

Soil disturbances typical of construction actions are often associated with increased potential for soil erosion. Eroded materials can be carried by wind or runoff, but primarily runoff, to receiving waters, which can cause these waters to exceed instream water quality standards for turbidity that in turn can cause damage to the waters' natural flora and fauna or make the water unfit for its designated uses. If not contained properly, accidental releases of construction-related hazardous materials may also be carried from the site of a release to receiving waters. In the case of the Project, these hazardous materials would typically consist of fuels and lubricants present in equipment or storage containers at locations where construction activities would occur and at construction staging or storage yards. Additional potential contaminants would be associated with concrete operations, including at temporary concrete batch plants that would be needed for areas too far from commercial batch plants. In any of these locations there would be the potential for contaminants to leak, spill, or otherwise accidently release to the environment. If the released quantity was large enough and it was not cleaned up quickly, it could flow (if liquid) or be carried by runoff to an existing drainage channel and eventually reach surface water. If this were to occur, instream water quality standards could be threatened and downstream uses of the water could be put at risk.

Stormwater control and pollution prevention measures, as well as the construction actions in which they would be integrated, would be managed in accordance with plans and procedures that the Applicant would be required to develop and implement. The construction would require a stormwater discharge permit under the EPA's NPDES program. Each of the states in which construction actions would occur has been given the authority by EPA to implement a state program. Arkansas and Tennessee implement their own state programs pursuant to this authority; Oklahoma and Texas implement their own programs except in Indian Country and for specific discharges (not applicable to the Project) where EPA implements the permitting program for stormwater discharges during construction (EPA 2013a). Each of these states implements its NPDES stormwater discharge permit program through a general permit; referred to here simply as the construction general permit. Common to all of the construction general permits is the requirement for the permit applicant to prepare a SWPPP. Information that must be presented in a SWPPP includes the following (EPA 2014):

- Descriptions and locations of the stormwater control measures to be installed and maintained during construction to minimize erosion and discharge of sediments
- Procedures for inspection, maintenance, and, if necessary, corrective actions for stormwater control measures
- A list of construction site pollutants and locations of all potential pollutant-generating activities
- Descriptions of the procedures to be followed to prevent and respond to spills and leaks of site pollutants
- Identification of all sources of allowable non-stormwater discharges
- Description of staff training applicable to implementation of the SWPPP
- A map or maps showing drainage areas of the work site, before and after major grading, and stormwater discharge locations
- A map or maps showing locations of all potential pollutant-generating activities and stormwater control measures

Measures to prevent spills and leaks of site pollutants may include items such as using secondary containment for onsite fueling tanks or containers; providing cover, containment, and protection for chemicals, liquid products, petroleum products, and other potentially hazardous materials; using spill prevention and control measures when conducting maintenance, fueling, and repair of equipment and vehicles; and providing immediate response to any spill incident. Similarly, the Applicant would develop and follow its own plans to implement these measures as described in Section 2.1.7 to minimize the potential for accidental discharge of hazardous or controlled substances. The elements of the planning, either part of the SWPPP or the SPCCP if developed to include construction, would also minimize the potential for contaminants to leave the site should a discharge occur.

Concrete operations are mentioned separately because they are common to construction actions and involve equipment carrying materials of concern in addition to fuels and lubricants that could become sources of contamination to surface waters if managed improperly or accidentally released. The Applicant would perform washout of concrete trucks and equipment, either at the construction site or at a temporary batch plant, at storage tanks, plastic-lined berms, or some similar containment structure. Captured liquids would not be discharged; rather they would be allowed to evaporate or removed for disposal at an approved off-site location. Dried concrete would similarly be hauled off for proper disposal or recycling, or be broken up and used as clean fill. The Applicant may also bury hardened concrete in on-site embankments in accordance with applicable permit requirements.

It is also anticipated that in some areas equipment and vehicle washing would be required to prevent spread of weeds (removing them from the equipment at or near their source rather than allowing equipment to carry them out of the area). Such actions would generate only a minimal amount of wastewater, but would be done in designated, approved wash stations.

The deepest foundations would be those for the transmission line structures. In most areas of the Project, foundation depths for lattice structures would be 30 to 32 feet and for pole structures the depths would be 40 to 44 feet. Within the Mississippi floodplain, foundation depths would be greater: from 114 to 132 feet deep for lattice structures and from 83 to 94 feet deep for pole structures as described in Appendix F. Structure foundations would have to be deeper in the floodplain areas given the expected soil conditions. In the floodplain, pole structures are identified as having the more shallow foundations than lattice structures because, due to engineering constraints, the Applicant would need to limit the height of poles in floodplains to 130 feet to minimize the foundation depth (Thomas 2014). Lattice structures would be used exclusively in floodplain locations requiring greater heights than 130 feet. Other than possibly in the Texas and Oklahoma panhandles, these foundation depths could reach the water table in some areas of each region of the Project. As a result, it is expected that at some construction sites, groundwater would have to be pumped from excavations or boreholes to complete foundation construction and the discharge, if mismanaged, could be of concern to area surface waters. In such cases, water would be discharged to vegetated areas through the use of flow control devices (EPM W-8 in Section 3.15.6.1.5).

The Applicant has also identified two types of Project-related materials that would be used as needed in excavations and boreholes: Super Mud™ and high yield bentonite gel, both products of PDSCo. Inc. (Polymer Drilling Systems) of El Dorado, Arkansas. Super Mud™ is described as a synthetic polymer used to create high viscosity slurries for stabilizing excavations. High yield bentonite gel is described as a polymer extended sodium bentonite as described in Appendix F, which is a naturally occurring clay material. The bentonite, in a slurry, is designed for use in drilling applications and acts to stabilize the borehole walls and while it circulates back to the surface, cooling the drill bit and transporting drill cuttings in the process. Because of the potential for these materials to come into contact with groundwater, they are described in more detail in Section 3.7.6.2. After use of either material, disposition of a relatively large volume of slurry would be necessary and discharge to any surface water would be inappropriate. These slurry fluids would be recycled to the extent practicable, but if disposal was necessary, it would be sent offsite. The Applicant may add cement to solidify residual slurry so that the slurry can be disposed in a public landfill. All disposal would be in accordance with applicable federal, state, and local regulations.

Considering the requirements of the construction general permits for stormwater discharges, the measures that the Applicant would implement per its internal plans and procedures, and the limited amount of potentially hazardous materials involved (i.e., the Project would not include large bulk storage operations), it is unlikely that construction activities would result in contaminants, either sediment or chemicals, reaching surface water. This conclusion is applicable to the surface waters of special interest and impaired waters identified in Section 3.15.5 as well as other surface waters. With regard to surface waters of special interest and impaired waters, additional regulatory requirements identified in the subsequent discussions of site-specific impacts would further reduce the potential for adverse impacts.

3.15.6.1.2 Changes to Runoff Rates

Changes to stormwater runoff rates over large areas have the potential to affect water levels in receiving streams, reservoirs, or ponds. If the change is an increase in runoff, it could be associated with flooding around the receiving waters or in upgradient drainage channels. During construction, soils at the sites of the transmission line structures and converter stations would be broken up and loosened for some period of time, either in areas of disturbed soils or in soil stockpiles, and would be expected to have lower runoff rates, than before the disturbance. Higher infiltration rates would mean less water reaching drainage channels and receiving waters. At the same time, the soil in unpaved areas where heavy equipment traveled to, from, or around construction sites and in the temporary staging or storage areas could become more compacted than natural conditions and result in increased runoff. Conditions of loosened soil, however, would be relatively short-term and, for the most part, the disturbed areas would be restored to a pre-disturbance condition once the foundations and structures were in place. With regard to soils that may become compacted as a byproduct of equipment traffic, the Applicant would take measures to prevent serious impacts, to include the use of low ground pressure equipment and, as appropriate, the use of temporary equipment mats (see EPM GE-27 in Section 3.15.6.1.5). If necessary, the Applicant would also undertake soil remediation actions including decompaction, particularly in agricultural areas, to return soils to pre-disturbance conditions (see EPM AG-2 in Section 3.15.6.1.5). As each converter station was constructed, it would represent an area of impervious surfaces and increased runoff, but proper management of the runoff would be part of the facility design. Whether it involved retention or detention ponds, or simply to tie in with an existing municipal stormwater drainage system, the facility design would be required to include a stormwater management approach that did not adversely impact facilities or surface waters in the area. Also, the facilities are not so large that they would involve large increases in the amount of runoff to manage. The relatively small and short-term changes in runoff rates associated with the proposed construction actions would not be expected to cause noticeable changes in the area's existing (natural or man-made) drainage systems or surface waters.

3.15.6.1.3 Direct Impacts or Disturbances to Surface Water or Drainage Channels

Construction actions would occur over a great distance and variety of land types that, as described in Section 3.15.5, contain many streams and drainage channels, some with intermittent flow and others with perennial flow, and other waterbodies. The Applicant would avoid surface waters and their floodplains, to the extent practicable, in siting converter stations and transmission line foundations (EPM GE-9 in Section 3.15.6.1.5); would not construct counterpoise or fiber optic cable trenches across waterbodies (EPM W-6 in Section 3.15.6.1.5); and, in general, would avoid damage to drainage features as practicable. There is sufficient flexibility in the micro-siting of facilities away from surface water features and, in the case of transmission lines, in placing structures such that surface waters and drainage features can be spanned by the lines. Therefore, the impact evaluations in this section are based on the assumption that Project facilities, including transmission line structures, would not be constructed in streams (perennial or intermittent) or their channels, or in any lakes, reservoirs, or ponds. The siting of access roads, however, generally does not include the same means of avoidance and, as a result, access roads are components of the Project most likely to require disturbance of drainage features. Since the Project has not yet progressed to the stage of detailed, location-specific design, the manner in which surface waters and drainage features would be crossed or the full extent of existing crossing routes are not yet available. The Applicant has, however, identified four typical crossing methods for access roads if they are necessary. Selection of one of the crossing methods would depend on stream characteristics as well as requirements associated with permits for crossing waters or floodplains (Appendix C). The four types of crossing methods are briefly summarized as follows (see Appendix F):

- Type 1, Drive-Through Crossings—This type of crossing applies to seasonally dry, non-fish-bearing drainages that would require no more than minimal grading or fill to support vehicle travel. Fill material, if needed, would generally consist of commercially available aggregate and the Applicant would limit the quantity used to that needed for safe vehicle travel. The average disturbance for a Type 1 crossing would be about 25 feet along the waterbody.

- Type 2, Ford Crossings—This type of crossing applies to streams (seasonally dry or perennial) with shallow, but defined channels that require grading and stabilization of stream banks and, in some cases, the channel bed to allow vehicle travel. Approaches and, if needed, the streambed would be rock armored with commercially available aggregate or large angular rock (pit run), placed to maintain the dimensions of the natural streambed and not impede natural flow. The average disturbance for a Type 2 crossing would be about 75 feet along the waterbody.
- Type 3, Culvert—This type of crossing applies to more incised stream channels and with consistent flow regimes sufficient to maintain fishery populations. Typically, the culvert would be designed to be partially buried so that streambed material can be maintained in its bottom. Scour-resistant materials would be installed around the edges of the culvert and a stable travel surface installed across the culvert. The average disturbance for a Type 3 crossing would be about 30 to 60 feet, depending on the channel profile along the waterbody.
- Type 4, Spanning Structure—These bank-to-bank crossing structures apply to higher quality defined perennial stream channels up to a width of about 30 feet. The type of structure designed would depend on the width of the channel. The average disturbance for a Type 4 crossing would be about 30 to 60 feet along the waterbody.

Crossing a drainage feature, no matter the type, would result in impacts to the drainage feature. The extent of those impacts would depend on the nature of the drainage feature and the type of crossing method used. As indicated in the description of crossing types, the higher the quality of the stream, the more elaborate the crossing method that would be expected. In any of the crossing types, however, the intent would be to minimize the length of the drainage feature that would be affected and to maintain flow characteristics through the disturbed section so that effects upstream or downstream would also be minimized. In flowing streams, there could be local impacts to bottom-dwelling aquatic communities, and during construction there would likely be increased turbidity to downstream areas. Increased turbidity would be expected to be short-lived, but depending on the type of crossing, it would likely take longer for bottom communities to recover.

3.15.6.1.4 Effects on Water Availability

Adverse effects on water availability could result if the Project hindered the use of a local surface water source or if the Project's need for water reduced the amount of water available for other existing users. The former situation could result from the Project accidentally causing contamination or physical damage to a stream or even an intake structure so that the water could not be withdrawn. The potential to damage surface water sources would be expected to be limited to access road crossings as was discussed in Section 3.15.6.1.3; the potential for surface water contamination was discussed in Section 3.15.6.1.1.

Water would be needed to support the Project's construction activities, but the activities would not involve major demands for water. The types of water needs expected during construction were described in the groundwater discussion of Section 3.7.6.1.3 and, as noted in that section, the Applicant estimates the Project would require approximately 110 million gallons of water. Construction duration is anticipated to be 36 to 42 months Assuming a 36 month duration, this water demand equates to about 0.1 million gallons per day, which the Applicant plans to obtain from municipal water providers along the transmission line route. The Applicant does not anticipate the need to drill wells to obtain water or to withdraw water directly from surface water sources to support construction actions. The water demand also would be spread out over a large geographic area, so the average demand of 0.1 million gallons per day would be experienced in different areas along the 700-mile route as construction progressed. Construction of the proposed converter stations, however, would be expected to cause their portions of the overall HVDC transmission line route to be associated with a higher percentage of the water demand than those sections with only transmission lines being constructed. As summarized in the average 2005 water use tables in Section 3.7.5, the use of surface water varied from 3 to 1,296 million gallons per day within the seven regions along the HVDC transmission line route. Because water for the Project is expected to come from municipal providers, its source could be groundwater or surface water depending on which part of the route is being worked. The only regions where surface water use is less than 140 million gallons per day are Regions 1 and 2, where public water supplies come entirely from groundwater. Similarly, water to support the Project in these two regions would not be expected to come from surface water sources. In Regions 3 through 7, a water demand of 0.1 million gallons per day over a 36-month construction period is minor compared to quantities of surface water already being used. Water demand associated with the Project is therefore not expected to have noticeable effects on surface water resources beyond those resulting from existing water usage.

3.15.6.1.5 Environmental Protection Measures

The Applicant has developed and would implement a comprehensive list of EPMs to avoid and minimize impacts to surface water. Implementation of these EPMs is assumed throughout the impact analysis that follows for the Project. A complete list of EPMs for the Project is provided in Appendix F. The EPMs associated with surface water are presented below in three general potential impact categories: (1) contamination, (2) runoff rates, and (3) physical impacts. Each EPM is identified by its Applicant-designated reference number.

Practices will be implemented to specifically minimize the potential for release or mismanagement of hazardous materials that could eventually result in surface water contamination. These EPMs include the following:

- GE-1: Clean Line will train personnel on health, safety, and environmental matters. Training will include practices, techniques, and protocols required by federal and state regulations and applicable permits.
- GE-5: Any herbicides used during construction and operations and maintenance will be applied according to label instructions and any federal, state, and local regulations.
- GE-13: Emergency and spill response equipment will be kept on hand during construction.
- GE-14: Clean Line will restrict the refueling and maintenance of vehicles and the storage of fuels and hazardous chemicals within at least 100 feet from wetlands, surface waterbodies, and groundwater wells, or as otherwise required by federal, state, or local regulations.
- GE-21: Clean Line will maintain construction equipment in good working order. Equipment and vehicles that show excessive emissions of exhaust gases and particulates due to poor engine adjustments or other inefficient operating conditions will be repaired or adjusted.
- GE-28 Hazardous materials and chemicals will be transported, stored, and disposed of according to federal, state, or local regulations or permit requirements.
- GE-31: Clean Line will provide sanitary toilets convenient to construction; these will be located greater than 100 feet from any stream or tributary or to any wetland. These facilities will be regularly serviced and maintained; waste disposal will be properly manifested. Employees will be notified of sanitation regulations and will be required to use sanitary facilities.
- W-14: Clean Line will ensure that there is no off-site discharge of wastewater from temporary batch plant sites.

Practices will be implemented to minimize changes to stormwater runoff rates that could potentially change drainage patterns and runoff quantity or quality. These EPMs include the following:

- GE-3: Clean Line will minimize clearing vegetation within the ROW, consistent with a Transmission Vegetation Management Plan filed with NERC, and applicable federal, state, and local regulations.
- GE-6: Clean Line will restrict vehicular travel to the ROW and other established areas within the construction, access, or maintenance easement(s).
- GE-7: Roads not otherwise needed for maintenance and operations will be restored to preconstruction conditions. Restoration practices may include decompacting, recontouring, and re-seeding. Roads needed for maintenance and operations will be retained.
- GE-27: Clean Line will minimize compaction of soils and rutting through appropriate use of construction equipment (e.g., low ground pressure equipment and temporary equipment mats).
- GE-30: Clean Line will minimize the amount of time that any excavations remain open.
- GEO-1: Clean Line will stabilize slopes exposed by its activities to minimize erosion.
- W-3: Clean Line will establish streamside management zones within 50 feet of both sides of intermittent and perennial streams and along margins of bodies of open water where removal of low-lying vegetation is minimized.
- W-7: Clean Line will locate spoil piles from foundation excavations and fiber optic cable trenches outside of streamside management zones.
- W-8: Dewatering will be conducted in a manner designed to prevent soil erosion (e.g., through discharge of water to vegetated areas and/or the use of flow control devices).

Practices will be implemented to minimize direct, physical impacts to surface water features and the potential to restrict the use of a surface water. These EPMs include the following:

- GE-9: Clean Line will avoid and/or minimize damage to drainage features and other improvements such as ditches, culverts, levees, tiles, and terraces; however, if these features or improvements are inadvertently damaged, they will be repaired and or restored.
- W-1: Clean Line will avoid and/or minimize construction of access roads in special interest waters.
- W-2: Clean Line will identify, avoid, and/or minimize adverse effects to wetlands and waterbodies. Clean Line will not place structure foundations within the Ordinary High Water Mark of Waters of the United States.
- W-5: Clean Line will construct access roads to minimize disruption of natural drainage patterns including perennial, intermittent, and ephemeral streams.
- W-6: Clean Line will not construct counterpoise or fiber optic cable trenches across waterbodies.
- W-15: Clean Line will seek to procure water from municipal water systems where such water supplies are within a reasonable haul distance; any other water required will be obtained through permitted sources or through supply agreements with landowners. (As noted in Section 3.7.6.1.3, the Applicant does not anticipate the need to drill wells to obtain water to support construction actions, but if new wells became necessary to support operational facilities, the Applicant would obtain the necessary approvals and limit withdrawal volumes so as to not adversely affect supplies for other uses.)

3.15.6.2 Impacts Associated with the Applicant Proposed Project

3.15.6.2.1 Converter Stations and AC Interconnection Siting Areas

3.15.6.2.1.1 Construction Impacts

3.15.6.2.1.1.1 Oklahoma Converter Station Siting Area and AC Interconnection Siting Area

Limited surface water features consisting of 1.6 miles of intermittent stream beds, no perennial streams, and no major waterbodies are present within the Oklahoma Converter Station and AC Interconnection Siting Areas. Considering a representative 200-foot-wide ROW for the AC interconnection, the length of intermittent streams enclosed is 0.2 mile. Potential impacts associated with construction of the station and AC interconnection would be the same as those common impacts described in Section 3.15.6.1. Water needed to support construction of the converter station and AC interconnection—although expected to be obtained from a municipal provider—would likely not come from surface water because groundwater is the predominant source of water in Texas County.

3.15.6.2.1.1.2 Tennessee Converter Station Siting Area and AC Interconnection Siting Area

Limited surface water features consisting of only a few drainage features, including only 0.25 mile of perennial streams, 4.4 miles of intermittent streams, and no major waterbodies are present within the Tennessee Converter Station and AC Interconnection Siting Areas. The 200-foot representative ROW for the AC interconnection would encompass no perennial or intermittent streams. Potential impacts associated with construction of the station and AC interconnection would be the same as those common impacts described in Section 3.15.6.1. The Applicant would avoid surface waters to the extent practicable in selecting the ultimate construction site for the station. Potential impacts associated with construction of the station and AC interconnection line would be the same as those common impacts described in Section 3.15.6.1. Water needed to support the construction of the converter station would likely not come from surface water because public water supplies in both Shelby and Tipton counties come entirely from groundwater.

3.15.6.2.1.2 Operations and Maintenance Impacts

Operations and maintenance of the Oklahoma and Tennessee converter stations and AC interconnections would not be expected to have any impacts on surface water. There would be no water demand other than the minor amount of drinking water required to support fewer than 15 full-time workers at each station and the station would be connected to the municipal water system and the public water systems in the region use groundwater sources (Tables 3.7-5 and 3.7-22).

3.15.6.2.1.3 Decommissioning Impacts

Decommissioning of converter stations and the associated AC interconnection transmission lines would be expected to have impacts similar to those described in Section 3.15.6.1 for common construction activities, i.e., the same types of measures would be required to manage the fuels and lubricants that would be present in equipment and actions to protect stormwater runoff at the site would ensure that contaminants did not reach surface water. Decommissioning actions may require larger equipment than required during typical operation and maintenance activities. As a result, access to some areas may need to be improved or even reestablished and, as during construction, could involve direct disturbances to surface water or drainage channels. Water demand during decommissioning would be limited to that needed for actions such as dust suppression, soil compaction, and possibly re-seeding or landscaping to put the ground back into suitable condition. Water demand would be expected to be less than for construction and would not adversely impact surface water resources.

3.15.6.2.2 AC Collection System

3.15.6.2.2.1 Construction Impacts

As indicated in the discussion of common construction impacts (Section 3.15.6.1), the Applicant would avoid surface waters to the extent practicable in selecting the sites for transmission line structures for any of the AC collection system routes. However, as noted in Section 3.15.6.1.3, access roads may have to cross drainage features. If an access road required a new crossing over any of the impaired streams in any of the regions, or if construction sites were close enough to contribute stormwater runoff to these streams, there would be additional requirements to ensure no adverse impacts to water quality. For example, Oklahoma's NPDES construction general permit includes additional requirements for construction actions that could involve stormwater runoff to impaired waters. These added requirements include an increased frequency for inspections as well as protective measure planning that is specific to the surface water and contaminants of concern (ODEQ 2012). Also common to all of the AC collection system routes, groundwater is the predominant source of water in the area (Table 3.7-6), so water to support construction of any collector line, although expected to be obtained from a municipal provider, would likely not come from surface water.

3.15.6.2.2.1.1 AC Collection System Route E-1

As shown in Table 3.15-5, the 200-foot-wide representative ROW of AC Collection System Route E-1 encompasses 0.23 mile of perennial streams, 1.61 miles of intermittent streams, no major waterbodies, and 0.45 acre of reservoirs, lakes, and ponds. AC Collection System Route E-1 is only one of three AC collection system routes (along with SE-2 and SW-1) to encompass no major waterbodies. AC Collection System Route E-1 also encompasses a section of Palo Duro Creek, which is identified as an Oklahoma impaired water (Table 3.15-6) and additional requirements could be applicable as identified in Section 3.15.6.2.2.1 above. Potential impacts associated with construction of AC Collection System Route E-1 would be the same as those common impacts described in Section 3.15.6.1.

3.15.6.2.2.1.2 AC Collection System Route E-2

The 200-foot-wide ROW of AC Collection System Route E-2 encompasses 0.37 mile of perennial streams, 2.18 miles of intermittent streams, 0.07 mile of major waterbodies, and 0.99 acre of reservoirs, lakes, and ponds (Table 3.15-5). AC Collection System Route E-2 also encompasses a section of Palo Duro Creek, an Oklahoma impaired water (Table 3.15-6) and additional requirements could be applicable as identified in Section 3.15.6.2.2.1 above. Potential impacts associated with construction of the AC Collection System Route E-2 would be the same as those common impacts described in Section 3.15.6.1.

3.15.6.2.2.1.3 AC Collection System Route E-3

The 200-foot-wide ROW of AC Collection System Route E-3 encompasses 0.12 mile of perennial streams, 2.39 miles of intermittent streams, 0.01 mile of major waterbodies, and 0.31 acre of reservoirs, lakes, and ponds (Table 3.15-5). AC Collection System Route E-3 also encompasses a section of Palo Duro Creek, an Oklahoma impaired water (Table 3.15-6) and additional requirements could be applicable as identified in Section 3.15.6.2.2.1 above. Potential impacts associated with construction of AC Collection System Route E-3 would be the same as those common impacts described in Section 3.15.6.1.

3.15.6.2.2.1.4 AC Collection System Route NE-1

The 200-foot-wide ROW of AC Collection System Route NE-1 encompasses 0.41 mile of perennial streams, 0.25 mile of intermittent streams, 0.12 mile of major waterbodies, and no area of reservoirs, lakes, and ponds

(Table 3.15-5). Potential impacts associated with construction of AC Collection System Route NE-1 would be the same as those common impacts described in Section 3.15.6.1.

3.15.6.2.2.1.5 AC Collection System Route NE-2

The 200-foot-wide ROW of AC Collection System Route NE-2 encompasses 0.2 mile of perennial streams, 1.33 miles of intermittent streams, 0.10 mile of major waterbodies, and 1.95 acres of reservoirs, lakes, and ponds (Table 3.15-5). Potential impacts associated with construction of AC Collection System Route NE-2 would be the same as those common impacts described in Section 3.15.6.1.

3.15.6.2.2.1.6 AC Collection System Route NW-1

The 200-foot-wide ROW of AC Collection System Route NW-1 encompasses 0.16 mile of perennial streams, 2.03 miles of intermittent streams, 0.09 mile of major waterbodies, and no area of reservoirs, lakes, and ponds (Table 3.15-5). The AC Collection System Route NW-1 also encompasses a section of the Beaver River, an Oklahoma impaired water (Table 3.15-6) and additional requirements could be applicable as identified in Section 3.15.6.2.2.1 above. Potential impacts associated with construction of AC Collection System Route NW-1 would be the same as those common impacts described in Section 3.15.6.1.

3.15.6.2.2.1.7 AC Collection System Route NW-2

The 200-foot-wide ROW of AC Collection System Route NW-2 encompasses 0.51 mile of perennial streams, 0.95 mile of intermittent streams, 0.18 mile of major waterbodies, and 0.04 acre of reservoirs, lakes, and ponds (Table 3.15-5). The distance of major waterbodies is the highest of any of the AC collection system routes. Potential impacts associated with construction of AC Collection System Route NW-2 would be the same as those common impacts described in Section 3.15.6.1.

3.15.6.2.2.1.8 AC Collection System Route SE-1

The 200-foot-wide ROW of AC Collection System Route SE-1 encompasses 0.42 mile of perennial streams, 2.09 miles of intermittent streams, 0.04 mile of major waterbodies, and 2.61 acres of reservoirs, lakes, and ponds. The area of reservoirs, lakes, and ponds is the highest of any of the AC collection system routes. AC Collection System Route SE-1 also encompasses a section of Palo Duro Creek, an Oklahoma impaired water (Table 5.15-6) and additional requirements could be applicable as identified in Section 3.15.6.2.2.1 above. Potential impacts associated with construction of AC Collection System Route SE-1 would be the same as those common impacts described in Section 3.15.6.1.

3.15.6.2.2.1.9 AC Collection System Route SE-2

The 200-foot-wide corridor of AC Collection System Route SE-2 encompasses no perennial streams, 0.3 miles of intermittent streams, no major waterbodies, and 0.38 acre of reservoirs, lakes, and ponds (Table 3.15-5). The ROW of AC Collection System Route SE-2 is only one of two AC collection system routes encompassing no perennial streams—the length of intermittent streams is the second lowest of any of the routes—and it is only one of three alternatives with no major waterbodies. Potential impacts associated with construction of AC Collection System Route SE-2 would be the same as those common impacts described in Section 3.15.6.1.

3.15.6.2.2.1.10 AC Collection System Route SE-3

The 200-foot-wide ROW of AC Collection System Route SE-3 encompasses 0.37 mile of perennial streams, 2.07 miles of intermittent streams, 0.07 mile of major waterbodies, and 1 acre of reservoirs, lakes, and ponds (Table 3.15-5). AC Collection System Route SE-3 also encompasses a section of Palo Duro Creek, an Oklahoma impaired water (Table 3.15-6), and additional requirements could be applicable as identified in Section 3.15.6.2.2.1 above. SE-3 also encompasses a section of Wolf Creek, which is designated by Texas as a water of high water quality/exceptional aquatic life/high aesthetic value. Texas Surface Water Quality Standards (TAC 30-307) prohibit discharges to Wolf Creek that could lower its water quality such that its designations could not be maintained. Potential impacts associated with construction of AC Collection System Route SE-3 would be the same as those common impacts described in Section 3.15.6.1.

3.15.6.2.2.1.11 AC Collection System Route SW-1

The 200-foot-wide ROW of AC Collection System Route SW-1 encompasses no perennial streams, 0.86 miles of intermittent streams, no major waterbodies, and no area of reservoirs, lakes, and ponds (Table 3.15-5). The ROW of SW-1 is only one of two AC collection system routes encompassing no perennial streams and only one of three routes with no major waterbodies or no area of reservoirs, lakes, and ponds. Potential impacts associated with construction of the AC Collection System Route SW-1 would be the same as those common impacts described in Section 3.15.6.1.

3.15.6.2.2.1.12 AC Collection System Route SW-2

The 200-foot-wide ROW of AC Collection System Route SW-2 encompasses 0.14 mile of perennial streams, 2.91 miles of intermittent streams, 0.08 mile of major waterbodies, and 0.21 acre of reservoirs, lakes, and ponds (Table 3.15-5). The length of intermittent streams is the highest of any of the AC collection system routes. Potential impacts associated with construction of AC Collection System Route SW-2 would be the same as those common impacts described in Section 3.15.6.1.

3.15.6.2.2.1.13 AC Collection System Route W-1

The 200-foot-wide corridor of AC Collection System Route W-1 encompasses 0.17 mile of perennial streams, 1.05 miles of intermittent streams, 0.08 mile of major waterbodies, and 0.49 acre of reservoirs, lakes, and ponds (Table 3.15-5). Potential impacts associated with construction of AC Collection System Route W-1 would be the same as those common impacts described in Section 3.15.6.1.

3.15.6.2.2.2 Operations and Maintenance Impacts

Operations and maintenance of AC collection system routes would not impact surface water. During operations and maintenance, no notable sources of contaminants would be in use other than the typical fuels and lubricants found in vehicles and equipment, herbicides used to maintain ROWs and access roads would be applied in accordance with label instructions and any federal, state, and local regulations to minimize the potential for spreading, and no soil disturbance would occur. Access roads developed during construction would be maintained as needed to support long-term operations and maintenance actions.

3.15.6.2.2.3 Decommissioning Impacts

Decommissioning of AC collection system lines would be expected to have impacts similar to those described in Section 3.15.6.1 for common construction activities, i.e., the same types of measures would be required to manage the fuels and lubricants that would be present in equipment and actions to protect stormwater runoff at the site would ensure that contaminants did not reach surface water. Decommissioning actions may require larger equipment than required during typical operation and maintenance activities. As a result, access to some areas may need to be improved or even re-established and, as during construction, could involve direct disturbances to surface water or drainage channels. Water demand during decommissioning would be limited to that needed for actions such as dust suppression, soil compaction, and possibly re-seeding or landscaping to put the ground back into suitable condition and would be expected to be less than for construction and would not adversely impact surface water resources.

3.15.6.2.3 HVDC Applicant Proposed Route

3.15.6.2.3.1 Construction Impacts

This section addresses potential impacts from construction of the HVDC transmission line within each of the seven regions of the Applicant Proposed Route. The surface water features described in each region are those located within a 200-foot-wide representative ROW of the Applicant Proposed Route. Surface water features and elements within the ROWs were presented in the regional discussions of Section 3.15.5 along with the information for the 1,000-foot-wide ROI.

Common to construction in all of the regions and as described in Section 3.15.6.1.3, the Applicant would avoid surface waters to the extent practicable in selecting the sites for transmission line structures, but access roads may have to cross surface drainage features. If an access road required a new crossing over any of the impaired streams in any of the regions, or if construction sites were close enough to contribute stormwater runoff to these streams, there would be additional requirements to ensure no adverse impacts to water quality. For example, the Oklahoma, Arkansas, and Tennessee general NPDES stormwater construction permits each include additional requirements for construction actions that could involve stormwater runoff to impaired waters as follows:

- Oklahoma's added requirements include an increased frequency for inspections as well as protective measure planning that is specific to the surface water and contaminants of concern (ODEQ 2012).
- Arkansas' added requirements include consideration of additional BMPs to address specific contaminants of concern and additional monitoring to ensure the BMPs are effective (ADEQ 2011).
- Tennessee's added requirements include an increased width of the required buffer zone, design of structures against a greater intensity storm, and specific training requirements for the preparer of the operator's SWPPP (TDWPC 2011).

3.15.6.2.3.1.1 Region 1

As shown in Table 3.15-4, the 200-foot-wide ROW of the Applicant Proposed Route in Region 1 encompasses 0.86 mile of perennial streams, 5.92 miles of intermittent streams, 0.03 mile of major waterbodies, and 9.9 acres of reservoirs, lakes, and ponds. The only federal or state surface water designations of special interest in Region 1 are those identified by the state of Oklahoma as impaired waters. The five impaired waters within the ROW of the Applicant Proposed Route are Palo Duro Creek, Kiowa Creek, Beaver River, Clear Creek, and Otter Creek (Table 3.15-6). With the added requirements if impaired waters were to be affected, potential impacts associated with construction of the Applicant Proposed Route in Region 1 would be the same as those common impacts described in Section 3.15.6.1. Groundwater is the predominant source of water in the four-county area of Region 1, so water to support construction of the transmission line, although expected to be obtained from a municipal provider, would likely not come from surface water.

3.15.6.2.3.1.2 Region 2

The 200-foot-wide ROW of the Applicant Proposed Route in Region 2 encompasses 1.43 miles of perennial streams, 3.75 miles of intermittent streams, 0.01 mile of major waterbodies, and 1.9 acres of reservoirs, lakes, and ponds (Table 3.15-8). Federal or state surface water designations of special interest in Region 2 consist of the Cimarron River, designated as critical habitat by both the USFWS and the state of Oklahoma (Table 3.15-9), and several streams identified by the state of Oklahoma as impaired waters. Four impaired waters occur within the ROW of the Applicant Proposed Route in Region 2: East Griever Creek, Cimarron River, Turkey Creek, and Buffalo Creek (Table 3.15-10). With the added requirements if impaired waters were to be affected, potential impacts associated with construction of the Applicant Proposed Route in Region 2 would be the same as those common impacts described in Section 3.15.6.1. Groundwater is the predominant source of water in the three-county area of Region 2, so water to support construction of the transmission line, although expected to be obtained from a municipal provider, would likely not come from surface water.

3.15.6.2.3.1.3 Region 3

The 200-foot-wide ROW of the Applicant Proposed Route in Region 3 encompasses 10.45 miles of perennial streams, 7.75 miles of intermittent streams, 0.15 mile of major waterbodies, and 39.5 acres of reservoirs, lakes, and ponds (Table 3.15-12). As indicated in Section 3.15.5.3.2, there are many small dams and reservoirs in areas of Region 3, which have been captured, as applicable, in the acreage of reservoirs, lakes, and ponds and possibly miles of major waterbodies. Because of their relatively small size, it is expected these features would be easily avoided by transmission line structures and access roads. Federal or state surface water designations of special interest in the Region 3 ROW include the source or watershed protection area for Cushing Lake (Table 3.15-13), which is used as a source for drinking water. The ROW only passes through the special provision watershed of Cushing Lake. The Region 3 ROW of the Applicant Proposed Route also encompasses eight streams identified by the state of Oklahoma as impaired waters: Skeleton Creek, Cimarron River, Stillwater Creek, West Spring Creek, Browns Creek, Begger Creek, Salt Creek, and Adams Creek (Table 3.15-14). With the added requirements if impaired waters were to be affected, potential impacts associated with construction of the Applicant Proposed Route in Region 3 would be the same as those common impacts described in Section 3.15.6.1. Surface water is the predominant source of water in the eight-county area of Region 3, but groundwater use is also notable, so water to support construction of the transmission line, although expected to be obtained from a municipal provider, could come from both surface water and groundwater.

3.15.6.2.3.1.4 Region 4

As shown in Table 3.15-16, the 200-foot-wide ROW of the Applicant Proposed Route in Region 4 encompasses 3.5 miles of perennial streams, 8.96 miles of intermittent streams, 0.24 mile of major waterbodies, and 16.1 acres of reservoirs, lakes, and ponds. As noted for Region 3, the small dams and reservoirs in the western portion of Region 4 (Section 3.15.5.4.2), are captured, as applicable, in the acreage of reservoirs, lakes, and ponds and possibly miles of major waterbodies and would be easily avoided by transmission line structures and access roads. Region 4 of the transmission line route includes a large number of surface waters with designations of special interest as shown in Table 3.15-17. Rather than attempting to identify each of the surface water features of interest that could be affected by construction, this discussion simply identifies the number of features along the route being discussed and the number of designations involved; Table 3.15-17 can be consulted for additional detail. Federal or state surface water designations of special interest within the ROW of the Applicant Proposed Route in Region 4 includes eight surface waters with a total of 14 designations plus three non-specific source water protection areas. Three of the surface waters (the Arkansas, Lower Illinois, and Mulberry rivers) are designated Section 10 Navigable Waters and, as indicated in Table 3.15-1, any action involving dredging or filling or any other obstruction or alteration of these rivers would require a permit from the USACE; requirements under Section 404 of the CWA would also be applicable. Section 10 Navigable Waters are also addressed in Section 3.19.

As noted in Section 3.15.5.4.2, the Lee Creek Variation within the Applicant Proposed Route avoids the 300-foot buffer zone established around Lee Creek Reservoir by the city of Fort Smith, which is one of the special designations considered in the preceding paragraph.

The ROW of the Applicant Proposed Route also encompasses three streams identified by the state as impaired waters: Sallisaw, Little Sallisaw, and Lee creeks, all in Oklahoma. With the added requirements if impaired waters were to be affected, potential impacts associated with construction of the Applicant Proposed Route in Region 4 would be the same as those common impacts described in Section 3.15.6.1. Surface water is the predominant source of water in the six-county area of Region 4, so water to support construction of the transmission line, although expected to be obtained from a municipal provider, would likely come from surface water.

3.15.6.2.3.1.5 Region 5

The 200-foot-wide ROW of the Applicant Proposed Route in Region 5 encompasses 2.16 miles of perennial streams, 9.32 miles of intermittent streams, 0.24 mile of major waterbodies, and 17.3 acres of reservoirs, lakes, and ponds (Table 3.15-20). Federal or state surface water designations of special interest within the ROW of the Region 5 Applicant Proposed Route includes four specific surface waters (Illinois Bayou, Cadron Creek, Little Red River, and White River) with five designations as shown in Table 3.15-21 and two non-specific source water protection areas. Since the White River is designated a Section 10 Navigable Water, any action involving dredging or filling or any other obstruction or alteration of this river would require a permit from the USACE; requirements under Section 404 of the CWA would also be applicable (Table 3.15-1). The ROW of the Applicant Proposed Route in Region 5 also encompasses six streams identified by the state as impaired waters: West Fork Point Remove Creek, East Fork Point Remove Creek, Little Red River, Ten Mile Creek, Glaise Creek, and Departee Creek (Table 3.15-22). With the added requirements if impaired waters were to be affected, potential impacts associated with construction of the Applicant Proposed Route in Region 5 would be the same as those common impacts described in Section 3.15.6.1. Surface water is the predominant source of water in the seven-county area of Region 5, but groundwater use is also notable, so water to support construction of the transmission line, although expected to be obtained from a municipal provider, could come from surface water or groundwater.

3.15.6.2.3.1.6 Region 6

The 200-foot-wide corridor of the Applicant Proposed Route in Region 6 encompasses 0.83 mile of perennial streams, 3.48 miles of intermittent streams, 0.2 mile of major waterbodies, and 5.2 acres of reservoirs, lakes, and ponds (Table 3.15-24). Federal or state surface water designations of special interest within the ROW of the Applicant Proposed Route in Region 6 include only the L'Anguille River, which is on the Nationwide Rivers Inventory (Table 3.15-25). The ROW of the Applicant Proposed Route also encompasses three streams identified by the state as impaired waters: Cache River, Bayou DeView, and L'Anguille River (Table 3.15-26). With the added requirements if impaired waters were to be affected, potential impacts associated with construction of the Applicant Proposed Route in Region 6 would be the same as those common impacts described in Section 3.15.6.1. Groundwater is the predominant source of water used in the three-county area of Region 6, so water to support construction of the transmission line, although expected to be obtained from a municipal provider, would likely not come from surface water.

3.15.6.2.3.1.7 Region 7

The 200-foot-wide ROW of the Applicant Proposed Route in Region 7 encompasses 0.54 mile of perennial streams, 4.3 miles of intermittent streams, 0.64 mile of major waterbodies, and 2.4 acres of reservoirs, lakes, and ponds (Table 3.15-28). Federal or state surface water designations of special interest within the corridor of the Applicant Proposed Route include two surface waters, St. Francis River and Mississippi River, and three designations (Table 3.15-29). Because of the Section 10 Navigable Waters designation on both these rivers, any action involving dredging or filling or any other obstruction or alteration would require a permit from the USACE; requirements under Section 404 of the CWA would also be applicable (Table 3.15-1). The ROW of the Applicant Proposed Route in Region 7 also encompasses one stream in Arkansas and four streams in Tennessee identified as impaired waters: Tyronza River, Mississippi River, Royster Creek, North Fork Creek, and Big Creek (Table 3.15-30). With the added requirements if impaired waters were to be affected, potential impacts associated with construction of the Applicant Proposed Route in Region 7 would be the same as those common impacts described in Section 3.15.6.1. Groundwater is the predominant source of water used in the four-county area of Region 7, so water to support construction of the transmission line, although expected to be obtained from a municipal provider, would likely not come from surface water.

3.15.6.2.3.2 Operations and Maintenance Impacts

Operations and maintenance of the HVDC transmission line in Regions 1 through 7, using the Applicant Proposed Route, would not impact surface water. During operations and maintenance, no notable sources of contaminants would be in use other than the typical fuels and lubricants found in vehicles and equipment; herbicides used to maintain ROWs and access roads would be applied in accordance with label instructions and any federal, state, and local regulations to minimize the potential for spreading; no soil disturbance would occur; and water needs would be limited to personal needs of the few workers that would be associated with maintenance of facilities and equipment. Access roads developed during construction would be maintained as needed to support long-term operations and maintenance actions.

3.15.6.2.3.3 Decommissioning Impacts

Decommissioning of HVDC transmission lines would be expected to have impacts similar to those described in Section 3.15.6.1 for common construction activities. The same types of measures would be required to manage the fuels and lubricants that would be present in equipment and actions to protect stormwater runoff at the site would ensure that contaminants did not reach surface water. Decommissioning actions may require larger equipment than required during typical operation and maintenance activities. As a result, access to some areas may need to be improved or even re-established and, as during construction, could involve direct disturbances to surface water or drainage channels. Water demand during decommissioning would be limited to that needed for actions such as dust suppression, soil compaction, and possibly re-seeding or landscaping to put the ground back into suitable condition. Water demand would be less than for construction and would not adversely impact surface water resources.

3.15.6.3 Impacts Associated with the DOE Alternatives

3.15.6.3.1 Arkansas Converter Station Alternative Siting Area and AC Interconnection Siting Area

3.15.6.3.1.1 Construction Impacts

The siting area for the Arkansas alternative converter station and AC interconnection is large with many drainage features, including 12.82 miles of perennial streams and about 57.88 miles of intermittent streams, but no major waterbodies. The 200-foot representative ROW for the AC interconnection would encompass 0.04 mile of perennial streams and 0.3 mile of intermittent streams. Although the siting area for the Arkansas converter station is larger than that considered for the previously discussed Oklahoma and Tennessee converter stations, the ultimate footprint of the Arkansas station, if constructed, would be similar to the other stations. As indicated previously, the Applicant would avoid surface waters to the extent practicable in selecting the ultimate construction site for the station. Potential impacts associated with construction of the station and the AC interconnection line would be the same as those common impacts described in Section 3.15.6.1. Surface water is the predominant source of water in both Pope and Conway counties, where the siting area is located, so water to support construction of the converter station and interconnection transmission line would likely come from surface water even though it is expected to be obtained from a municipal provider.

3.15.6.3.1.2 Operations and Maintenance Impacts

Operations and maintenance of the Arkansas converter station basically would be the same as described in Section 3.15.6.2.1.2 for the Oklahoma and Tennessee converter stations. The public water systems in the region predominantly use surface water (Table 3.7-15).

3.15.6.3.1.3 Decommissioning Impacts

Decommissioning of the Arkansas converter station and the associated AC interconnection line would be as described in Section 3.15.6.2.1 for the Oklahoma and Tennessee stations.

3.15.6.3.2 HVDC Alternative Routes

3.15.6.3.2.1 Construction Impacts

This section addresses potential impacts from construction of transmission line along HVDC alternative routes within each of the seven regions of the Project. The surface water features described in each region are those located within a 200-wide representative ROW of the HVDC alternative routes. Surface water features and elements within the ROWs were presented in the regional discussions of Section 3.15.5 along with the information for the corresponding 1,000-foot-wide ROI.

The same considerations described for the Applicant Proposed Route in Section 3.15.6.2.3.1 would be applicable to the HVDC alternative routes. That is, the same considerations of avoiding surface waters to the extent practicable, the potential need for access roads to cross surface drainage features, and the additional stormwater runoff control measures needed if impaired waters could be affected would be applicable to the HVDC alternative routes.

3.15.6.3.2.1.1 Region 1

Table 3.15-4, provides the miles of perennial streams, intermittent streams, and major waterbodies that would be crossed by the 200-foot-wide ROWs of HVDC Alternative Routes 1-A, 1-B, 1-C, and 1-D. Table 3.15-4 also provides the acreage of reservoirs, lakes, and ponds within each of the ROWs. As shown in the table, the ROWs of the HVDC alternative routes would contain the following in comparison to the corresponding links of the Applicant Proposed Route.

- Perennial streams—1-A, 1-B, and 1-C would encompass smaller amounts (by 0.11, 0.2, and 0.1 mile, respectively) and 1-D would encompass the same amount
- Intermittent streams—1-A, 1-B, and 1-C would encompass greater amounts (by 2.69, 0.59, and 0.22 miles, respectively) and 1-D would encompass a smaller amount (by 0.33 mile)
- Major Waterbodies—1-A and 1-C would encompass greater amounts (both by 0.01 mile), 1-B would encompass a smaller amount (by 0.02 mile), and 1-D would encompass the same amount
- Reservoirs, Lakes, and Ponds—1-A, 1-B, 1-C, and 1-D would encompass smaller amounts (by 3.1, 6.1, 6.0, and 0.8 acres, respectively)

No surface waters within the Region 1 ROI have federal or state classifications of special interest other than those identified as having impaired water quality. As shown in Table 3.15-6, Region 1 of the Applicant Proposed Route would contain six surface water segments identified by the state of Oklahoma as having impaired water quality: Palo Duro Creek, Kiowa Creek, Beaver River, Clear Creek, Otter Creek, and Sand Creek. These six impaired waters would also be crossed the corresponding HVDC alternative routes, except that HVDC Alternative Route 1-A would avoid Clear Creek and Otter Creek. However, 1-A would cross an additional impaired water, Sand Creek, which would not be crossed by any of the other Region 1 HVDC transmission line routes.

Groundwater is the predominant source of water in the four-county area of Region 1, so water to support construction of the transmission line, although expected to be obtained from a municipal provider, would likely not come from surface water. Potential impacts associated with construction of an HVDC alternative route in Region 1 would be the same as those common impacts described in Section 3.15.6.1.

3.15.6.3.2.1.2 Region 2

Table 3.15-8, provides the miles of perennial streams, intermittent streams, and major waterbodies that would be crossed by the 200-foot-wide ROWs of HVDC Alternative Routes 2-A and 2-B. Table 3.15-8 also provides the acreage of reservoirs, lakes, and ponds within each of the ROWs. As shown in the table, the ROWs of the HVDC alternative routes would contain the following in comparison to the corresponding links of the Applicant Proposed Route:

- Perennial streams—2-A and 2-B would encompass greater amounts (by 2.03 and 0.38 mile, respectively)
- Intermittent streams—2-A and 2-B would encompass smaller amounts (by 1.22 and 0.6 mile, respectively)
- Major Waterbodies—2-A would encompass a greater amount (by 0.04 mile) and 2-B would encompass the same amount
- Reservoirs, Lakes, and Ponds—2-A and 2-B would encompass greater amounts (by 5.7 and 0.5 acres, respectively)

As shown in Table 3.15-9, the Cimarron River is the only surface water within the Region 2 ROI that has federal or state classifications of special interest other than those identified as having impaired water quality. The Cimarron River, which is within the 200-foot ROW of both the Applicant Proposed Route and HVDC Alternative Route 2-A, has a USFWS designation of critical habitat and an Oklahoma designation as a water of recreational and/or ecological significance. As shown in Table 3.15-10, the Applicant Proposed Route in Region 2 would cross four surface water segments identified by the state of Oklahoma as having impaired water quality: East Griever Creek, Cimarron River, Turkey Creek, and Buffalo Creek. These four also would be crossed by the corresponding HVDC alternative routes. However, 2-A would cross three additional impaired waters; Main Creek, Griever Creek, and Cottonwood Creek, which would not be crossed any of the other Region 2 HVDC transmission line routes.

Groundwater is the predominant source of water in the three-county area of Region 2, so water to support construction of the transmission line, although expected to be obtained from a municipal provider, would likely not come from surface water. Potential impacts associated with construction of an HVDC alternative route in Region 2 would be the same as those common impacts described in Section 3.15.6.1.

3.15.6.3.2.1.3 Region 3

Table 3.15-12 provides the miles of perennial streams, intermittent streams, and major waterbodies that would be crossed by the 200-foot-wide ROW of HVDC Alternative Routes 3-A through 3-E. Table 3.15-12 also provides the acreage of reservoirs, lakes, and ponds within each of the ROWs. As shown in the table, the ROWs of the HVDC alternative routes would contain the following in comparison to the corresponding links of the Applicant Proposed Route:

- Perennial streams—3-A, 3-B, and 3-E would encompass greater amounts (by 0.87, 0.62 and 0.06 mile, respectively) and 3-C and 3-D would encompass smaller amounts (by 1.66 and 1.13 miles, respectively)
- Intermittent streams—3-A and 3-B encompass smaller amounts (both by 0.76 mile) and 3-C, 3-D, and 3-E would encompass greater amounts (by 3.18, 2.27, and 0.74 miles, respectively)
- Major Waterbodies—3-A, 3-B, 3-C, and 3-D would encompass smaller amounts (by 0.02, 0.03, 0.02, and 0.01 mile, respectively) and 3-E would encompass the same amount
- Reservoirs, Lakes, and Ponds—3-A, 3-B, and 3-D would encompass greater amounts (by 5.6, 6.0, and 2.0 acres, respectively) and 3-C and 3-E would encompass smaller amounts (11.9 and 0.2 acres, respectively)

As shown in Table 3.15-13, Lake Carl Blackwell and Cushing Lake are the surface waters within the Region 3 ROI that have federal or state classifications of special interest other than those identified as having impaired water quality. Oklahoma classifies both lakes as special provision watersheds for sensitive public and private water supplies; the state also designates Lake Carl Blackwell as a source water protection area. The special provision watershed of Cushing Lake is within the 200-foot ROW of both the Applicant Proposed Route and the corresponding HVDC Alternative Route (i.e., 3-C) and the watershed of Carl Blackwell is only within the ROWs of HVDC Alternative Routes 3-A and 3-B.

As shown in Table 3.15-14, the Applicant Proposed Route in Region 3 would cross eight streams identified by the state of Oklahoma as impaired waters: Skeleton Creek, Cimarron River, Stillwater Creek, West Spring Creek, Browns Creek, Begger Creek, Salt Creek, and Adams Creek. Of those eight, HVDC Alternative Routes 3-A and 3-B would avoid Skeleton Creek and 3-C would avoid West Spring Creek and Begger Creek; the other five would be crossed by corresponding alternative routes. However, several of the HVDC alternative routes would cross additional impaired waters that would not be crossed by the Applicant Proposed Route: 3-A/3-B would cross West Beaver Creek, 3-B would cross Stillwater Creek, 3-C would cross Little Deep Fork Creek, and 3-C/3-D would cross Butler Creek.

Surface water is the predominant source of water in the eight-county area of Region 3, but groundwater use is also notable, so water to support construction of the transmission line, although expected to be obtained from a municipal provider, could come from both surface water and groundwater. Potential impacts associated with construction of an HVDC alternative route in Region 3 would be the same as those common impacts described in Section 3.15.6.1.

3.15.6.3.2.1.4 Region 4

Table 3.15-16 provides the miles of perennial streams, intermittent streams, and major waterbodies that would be crossed by the 200-foot-wide ROWs of HVDC Alternative Routes 4-A through 4-E. Table 3.15-16 also provides the acreage of reservoirs, lakes, and ponds within each of the ROWs. As shown in the table, the ROWs of the HVDC alternative routes would contain the following in comparison to the corresponding l of the HVDC Applicant Proposed Route:

- Perennial streams—4-A, 4-B, 4-D, and 4-E would encompass smaller amounts (by 0.36, 0.92, 0.62, and 0.37 mile, respectively) and 4-C would encompass a greater amount (by 0.16 mile)
- Intermittent streams—4-A, 4-B, 4-D, and 4-E would encompass greater amounts (by 0.4, 1.17, 0.84 and 0.92 mile, respectively) and 4-C would encompass a smaller amount (by 0.16 mile)
- Major Waterbodies—4-A, 4-B, and 4-D would encompass smaller amounts (by 0.05, 0.06, and 0.08 mile, respectively), and 4-C would encompass the same amount, and 4-E would encompass a greater amount (by 0.08 mile)
- Reservoirs, Lakes, and Ponds—4-A, 4-C, 4-D, and 4-E would encompass greater amounts (by 1.1, 0.5, 0.2, and 4.3 acres, respectively) and 4-B would encompass a smaller amount (by 2.6 acres)

Region 4 of the HVDC transmission line route includes a large number of surface waters with designations of special interest as shown in Table 3.15-17. The table lists 11 named surface water features, many with multiple designations, and 6 non-specific (not publicly available) source water protection areas. Of those table listings, the ROW of the Applicant Proposed Route would encompass eight named surface water features and three non-specific source water protection areas. Compared to features along the Applicant Proposed Route:

- HVDC Alternative Routes 4-A/4-B would avoid two (Briar Creek and Lee Creek Reservoir) but would encompass three (Brushy Creek, Little Lee Creek, and the portion of Lee Creek that is an Oklahoma Scenic River) additional features.
- HVDC Alternative Route 4-A would encompass Webbers Creek.
- HVDC Alternative Route 4-B would encompass Lee Creek where it is an Arkansas extraordinary resource water.
- HVDC Alternative Routes 4-A, 4-B, 4-D would encompass two non-specific source water protection areas.
- HVDC Alternative Route 4-E would encompass a non-specific source water protection area.

HVDC Alternative Route 4-B and the corresponding Link 7 of the Applicant Proposed Route would cross the Mulberry River, which is designated a Section 10 Navigable Water and, as indicated in Table 3.15-1, any action involving dredging or filling or any other obstruction or alteration of these rivers would require a permit from the USACE; requirements under Section 404 of the CWA would also be applicable.

As shown in Table 3.15-18, the Applicant Proposed Route in Region 4 would cross three streams identified by the state of Oklahoma as having impaired water quality: Sallisaw Creek, Little Sallisaw Creek, and Lee Creek. Of those three, each would be crossed by corresponding alternative routes (specifically 4-A and 4-B). HVDC Alternative Routes 4-A and 4-B would also cross an additional impaired stream, Little Lee Creek, that would not be crossed by the Applicant Proposed Route.

Surface water is the predominant source of water in the six-county area of Region 4, so water to support construction of the transmission line, although expected to be obtained from a municipal provider, would likely come from surface water. Potential impacts associated with construction of an HVDC alternative route in Region 4 would be the same as those common impacts described in Section 3.15.6.1.

3.15.6.3.2.1.5 Region 5

Table 3.15-20 provides the miles of perennial streams, intermittent streams, and major waterbodies that would be crossed by the 200-foot-wide ROWs of HVDC Alternative Routes 5-A through 5-F. Table 3.15-20 also provides the acreage of reservoirs, lakes, and ponds within each of the ROWs. As shown in the table, the ROWs of the HVDC alternative routes would contain the following in comparison to the corresponding links of the Applicant Proposed Route:

- Perennial streams—5-A, 5-C, and 5-F would encompass smaller amounts (by 0.18, 0.08, and 0.01 mile, respectively) and 5-B, 5-D, and 5-E would encompass greater amounts (by 0.18, 0.02, and 0.09 mile, respectively)
- Intermittent streams—5-A, 5-B, 5-D, 5-E and 5-F would encompass greater amounts (by 0.33, 2.0, 0.3, 0.99, and 0.46 miles, respectively) and 5-C would encompass a smaller amount (by 0.14 mile)
- Major Waterbodies—5-A, 5-E, and 5-F would encompass the same amount, 5-B and 5-C would encompass greater amounts (by 0.02 and 0.01, respectively), and 5-D would encompass a smaller amount (by 0.01)
- Reservoirs, Lakes, and Ponds—5-A, 5-B, 5-C, 5-D, 5-E, and 5-F would all encompass greater amounts (by 0.4, 3.4, 1.0, 0.4, 3.8, and 2.7 acres, respectively)

As shown in Table 3.15-21, there are six specific surface waters within the Region 5 ROI that have federal or state classifications of special interest and two non-specific (not publicly available) source water protection areas. The ROW of the Applicant Proposed Route would encompass four of specific surface waters (Illinois Bayou, Cadron Creek, Little Red River, and White River) as well as both of the non-specific source water protection areas, and these same items would be encompassed by corresponding HVDC alternative routes. The remaining two specific surface waters in Table 3.15-21 are East Fork Cadron Creek, which would be encompassed by 5-B/5-E/5-F, and Departee Creek, which would be encompassed by 5-D. HVDC Alternative Route 5-D would cross the White River, which is designated as Section 10 Navigable Waters and, as indicated in Table 3.15-1, any action involving dredging or filling or any other obstruction or alteration of this river would require a permit from the USACE; requirements under Section 404 of the CWA would also be applicable.

Table 3.15-22 identifies the seven Region 5 surface waters identified by the state of Arkansas as having impaired water quality: West Fork Point Remove Creek, East Fork Point Remove Creek, Cypress Creek, Little Red River, Ten Mile Creek, Glaise Creek, and Departee Creek. Of these seven streams, the first six listed would be encompassed by both the Applicant Proposed Route and a corresponding HVDC alternative route. Cypress Creek would be encompassed only by HVDC Alternative Route 5-B.

Surface water is the predominant source of water in the seven-county area of Region 5, but groundwater use is also notable, so water to support construction of the transmission line, although expected to be obtained from a municipal provider, could come from surface water or groundwater. Potential impacts associated with construction of an HVDC alternative route in Region 5 would be the same as those common impacts described in Section 3.15.6.1.

3.15.6.3.2.1.6 Region 6

Table 3.15-24 provides the miles of perennial streams, intermittent streams, and major waterbodies that would be crossed by the 200-foot-wide ROWs of HVDC Alternative Routes 6-A through 6-D. Table 3.15-24 also provides the acreage of reservoirs, lakes, and ponds within each of the ROWs. As shown in the table, the ROWs of the HVDC alternative routes would contain the following in comparison to the corresponding links of the Applicant Proposed Route:

- Perennial streams—6-A would encompass a smaller amount (by 0.06 mile) and 6-B, 6-C, and 6-D would encompass greater amounts (by 0.02, 0.1, and 0.13 mile, respectively)
- Intermittent streams—6-A would encompass the same amount, 6-B would encompass a smaller amount (by 0.45 mile) and 6-C and 6-D would encompass greater amounts (by 0.02 and 0.14 mile, respectively)
- Major Waterbodies—6-A would encompass the same amount and 6-B, 6-C, and 6-D would encompass smaller amounts (by 0.02, 0.05, and0.04 mile, respectively)
- Reservoirs, Lakes, and Ponds—6-A would encompass a smaller amount (by 1.5 acres), 6-B and 6-C would encompass greater amounts (both by 1.5 acres), and 6-D would encompass the same amount

As shown in Table 3.15-25, the L'Anguille River is the only surface water within the Region 6 ROI that has federal or state classifications of special interest other than those identified as having impaired water quality. The portion of the L'Anguille River that is in the National Rivers Inventory runs south from the Poinsett-Cross county line, so the ROW of HVDC Alternative Route 6-C avoids the designated section of the river. Table 3.15-26 lists the three surface water segments in Region 6 that are identified by the state of Arkansas as having impaired water quality: Cache River, Bayou DeView, and the L'Anguille River. All three of the impaired waters are encompassed by the Applicant Proposed Route and the corresponding HVDC alternative routes.

Groundwater is the predominant source of water used in the three-county area of Region 6, so water to support construction of the transmission line, although expected to be obtained from a municipal provider, would likely not come from surface water. Potential impacts associated with construction of an HVDC alternative route in Region 6 would be the same as those common impacts described in Section 3.15.6.1.

3.15.6.3.2.1.7 Region 7

Table 3.15-28 provides the miles of perennial streams, intermittent streams, and major waterbodies that would be crossed by the 200-foot-wide ROWs of HVDC Alternative Routes 7-A through 7-D. Table 3.15-28 also provides the acreage of reservoirs, lakes, and ponds within each of the ROWs. As shown in the table, the ROWs of the HVDC alternative routes would contain the following in comparison to the corresponding links of the Applicant Proposed Route:

- Perennial streams—7-A, 7-C, and 7-D would encompass greater amounts (by 1.47, 0.15, and 0.22 miles, respectively) and 7-B would encompass a smaller amount (by 0.01 mile)

- Intermittent streams—7-A and 7-C would encompass greater amounts (by 2.0 and 0.32 miles, respectively), and 7-B and 7-D would encompass smaller amounts (by 0.21 and 0.08 mile, respectively)
- Major Waterbodies—7-A and 7-C would encompass greater amounts (by 0.26 and 0.01 mile, respectively) and 7-B and 7-D would encompass the same amount
- Reservoirs, Lakes, and Ponds—7-A would encompass a greater amount (by 0.9 acre), 7-B and 7-D would encompass smaller amounts (by 0.1 and 0.8 acre, respectively), and 7-C would encompass the same amount

As shown in Table 3.15-29, the St. Francis River and the Mississippi River are the only surface waters within the Region 7 ROI that have federal or state classifications of special interest other than those identified as having impaired water quality. Both rivers would be crossed by HVDC Alternative Route 7-A and Link 1 of the Applicant Proposed Route. Also as shown in Table 3.15-29, both rivers are designated Navigable Waters of the U.S and the Mississippi River is also designated an exceptional Tennessee Water. Because the Region 7 alternatives would cross two surface waters designated as Section 10 Navigable Waters, any action involving dredging or filling or any other obstruction or alteration of these rivers would require a permit from the USACE as indicated in Table 3.15-1; requirements under Section 404 of the CWA would also be applicable.

Table 3.15-30 identifies the five Region 7 surface waters identified by the state of Arkansas or the state of Tennessee as having impaired water quality: Tyronza River in Arkansas; and Mississippi River, Royster Creek, Big Creek, and North Fork Creek in Tennessee. Also as shown in Table 3.15-30, the state identifies eight different stream segments for these five streams that are within the 200-foot wide ROWs of the HVDC transmission line routes. Although crossings may be over different segments of the same stream, both the Applicant Proposed Route and corresponding HVDC alternative routes would encompass each stream.

Groundwater is the predominant source of water used in the four-county area of Region 7, so water to support construction of the transmission line, although expected to be obtained from a municipal provider, would likely not come from surface water. Potential impacts associated with construction of an HVDC alternative route in Region 7 would be the same as those common impacts described in Section 3.15.6.1.

3.15.6.3.2.2 Operations and Maintenance Impacts

Operations and maintenance of an HVDC transmission line in Regions 1 through 7, using any of the HVDC alternative routes, would not impact surface water. During operations and maintenance, no notable sources of contaminants would be in use other than the typical fuels and lubricants found in vehicles and equipment, herbicides used to maintain ROWs and access roads would be applied in accordance with label instructions and any federal, state, and local regulations to minimize the potential for spreading, no soil disturbance would occur, and water needs would be limited to personal needs of the few workers that would be associated with maintenance of facilities and equipment. Access roads developed during construction would be maintained as needed to support long-term operations and maintenance actions.

3.15.6.3.2.3 Decommissioning Impacts

Decommissioning of HVDC transmission lines with the Applicant Proposed Route or any of the HVDC alternative routes, would be expected to have impacts similar to those described in Section 3.15.6.1 for common construction activities, i.e., the same types of measures would be required to manage the fuel and lubricants that would be present in equipment and actions to protect stormwater runoff at the site would ensure that contaminants did not reach surface water. Decommissioning actions may require larger equipment than required during typical operation and maintenance activities. As a result, access to some areas may need to be improved or even re-established and, as during construction, could involve direct disturbances to surface water or drainage channels. Water demand during decommissioning would be limited to that needed for actions such as dust suppression, soil compaction, and possibly re-seeding or landscaping to put the ground back into suitable condition. Water demand would be less than for construction and would not adversely impact surface water resources.

3.15.6.4 Best Management Practices

The Applicant has developed a comprehensive list of EPMs that would avoid and minimize impacts to surface water. A complete list of EPMs for the Project is provided in Appendix F; those EPMs that would minimize: (1) the potential for contamination to reach surface water, (2) changes to stormwater runoff or drainage patterns, and (3) direct, physical impacts to surface water features or restrictions on the use of a surface water are summarized in Section 3.15.6.1.5. The EPMs are comprehensive enough to avoid or minimize potential adverse impacts to surface water. DOE has therefore not identified any additional surface-water-related BMPs.

3.15.6.5 Unavoidable Adverse Impacts

Proper construction practices and measures, including those necessary to meet regulatory requirements and those protective measures proposed by the Applicant, should minimize adverse impacts to surface waters. In spite of these measures, adverse impacts to surface water resources, although minor, would still be likely. Construction and operations and maintenance of the Project would require a moderate level of water use, and some access roads would likely traverse through or over stream channels.

Sediment-laden runoff from a construction site could occur and could have adverse effects on a receiving water. The construction general permit for stormwater discharges would minimize the potential for such incidents and would keep potential adverse impacts to these surface waters to a minimum.

3.15.6.6 Irreversible and Irretrievable Commitment of Resources

The Project would involve a commitment of surface water resources, but at least to some extent, those resources would be replenished by cyclic precipitation and snow melt. The commitment of surface water resources would be irreversible in that it would limit, in the short term, future options for use of that resource. Over time, however, the amounts of water used to support construction would be expected to have a negligible effect on surface water resources. In other words, the surface water resource would be renewable or recoverable, so the commitment would not be considered irretrievable.

3.15.6.7 Relationship between Local Short-term Uses and Long-term Productivity

Surface water required to support the Project would represent a new, short-term use of the resource, but would have negligible effect on its long-term productivity. Any alterations to streambeds required by access road construction would have short term impacts on the altered segment of stream, but over time the impacts would be expected to fade as natural flora and fauna re-established and the impacted stream segments would be small.

3.15.6.8 Impacts from Connected Actions

3.15.6.8.1 Wind Energy Generation

3.15.6.8.1.1 Construction Impacts

Construction of wind farms in the Oklahoma and Texas panhandle areas would be expected to involve potential impacts to surface waters similar to those described in Section 3.15.6.1 for common construction activities. Sources of contamination, primarily in the form of fuels and lubricants, would be present at construction sites and at associated construction staging and storage yards. Soils in construction areas, access routes, and support areas would be disturbed and, for at least some period of time, would be expected to experience changes in stormwater runoff rates as compared to undisturbed conditions. Construction actions, particularly for access roads, could result in direct disturbances of surface waters or drainage channels. Water needs to support construction activities could affect the availability of surface water resources for other users in the region.

The surface water features that could be affected by construction or that could alter construction approaches due to added requirements are presented in Section 3.15.5.8.1 by WDZ. All of the WDZs contain various lengths of perennial and intermittent streams as well as various areas of reservoirs, lakes, and ponds (Table 3.15-32). Beaver River in WDZ D and Wolf Creek in WDZ L are the only surface water segments of special interest in any of the WDZs (Table 3.15-33). Segments of Beaver River in WDZ-F and -J and a segment of Palo Duro Creek in WDZ J are the only impaired waters in any of the WDZs (Table 3.5-34). Although there are differences in surface water features between the WDZs, DOE has no way of predicting precisely where wind farms might be constructed within the WDZs and, therefore, cannot address whether those features would be of concern to a specific wind farm action. Further, it is estimated that only 20 to 30 percent of any WDZ would actually be included within wind farms and the nature of wind farms is that large areas are required, but only relatively small areas are physically impacted. As a result, wind farm design would be expected to have flexibility on where roads and facilities were placed and what locations, specifically those with environmental concerns, could be avoided. Because of these factors, DOE has not identified potential surface water impacts for individual WDZs; rather the discussion that follows provides more detail on the typical impacts that would be expected from the construction of wind farms within any of the WDZs.

3.15.6.8.1.1.1 Potential for Surface Water Contamination

Construction of even one large wind turbine would involve land disturbance of more than 1 acre (BLM 2005), which is the trigger in both Oklahoma and Texas for requiring a construction general permit for stormwater discharges under the EPA NPDES program as implemented by each state. Accordingly, construction of a wind farm in either state would be subject to the requirements of a construction general permit and the standard permit provisions described in Section 3.15.6.1.2. The future wind farm developer would be required to prepare and implement a SWPPP, which would in turn act to prevent surface water contamination by requiring actions to prevent contaminant releases, including sediment-laden runoff. If a wind farm construction action were to require setup of a temporary concrete batch plant, its operation would also be subject to permit requirements.

Wind farm construction activities could involve foundation depths up to 40 feet if pier foundations are used, but the often-used mat foundations, while requiring more land area, generally do not require excavations of more than 10 feet in depth (DOE 2013). As shown by the water table depths in Table 3.7-23, construction of pier foundations in WDZs in Beaver County, Oklahoma, or in Ochiltree County, Texas, could encounter groundwater, but construction would be unlikely to reach groundwater in the other counties. Construction of mat foundations would be unlikely to encounter groundwater in any of the WDZs. As described in Section 3.15.6.1.2 for the Project, were it necessary to pump groundwater from excavations or boreholes to complete foundation construction, water would likely be discharged to vegetated areas through flow control devices or in some other manner approved by the regulatory agency. Also, excavation of deep foundations could involve additives such as drilling muds or bentonite to help stabilize excavation or borehole walls. These materials would also have to be disposed in accordance with applicable federal, state, and local regulations.

With the wind farm development elements described above, it is expected that construction of the connected action would involve the same minor potential for surface water contamination impacts as described in Section 3.15.6.1.1 for general construction under the Project.

3.15.6.8.1.1.2 Changes to Runoff Rates

As described in Section 3.15.6.1.2 for the Project, soils at connected action construction sites would be broken up, loosened, and stockpiled for some period of time during which such soils would have lower stormwater runoff rates than undisturbed soils. Similarly, soil in some areas could be compacted to improve its stability or simply from equipment traffic and have higher runoff rates as a result. However, such conditions would be expected to be relatively short term, with most soils being restored to a pre-disturbance condition once foundations and structures were in place. Also, disturbed areas would be relatively small in comparison to surrounding areas not disturbed by the connected action; it is estimated that the footprint of all wind farm facilities and structures, including access roads, would be no more than 5 to 10 percent of the total wind farm area (BLM 2005) and could be as low as 1 to 3 percent of the total area (DOE 2013). The total area disturbed during construction would be higher, but the relatively small and short-term changes in runoff rates would not be expected to result in any noticeable changes in the area's existing drainage systems or surface waters.

3.15.6.8.1.1.3 Direct Impacts or Disturbances to Surface Water or Drainage Channels

Since wind farm developments require relatively small amounts of dedicated land (or restated, there are large areas of unused land between individual wind turbines), developers would have the ability to avoid small drainage channels in positioning wind turbines. As a matter of reducing costs and protecting valuable equipment, it is assumed developers would want to avoid locating wind turbines or support facilities in large channels or surface waters, unless for some reason channel relocation was a viable option.

Similar to what was described in Section 3.15.6.1.3 for the construction impacts under the Project, the components of a wind farm most likely to result in disturbance of drainage features would be the access roads. It is reasonable to assume that wind farm developers would want to avoid crossing drainage channels to the extent practicable simply to avoid the associated issues (e.g., risks to equipment, difficulty in maintaining long-term access, potential for added regulatory requirements, and other issues that could add to project costs in the long-term), but in some cases options may be limited. It is also reasonable to assume that wind farm developers would establish some criteria for the manner in which drainage channels would be crossed such as those identified by the Applicant and described in Section 3.15.6.1.3. Also as described in that section, the impacts from putting access roads across drainage channels would depend on the nature of the drainage feature and the type of crossing used. Streams or other surface waters already identified as impaired or designated to be of special value would require more elaborate and protective crossing methods if they could not be avoided.

3.15.6.8.1.1.4 Effects on Water Availability

Water would be needed to support construction of the connected action wind farms. Primary water needs would include use for soil compaction during road, substation, and wind turbine foundation construction; as a component of concrete; and for dust suppression. As shown in Table 3.7-26, the vast majority of water used in the six-county area of the WDZs comes from groundwater. Accordingly, it is assumed that a great majority, if not all, of the water needed to support construction of the connected action wind farms would be from groundwater sources, so the availability of surface waters would not be directly impacted.

Section 3.7.6.8.1 describes the basis for estimating a peak average water demand of about 0.54 million gallons per day for wind farm construction. As described in that section, this water demand would be spread over the 12 WDZs. At any given time, the water demand could be focused in a small number of the zones, but over time the average in any single zone would be expected to be only a fraction of the 0.54 million gallons per day. Although this water demand is only a small portion (0.06 percent) of the total water used in the six-county area in which the WDZs are located, it represents more than one-third of the same area's surface water usage. These values highlight the disparity of groundwater usage over surface water usage in the six-county region and the high effects on surface water availability that would be expected if a large portion of the water demand for wind farm construction were to come from surface water. In some situations, heavy groundwater usage can have indirect impacts on surface water by such effects as decreasing spring flows or increasing the portion of surface flow that is lost to infiltration. However, the amount of water that would be needed to support wind farm construction actions would represent such a small portion of the amount of groundwater already used in the area that it would not be expected to result in noticeable changes to existing interrelationships between surface waters and groundwater of the region.

3.15.6.8.1.2 Operations and Maintenance Impacts

Compared to pre-wind farm conditions, long-term operations and maintenance of wind farms in any one of the WDZs would only result in minor changes to stormwater runoff and drainage. As noted in Section 3.15.6.8.1, the footprint of all long-term wind farm facilities and structures would likely be approximately 1 percent of the total wind farm area. Much of this footprint would be expected to be relatively impervious to water and, therefore, involve increased runoff. However, the nature of a wind farm is that the footprint of built-up facilities would be reasonably well dispersed over its entire area. For example, an access road, substation, and control building, if collocated, would likely represent the largest single footprint of built-up area and the wind turbine locations would always be widely dispersed. Added runoff from these dispersed impervious areas would be small and easily managed in the semiarid climate of the Oklahoma and Texas panhandles and would not be expected to cause adverse impacts to existing surface waters.

Operations and maintenance of wind farm facilities would not impact surface water. During operations and maintenance, no notable sources of contaminants would be in use other than the typical fuels and lubricants found in vehicles and equipment, additional stormwater runoff from built-up areas would be dispersed and minor, and water needs would be limited to personal needs of the workers operating and maintaining the wind farm facilities and equipment.

3.15.6.8.1.3 Decommissioning Impacts

Decommissioning of wind farms would be expected to have impacts similar to those described in Section 3.15.6.8.1 and in more detail in Section 3.15.6.1 for common construction activities, i.e., measures would be required to manage the fuel and lubricants that would be present in equipment in a manner protective of stormwater runoff that could then reach surface waters away from the construction sites. Water demand during decommissioning would be limited to that needed for actions such as dust suppression, soil compaction, and possibly re-seeding or landscaping to put the ground back into suitable condition. Water demand would be less than for construction, would likely come from groundwater, and would not adversely impact surface water resources.

3.15.6.8.2 Optima Substation

Surface water impacts from construction of the future Optima substation would be the same as described in Section 3.15.6.2.1 for the Oklahoma Converter Station and AC Interconnection Siting Areas and the common construction impacts described in Section 3.15.6.1. There are few intermittent streams and no perennial streams or major waterbodies in the area proposed for the substation. Impacts during operation and maintenance would be expected to be similar to those described for the Oklahoma Converter Station and AC Interconnection Siting Areas in Section 3.15.6.2.1.1.

3.15.6.8.3 TVA Upgrades

A precise ROI has not been identified for the TVA upgrades. Where possible, general impacts associated with the required TVA upgrades are discussed below.

Surface water impacts of concern for the required TVA upgrades, like the Project, are associated with the potential for runoff and receiving water contamination, changes to runoff rates, disturbances to surface water or drainage channels, and effects on water availability as described in Section 3.15.6.1.1. These potential impacts would be limited primarily to the construction phase of the required upgrades and, accordingly, to the construction of a new transmission line. The TVA upgrades would not be expected to use large quantities of water during long-term operations.

Construction of a new transmission line would be expected to involve the same potential contaminants (primarily fuels and lubricants in equipment) as the Project during construction and implementation of the same type of measures to ensure those contaminants were not released. The construction would be expected to involve relatively minor changes to runoff rates and, to minimize liability and costs, TVA would take precautions to minimize disturbances to surface water and drainage features. Water needs for dust suppression, soil compaction, equipment cleaning, and concrete formulation would be relatively minor and short term. There would be little potential for impacts to surface water during upgrades involving modifications to existing facilities. A possible exception would be if replacement of structures was required as part of the upgrades to existing transmission lines. These type activities could involve new ground disturbances and potential for impacts to surface water similar to those described for typical construction.

3.15.6.9 Impacts Associated with the No Action Alternative

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not be constructed. Surface water conditions would remain as described in the affected environment descriptions of Section 3.15.5.

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Contents

Tables

Figures Presented in Appendix A

3.16 Transportation

This section includes evaluation of existing roadways, railroads, river navigation, and airports/airstrips within the ROI and an evaluation of the potential impacts from specific Project components on transportation amenities. Local bus and emergency routes would be addressed in the more detailed, location-specific Transportation and Traffic Management Plan (see Section 3.16.6.1.2) to be developed prior to construction. Bus and emergency routes are not expected to be prevalent in the Project ROI because the Project traverses areas that are predominantly rural and that have low population densities. Bus and emergency routes are therefore not specifically identified in the affected environment section but are addressed qualitatively in the impacts section.

3.16.1 Regulatory Background

A variety of federal, state, and local agencies administer and regulate roadways and railways. The American Association of State Highway and Transportation Officials (AASHTO) sets standards for construction and operation of interstate and U.S. highways, which are regulated by the FHWA. State departments of transportation are responsible for state highways and routes. County and local roads are controlled by the presiding jurisdiction (cities, counties). Other roads on federal lands are managed by the applicable federal agencies (such as USFS or USACE). Railroad operations are regulated primarily by state commissions. State transportation agencies in the ROI include the Oklahoma Department of Transportation (OKDOT), the Arkansas State Highway and Transportation Department, the Texas Department of Motor Vehicles, the Texas DOT (TXDOT), and the Tennessee DOT (TNDOT). Table 3.16-1 provides a summary of regulatory entities and requirements associated with transportation resources in the area of the Project.

Table 3.16-1:
Regulatory Requirements and Authority Associated with Transportation Resources

Regulatory Entity or Requirement	Key Elements
Roadways	
Encroachment or ROW Permits	Cities, counties, and other public agencies typically require an encroachment permit or similar authorization from the applicable jurisdictional agency at locations where road construction activities would occur within or above the public road ROW. A utility permit (ROW permit or encroachment permit) for state and federal highways must be obtained from the OKDOT for all crossings or encroachment on such highways in Oklahoma, the Arkansas State Highway and Transportation Department, the TXDOT (utility installation request); and the TNDOT Right-of-Way Division Utilities Office. These roadway use permits or similar road use agreements/documents stipulate the party responsible for the repair of damage to roadways and structures caused by a project. The Applicant or its construction contractor must visually document road conditions before and after construction phase and repair road to conditions before construction started or as directed by the applicable state DOT and/or local departments of public works.
Design standards, specifications, and guidelines for roadways (interstate and U.S. highways)	In general, AASHTO and the FHWA define nationwide design standards, specifications, and guidelines for roadways (interstate and U.S. highways) to be used for design and traffic control of roadways. The specific requirements of the permit from the applicable transportation agency are individually determined based on Project and jurisdiction specifics. Permits issued by state and local jurisdictions may include the following requirements: • Identify all roadway locations where special construction techniques such as night construction would be used to minimize impacts to traffic flow. • Develop circulation and detour plans to minimize impacts to local street circulation, which may include the use of signing and flagging to guide vehicles through and/or around the construction zone. • Schedule truck trips outside of peak morning and evening commute hours.

Table 3.16-1:
Regulatory Requirements and Authority Associated with Transportation Resources

Regulatory Entity or Requirement	Key Elements
	• Limit lane closures during peak hours to the extent possible. • Install temporary traffic control devices as specified in the Manual of Uniform Traffic Control Devices for Streets and Highways (FHWA 2009). • Store construction materials only in designated areas.
Oversize and Overweight Permits	Oversize and overweight permits must be obtained from the Oklahoma Department of Public Safety (http://www.dps.state.ok.us/swp/) for roadway travel in Oklahoma, the Arkansas State Highway and Transportation Department (http://www.arkansashighways.com/) for roadway travel in Arkansas, the Texas Department of Motor Vehicles (http://www.txdmv.gov/), and the TNDOT (www.tdot.state.tn.us/). Truck load limits are presented below. Truck Weight and Size Specifications for Oversize/Overweight Vehicles (Texas, Oklahoma, Arkansas, Tennessee) Vehicle Parameters — Specifications Gross Weight — 80,000 pounds for gross vehicle weight 20,000 pounds for single axle weight 34,000 pounds for tandem axle weight[1] Length — 90 feet Width — 8 feet 6 inches Height — 13 feet, 6 inches[2] 1 The tandem axle weight limit is 40,000 pounds in Oklahoma. 2 The height limit is 14 feet in Texas. Sources: AHTD (2011), OKDPS (2014), TNDOT (2003), TXDMV (2014)
National Scenic Byways Program (23 USC § 162) through the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) (Public Law 102-240)	The FHWA is responsible for administering the National Scenic Byways Program (23 USC § 162) through the ISTEA (Public Law 102-240). A scenic byway is a public road with special scenic, historic, recreational, cultural, archaeological, and/or natural qualities that have been recognized as such through legislation or official declaration. ROW acquisition would also be necessary for the crossing of roads that are designated as scenic byways. Although some additional scrutiny might be involved for the acquisition of ROW to cross scenic byways, no specific additional requirements or limitations have been identified beyond what is required for other federal and state highways. Historic Route 66, Cherokee Hills Byway, Crowley's Ridge Parkway, and the Great River Road National Scenic Byways are crossed by Proposed or Alternative Routes. Additional discussion of scenic byways is included in Section 3.12.
Arkansas Scenic Highways	Arkansas has designated numerous scenic highways through legislative acts that provide a means to further administer and finance such roadways by the Arkansas State Highway and Transportation Department (AHTD 2011). Many of these highways are submitted for consideration as a federal scenic byway. Numerous scenic highways are crossed by the Applicant Proposed Route or HVDC alternative routes. However, additional requirements in terms of traffic controls, ROW acquisition, and heavy vehicle permitting are not indicated beyond what is required for other State highways. Additional discussion of Arkansas scenic highways is included in Section 3.12.
Railroads	
Railroad Operation and Operators	The Oklahoma Corporation Commission Transportation Division, the Arkansas Public Service Commission, and the TNDOT Rail Safety/Regulatory Unit (partners with the Federal Railroad Administration to enforce federal law) oversee railroad operations and operators in their respective states. These entities make public decisions involving railroad safety matters. Specific procedures and standards apply in each state for shared corridor operations and modifications of at-grade crossing. The TXDOT Railroad Division coordinates project development for any projects that affect railroad right-of-way in the state. The Federal Railroad Administration (FRA) was created by the DOT Act of 1966 and its mission is to enable the safe, reliable, and efficient movement of people and goods (FRA 2014).

Table 3.16-1:
Regulatory Requirements and Authority Associated with Transportation Resources

Regulatory Entity or Requirement	Key Elements
NESC (IEEESA 2012)	The NESC (IEEESA 2012) sets policies for practical safeguarding of persons during the installation, operation, or maintenance of electric supply and communication lines and associated equipment. Any railroad/overhead utility crossing interaction would conform to NESC requirements and applicable code requirements. Key requirements include the following four items: 1. Poles or other structures supporting power must be 50 feet from the centerline of main running tracks, centralized traffic control sidings and heavy tonnage spurs. Pole location adjacent to industry tracks must provide at least a 30-foot clearance from the centerline of track when measured at right angles. If located adjacent to curved track, then said clearance must be increased at the rate of 1.5 inches per degree of curved track. 2. Regardless of the voltage, un-guyed poles must be located a minimum distance from the centerline of any track equal to the height of the pole above the ground line plus 10 feet. If guying is required, the guys must be placed in such a manner as to keep the pole from leaning or falling in the direction of the tracks. 3. High voltage poles and structures (345kV and higher) must be located outside the railroad ROW. 4. Crossings must not be installed under or within 500 feet from the end of any railroad bridge or 300 feet from the centerline of any culvert or switch area.
National Transportation Safety Board (NTSB) Office of Railroad, Pipeline and Hazardous Materials	The National Transportation Safety Board (NTSB) Office of Railroad, Pipeline and Hazardous Materials Investigations investigates accidents involving railroads, oil and gas pipelines, and the transportation of hazardous materials (NTSB 2014). On the basis of the investigations conducted by this Office, the NTSB issues safety recommendations to federal and state regulatory agencies, industry and safety standards organizations, carriers and pipeline operators, equipment and container manufacturers, producers and shippers of hazardous materials, and emergency response organizations. The railroad division has the responsibility for railroad accident investigations involving passenger railroads, freight railroads, commuter rail transit systems and other transportation systems operating on a fixed guideway. These accidents typically involve collisions or derailments; some of these accidents lead to the release of hazardous materials.
River Navigation[1]	
USACE Memphis District	The USACE Memphis District is mandated by Congress to keep the Mississippi River open for commercial navigation by obtaining and maintaining a 9-foot-deep and 300-foot-wide channel. About 175 million tons of cargo are transported by barge through the Memphis District's reach (355 miles) of the river each year. The Memphis District is also responsible for maintenance dredging of 10 harbors on the Mississippi River. These harbors serve as vital links to rail and highway transportation systems in the region, helping to deliver products and commodities to and from global markets.
USACE Tulsa District	The USACE Tulsa District is mandated by Congress to keep the McClellan-Kerr Arkansas River Navigation System open for commercial navigation. The system crosses the state of Arkansas into Oklahoma traversing the state until it reaches the confluence of the Arkansas and Verdigris River where the navigation channel follows the Verdigris River terminating 51 miles upstream at the Port of Catoosa, near Tulsa, Oklahoma. The Tulsa District maintains a minimum 9-foot-deep and 250-foot wide channel along the Arkansas River.
Airports and Navigation Aids	
FAA Review Requirements (14 CFR 77.9)	Airports require clear zones for aviation safety. Clear zones vary according to airport activity and the types of aircraft operating at a particular airport. Large airports and military facilities have more extensive requirements than smaller airports and smaller landing strips. Clear zone requirements typically involve a three-dimensional space free of aviation obstacles. In some areas, guy wires, towers, transmission lines, tall buildings, and other possible aviation hazards are marked, lighted, and/or charted based on Federal Aviation Administration (FAA) requirements. FAA requirements also cover an airport's radar, flight control instruments, flight paths, and other fundamental aspects of airport operations and safety. Standards are applied along with customization to address actual conditions at individual airports. Locations where potential air space obstruction hazards would be constructed may require submittal of a Notice of Proposed Construction or Alteration to the FAA based on criteria contained in 14 CFR Part 77, Safe, Efficient Use, and Preservation of the Navigable Airspace. Overhead transmission lines and their

Table 3.16-1:
Regulatory Requirements and Authority Associated with Transportation Resources

Regulatory Entity or Requirement	Key Elements

	supporting structures are subject to these requirements (FAA 2014a). Pursuant to 17 CFR 77.9, any person/organization who intends to sponsor any of the following construction or alterations must file notice with the FAA:
	• Any construction or alteration exceeding 200 feet above ground level
	• Any construction or alteration:
	  o Within 20,000 feet of a public use or military airport which exceeds a 100:1 surface from any point on the runway of each airport with at least one runway more than 3,200 feet
	  o Within 10,000 feet of a public use or military airport which exceeds a 50:1 surface from any point on the runway of each airport with its longest runway no more than 3,200 feet
	  o Within 5,000 feet of a public use heliport which exceeds a 25:1 surface
	• Any highway, railroad or other traverse way whose prescribed adjusted height would exceed the above-noted standards
	• Any construction or alteration located on a public use airport or heliport regardless of height or location
	
	Other FAA requirements for notification include non-height related criteria such as proximity to a navigation facility, encroachment on the airport property, and emission of potential interference frequencies. The FAA notification criteria evaluation tool is available at the following link: https://oeaaa.faa.gov/oeaaa/external/gisTools/gisAction.jsp?action=showNoNoticeRequiredToolForm.

FAA Requirements—Landing Strips and Other Aviation Purposes (14 CFR Part 157)	The applicable FAA regulation for landing strips for agricultural and other aviation purposes is 14 CFR Part 157. These airports may or may not be shown on the FAA sectional charts.
FAA Requirements—Federal Aviation Act of 1958 (Public Law 85-726) (14 CFR Part 77)	Additional requirements are applicable at military sites and within military operating areas and military training routes. Unlike public airports, military operations often include large areas surrounding their airports and operations for testing, training, and other purposes well beyond the military airport areas' landing and takeoff boundaries. These areas are given special airspace designations linked to corresponding military operations. A Section 1101 Air Space Permit is required for air space construction clearance according to the Federal Aviation Act of 1958 (Public Law 85-726) (14 CFR Part 77). The Applicant will address any identified operations and safety issues near military airports that may create unresolved conflicts in military airspace operating areas. Incorporation of design features and implementation of BMPs are expected to lessen the extent of the safety issues to permissible levels. If not, it is currently assumed that any routes with irresolvable issues related to airports or airspace will require additional mitigation to be applied, including the possibility of suggested reroutes.
FAA Navigation Aids	Air navigation aid facilities are used for various purposes including assistance for pilot navigation. An automatic direction finder uses non-directional beacons (NDBs) on the ground to drive a display that shows the direction of the beacon from the aircraft. NDBs continue to be used as a common form of navigation in some areas with relatively few other navigational aids. Very high frequency omnidirectional range (VOR) is a more sophisticated system, and is still the primary air navigation system established for aircraft flying under instrument flight rules (IFR). Air navigation facilities have varied owners and operators including the FAA, the military services, private organizations, individual states and foreign governments. The FAA has the statutory authority via the Federal Aviation Act of 1958 to establish, operate, and maintain air navigation facilities and to prescribe standards for the operation of any of these aids which are used for instrument flight in federally controlled airspace (FAA 2014b). If large structures are in the immediate proximity of these navigation facilities, there is a potential to interfere with the ability of the facilities to transmit signals.

1 USACE river navigation requirements are also addressed in Section 3.15.

3.16.2 Data Sources

The data sources used to analyze transportation resources are described below:

- Data sources used to analyze transportation amenities for the ROI include data for major roads, public roads, roadways, and railroads (GIS Data Sources: BTS 2013; TXDOT 2013; CSA 2007; AHDT 2006a; USCB 2000).
- Annual average daily traffic (AADT) counts for points along roadways within ROIs were obtained from Clean Line (2013, 2014). These AADTs originated from the OKDOT 2012 AADT estimates (OKDOT 2012), the AHDT 2012 AADT (Annual Average Daily Traffic) estimates (AHTD 2012), the TNDOT 2012 AADT estimates (TNDOT 2012), and the TXDOT 2012 AADT estimates (TXDOT 2012).
- A traffic analysis was performed to assess potential traffic impacts during construction of the Project. Detailed data and analysis tables are provided in *Traffic Technical Report for the Plains & Eastern Clean Line* and supplement to the *Traffic Technical Report* (Clean Line 2013).
- The data sources for airports and airstrips (also referred to as airfields) are the Bureau of Transportation Statistics and GIS shape files provided by Clean Line, respectively (GIS Data Sources: BTS 2013a; Clean Line 2013b).
- The data source for navigation aids is FAA's National Flight Database (FAA 2014b).

3.16.3 Region of Influence

3.16.3.1 Region of Influence for the Project

The ROI used to define and evaluate roadway transportation resources and the effects of the Project is a 6-mile area around the Project components. For the transmission line corridors, the 6-mile-wide area extends from each side of the centerline of the Applicant Proposed Route, HVDC alternative routes, and the AC collection system routes (12 miles wide in total). This area defines the ROI surrounding the converter station and AC interconnection siting areas and ensures that area interstate highways, U.S. highways, state highways, and local roads were included in the overall impact evaluation and that the major types of public roadways that may be directly impacted by Project vehicles would be included in the traffic analysis.

Railroads were identified based on the potential encroachment within the ROI defined above. Encroachment refers to areas where railroads and railroad ROWs might be affected because the Project would cross the railroad ROW or be located in close proximity to the Project.

Airports, airstrips, and navigational aids were identified in a 4-mile-wide corridor from the HVDC transmission line and AC collection system transmission line centerlines. A distance of 4 miles is consistent with the FAA safety requirements discussed in Section 3.16.1. Specific mileage from centerlines is also provided as an indicator of the strength and likelihood of potential effects to airports, airstrips, and navigational aids.

3.16.3.2 Region of Influence for Connected Actions

3.16.3.2.1 Wind Energy Generation

The ROI for evaluation of existing traffic conditions is all public roadways within 6 miles of the AC collection system route centerlines, an area that includes 85 percent of the land area within each of the WDZs. Traffic counts also were evaluated for major highways in an area approximately 12 miles around the WDZs because the WDZs are located in a rural area with low population densities. The WDZs and surrounding communities include rural areas of Oklahoma, Texas, and Kansas. The ROI in the WDZs includes Cimarron and Beaver counties in Texas and Oklahoma, respectively; Sherman, Hansford, and Ochiltree counties in Texas; and southern portions of Baca and Morton counties in Kansas.

3.16.3.2.2 Optima Substation

The transportation ROI for the future Optima Substation includes a 6-mile area surrounding the 160-acre site (Section 3.1), and is entirely included within the Project ROI for Region 1.

3.16.3.2.3 TVA Upgrades

The ROI for TVA upgrades is described in Section 3.1.1.

3.16.4 Affected Environment

3.16.4.1 Roadways

The roadway network in the ROI includes interstate highways, U.S. highways, state highways, and local roads. Public roadways are classified into Class I two-lane highways, Class II two-lane highways, basic freeway segments, and multi-lane highways as defined below. Class I two-lane highways are highways on which motorists expect to travel at relatively high speeds. These highways are major intercity routes, primary connectors of major traffic generators, daily commuter routes, or major links in state or national highway networks. The roadways serve mostly long-distance trips or provide the connections between facilities that serve long-distance trips (TRB 2010).

Class II two-lane highways are highways where motorists do not necessarily expect to travel at high speeds. These highways function as access routes to Class I highways, serve as scenic or recreational routes (not primary arterials), or pass through rugged terrain where high-speed operation is not possible. These roadways most often serve relatively short trips.

Basic freeway segments are roadway segments outside the influence area of traffic merging and lane-changing caused by the presence of on-ramps and off-ramps.

Multi-lane highways have four to six lanes (including both directions) and posted speed limits that range from 40 to 65 miles per hour. They may be divided by medians, may be undivided, or may have a two-way left turn lane. These roadways are typically located in suburban areas leading to central cities or along high-volume rural corridors connecting two cities or two activity centers that generate a substantial number of daily trips.

The affected environment includes major roadways within the ROI and available information on the existing roadway level of service (LOS), a measure of the quality of service of a roadway. There are six letter designations of LOS from A to F, with LOS-A (free traffic flow with little delay) representing the best roadway operating conditions and LOS F (roadway congestion with long delays) representing the worst operating conditions (TRB 2010). The acceptable LOS for a roadway varies as defined by the federal, state, county, or local agency with jurisdiction over the roadway. According to AASHTO, a LOS-C or better is considered acceptable on rural roadways (AASHTO 2011). Within urban areas, LOS-D generally is considered the minimum acceptable LOS (AASHTO 2011). States have individual requirements and thresholds or criteria regarding decreases in LOS that might trigger the necessity for road capacity improvements for Project construction activities.

General characterization of the current LOS on existing roadways was performed in the Traffic Analysis (Clean Line 2014) for the Project and is summarized in Section 3.16.5. Overall, public roadways in the Project ROI currently operate at an acceptable LOS-C or better as depicted in Figures 3.16-1a through 1f (located in Appendix A). Exceptions are local street segments in Van Buren, Arkansas, in Region 4, and a local street in Searcy, Arkansas, in Region 5 that currently operate at LOS-D. Tables listing all the roadway segments, including local roadways, and related details (i.e., name, segment ID, class, and LOS) in the transportation ROI are provided in the *Traffic Technical Report* and supplement to the *Traffic Technical Report* (Clean Line 2013, 2014).

In addition to LOS, the roadway affected environment is presented in Section 3.16.5 in relation to state and federal roadway crossings and areas of potential ROW encroachment by region. Although the crossing of local and county roadways would also trigger permits, requirements for such crossings or encroachments are generally not as rigorous. The numerous crossings of local and county roadways by Project components are depicted in the maps included on Figure 1.0-2 in Appendix A.

3.16.4.1.1 Construction Haul Roads

Currently, it is anticipated that the materials necessary for construction of the Project would be shipped via major roadways including interstate highways, federal highways, and state highways. More specific haul routes would be identified in a Transportation and Traffic Management Plan. Because haul routes cannot be specifically identified by Project alternative at this point in the planning process, they are not used to further evaluate specific impacts. Once at the appropriate staging area, materials would be moved to designated locations along the HVDC transmission line and other Project components for assembly and installation via existing roads, overland routes, and temporary access roads.

The major roadways near each Project component and region are listed in Table 3.16-2. These roads could serve as haul routes during Project construction. The daily commuting routes for construction workers are expected to follow the same roads as the truck haul routes to the construction ROW or temporary staging areas for parking. Improvements to or closure of any roads, intersections, or bridges are not expected to be necessary to accommodate oversized truck deliveries to the Project components. However, if closures were necessary, their durations would be minimized as specified in Section 3.16.6.1.2, and closures would be conducted in accordance with a Transportation and Traffic Management Plan and appropriate state DOT requirements and procedures.

Table 3.16-2:
Potential Primary Haul Roads by Region

Project Region	Interstates/Turnpikes	U.S. Highways	State Highways	Local Roads
Region 1	Nearest: I-40	US-412, US-85, US-270, US-283, US-64, US-183	SH-136, SH-3, SH-23, SH-149, SH-34, SH-46	CR-202, CR-16, CR-14, CR-A
AC Collection System		US-54, US-83, US-412, US-287	SH-95, SH-3, SH-15, SH-207, SH-70, SH-23	CR-14
Oklahoma Converter Station		US-54, US-412	SH-136, SH-3	CR-33, CR-202, CR-282, CR-16
Region 2	Nearest: I-40, I-35	US-64, US-412, US-412, US-281, US-60, US-81	SH-50, SH-34, SH-15, SH-3, SH-45, SH-58, SH-51, SH-8, SH-132	None of particular note
Region 3	I-40, I-35, I-44, Muskogee Turnpike	US-81, US-64, US-177, US-75, US-266, US-63, Alt US-75, US-69, US-62	SH-74, SH-51, SH-18, SH-99, SH-33, SH-48, SH-66, SH-16, SH-72, SH-52, SH-10	None of particular note

Table 3.16-2:
Potential Primary Haul Roads by Region

Project Region	Interstates/Turnpikes	U.S. Highways	State Highways	Local Roads
Region 4	I-40, Muskogee Turnpike, I-540	US-64, US-59, US-71	SH-82, SH-101, SH-64B, SH-220, SH-22, SH-23, SH-352, SH-96, SH-103, SH-164	CR-76
Region 5	I-40	US-64, US-65, US-67, US-167	SH-7, SH-27, SH-124, SH-164, SH-247, SH-95, SH-9, SH-92, SH-287, SH-336, SH-25, SH-5, SH-36, SH-258, SH-157, SH-16, SH-337, SH-367	None of particular note
Arkansas Converter Station	I-40	US-64	SH-105, SH-124, SH-213, SH-213, SH-247, SH-95, SH-164, SH-7, SH-287, SH-9, SH-7	Buttermilk Road, St. Joe Road
Region 6	I-40, I-55	US-67, US-49, US-63	SH-14, SH-37, SH-18, SH-367, SH-214, SH-145, SH-149, SH-75, SH-163, SH-42	None of particular note
Region 7	I-40, I-55	US-63, US-61, US-51	SH-14, SH-149, SH-75, SH-140, SH-27, SH-178, SH-3, SH-51, SH-77, SH-204, SH-385	Mudville Road
Tennessee Converter Station	I-40, I-55	US-51	SH-385, SH-14, SH-3, SH-51	Mudville Road

GIS Data Sources: BTS (2013), TXDOT (2013), CSA (2007), AHTD (2006a), USCB (2000)

3.16.4.2 Railroads

Numerous railroads are located within the ROI as shown on Figures 3.16-1a through 3.16-1f in Appendix A. Railroads are more specifically discussed in Section 3.16.5 by region.

3.16.4.3 River Navigation

The Project crosses the Arkansas River between Oklahoma and Arkansas (Regions 3 and 4) and the Mississippi River between Arkansas and Tennessee (Region 7). A discussion of River Navigation is provided only for Regions 3, 4, and 7.

3.16.4.4 Airports and Navigational Aids

Airports and airstrips are shown on Figures 3.16-1a through 3.16-1f, in Appendix A and airports within the ROI are listed in Table 3.16-3. Fifty-two airports, airstrips, and heliports are located within the ROI including, 12 public airports, 13 private airports, 20 private airstrips, 3 public heliports, and 4 private heliports. These air travel facilities are more specifically discussed in Section 3.16.5 by region.

Table 3.16-3:
Airports and Airstrips within the ROI

Airport Name	County, State	Type	Private/ Public	Region	Route	Distance from Centerline (miles)
Hooker Municipal Airport	Texas County, OK	Airport	Public	1	AC Collection System Route NE-1	2.6
					AC Collection System Route NE-2	2.8
Guymon Municipal Airport	Texas County, OK	Airport	Public	1	AC Collection System Route NW-1	3.5
Laverne Municipal Airport	Harper County, OK	Airport	Public	1	AR 1-A	1.3
Steinert Lakes	Garfield County, OK	Airport	Private	2	AR 2-B	0.9
					APR	3.2
Okmulgee Regional Airport	Okmulgee County, OK	Airport	Public	3	AR 3-C	2.5
Jones Memorial	Creek County, OK	Airport	Public	3	AR 3-C	1.4
Bristow Hospital	Creek County, OK	Heliport	Public	3	AR 3-C	3.6
HSI	Lincoln County, OK	Heliport	Private	3	AR 3-C	0.3
					APR	0.6
Cushing Municipal Airport	Payne County, OK	Airport	Public	3	APR	0.8
					AR 3-C	2.0
Keefton Emergency Helicopter Service	Muskogee County, OK	Private Airfield	Private	3	APR	0.3
					AR 3-C, AR 3-D	1.5
					AR 3-E	2.3
Davis Field	Muskogee County, OK	Airport	Public	3	APR	3.5
Eagle Creek	Okmulgee County, OK	Airport	Private	3	APR	1.6
Ragwing Acres	Okmulgee County, OK	Airport	Private	3	APR	2.8
Neversweat	Creek County, OK	Airport	Private	3	APR	3.2
Richardson Regional—Campbell Road	Payne County, OK	Heliport	Private	3	APR	3.4
Cushing Regional Hospital	Payne County, OK	Heliport	Private	3	APR	2.5
Ozark-Franklin County	Franklin County, AR	Airport	Public	4	APR	0.6
					A 4-B	3.7
					AR 4-E	3.9
Crawford Memorial Hospital	Crawford County, AR	Heliport	Private	4	AR 4-C	3.9
Johnson Regional Medical Center	Johnson County, AR	Heliport	Public	4	AR 4-E	3.1
Hospital (unnamed)	Johnson County, AR	Heliport	Public	4	AR 4-E	1.3
					APR	4.0
Clarksville Municipal	Johnson County, AR	Airport	Public	4	AR 4-E	1.1
					APR	3.7
Neversweat Too	Sequoyah County, OK	Airport	Private	4	APR	3.4
Gustafson	Sequoyah County, OK	Airport	Private	4	APR	1.1

Table 3.16-3:
Airports and Airstrips within the ROI

Airport Name	County, State	Type	Private/ Public	Region	Route	Distance from Centerline (miles)
Landers Loop	Pope County, AR	Airport	Private	5	APR	2.3
					AR 5-A	2.9
Heifer Creek Ranch	Conway County, AR	Airport	Private	5	AR 5-B	2.8
Brown's	White County, AR	Airport	Private	5	AR 5-B, AR 5-E, AR 5-F	1.8
RAK	Faulkner County, AR	Airport	Private	5	AR 5-B, AR 5-E	2.3
McDonald's Strip	White County, AR	Airport	Private	5	AR 5-B, AR 5-E, AR 5-F	1.2
					APR	3.0
Unnamed	White County, AR	Private Airfield	Private	5	AR 5-B, AR 5-E, AR 5-F	0.5
					APR	3.9
Unnamed	White County, AR	Private Airfield	Private	5	AR 5-B, AR 5-E, AR 5-F	0.2
					APR	2.7
					AR 5-C	2.7
Unnamed	Jackson County, AR	Private Airfield	Private	6	APR	1.8
					AR 6-A	2.0
					AR 6-B	3.7
Unnamed	Jackson County, AR	Private Airfield	Private	6	APR	1.8
					AR 6-A	2.0
					AR 6-C	3.7
Unnamed	Poinsett County, AR	Private Airfield	Private	6	APR	1.5
					AR 6-A	1.5
					AR 6-C	2.2
Temporary Airstrip	Poinsett County, AR	Private Airfield	Private	6	AR 6-A	0.5
					APR	0.7
					AR 6-C	2.2
Unnamed	Poinsett County, AR	Private Airfield	Private	6	AR 6-C	1.3
					APR	1.5
					AR 6-A	2.4
Unnamed	Poinsett County, AR	Private Airfield	Private	6	APR	0.1
					AR 6-A	1.3
					AR 6-B	1.5
Unnamed	Poinsett County, AR	Private Airfield	Private	6	AR 6-B	1.1
					APR	1.4
					AR 6-A	3.4
Unnamed	Jackson County, AR	Private Airfield	Private	6	AR 6-B	1.2
					APR	2.2
					AR 6-A	4.0
Unnamed	Poinsett, AR	Private Airfield	Private	6	APR	2.4
					AR 6-B	2.5
					AR 6-A	3.9

Table 3.16-3:
Airports and Airstrips within the ROI

Airport Name	County, State	Type	Private/ Public	Region	Route	Distance from Centerline (miles)
Unnamed	Poinsett County, AR	Private Airfield	Private	6	APR	3.1
					AR 6-B	3.2
Unnamed	Jackson County, AR	Private Airfield	Private	6	AR 6-B	3.4
Unnamed	Poinsett County, AR	Private Airfield	Private	6	AR 6-C	0.7
					APR	1.3
Unnamed	Poinsett County, AR	Private Airfield	Private	6	AR 6-C	1.1
					APR	3.4
Unnamed	Poinsett County, AR	Private Airfield	Private	6	AR 6-C	1.8
					APR	3.2
Unnamed	Poinsett County, AR	Private Airfield	Private	6	AR 6-C	3.3
Unnamed	Poinsett County, AR	Private Airfield	Private	6	APR	3.2
Marked Tree Municipal Airport	Poinsett County, AR	Airport	Public	7	AR 7-A	1.1
					APR	2.9
Woodbridge Field	Poinsett County, AR	Airport	Private	7	AR 7-A	2.7
Unnamed	Tipton County, TN	Private Airfield	Private	7	AR 7-A	3.6
Millington Regional Jetport	Shelby County, TN	Airport	Public	7	APR	2.1
					AR 7-C, AR 7-D	2.1
					AR 7-B	2.3
Charles W. Baker	Shelby County, TN	Airport	Public	7	AR 7-C	3.5
Ray	Shelby County, TN	Airport	Private	7	AR 7-C, AR 7-D, Representative Tennessee AC Interconnect	0.4

GIS Data Sources: BTS (2013), Clean Line (2013b)

Navigation aids within 4 miles of the HVDC transmission line centerlines are provided in Table 3.16-4. Navigation aids are only present in the ROI in Regions 3, 4 and 7.

Table 3.16-4:
Navigation Aids within the ROI

Facility	Owner	Region	Route	Distance From Centerline (miles)	Type of Facility/Status
CUH NDB Cushing	City of Cushing	3	AR 3-C	1.9	Nondirectional Radio Beacon/Operational Instrument Flight Rules
CUH NDB Cushing	City of Cushing	3	APR (Link 4)	2.6	Nondirectional Radio Beacon/Operational Instrument Flight Rules
OKM VOR/DME OKMULGEE	FAA	3	AR 3-C	0.8	VOR Distance Measuring Equipment/ Operational Instrument Flight Rules

Table 3.16-4:
Navigation Aids within the ROI

Facility	Owner	Region	Route	Distance From Centerline (miles)	Type of Facility/Status
OKM VOR/DME OKMULGEE	FAA	3	APR (Link 4)	3.0	VOR Distance Measuring Equipment/ Operational Instrument Flight Rules
MKO NDB Muskogee	City of Muskogee	3	APR (Link 6)	1.1	Nondirectional Radio Beacon/ Decommissioned
MKO NDB Muskogee	City of Muskogee	3	APR (Link 5)	1.1	Nondirectional Radio Beacon/ Decommissioned
MKO NDB Muskogee	City of Muskogee	3	AR 3-E	1.1	Nondirectional Radio Beacon/ Decommissioned
MKO NDB Muskogee	City of Muskogee	3	AR 3-C	1.8	Nondirectional Radio Beacon/ Decommissioned
MKO NDB Muskogee	City of Muskogee	3	AR 3-D	1.8	Nondirectional Radio Beacon/ Decommissioned
CZE NDB Clarksville	City of Clarksville	4	AR 4-E	1.35	Nondirectional Radio Beacon/Operational Instrument Flight Rules
CZE NDB Clarksville	City of Clarksville	4	APR (Link 9)	3.9	Nondirectional Radio Beacon/Operational Instrument Flight Rules
MIG NDB Millington	Memphis-Shelby County Airport	7	AR 7-C	3.4	Nondirectional Radio Beacon/Operational Instrument Flight Rules

Source: FAA (2014b)

3.16.5 Regional Description

3.16.5.1 Region 1

3.16.5.1.1 Roadways

Region 1 is primarily rural; small towns are scattered throughout the ROI. Communities in or near the Region 1 ROI include Guymon, Hardesty, Beaver, and Laverne, Oklahoma. Major federal and state highways in the ROI for Region 1 include US-64, US-83, US-183, US-283, US-270, and US-412 and state highways (SH)-23, SH-34, SH-46, SH-94, SH-136, SH-149, and SH-207. The tables provided in the *Traffic Technical Report* and supplement to the *Traffic Technical Report* (Clean Line 2013, 2014) list local roads in the region. Major highways within the ROI for the Oklahoma converter station include SH-136 and SH-207. Major highways in ROI for the AC collection system routes include US-54, US-56, US-64, US-83, and US-412 and SH-15, SH-70, SH-94, SH-95, SH-136, SH-192, and SH-207. Average daily traffic counts (ADTC) are estimated at a maximum of 1,100 on state highways and a maximum of 4,800 for federal and joint federal/state roadways in Region 1 for 2012 (Clean Line 2013, 2014). The major highways, as well as the local roads, in the ROI currently operate at an acceptable average daily LOS-C or better.

3.16.5.1.2 Railroads

The Burlington Northern Santa Fe Railway (BNSF) railroad parallels US 54 in Texas County, Oklahoma, in the ROI in Region 1. A majority of the 13 AC collection system routes would require crossing the railroad. No other operational railroads are located in the ROI in Region 1.

3.16.5.1.3 Airports and Navigation Aids

Three public airports are located in the ROI in Region 1 (Table 3.16-3). Laverne Municipal Airport is located within 1.23 miles of the HVDC Alternative Route 1-A centerline. Hooker Municipal Airport is located 2.56 miles from the centerlines of AC Collection System Routes NE-1 and NE-2. Guymon Municipal Airport is located 3.47 miles from the centerline of AC Collection System Route NW-1. Navigation aids are not located within the ROI in Region 1.

3.16.5.2 Region 2

3.16.5.2.1 Roadways

Region 2 is mostly rural; the largest communities are the towns of Woodward and Fairview, Oklahoma. Major highways in the ROI include US-60/281, US-81, US-183, and US-412; and SH-8, SH-34, SH-34C, SH-50, SH-50B, SH-51, SH-51A, SH-58, SH-74E, SH-132, and SH-183. ADTC are estimated at a maximum of 7,000 on state highways and a maximum of 8,200 for federal and joint federal/state federal and joint federal/state roadways in Region 2 for 2012. Major and local roadways currently operate at an acceptable average daily LOS-B or better in the ROI (Clean Line 2013, 2014).

3.16.5.2.2 Railroads

Railroads in the ROI in Region 2 include (from west to east) the BNSF Railway, the Grainbelt Corporation Railroad, and the Union Pacific Railroad (UPRR). Railroads are located along US-412 in Woodward County, Oklahoma; in a rural region of Major County, Oklahoma; and along US-81 in Garfield County, Oklahoma.

3.16.5.2.3 Airports and Navigation Aids

One private airstrip, Steinert Lakes, is located within 1 mile from the centerlines of the Applicant Proposed Route and one HVDC alternative route. Navigation aids are not located within the ROI in Region 2.

3.16.5.3 Region 3

3.16.5.3.1 Roadways

Large communities in the ROI in Region 3 include Stillwater, Cushing, Drumright, and Muskogee. Major highways in the ROI include interstates I-35, I-40 and I-44; US-62, US-64, US- 69, US-75, US-77, US-177, and US-266; SH-10, SH-16, SH-18, SH-33, SH-48, SH-51, SH-52, SH-56, SH-64, SH-66, SH-72, SH-74, SH-86, SH-99, SH-100, SH-105, SH-108, and SH-162; and the Muskogee Turnpike. ADTC are estimated at a maximum of 16,100 on state highways and a maximum of 19,300 for federal and joint federal/state roadways in Region 3 for 2012. I-35 had a maximum ADTC of 20,300 in 2012; and I-44 had a maximum ADTC of 25,900. Major and local roadways currently operate at an acceptable average daily LOS-C or better in Region 3 (Clean Line 2013, 2014).

3.16.5.3.2 Railroads

Railroads in the ROI in Region 3 include (from west to east) the Stillwater Central Railroad, the BNSF, and the UPRR (in Muskogee County, Oklahoma). The crossings are located near US-77 in Logan County, Oklahoma; near I-44 in Creek County, Oklahoma; near US-75 in Okmulgee County, Oklahoma; and near US-69 in Muskogee County, Oklahoma (or the town of Oktaha, Oklahoma).

3.16.5.3.3 River Navigation

The USACE Tulsa District maintains navigation along the Arkansas River at the western Project crossing within Region 3.

3.16.5.3.4 Airports and Navigation Aids

Airports and airstrips in the ROI in Region 3 include Cushing Municipal Airport, Jones Memorial, Neversweat airstrip, Ragwind Acres airstrip, Eagle Creek airstrip, Okmulgee Regional Airport, and Davis Field. Heliports in the ROI include Richardson Regional Airport, Bristow Hospital, HSI, Cushing Regional Hospital, and Keefton Emergency Helicopter Service. Two operational navigation aid facilities are located in the Region 3 ROI including Cushing Non-directional Radio Beacon (CUH NDB) and Okmulgee VHF (very high frequency) Navigational Facility/UHF (ultra high frequency) Standard Distance Measuring Equipment (OKM VOR/DME). One decommissioned navigation facility—Muskogee Non-directional Radio Beacon (MKO NDB)—is located in the ROI.

3.16.5.4 Region 4

3.16.5.4.1 Roadways

Large communities in Region 4 include Sullisaw, Fort Smith, and Clarksville. Major highways in the region include these interstates: I-40 and I-540; US-59, US-60, US- 64, and US-71; SH-10, SH-21, SH-23, SH-59, SH-60, SH-71, SH-82, SH-96, SH-100, SH-101, SH-103, SH-109, SH-123, SH-162, SH-164, SH-186, SH-194, SH-215, SH-219, SH-220, SH-252, SH-255, SH-282, SH-309, SH-315, SH-348, SH-352, SH-359, and SH-924. ADTC are estimated at a maximum of 3,500 on state highways and a maximum of 12,500 for federal and joint federal/state roadways in Region 4 for 2012. I-40 had a maximum ADTC of 40,000 in 2012 in the region and I-540 had a maximum ADTC of 22,000. All public roadways in the region currently operate at an acceptable LOS-C or better except for segments along Fayetteville Road and North Highway 59 in Van Buren, Arkansas, and a segment of nearby I-40 that currently operate at LOS-D.

3.16.5.4.2 Railroads

Railroads in the ROI in Region 4 include (from west to east) the Kansas City Southern Railroad, the UPRR (in Sequoyah County, Oklahoma), and the Arkansas & Missouri Railroad. The crossings are located near SH-10 in Muskogee County, Oklahoma (or near the town of Marble City in Sequoyah County, Oklahoma); near the town of Sallisaw in Sequoyah County, Oklahoma; near I-540 in Crawford County, Arkansas, and near the town of Mulberry in Crawford County, Arkansas.

3.16.5.4.3 River Navigation

The USACE Tulsa District maintains navigation along the Arkansas River at the eastern Project crossing within Region 4.

3.16.5.4.4 Airports and Navigation Aids

Airports and airstrips in the ROI in Region 4 include an unnamed airstrip near Neversweat Too airstrip, Gustafson airstrip, Ozark-Franklin County Airport, and Clarksville Municipal Airport. Heliports in the ROI include Johnson Regional Medical Center, an unnamed hospital near Clarksville, and Crawford Memorial Hospital. Ozark-Franklin County Airport is less than 1 mile from the Applicant Proposed Route and Alternative Route 4-B centerlines. One operational navigation aid facility is located in the Region 4 ROI: Clarksville Non-directional Radio Beacon (CZE NDB).

3.16.5.5 Region 5

3.16.5.5.1 Roadways

The larger communities in or near the Region 5 ROI include Dover, Russelville, Damascus, Twin Groves, Greenbriar, Guy, Rose Bud, Heber Springs, and Branch, Arkansas. Major highways in Region 5 include US-65, US-67, US-167, and US-285; SH-5, SH-7, SH-9, SH-14, SH-16, SH-17, SH-25, SH-27, SH-36, SH-87, SH-92, SH-95, SH-105, SH-107, SH-110, SH-124, SH-157, SH-164, SH-213, SH-224, SH-225, SH-247, SH-258, SH-287, SH-305, SH-310, SH-337, SH-356, and SH-367. The Arkansas convertor station and AC interconnect is located in Pope and Conway counties, Arkansas. Major highways in this area include I-40; US-64; and SH-95, SH-105, SH-124, SH-164, SH-213, SH-247, SH-326, and SH-363. ADTC are estimated to be maximums of 11,000 on state highways and 7,600 for federal and joint federal/state roadways in Region 5 for 2012. Public roadways in the region currently operate at an acceptable LOS-C or better except, for a segment along West Race Avenue in Searcy, Arkansas, and near US-67 that currently operates at LOS-D (Clean Line 2013, 2014).

3.16.5.5.2 Railroads

The UPRR is in the ROI in Region 5. The crossing is located near SH-367 in Jackson County, Arkansas.

3.16.5.5.3 Airports and Navigation Aids

Airstrips in the ROI in Region 5 include Landers Loop airstrip, Heifer Creek Ranch airstrip, Rak airstrip, McDonald's airstrip, two unnamed airstrips, and Brown's airstrip. No public airports or heliports are located in the ROI. One unnamed private airfield is within 0.2 mile of all HVDC transmission line alternatives. Navigation aids are not located within the ROI in Region 5.

3.16.5.6 Region 6

3.16.5.6.1 Roadways

Communities within the Region 6 ROI include Newport, Beedeville, Hickory Ridge, Harrisburg, Cherry Valley, and Marked Tree, Arkansas. Major highways in Region 6 include US-49, US-63, US-67; and SH-1, SH-14, SH-17, SH-18, SH-37, SH-42, SH-69, SH-75, SH-145, SH-149, SH-163, SH-193, SH-214, SH-224, SH-367, SH-373, SH-384, and SH-463. ADTC on state highways are estimated at a maximum of 12,000 and reach a maximum of 6,900 for federal and joint federal/state roadways in Region 6 for 2012. Major and local roadways currently operate at an acceptable average daily LOS-C or better in the Region 6 ROI (Clean Line 2013, 2014).

3.16.5.6.2 Railroads

Railroads in the ROI in Region 6 include three segments of the UPRR. The crossings are located along US-49 in Poinsett County, Arkansas, and near SH-1 in Poinsett and Cross counties, Arkansas.

3.16.5.6.3 Airports and Navigation Aids

Numerous private airstrips occur in the ROI in Region 6. One private airstrip is 0.1 mile from the centerline of the Applicant Proposed Route; on private airfield is within 0.7 mile of the centerline of HVDC Alternative Route 6-C; and a temporary airstrip is within 0.7 mile of the centerlines of HVDC Alternative Route 6-A and the Applicant Proposed Route. No heliports or navigation aids are located within the ROI in Region 6.

3.16.5.7 Region 7

3.16.5.7.1 Roadways

Communities in and near the Region 7 ROI include Marked Tree, Lepanto, Tyronza, Gilmore, and Osceola, Arkansas; and Munford, Gilt Edge, Millington, Atoka, Brighton, Bartlett, Memphis, Lakeland, and Arlington, Tennessee. Major highways in Region 7 include I-55; US-51, US-61, and US-63; and SH-14, SH-42, SH-75, SH-77, SH-87, SH-118, SH-119, SH-135, SH-140, SH-149, SH-181, SH-198, SH-239, SH-297, SH-308, SH-322, SH-385, and SH-463. The Tennessee Convertor Station Siting Area is located in Shelby and Tipton counties, Tennessee, where the major highways include US-51 and SH-385. ADTC are estimated at maximums of 11,000 on state highways and 23,634 for federal and joint federal/state roadways in the region. I-55 had a maximum ADTC of 19,000 in 2012 in Region 7 for 2012. Major and local roadways currently operate at an acceptable average daily LOS-C or better in the ROI (Clean Line 2013, 2014).

3.16.5.7.2 Railroads

Railroads in the ROI in Region 7 include (from west to east) the BNSF Railroad and the Canadian National Railroad. The crossings are located along US-63 in Poinsett County, Arkansas; along US-61 in Mississippi County, Arkansas; and near US-51 (or near SH-385) in Shelby and Tipton counties, Tennessee.

3.16.5.7.3 River Navigation

The USACE Memphis District maintains navigation along the Mississippi River at the Project crossing within Region 7.

3.16.5.7.4 Airports and Navigation Aids

Airports and airstrips in the ROI in Region 7 include Marked Tree Municipal Airport, Woodbridge Field, an unnamed airstrip, Millington Regional Jetport, and Ray airport. The Marked Tree Municipal Airport is located 1 mile from the HVDC Alternative Route 7-A and Applicant Proposed Route. Ray, a private airstrip, is located 0.4 mile from the centerline of HVDC Alternative Route 7-C. No heliports are located in the ROI. One navigation aid facility is located in the Region 7 ROI: Millington Non-directional Radio Beacon (MIG NDB).

3.16.5.8 Connected Actions

3.16.5.8.1 Wind Energy Generation

3.16.5.8.1.1 Roadways

Table 3.16-5 provides AADT ranges for roadway segments, major highways, and communities in the ROI. Major highways in the ROI include US-56, SH-3 (Oklahoma), US-64, SH-51 (Kansas), US-54, SH-136 (Oklahoma), SH-15 (Texas), US-83, SH-70 (Texas), SH-23 (Oklahoma), and SH-95 (Oklahoma). Maximum ADTC counts in the ROI range from 400 adjacent to WDZ-G to 10,300 in WDZ-A for 2012 (Clean Line 2013, 2014). Major and local roadways currently operate at an acceptable average daily LOS-B or better in the ROI.

Table 3.16-5:
Connected Action—Roadways in WDZ and Wind Energy Generation ROI

WDZ	AADT (maximum for roadway segments in 2012)[1]	Major Federal and State Roadways	Communities
A	10,300	US-83, SH-15, SH-192, SH-143	Perryton, TX
B	2,000	SH-136, SH-207, SH-15, Hansford CR-278	Hardesty, OK
Adjacent to WDZ-B ROI[2]	1,850		Gruver, TX
C	1,500	US-54, US-287, SH-136, SH-15	None
Adjacent to WDZ-C ROI[2]	4,400		Stratford, TX
	6,200		Cactus, TX
	4,100		Sunray, TX
D	2,200	US-412, SH-3, SH-94, SH-136	Hardesty, OK
E	8,600	US-412, SH-136, US-54, SH-3, US-64	Guymon, OK, Hardesty, OK, Optima, OK
F	8,600	US-54, SH-3, US-54, US-412, SH-95, SH-136	Texhoma, TX; Texhoma, OK; Guymon, OK; Goodwell, OK
G	1,400	US-56, SH-3, SH-95, SH-27, US-412, SH-171, US-287, US-385, US-64, SH-325	Kerrick, OK
Adjacent to WDZ-G ROI[2]	5,000		Boise City, OK
	400		Keyes, OK
	2,000		Elkhart, KS
H	1,400	SH-95, SH-3	None
I	7,600	SH-94, Texas CR 7, US- 54, US- 64	Hooker, OK; Adams, OK; Optima, OK; Turpin, OK;
Adjacent to WDZ-I ROI[2]	6,700		Tyrone, OK
	7,340		Liberal, KS
J	3,300	US-83, SH-3, US-412	Balko, OK; Turpin, OK
Adjacent to WDZ-J ROI[2]	3,100		Beaver, OK
	7,340		Liberal, KS
K	3,300	US-83, SH-3, SH-23, US-270, SH-15	Balko, OK; Perryton TX
Adjacent to WDZ-K ROI[2]	2,900		Booker, TX
	3,100		Beaver, OK
L	4,500	SH-70, SH-15, SH-51, SH-207, SH-23, US-83	Spearman, TX; Waka, TX
Adjacent to WDZ-L ROI[2]	820		Morse, TX

1 Source: Clean Line (2014)
2 Adjacent areas are major highways outside of WDZs generally within 12 miles. Sources: TXDOT (2014), OKDOT (2014), (KSDOT) (2014)

3.16.5.8.1.2 Railroads

Railroads in the WDZ ROIs are listed in Table 3.16-6. In WDZ-A, the Southwest Railroad is located along SH-15 and SH-192 and passes through Perryton, Texas. Two BNSF lines located in WDZ-C both pass through Stratford, Texas. In WDZ-L, the Southwest Railroad is located along SH-15 and passes through Spearman, Texas, along US-287 northwest of the WDZ. In WDZ-E, a BNSF line passes through Guymon, Oklahoma, along US-54 within the ROI northwest of the WDZ. In WDZ-F, the BNSF line passes through Texhoma (Oklahoma and Texas) and Goodwell, Oklahoma, along US-54. In WDZ-G, the CVR line is located along US-56 and passes through Elkhart, Kansas, north of the WDZ boundary. In WDZ-I, the BNSF line passes through Hooker, Oklahoma, along US-54. Southwest Railroad is located 2.61 miles south of WDZ-K and runs along SH-15/SH-192.

Table 3.16-6:
Connected Action—Railroads in WDZ ROIs (within 6 miles of WDZ boundaries)

WDZ	Name	Proximity to WDZ (miles)[1]
A	Southwest	Within WDZ
B	None	NA
C	BNSF	Within WDZ
C	BNSF	0.6
D	None	NA
E	BNSF	1.4
F	BNSF	Within WDZ
G	CVR	Within WDZ
H	None	NA
I	BNSF	Within WDZ
J	None	NA
K	Southwest Railroad	2.6
L	Southwest Railroad	0.8

GIS Data Sources: BTS (2013), TXDOT (2013), CSA (2007), AHTD (2006a), USCB 2000
1 All within 6 miles of the WDZ boundaries.

3.16.5.8.1.3 Airports and Navigation Aids

Airports, airstrips, and navigation aids in the ROI are listed in Table 3.16-7.

Table 3.16-7:
Connected Action—Airports and Navigation Aids in WDZ ROIs

WDZ	Name	Type of Facility	Proximity to WDZ (miles)[1]
A	Perryton Ochiltree County Airport	Public airport	Within WDZ
A	PYX NDB Perryton	Navigation aid. Operational IFR.	0.16
B	Gruver Municipal Airport	Public airport	3.2
C	Stratford Field	Public airport	0.5
D	No facilities	NA	NA
E	Guyman Municipal Airport	Public airport	2.3
E	GUY NDB Guymon	Navigation aid. Operational IFR.	3.7
F	Guyman Municipal Airport	Public airport	1.1
F	GUY NDB Guymon	Navigation aid. Operational IFR.	1.7
F	Municipal Airport (near Texhoma)	Public airport	Within WDZ
G	Elkhart-Morton County Airport	Public airport	2.5
G	EHA NDB Elkhart	Navigation aid. Operational IFR.	2.8
H	No facilities	NA	NA
I	Hooker Municipal Airport	Public airport	Within WDZ
J	No facilities	NA	NA

Table 3.16-7:
Connected Action—Airports and Navigation Aids in WDZ ROIs

WDZ	Name	Type of Facility	Proximity to WDZ (miles)[1]
K	No facilities	NA	NA
L	Major Samuel B Cornelius Field	Military airfield	1.9

GIS Data Sources: BTS (2013), Clean Line (2013b); Source: FAA (2014b)
1 Distances are to closest airport feature, including runways.

3.16.5.8.2 Optima Substation

The future Optima Substation ROI is entirely included in the western area of Region 1 and transportation conditions would be similar to those described in Section 3.16.6.2.1 for the Oklahoma Converter Station Siting Area and the AC collection system routes. Major highways in these areas include US-54, US-56, US-64, US-83, and US-412 and SH-15, SH-70, SH-94, SH-95, SH-136, SH-192, and SH-207. ADTC are estimated at a maximum of 1,100 on state highways and a maximum of 4,800 for federal and joint federal/state roadways for 2012. The major highways, as well as the local roads, currently operate at an acceptable average daily LOS-C or better.

3.16.5.8.3 TVA Upgrades

A precise ROI has not been identified for the TVA upgrades. Where possible, general impacts associated with the required TVA upgrades are discussed in the impact sections that follow.

3.16.6 Impacts to Transportation

Impacts to traffic on roadways would include increased traffic during construction activities from workers commuting to the construction sites, as well as increased traffic from the hauling of materials and equipment to the construction sites. Incidental congestion and delay would be expected from the following:

- Slow-moving trucks and construction vehicles
- Vehicle turning movements where construction occurs near and parallel to roadways
- Travel delays and detours associated with transmission line installation in some locations

Temporary travel delays involving major roads (interstate highways, federal highways, and state highways) and railroads may also occur for HVDC or AC line installation at crossings. Shorter duration delays or no delays are anticipated where lines cross narrower roads with lower traffic volumes.

No improvements to public roadways are planned as part of the Applicant Proposed Project or DOE Alternatives.

3.16.6.1 Methodology

3.16.6.1.1 Traffic Impacts

3.16.6.1.1.1 Level of Service

As discussed above (Section 3.16.4.1), impacts to roadway traffic are assessed using the concept of Level of Service (LOS). A qualitative description of LOS is provided in Table 3.16-8. LOS for roadways in the ROI was calculated to assess the potential effects to roadway traffic during construction and operations of the separate components of the Project. These calculations were performed using the standard methods in the Highway Capacity Manual (TRB 2010), and results were used to assess the potential change in LOS from the Project on roadways. Details of the

Traffic Analysis calculations are provided in the *Traffic Technical Report* and supplement to the *Traffic Technical Report* (Clean Line 2013, 2014).

Table 3.16-8:
General Description of LOS

LOS	General Description	Motorist Experience
A	Free flow. Traffic flows at or above the posted speed limit and motorists have complete mobility between lanes.	Motorists have a high level of physical and psychological comfort.
B	Reasonably free flow. LOS A speeds are maintained, maneuverability within the traffic stream is slightly restricted.	Motorists still have a high level of physical and psychological comfort.
C	Stable flow, at or near free flow. Ability to maneuver through lanes is noticeably restricted and lane changes require more driver awareness.	Most experienced drivers are comfortable, roads remain safely below but efficiently close to capacity, and posted speed is maintained.
D	Approaching unstable flow. Speeds slightly decrease as traffic volume is slightly increased.	Freedom to maneuver within the traffic stream is much more limited and driver comfort levels decrease.
E	Unstable flow, operating at capacity. Flow becomes irregular and speed varies rapidly because there are virtually no usable gaps to maneuver in the traffic stream and speeds rarely reach the posted limit.	Any incident will create serious delays. Drivers' level of comfort becomes poor.
F	Forced or breakdown flow. Every vehicle moves in lockstep with the vehicle in front of it, with frequent slowing required.	Travel time cannot be predicted and drivers' level of comfort is poor.

Source: TRB (2010)

To estimate potential changes in LOS from the Project, the Applicant provided anticipated trip generation summarized in Table 3.16-9. Workers, vehicle trips, and the duration of construction activities for the Project are discussed and presented in detail in Sections 2.1.2 and 3.13. The duration of construction for the entire Project would be approximately 36 to 42 months including the initiation of clearing and grading activities through cleanup and restoration tasks. Construction is expected to run concurrently over different areas, and construction within all areas would not occur during the same time. Activities in one segment may be parallel or staggered with activities in other segments. The duration of construction within a 140-mile construction segment is estimated to be 24 months, but disturbance at any one location would be much shorter, depending on localized construction activities and progress. The types of construction vehicles in use at any time would depend on construction activities such as grading, structure construction, access road construction, reclamation, and other activities further described in Section 2.1. Construction vehicle types are summarized in Table 3.16-10 and are broken down by construction activity in the *Traffic Technical Report for the Plains & Eastern Clean Line* and supplement to the *Traffic Technical Report* (Clean Line 2013, 2014). The table provides information on vehicles that would be on roads and also the types of equipment that might be hauled to the site. The hauling information provides information on heavy equipment hauling on roads.

Table 3.16-9:
Summary of Trips During Project Construction

Project Component	Peak Number of Total Daily Trips	Peak Personal (Worker) Trips	Peak Light Construction Vehicle Trips	Peak Heavy Construction Vehicle Trips
HVDC Transmission Line (140-mile segment)	273	54	86	133
AC Collection System	273	54	86	133
HVDC Converter Stations	844	132	250	462
HVDC Transmission Line (140-mile segment), converter station, and AC collection system (simultaneous construction)—Region 1 only	1,390	276	438	676
HVDC Transmission Line (140-mile segment) and converter stations (simultaneous construction) Regions 1, 5, and 7 only	1,117	212	352	553

Source: Appendix F of this EIS.

Table 3.16-10:
Summary of Construction Vehicles/Equipment

Vehicles (on-road light)	Vehicles (on-road heavy)	Vehicles (off-road, to be hauled to construction site)	Other Equipment to be Hauled to Construction Site
Pick-up truck, Truck (1-ton), Utility van, Mechanic's truck, truck (2-ton), splicing truck/van, welder truck, boom lift truck,	Dump truck, Concrete truck, Concrete Pump truck, fuel truck, crane (15-ton boom truck), crane (30-ton), crane (120- to 300-ton), articulated dump truck, road sweeper, water truck, flatbed truck, reel stand truck, steel haul truck, truck (5-ton)	Plate compactor, trencher, excavator mini, 100 Series excavator, vibratory compactor, bobcat/skid loader, forklift (telescopic), lowboy truck, loader backhoe, wheel loader (5 CY), motor grader, bulldozer (100 and 300 Series), scraper, all terrain vehicle, single-drum puller (large), trencher, wagon drill, wire reel trailer, flail mower or Bush hog, crane (rubber-tired), wire puller (small), feller buncher, loader, motor grader, roller compactor, skidder, 3-drum puller (heavy), 3-drum puller (medium), double bull-wheel tensioner (heavy), double bull-wheel tensioner (light), helicopter (small), single-drum puller (large)	Air compressor, generator, construction trailer, chipper, hydra-ax or mulcher

Source: Appendix F of this EIS

Construction LOS was calculated for each of the roadway segments in the ROI where AADT counts were available (Clean Line 2014). Traffic count data are generally collected and available for federal and state highways, as well as other well-traveled roadways such as county roads and major local roads near communities. Traffic count data are generally not collected or available for lesser-traveled roadways. The analysis does not include the urban street segment category because of variations in how the state DOTs collect AADT data for city streets. In Oklahoma and Arkansas, AADT counts are only collected for select city streets; in Tennessee and Texas, AADT counts are not collected for any city streets. Although urban street segments have the potential to be accessed for construction purposes, major roadways in towns and urban areas throughout the Project are generally accounted for by the other roadway categories that are included in the LOS analysis. Each roadway segment corresponds to an AADT count data point with lengths delimited based on the AADT data.

The traffic analysis estimated the total arriving and departing traffic on a daily basis resulting from construction based on Project trips. The analysis includes the very conservative assumption that each roadway within the ROI could receive the full number of estimated peak daily construction trips. This assumption is implausible because the roadways cannot all receive the full number of trips. The assumption is used as a screening tool to identify roadways where potential effects would be negligible (even under the most conservative trip scenario), and thus to focus on roadway segments with greater potential for impacts. A more detailed traffic analysis is not possible at this stage of the Project because specific commuting and haul routes based on worker residences, material and equipment locations, and construction site destinations would not be identified until the design phase of the Project, when a Transportation Management Plan would be developed. Traffic from construction activities outside the ROI would be much more dispersed, and roadways outside the ROI are unlikely to receive the full number of trips.

The analysis considers simultaneous construction activities within Regions 1, 5, and 7, where the HVDC transmission line and converter stations (Oklahoma, Arkansas, and Tennessee) might be under construction during the same time. The analysis also considers simultaneous construction of the AC collection system and HVDC transmission lines for Region 1. The specific criteria used to assess the LOS for two-lane highways (both Class I and Class II), basic freeway segments, and multi-lane highways are provided in Table 3.16-11. Given the numerous roadways and associated jurisdictions traversed and affected by the Project, the AASHTO minimum LOS for rural and urban areas (C and D, respectively) have been used to evaluate impacts.

Table 3.16-11:
LOS-Criteria Summary

	2-Lane Class I (at 45 mph)	2-Lane Class I (at 45 mph)	2-Lane Class II (at 45 mph)	Basic Freeway Segments (at 70 mph)	Multi-Lane Highway Segments (at 55 mph)
LOS	Avg. Travel Speed (mph)	Percent Time Following	Percent Time Following	Density (cars/mile/lane)	Density (cars/mile/lane)
A	>55	<35	<40	<11	<11
B	>50–55	>35–50	>40–55	>11–18	>11–18
C	>45–50	>50–65	>50–70	>18–26	>18–26
D	>40–45	>65–80	>70–85	>26–35	>26–35
E	<40	>80	>85	>35-41	>35-41

Source: TRB (2010)

3.16.6.1.1.2 Bus and Emergency Routes

Construction traffic has the potential to impact bus and emergency routes for roadways near the construction areas. Public bus routes are expected to be rare in the ROI because most of the Project is located within rural areas without bus routes. Sections 3.16.6.2 and 3.16.6.3 identify more populated areas where the Project could impact bus and emergency routes. Bus and emergency routes would be specifically identified in association with a Transportation and Traffic Management Plan, which also would include measures to avoid or minimize potential impacts to bus routes and emergency vehicle traffic.

3.16.6.1.1.3 Roadway ROW and Railroad

Impacts resulting from roadway and railroad crossings are generally evaluated by identifying the interstates, federal and state highways, and railroads that would be crossed by the Project. Crossings have the potential to involve short-term traffic delays and interruptions, including temporary lane closures in some cases.

Impacts could also occur in areas where the routes are located adjacent to roadways and railroads. Construction activities that take place adjacent to major roadways have the potential to cause temporary adverse impacts to traffic from vehicles entering and leaving the roadway and could involve lane closures.

The Transportation and Traffic Management Plan would include railroad crossing protocols and construction and post-construction practices to avoid vehicle, railroad, and transmission line conflicts. Typically, stoppage of railroad traffic is not required during construction or conductor stringing and tensioning activities. Crossing activities are similar to those for road crossings and typically involve the use of guard structures. Stringing and tensioning activities would be performed in coordination with the appropriate railroad authorities as required.

An analysis of representative transmission line centerlines was performed to identify roadways within 50 feet of the centerlines (see Table 3.16-17 in Section 3.16.6.2.3). The analysis includes the following roadway categories: local, minor arterial/minor collector, principal arterial/major urban collector, county roads, state highways, federal highways, and interstates.

3.16.6.1.1.4 Airport, Airfield, and Navigation Aid

Transmission line structures and lines are a navigation issue and can become a hazard if they are located too close to airport operations or military airspace operating areas. Transmission line construction near an airport presents the potential for new flight safety issues. Effects can occur depending on the proximity between flight paths and transmission line locations, structure and conductor heights, and compliance with applicable requirements. Incorporation of design features and implementation of EPMs are expected to reduce the extent of the safety issues to permissible levels. Any routes with irresolvable issues related to airports or airspace would require FAA review and coordination with specific facilities or entities.

Airports, airfields, and navigation aids within 4 miles of the Applicant Proposed Route and the HVDC alternative routes were identified (see Table 3.16-3 for airports and airstrips). Specific mileage from the representative centerlines is provided to identify potential for conflicts, the triggering of FAA review requirements, or potential impacts to navigation aids.

3.16.6.1.1.5 Roadway Infrastructure

Roadway pavement or other infrastructure might be damaged by heavy vehicles delivering equipment and materials to the site. Specifications and haul routes for oversize/overweight vehicles and equipment would be developed for a Transportation and Traffic Management Plan. Other impacts to roadway infrastructure could include damage from temporary access points. Such damage would be repaired and restored, so the impacts would be temporary. These impacts would be generally common to all alternatives and are therefore not specifically evaluated in terms of the Applicant Proposed Route and HVDC alternative routes.

3.16.6.1.2 EPMs

The Applicant would implement EPMs to avoid or minimize potential impacts resulting from construction, operations and maintenance, and decommissioning of the Project. Prior to construction, the Applicant would develop and implement a Transportation and Traffic Management Plan that would detail the requirements, permits, plans, and mitigation procedures that would be implemented to avoid or minimize potential impacts on transportation infrastructure and traffic conditions.

The Applicant has developed a comprehensive list of EPMs that would avoid or minimize transportation impacts. Implementation of these EPMs is assumed throughout the impact analysis that follows. A complete list of EPMs for the proposed Project is provided in Appendix F*;* those EPMs that would specifically minimize the potential for transportation impacts are listed below:

- LU-2: Clean Line will minimize the frequency and duration of road closures.
- GE-26: When needed, Clean Line will use guard structures, barriers, flaggers, and other traffic controls to minimize traffic delays and road closures.
- GE-8: Access controls (e.g., cattle guards, fences, gates) will be installed, maintained, repaired, replaced, or restored as required by regulation, road authority, or as agreed to by landowner.
- LU-1: Clean Line will work with landowners and operators to ensure that access is maintained as needed to existing operations (e.g., to oil/gas wells, private lands, agricultural areas, pastures, hunting leases).
- LU-4: Clean Line will coordinate with landowners to site access roads and temporary work areas to avoid and/or minimize impacts to existing operations and structures.
- GE-1: Clean Line will train personnel on health, safety, and environmental matters. Training will include practices, techniques, and protocols required by federal and state regulations and applicable permits.
- GE-6: Clean Line will restrict vehicular travel to the ROW and other established areas within the construction, access, or maintenance easement(s).
- GE-7: Roads not otherwise needed for maintenance and operations will be restored to preconstruction conditions. Restoration practices may include decompacting, recontouring, and re-seeding. Roads needed for maintenance and operations will be retained.
- GE-16: Where required by FAA, or in certain areas to protect aviator safety, Clean Line will mark structures and/or conductors and/or shield wires with high-visibility markers (i.e., marker balls or other FAA-approved devices).

3.16.6.2 Impacts Associated with the Applicant Proposed Project

3.16.6.2.1 Converter Stations and AC Interconnection Siting Areas

Based on the traffic impact analysis (Clean Line 2014), construction of the Oklahoma converter station and AC interconnection is not predicted to result in an LOS decrease for any roadway segments.

Construction of the Tennessee converter station (simultaneously with the HVDC transmission line) is predicted to result in a decrease from LOS-A to LOS-B for nine roadway segments; from LOS-B to LOS-C for five roadway segments; and from LOS-C to LOS-D for six roadway segments. With an LOS-B or LOS-C, impacts to roadways would be minimally noticeable to motorists and temporary during construction, and all roadways would continue to operate at an acceptable LOS-C or better. For roadways that are currently operating at LOS-C, a decrease to LOS-D might be unacceptable to specific jurisdictions. The area of the Tennessee converter station is more densely populated and urbanized than most other portions of the proposed Project. It is important to note that the decrease from LOS-C to LOS-D is only a one-level drop in operation level and would be minimally noticeable to motorists. In addition, the assumptions made for the traffic analysis are conservative and were intended to identify where there might be potential effects to roadway segments in the ROI. The scenario that peak traffic would be distributed entirely to the roadway segments with resulting decreases to LOS-D is a worst-case scenario; actual impacts to these roadway segments are expected to be less than predicted.

Airports, airstrips, and navigation aids in relation to potential FAA requirements and review are not relevant for the converter stations, except in cases of direct property encroachment, because the converter station structures would not exceed 85 feet in height, well below the 200-foot FAA review trigger, and the direct property encroachment would be avoided. Areas where the AC interconnection might conflict with airports and airstrips would be evaluated in greater detail during the detailed Project design in terms of safety issues and FAA review requirements. Tower heights are not anticipated to exceed 180 feet. Although 180 feet would not trigger the 200-foot FAA review requirement, other FAA review triggers depend on proximity to airports and local topography considerations.

3.16.6.2.1.1 Construction Impacts

3.16.6.2.1.1.1 Oklahoma Converter Station Siting Area and AC Interconnection Siting Area

All public roadways within the Oklahoma Convertor Station Siting Area currently operate at an acceptable LOS-A. An estimated 1,117 additional construction trips could occur during construction of both the converter station and HVDC transmission line; a maximum of 1,390 trips are estimated under a scenario where the convertor station, AC collection system, and HVDC transmission line are under construction at the same time (Table 3.16-9). Construction trips for the converter station alone, or in conjunction with the HVDC transmission line, are not predicted to result in an LOS decrease for any roadway segments in the siting area ROI.

It is possible that the converter station might require acquisition of Texas CR-202 roadway ROW and require permitting from the county. Based on the assessment of roadway categories where centerlines are within 50 feet of the roadway, 0.04 mile of the Oklahoma converter station AC interconnection is within 50 feet of a principal arterial/major urban collector roadway.

No railroads are located in the Oklahoma Converter Station Siting Area. No airports, airstrips, or navigation aids are located within 4 miles of the siting area.

3.16.6.2.1.1.2 Tennessee Converter Station Siting Area and AC Interconnection Siting Area

All public roadways within the ROI of the Tennessee Converter Station Siting Area currently operate at an acceptable LOS-C or better. As shown in Table 3.16-12, during construction, trips generated from the converter station could result in LOS decreases as described below:

- LOS-A to LOS-B—segments of Mudville Road, Tipton Road, Tracy Road, Rosemark Road, West Union Road, Armour Road, and Sledge Road
- LOS-B to LOS-C—segments of Tipton Road, Brunswick Road, and Rosemark Road
- LOS-C to LOS-D—segments of SH-14 and local roads Munford Avenue, Atoka Idaville Road, Church Street, and Navy Road

These impacts to roadways are centered in the areas of Munford, Atoka, and Millington, Tennessee. It is important to note that the decrease from LOS-C to LOS-D is only a one-level drop in operation level, and would be minimally noticeable to motorists. In addition, the assumptions made for the traffic analysis are conservative and were intended to identify where there might be potential effects to roadway segments in the ROI. The scenario that peak traffic would be distributed entirely to the roadway segments with resulting decreases to LOS-D is a worst-case scenario and thus, actual impacts to these roadway segments are expected to be less than predicted.

Table 3.16-12:
Roadway Segments with LOS Decrease—Tennessee Converter Station Siting Area and Representative Interconnect

Roadway	Location	Map ID	Alternatives Impacted	Existing LOS	LOS with Project Construction
Class I					
Munford Avenue	in Munford, TN	474296840	TCS	C	D
Atoka Idaville Road	in Atoka, TN	474297776	TCS	C	D
Tipton Road	south of Munford, TN	474298720	TCS	B	C
Mudville Road	north of Millington, TN	477133599	TCS	A	B
Brunswick Road	northwest of Arlington, TN	477136320	TCS	B	C
Church Street	in Millington, TN	477137273	TCS	C	D
Navy Road	in Millington, TN	477136675	TCS	C	D
Navy Road	in Millington, TN	477136700	TCS	C	D
SH-14	east of Millington, TN	477138707	TCS	C	D
Munford Avenue	in Munford, TN	474296840	TCS and HVDC line	C	D
Atoka Idaville Road	in Atoka, TN	474297776	TCS and HVDC line	C	D
Atoka Idaville Road	east of Atoka, TN	474298172	TCS and HVDC line	B	C
Tipton Road	south of Munford, TN	474298720	TCS and HVDC line	B	C
Mudville Road	north of Millington, TN	477133599	TCS and HVDC line	A	B
Bethuel Road	in Millington, TN	477137092	TCS and HVDC line	B	C
Brunswick Road	northwest of Arlington, TN	477136320	TCS and HVDC line	B	C
Church Street	in Millington, TN	477137273	TCS and HVDC line	C	D
Navy Road	in Millington, TN	477136675	TCS and HVDC line	C	D
Navy Road	in Millington, TN	477136700	TCS and HVDC line	C	D
SH-14	east of Millington, TN	477138707	TCS and HVDC line	C	D
Class II					
Tipton Road	south of Munford, TN	474300336	TCS	A	B
Tracy Road	south of Munford, TN	474301493	TCS	A	B
Rosemark Road	northeast of Millington, TN	477133859	TCS	B	C
Rosemark Road	northeast of Millington, TN	477136190	TCS	A	B
West Union Road	north of Millington, TN	477134688	TCS	A	B
Armour Road	east of Millington	477136908	TCS	A	B
Sledge Road	east of Millington	477140121	TCS	A	B
Portersville Road	south of Brighton, TN	474294203	TCS and HVDC line	A	B
Maple Hill Dr	in Munford, TN	474297087	TCS and HVDC line	A	B
Tipton Road	south of Munford, TN	474300336	TCS and HVDC line	A	B
Tracy Road	south of Munford, TN	474301493	TCS and HVDC line	A	B
Rosemark Road	northeast of Millington, TN	477133859	TCS and HVDC line	B	C
Rosemark Road	east of Millington	477136190	TCS and HVDC line	A	B
West Union Road	north of Millington, TN	477134688	TCS and HVDC line	A	B
Armour Road	east of Millington	477136908	TCS and HVDC line	A	B
Sledge Road	east of Millington	477140121	TCS and HVDC line	A	B

Source: Clean Line (2014)
TCS = Tennessee Converter Station

In the case of both the converter station and HVDC transmission line being under construction in Region 7 at the same time, up to 1,117 construction trips would be generated (Table 3.16-9). For this case, the LOS of four additional public roads would be affected. During construction, trips generated from this scenario are predicted to cause an additional decrease from LOS-A to LOS-B for segments of Portersville Road and Maple Hill Drive, and from B to C for segments of Atoka Idaville Road and Bethuel Road.

With LOS-B and LOS-C, impacts to roadways would be temporary during construction. Although an LOS-D would result in a measurable decrease in roadway operation, the decrease would be temporary and the decrease in operation would be limited to one LOS level. This decrease is not likely to be noticed by motorists.

No portion of the AC Interconnection Siting Area is located within this area based on the assessment of roadway categories where the area is within 50 feet of the roadway.

No railroads are located within the Tennessee Converter Station Siting Area. Two airports are located within 4 miles of the converter station siting area—Millington Regional Jetport and Ray Airport. Equipment and buildings associated with the converter station are expected to be less than 85 feet in height and would not require consideration in regards to FAA requirements. Transmission line structures for the AC interconnection would not exceed 180 feet and would be located in relatively flat topography, but they may be subject to FAA review due to their proximity to the Millington Regional Jetport.

The Tennessee Converter Station Siting Area is located within a populated area that might contain bus routes and where emergency routes would be essential to maintain.

3.16.6.2.1.2 Operations and Maintenance Impacts

The operations and maintenance of the converter station and AC interconnection siting areas would require employees, resulting in an incremental increase in localized vehicle trips. The converter station and AC interconnection would be inspected regularly or as necessary using fixed-wing aircraft, helicopters, ground vehicles, all-terrain vehicles, and/or through pedestrian inspection.

Incidental safety impacts could occur in relation to slow-moving Project vehicles on steep roads with limited sight distance required for operations and maintenance of the converter stations or AC interconnection lines, but the travel volumes would be far lower and more distributed over time than those associated with the construction phase These impacts would be associated with normal travel to and from the AC interconnection transmission lines for inspections and repairs.

Based on the number of trips generated during the operational period and their distribution within the roadway network, substantial capacity and congestion impacts are not anticipated. Incidental congestion and delay would be expected from the following: slow-moving trucks and service vehicles and vehicle turning movements where activities occur near and parallel to roadways. Incidental travel time delays are not expected to substantially influence emergency response times or local travel. Access roads not required for facility operations and maintenance would be closed or closed and reclaimed/restored.

Railroad impacts would involve infrequent crossings by construction vehicles and occasional inspections and repairs near railroad tracks. Impacts to railroad operations could occur were a repair needed over an active track, but this is anticipated to be a rare event.

Operations and maintenance of the converter stations or AC interconnection lines would not result in impacts to airports.

3.16.6.2.1.3 Decommissioning Impacts

Impacts during decommissioning of the converter stations and AC interconnection would be similar to those anticipated during construction. EPMs would remain applicable during the decommissioning phase of the Project. The Applicant would be responsible for the decommissioning and reclamation of access roads following abandonment in accordance with the landowner's or appropriate agency's direction. Roadway reclamation would reduce motor vehicle access and return the access road areas back to preconstruction conditions. Temporary access roads may be left intact through mutual agreement of the appropriate landowners and jurisdictional entities.

3.16.6.2.2 AC Collection System

3.16.6.2.2.1 Construction Impacts

All public roadways within 6 miles of the centerline of the ROWs for the AC collection system routes currently operate at an acceptable LOS-B or better. As shown in Table 3.16-13, during construction of the AC collection system, trips added to the ROI could result in a decrease to LOS-B from LOS-A for segments of the following Class I roadways: US-83, US-412, SH-15, and Texas County Highway 28. Impacts to roadways would be temporary during construction.

Table 3.16-13:
Roadway Segments with LOS Decrease—AC Collection System

Roadway Segment	Location	Segment Map ID	Existing LOS	LOS during Project Construction
Class I				
County Highway 28	northeast of Guymon, OK	494361171	A	B
SH-15	near Spearman, OK	444942983	A	B
SH-15	near Spearman, OK	490055417	A	B
SH-15	near Spearman, OK	490055424	A	B
SH-15	near Spearman, OK	490234155	A	B
SH-15	near Spearman, OK	490234211	A	B
SH-70	south of Perryton, OK	490231684	A	B
SH-70	south of Perryton, OK	502121390	A	B
US-412	east of Balko, OK	493084995	A	B
US-412	near Hardesty, OK	494370475	A	B
US-412	near Hardesty, OK	494371189	A	B
US-412	near Hardesty, OK	494371676	A	B
US-412	near Hardesty, OK	494373033	A	B
US-412	near Hardesty, OK	494373352	A	B
US-83	south of Perryton, OK	490233696	A	B

Source: Clean Line (2014)

Table 3.16-14 lists the number of federal and state highway impacts by AC collection system route. Additional discussion for individual alternatives is provided in the sections below.

Table 3.16-14:
AC Collection System Roadway Impacts and Railroad Crossings by Alternative

Alternative	LOS Decrease—Number of U.S. Highways[1]	LOS Decrease—Number of State Highways[1]	Number of U.S. Highways Crossed[2]	Number of State Highways Crossed[2]	Number of Railroad Crossings[2]
E-1	2	3	1	0	0
E-2	2	3	1	0	0
E-3	2	3	1	0	0
NE-1	2	3	2	0	2
NE-2	2	3	0	1	0
NW-1	2	3	2	1	1
NW-2	2	3	0	1	1
SE-1	2	3	0	2	0
SE-2	0	0	0	0	0
SE-3	2	3	0	1	1
SW-1	0	0	0	0	0
SW-2	2	3	0	1	0
W-1	0	0	1	0	1

1 Source: Clean Line (2014)
2 GIS Data Sources: BTS (2013), TXDOT (2013), CSA (2007), AHTD (2006a), USCB (2000)

Table 3.16-15 lists the miles of AC collection system route centerlines within 50 feet of roadways.

Table 3.16-15:
AC Collection System Route Centerlines within 50 feet of Roadways (miles)

Route	Local Roads	Minor Arterials and Minor Collector Roads	Principal Arterials and Major Urban Collectors	State Highways	County Roads
E-1	<0.1	0	<0.1	0	0
E-2	1.1	0.3	0.1	0	0
E-3	5.1	0	3.4	0	0
NE-1	0	0	0	0	0
NE-2	0	0	0	0	0
NW-1	0	0	0	0	0
NW-2	0	0	0	0	0
SE-1	0.4	0.1	0.1	0.1	3.3
SE-2	0	0	0	0	0.1
SE-3	0.6	0.2	0.1	0.1	12.4
SW-1	0	0	0	0.1	0.2
SW-2	0	0	0	0.1	5.7
W-1	0	0	0	0	0

Source: Clean Line (2014)

The AC Collection System Routes E-1, NE-2, and NW-2 would cross US-412 resulting in a decrease from LOS-A to LOS-B for segments of the following roadways: US-83, US-412, SH-15, and County Highway 28. AC Collection System Routes E-1, NE-2, and NW-2 representative centerlines would not be located within 50 feet of any of the analyzed roadway categories. AC Collection System Routes E-1 and NE-2 would not cross any railroads. The representative centerline of AC Collection System Route NE-2 is located 2.79 miles from Hooker Municipal Airport (Table 3.16-3). Transmission structures for the AC collection system would not exceed 180 feet, so given the relatively flat topography of the area, they would not require an FAA review. AC Collection System Routes NW-1 and NW-2, cross one railroad at US-54; and SE-3, and W-1 also cross one railroad. AC Collection System Route NE-1 has two railroad crossings.

AC Collection System Routes E-2 and E-3 would both cross US-83, resulting in a decrease from LOS-A to LOS-B for segments of the following roadways: US-83, US-412, SH-15 and County Highway 28. AC Collection System Route E-2 is parallel to and within 50 feet of local roadways for approximately 1 mile. AC Collection System Route E-3 would be parallel to and within 50 feet of local roadways for 5 miles, and principal arterials/major urban collector roadways for 3.4 miles.

AC Collection System Routes NE-1 and NE-2 would both cross US-412 and US-54, resulting in a decrease from LOS-A from LOS-B for segments of the following roadways: US-83, US-412, SH-15, and County Highway 28. AC Collection System Routes NE-1 and NW-1 would not be located within 50 feet of any of the analyzed roadway categories. AC Collection System Route NE-1 would cross the railroad along US-54 at two locations. This alternative centerline is located 2.56 miles from Hooker Municipal Airport. AC Collection System Route NW-1 would cross the railroad along US-54. This alternative representative centerline is located 3.47 miles from Guymon Municipal Airport. Transmission structures for AC Collection System Routes NE-1 and NW-1 would not exceed 180 feet, so given the relatively flat topography of the area they would not require an FAA review.

AC Collection System Routes SE-1 and SE-3 would both cross SH-15, resulting in a decrease from LOS-A from LOS-B for segments of the following roadways: US-83, US-412, SH-15, and County Highway 28. Under LOS-B, impacts to roadways would be temporary during construction. AC Collection System Route SE-1 would be parallel to and within 50 feet of county roadways for 3.3 miles and AC Collection System Route SE-3 would be parallel to and within 50 feet of county roadways for 12.4 miles. The close proximity to roadways might result in impacts to roadway ROW and to traffic during construction. Both alternatives cross one railroad near SH-15.

AC Collection System Routes SE-2 and SW-1 would not result in an LOS decrease for segments of any roadways in the ROI. The alternatives would not cross any federal or state highways or railroads.

AC Collection System Route SW-2 would cross SH-15, resulting in a decrease from LOS-A to LOS-B for segments of the following roadways: US-83, US-412, SH-15, SH-207, and County Highway 28. The route is parallel to and within 50 feet of county roadways for 5.7 miles.

The AC Collection System Route W-1 would cross US-54, but not result in an LOS decrease for segments of any roadways in the ROI. The alternative crosses one railroad near US-54.

3.16.6.2.2.2 Operations and Maintenance Impacts

Operations and maintenance of both the AC collection system and HVDC transmission line in Oklahoma would require a total of 32 employees. These 32 new jobs would result in a related increase in population due to family size and also have the potential to induce an additional 83 jobs in Oklahoma and Texas (see Section 3.13). The additional trips that this potential increase in population would generate, including trips from the predicted induced employment, would be negligible in terms of the existing area roadway traffic. None of the routes would result in impacts to railroads or airports/airfields as a result of operations and maintenance of the AC collection system.

Impacts to traffic, roadway capacity and congestion, and railroads would be similar as describe in Section 3.16.6.2.1. Impacts on airports would not change during the operational phase.

3.16.6.2.2.3 Decommissioning Impacts

Impacts during decommissioning would be similar to those described in Section 3.6.6.2.1.

3.16.6.2.3 HVDC Applicant Proposed Route

3.16.6.2.3.1 Construction Impacts

Descriptions of construction impacts (including impacts to LOS) associated with the Applicant Proposed Route are provided by region in the Sections below. Table 3.16-16 provides a roadway impact summary by Project region and a list of roadway and railroad crossings. LOS impacts have been evaluated to describe potential impacts, but note that these are based on conservative assumptions (Section 3.16.6.1).

Table 3.16-16:
Applicant Proposed Route Roadway Impacts and Railroad Crossings by Region

Region	LOS Decrease—Number of Roadway Segments[1]	LOS Decrease to LOS-D or F[1]	Number of U.S. Highways Crossed[2]	Number of State Highways Crossed[2]	Number of Railroad Crossings[2]
1	11	0	5	1	0
2	10	0	3	3	3
3	37	0	8	5	4
4	34	12	4	12	3
5	8	1	3	13	1
6	5	0	1	7	2
7	15	10	4	5	3

1 Source: Clean Line (2014)
2 Source: OCGI (2012); GIS Data Sources: AHTD (2006a), TXDOT (2013), USCB (2013)

Table 3.16-17 lists the miles by region of Applicant Proposed Route centerlines within 50 feet of roadways.

Table 3.16-17:
Applicant Proposed Route Centerlines within 50 feet of Roadways by Region (miles)

Region	Local Roads	Minor Arterials and Minor Collector Roads	Principal Arterials and Major Urban Collectors	State Highways	County Roads	U.S. Highways	Interstates
Region 1	6.7	0.4	3.4	0	0	0	0
Region 2	19.8	0.2	1.2	0	0	0	0

Table 3.16-17:
Applicant Proposed Route Centerlines within 50 feet of Roadways by Region (miles)

Region	Local Roads	Minor Arterials and Minor Collector Roads	Principal Arterials and Major Urban Collectors	State Highways	County Roads	U.S. Highways	Interstates
Region 3	11.3	0.6	2.4	0	0	0	0.1
Region 4	1.4	37.1	0.6	0.6	5.2	0.2	0.4
Region 5	0	0	0	0.9	5.0	0.3	0
Region 6	0	0	0	0.4	10.4	0.1	0
Region 7	2.1	0	0	0.7	4.4	0.4	0.1

GIS Data Sources: BTS (2013), TXDOT (2013), CSA (2007), AHTD (2006a), USCB (2000)

The FAA standards for tall structures in areas near airports and airstrips apply to structures above 200 feet in height. It is unlikely that any of the transmission structures would be designed to exceed 200 feet, so it is unlikely that the Applicant Proposed Route would result in such impacts to airports and airstrips. However, FAA review requirements are also triggered by proximity and topography in some cases and the potential impacts are discussed below. Construction of the Project is not expected to otherwise impact air transportation.

3.16.6.2.3.1.1 Region 1

The Applicant Proposed Route would cross the following federal and state highways: US-83, US-283, US-270, US-183, US-34, and SH-23. The proximity to roadways might result in impacts to roadway ROW and to traffic. Table 3.16-18 lists LOS impacts in Region 1 for the Applicant Proposed Route. The route does not cross any railroads and the centerline is not located within 4 miles of airports, airfields, or navigation aids.

Table 3.16-18:
Roadways with LOS Decreases for the Applicant Proposed Route—Region 1

Roadway	Location	Map ID	Existing LOS	LOS with Project Construction
Region 1				
US-270	between the SH-23 intersection and intersection with US-283	493085071	A	B
		493085100	A	B
		493085124	A	B
		493085143	A	B
		493085150	A	B
		493085171	A	B
US-283	between the US-412 intersection and US-64 intersection	493111878	A	B
		493112161	A	B
		493112511	A	B
		493112972	A	B
US-412	between Guymon and Hardesty, OK	494373352	A	B

Source: Clean Line (2014)

3.16.6.2.3.1.2 Region 2

The Applicant Proposed Route would cross the following federal and state highways: SH-15, SH-58, SH-132, US-412, US-281, US-60, and US-81. The representative route centerline is parallel to and within 50 feet of 19.8 miles of local roads and 1.2 miles of principal arterials/major urban collector roads. The proximity to roadways might result in impacts to roadway ROW and to traffic. Table 3.16-19 provides a listing of LOS impacts in Region 2 for the Applicant Proposed Route. The route would cross three railroads in the area. Steinert Lakes private airport is located 3.2 mile from the route centerline (Table 3.16-3). Transmission structures for the Applicant Proposed Route are not expected to exceed 200 feet in height, and the landscape in the area is relatively flat and would not trigger the 1:50 slope ratio limitation, so FAA review requirements are not anticipated. The more populated area of Enid, Oklahoma, might have bus and emergency routes that could be impacted by construction traffic.

Table 3.16-19:
Roadways with LOS Decreases for the Applicant Proposed Route—Region 2

Roadway	Location	Map ID	Existing LOS	LOS with Project Construction
Class I				
SH-51	west of Hennessey, OK	499802732	A	B
East Jack Choate Avenue	In Hennessey, OK	499803699	A	B
SH-51	east of Hennessey	499803873	A	B
SH-58	South of Fairview, OK	499826079	A	B
US-60	north of Seiling, OK	499829895	A	B
South Main Street	in Fairview, OK	499830450	A	B
US-60	in Fairview, OK	499830451	A	B
US-60	north of Seiling, OK	499830588	A	B
Class II				
East Jack Choate Avenue	In Hennessey, OK	499803699	A	B
South Main Street	In Fairview, OK	499830450	A	B

Source: Clean Line (2014)

3.16.6.2.3.1.3 Region 3

The Applicant Proposed Route would cross the following federal and state highways: SH-74, SH-51, SH-18, SH-99, SH-48; US-177, US-75 Alternate, US-75, US-63, US-69; I-35, I-44; and the Muskogee Turnpike. The route centerline is within 50 feet of 11.3 miles of local roads and 2.4 miles of principal arterials/major urban collector roads. Table 3.16-20 provides a list of roadway segments that are predicted to have a decrease in LOS during construction. The Applicant Proposed Route crosses four railroads in Region 3. The eastern boundary of Region 3 (with Region 4) is located at the Arkansas River crossing. There are two highway crossings within the ROI: I-40 and US-64/SH-100. US-64/SH-100 is closer to the Applicant Proposed Route crossing and provides a more direct pathway to the eastern side of the river (within Region 4). This roadway also passes through Webbers Falls and Gore, Oklahoma, where segment LOS decreases are indicated during construction. Traffic impacts to US-64/SH-100 are likely in the area of the river crossing. Although roadway segments in Webbers Falls currently operate at LOS-A, roadway segments in Gore operate at LOS-B and LOS-C.

Table 3.16-20:
Roadways with LOS Decreases for the Applicant Proposed Route—Region 3

Roadway	Location	Map ID	Existing LOS	LOS with Project Construction
Class I				
East 6th Avenue	east of Stillwater	424886892	B	C
SH-108	in Ripley, OK	424900156	A	B
SH-108	in Ripley, OK	424900277	A	B
North Little Avenue	in Cushing, OK	424901487	B	C
SH-33	between Perkins and Cushing, OK	424902311	B	C
SH-33	between Perkins and Cushing, OK	424902390	B	C
SH-33	between Perkins and Cushing, OK	424902415	B	C
SH-33	between Perkins and Cushing, OK	424902447	B	C
SH-99	southwest of Drumright, OK	425801393	A	B
SH-99	southwest of Drumright, OK	425801863	A	B
SH-99	southwest of Drumright, OK	425806148	A	B
SH-16	northwest of Bristow, OK	428309035	A	B
West 4th Avenue	in Bristow, OK	428311066	B	C
West 4th Avenue	in Bristow, OK	428311068	B	C
East 1st Avenue	in Bristow, OK	428311270	B	C
South Chestnut Street	in Bristow, OK	428311782	B	C
Alt 75	south of Mounds, OK	428317448	A	B
West Highway 16	north of Slick, OK	428317653	A	B
SH-16	in Slick, OK	428875984	A	B
Alt 75	south of Mounds, OK	439896010	A	B
SH-33	between Perkins and Cushing, OK	439897933	B	C
SH-66	in Bristow, OK	439903008	B	C
US-62	south of Haskell, OK	444814176	A	B
US-64	in Haskell, OK	445475168	B	C
US-64	between Webbers Falls and Gore, OK	499618847	A	B
US-75 Bus	in Beggs, OK	499641185	B	C
US-75 Bus	in Beggs, OK	499641193	B	C
US-75 Bus	in Beggs, OK	499641199	B	C
US-75 Bus	in Beggs, OK	499641228	A	B
US-75 Bus	in Beggs, OK	499641245	A	B
SH-16	in Beggs, OK	499643392	A	B
US-64	in Gore, OK	499683838	B	C
US-64	in Gore, OK	499683842	B	C
SH-10	southeast of Gore, OK	499690169	A	B
SH-100	northeast of Gore, OK	516506775	A	B
SH-100	northeast of Gore, OK	516506777	A	B
US-64	southeast of Gore, OK	516507047	A	B
Class II				
Fairgrounds Road	east of Stillwater	424895827	A	B

Source: Clean Line (2014)

Two public airfields are within 4 miles of the Applicant Proposed Route centerline: Davis Field Airport is 3.5 miles from the centerline and Cushing Municipal Airport is 0.8 mile from the representative centerline (Table 3.16-3). Four private airports or airfields are located within 4 miles of the Applicant Proposed Route centerline, and three private heliports are located within 4 miles of the centerline. Two of the private airfields or heliports are located within 1 mile of the Applicant Proposed Route centerline. However, most transmission structures for the route are not expected to exceed 200 feet in height, and the landscape in the area is relatively flat so FAA review requirements are not anticipated for those structures. The height of the Arkansas River crossing could range from approximately 130 to 200 feet on the west bank within Region 3 to maintain necessary clearance over the navigable channels. River traffic may be controlled, in coordination with the USACE, during the short time required to span the conductor across the Arkansas River. No airports are located within 4 miles of the crossing area. Three navigation aids are located within 4 miles of the representative route centerline: CUH NDB, OKMVOR/DME, and MKO NDB. All of these navigation aids are located over 1 mile from the representative route centerline, and the route is not expected to cause interference with these facilities.

The more populated areas of Stillwater and Muskogee, Oklahoma, may have bus and emergency routes that could be impacted by construction traffic.

Figure 3.16-1 in Appendix A provides additional details regarding existing roadways; railroads, and airports and airstrips within Region 3.

3.16.6.2.3.1.4 Region 4

The Applicant Proposed Route would cross the following federal and state highways: SH-10, SH-100, SH-82, SH-352, SH-164, SH-103, SH-21, SH-123, US-59, SH-59, I-40, I-540, SH-162, US-64, SH-23, and SH-219. Table 3.16-21 lists roadway segments where the LOS is predicted to decrease during. The Applicant Proposed Route would result in a decrease from LOS-C to LOS-D for several segments. Although an LOS-D would result in a measurable decrease in roadway operations, the decrease would be temporary, and because the decrease is only one LOS level, a significant incremental impact is not expected in relation to existing conditions. At the Arkansas River crossing, the structure heights could range from approximately 180 to 250 feet on the east bank located in Region 4. Region 4 would have the same impacts at the Arkansas River crossing as described above for Region 3.

Table 3.16-21:
Roadways with LOS Decreases for the Applicant Proposed Route—Region 4

Roadway	Location	Map ID	Existing LOS	LOS with Project Construction
Class I				
SH-23	south of Ozark, AR	41455642	B	C
West Commercial Street	in Ozark, AR	41456033	C	D
Ozark Franklin County Airport	in Ozark, AR	425748260	A	B
SH-219	in Ozark, AR	425751612	C	D
Highway 219	north of Ozark, AR	425753499	A	B
North 6th Street	in Van Buren, AR	434179275	A	B
Dora Road	west of Van Buren, AR	443274111	A	B
East Cherokee Avenue	in Sallisaw, OK	495345002	C	D
East Cherokee Avenue	in Sallisaw, OK	495345030	C	D
SH-60	northwest of Alma, AR	496214037	A	B

Table 3.16-21:
Roadways with LOS Decreases for the Applicant Proposed Route—Region 4

Roadway	Location	Map ID	Existing LOS	LOS with Project Construction
Highway 282	northeast of Van Buren, AR	496215536	A	B
South Rogers Street	in Clarkesville, AR	496232484	C	D
South Rogers Street	in Clarkesville, AR	496232533	C	D
South Rogers Street	in Clarkesville, AR	496235352	C	D
East Main Street	in Clarkesville, AR	496236784	C	D
West Cherokee Avenue	in Vian, OK	499685764	B	C
South Thornton Street	in Vian, OK	499689658	B	C
East Schley Street	in Vian, OK	499689764	B	C
West Cherokee Avenue	in Sallisaw, OK	499690553	C	D
US-59	in Sallisaw, OK	499691323	C	D
West Cherry Street	in Alma, AR	508287883	A	B
US-64	west of Ozark, AR	508624079	A	B
East Main Street	in Clarkesville, AR	508628771	B	C
SH-123	in Clarkesville, AR	508628790	A	B
West Main Street	in Clarkesville, AR	510341660	C	D
West Main Street	in Clarkesville, AR	510342226	C	D
US-59	in Sallisaw, OK	510587183	B	C
North 11th Street	in Van Buren, AR	511174296	A	B
Class II				
North 6th Street	in Van Buren, AR	434179275	A	B
Dora Road	west of Van Buren, AR	443274111	A	B
SH-60	northwest of Alma, AR	496214037	A	B
Highway 282	northeast of Van Buren, AR	496215536	A	B
West Cherry Street	in Alma, AR	508287883	A	B
North 11th Street	in Van Buren, AR	511174296	A	B

Source: Clean Line (2014)

The Applicant Proposed Route crosses three railroads. The Applicant Proposed Route centerline is within approximately 1 mile of one public airport, Ozark-Franklin County Airport (within 0.6 mile) and 3.7 miles from Clarksville Municipal Airport. The Applicant Proposed Route centerline is within 2 miles of a private hospital heliport and within 4 miles of two private airports. However, most transmission structures are not expected to exceed 200 feet in height, and the landscape in the area is relatively flat, so they are unlikely to trigger FAA height or slope ratio limitations. The representative route centerline is 3.9 miles from the CZE NDB navigation aid and is not expected to impact the facility.

The more populated area of Van Buren, Arkansas may have bus and emergency routes that could be impacted by construction traffic.

3.16.6.2.3.1.5 Region 5

The Applicant Proposed Route would cross the following federal and state highways: US-65, US-167, US-67, SH-164, SH-105, SH-124, SH-95, SH-287, SH-107, SH-16, SH-157, SH-87, SH-367, and SH-224. Table 3.16-22 lists roadway segments where the LOS is predicted to decrease during construction. The representative centerline of the Applicant Proposed Route is within 50 feet of 0.9 mile of state highways and 5 miles of county roads. The proximity to roadways might result in impacts to roadway ROW and traffic.

Table 3.16-22:
Roadways with LOS Decreases for the Applicant Proposed Route—Region 5

Roadway	Location	Map ID	Existing LOS	LOS with Project Construction
Class I				
Little Rock Road	north of Rose Bud, AR	495086707	B	C
Edgemont Road	northeast of Quitman, AR	495087059	A	B
SR 124	northeast of Russellville, AR	496275226	A	B
Heber Springs Road West	south of Heber Springs, AR	515874130	C	D
Highway 9	northwest of Damascus, AR	516208297	A	B
Class II				
Edgemont Road	northeast of Quitman, AR	495087059	A	B
SR 124	east of Dover, AR	496275226	A	B
Highway 9	southwest of Choctaw, AR	516208297	A	B

Source: Clean Line (2014)

The Applicant Proposed Route crosses one railroad near US-67. The Applicant Proposed Route centerline is located 1 to 3 miles from one private airport and two private airstrips. Transmission structures for the route are not expected to exceed 200 feet in height and slope ratios in relation to the airports would not exceed 1:50, so FAA review requirements are not anticipated.

3.16.6.2.3.1.6 Region 6

The Applicant Proposed Route would cross the following federal and state highways: US-49, SH-17, SH-145, SH-37, SH-214, SH-1, SH-163, and SH-75. The crossings would require ROW permits. Table 3.16-23 lists roadway segments where the LOS is predicted to decrease during construction. The route centerline is within 50 feet of 10.4 miles of county roads. The proximity to roadways might result in impacts to roadway ROW and traffic.

Table 3.16-23:
Roadways with LOS Decreases for the Applicant Proposed Route—Region 6

Roadway	Location	Map ID	Existing LOS	LOS with Project Construction
Class I				
Highway 14 East	south of Newport, AR	41848771	A	B
SH-14	east of Marked Tree, AR	445617713	A	B
Highway 1	south of Cherry Valley, AR	495221858	B	C
SH-14	north of Newport, AR	500360708	A	B
Class II				
SH-14	north of Newport, AR	500360708	A	B

Source: Clean Line (2014)

The Applicant Proposed Route crosses two railroads: one near SH-1 and one near US-49. The Applicant Proposed Route centerline is 0.1 mile to 3.4 miles from 14 private airfields. Transmission structures for the route are not expected to exceed 200 feet in height and slope ratios in relation to the airports/airfields would not exceed 1:50, so FAA review requirements are not anticipated.

The height of the transmission structures at the Mississippi River crossing could reach approximately 380 feet on the west bank within Region 6 to maintain necessary clearance over the navigable channels.

3.16.6.2.3.1.7 Region 7

The Applicant Proposed Route would cross the following federal and state highways: US-63, US-61, US-51/SH-3, SH-149, SH-322, SH-308, SH-77, and I-55. Table 3.16-24 lists roadway segments where the LOS is predicted to decrease during construction of the proposed Project, including general locations. The route centerline is within 50 feet of 2.1 miles of local roads and 4.4 miles of county roads.

Table 3.16-24:
Roadways with LOS Decreases for the Applicant Proposed Route—Region 7

Roadway	Location	Map ID	Existing LOS	LOS with Project Construction
Class I				
US-63	in Gilmore, AR	385533228	C	D
Munford Avenue	in Munford, TN	474296840	C	D
Kimbrough Avenue	in Munford, TN	474297271	B	C
Atoka Idaville Road	in Atoka, TN	474297776	C	D
Navy Road	in Millington, TN	477136664	C	D
Navy Road	in Millington, TN	477136700	C	D
Armour Road	east of Millington, TN	477136908	A	B
Church Street	in Millington, TN	477137273	C	D
Raleigh Millington Road	in Millington, TN	477137862	C	D
SH-14	east of Millington, TN	477138707	C	D
Singleton Pkwy	in Millington, TN	477140029	C	D
Sledge Road	east of Millington, TN	477140121	A	B
Highway 63	in Gilmore, AR	507380920	C	D
Class II				
Armour Road	east of Millington, TN	477136908	A	B
Sledge Road	east of Millington, TN	477140121	A	B

Source: Clean Line (2014)

The Applicant Proposed Route would cross the Mississippi River in Region 7. Only two highways cross the river near the proposed Project: I-40/US-64 and I-55/US-61. These highways are located in the urban areas of West Memphis, Arkansas, on the western side of the river, and in Memphis, Tennessee, on the eastern side of the river, and they are not located in the 6-mile ROI. The AADTs on these interstate highways near the river crossing range from 54,725 to 58,389. AADTs along I-40 farther east in the city of Memphis increase to more than 80,000. The 1,117 trips associated with construction of the converter station and the HVDC transmission line (Table 3.16-9) could increase the AADT on these highways by about 2 percent. This increase would not be significant for either highway over a 24-hour period.

The Applicant Proposed Route crosses three railroads: one near US-63, one near US-61, and one near US-51. The Applicant Proposed Route is within 2.5 miles of the Marked Tree Municipal Airport. Based on a 50:1 surface extending from the runway of this airport and structure heights that are not expected to exceed 200 feet, FAA notification would not be required. The Applicant Proposed Route is within 2 miles of the Millington Regional Jetport. Based on a 100:1 surface extending from the runway of this airport and potential structure heights, transmission line structures are likely to be subject to FAA review. The Applicant has and intends to continue to coordinate with the City of Millington and the FAA in the implementation of solutions to ensure continued safe airport operations. The Applicant intends to complete and submit Form 7460-1 (Notice of Proposed Construction or Alteration) to initiate FAA review as required for all structures that meet the criteria under 17 CFR Part 77.

The transmission structure height at the Mississippi River crossing might reach 380 feet to maintain necessary clearance over the navigable channels. River traffic may be controlled, in coordination with the USACE, during the short time required to span the conductor across the Mississippi River. However, no airports are located within 4 miles of the crossing area.

The greater metropolitan area of Memphis, Tennessee, may have bus and emergency routes that could be impacted by construction traffic. Bus and emergency routes would be identified in a Transportation and Traffic Management Plan described in Section 3.16.6.1.2. The plan would also include specific measures to avoid and mitigate potential impacts to bus routes and emergency vehicle traffic.

3.16.6.2.3.2 Operations and Maintenance Impacts

Operations and maintenance of the HVDC transmission line in Arkansas would require a total of 10 employees. These 10 new jobs would result in related increased population associated with family members and have the potential to induce an additional 15 jobs (see Section 3.13) in Arkansas. The additional trips from this potential increase in population, including trips from the predicted induced employment, would be negligible in terms of the existing area roadway traffic.

The additional trips that would result from the very slight potential increase in the local population as a result of 32 new jobs over the entire state of Oklahoma (for both the AC collection system and the HVDC transmission line), 10 jobs in the state of Arkansas, and 15 jobs in the state of Tennessee during operations and maintenance of the HVDC transmission line, including trips from potential induced employment, would not be noticeable in terms of the existing area roadway traffic.

The general types of impacts to traffic, roadway capacity and congestion, and railroads would be similar as described in Section 3.16,6.2.1.2. River traffic would not be impacted. Impacts on airports would not change during the operational phase.

3.16.6.2.3.3 Decommissioning Impacts

Impacts during decommissioning would be similar to those described in Section 3.6.6.2.1.

3.16.6.3 Impacts Associated with the DOE Alternatives

3.16.6.3.1 Arkansas Converter Station Alternative Siting Area and AC Interconnection Siting Area

3.16.6.3.1.1 Construction Impacts

All roadways currently operate at an acceptable LOS-C or better within the ROI. As shown in Table 3.16-25, during construction, trips generated from the converter station could result in a decrease to LOS-B from LOS-A for several segments of roadway. All roadways would continue to operate at an acceptable LOS-C or better in the converter station siting area.

Table 3.16-25:
Roadway Segments with LOS Decrease—Arkansas Converter Station Siting Area and AC Interconnection Siting Area

Roadway	Location	Map ID	Alternatives Impacted	Existing LOS	LOS with Project Construction
Class I					
US-64	east of Atkins, AR	496274975	ACS	A	B
US-64	east of Atkins, AR	496274975	ACS and HVDC line	A	B
SH-247	north of Atkins, AR	496275121	ACS and HVDC line	A	B
Class II					
Avenue Two Southeast	in Atkins, AR	496274854	ACS	A	B
SH-105 North	south of Hector, AR	496276184	ACS	A	B
SH-124	northeast of Russellville, AR	496275352	ACS	A	B
SH-124	northeast of Russellville, AR	496275226	ACS	A	B
SH-124	northeast of Russellville, AR	496275226	ACS and HVDC line	A	B
Avenue Two Southeast	in Atkins, AR	496274854	ACS and HVDC line	A	B
SH-105 North	south of Hector, AR	496276184	ACS and HVDC line	A	B
SH-105 North	north of Atkins, AR	496275339	ACS and HVDC line	A	B
SH-124	northeast of Russellville, AR	496275352	ACS and HVDC line	A	B
SH-124	northeast of Russellville, AR	496275226	ACS and HVDC line	A	B

Source: Clean Line (2014)

SH-124 and SH-247 are located within the Arkansas Converter Station Siting Area. Based on the assessment of roadway categories where centerlines are within 50 feet of the roadway, 0.17 mile of the AC interconnect centerline is within 50 feet of a county roadway.

No railroads are located within the Arkansas Converter Station Siting Area, and no airports, airstrips, or navigation aids are located within 4 miles of the siting area.

3.16.6.3.1.2 Operations and Maintenance Impacts

An estimated 15 workers would be employed that could lead to an additional overall population increase of 45 persons in the local area. The additional trips from this increase in population, including trips from the predicted induced employment of 22 persons (see Section 3.13), would be negligible in terms of the existing area roadway traffic.

3.16.6.3.1.3 Decommissioning Impacts

Impacts during decommissioning would be similar to those described in Section 3.6.6.2.1.

3.16.6.3.2 HVDC Alternative Routes

3.16.6.3.2.1 Construction Impacts

Construction impacts to the transportation system under the HVDC alternative routes are discussed below by region. LOS impacts have been evaluated to describe potential impacts, but note that these are based on conservative assumptions (Section 3.16.6.1.1).

The number of railroad crossings would generally be the same for all of the alternatives because the HVDC transmission line would generally traverse the same area in each region, although the actual crossing locations would vary somewhat by HVDC alternative route.

The FAA standards for tall structures in areas near airports and airstrips apply to structures above 200 feet in height. It is unlikely that any of the transmission structures would be designed to exceed 200 feet, so it is unlikely that any of the alternatives would result in such impacts to airports and airstrips. Potential impacts to airports and airstrips, however, are discussed below and considered conservative. Construction of the proposed Project is not expected to otherwise impact air transportation.

3.16.6.3.2.1.1 Region 1

During construction of the HVDC transmission line, trips added to the analysis area are predicted to result in an LOS decrease to LOS-B from LOS-A for segments of the following roadways: US-412, US-270, and US-283. Table 3.16-26 provides an overview of impacts to roadway segments by HVDC alternative route.

Table 3.16-26:
Roadways with LOS Decreases—Region 1

Roadway	Location	Map ID	Alternatives Impacted	Existing LOS	LOS with Project Construction
US-412	West of the SH-23 intersection	493084995	AR 1-B, 1-C	A	B
US-270	between the SH-23 intersection and intersection with US-283	493085071	AR 1-B, 1-C, 1-D, APR	A	B
		493085100	AR 1-D, APR	A	B
		493085124	AR 1-D, APR	A	B
		493085143	AR 1-D, APR	A	B
		493085150	AR 1-D, APR	A	B
		493085171	AR 1-D, APR	A	B
US-283	between the US-412 intersection and US-64 intersection	493111123	AR 1-A	A	B
		493111878	AR 1-A, 1-D, APR	A	B
		493112161	AR 1-A, 1-D, APR	A	B
		493112511	AR 1-A, 1-D, APR	A	B
		493112972	AR 1-A, 1-D, APR	A	B
US-412	between Guymon and Hardesty, OK	494370475	AR 1-A, 1-C	A	B
		494371189	AR 1-A, 1-C	A	B
		494371676	AR 1-A, 1-B, 1-C	A	B
		494373033	AR 1-A, 1-B, 1-C	A	B
		494373352	AR 1-A, 1-B, 1-C, APR	A	B

Source: Clean Line (2014)

Table 3.16-27 provides a summary of potential impacts from the Region 1 HVDC alternative routes. None of the routes would cross any railroads. Although slight local variations would occur for specific alternatives, the overall impacts to traffic from the proposed Project are expected to be similar in relation to the Applicant Proposed Route.

Table 3.16-27:
HVDC Transmission Line Roadway Impacts and Railroad Crossings by HVDC Alternative Routes—Region 1

Alternative	LOS Decrease—Number of Roadway Segments[1]	LOS Decrease —Number of Segments Not Present with APR[1 2)]	Number of U.S. Highways Crossed[3]	Number of State Highways Crossed[3]	Number of Railroad Crossings[3]
1-A	10	5	4	2	0
1-B	5	3	1	0	0
1-C	7	5	1	0	0
1-D	10	0	1	0	0

NA Not applicable
1 Source: Clean Line (2014)
2 This column is based on an assessment of the comparable APR links for each HVDC Alternative route and indicates where there are additional roadway segments that are predicted for a LOS decrease.
3 Source: OCGI (2012); GIS Data Sources: AHTD (2006a), TXDOT (2013), USCB (2013)

As shown in Table 3.16-28, HVDC alternative routes have a greater number of miles within 50 feet of roadways than the comparable links of the Applicant Proposed Route.

Table 3.16-28:
Centerline within 50 Feet of Roadways—Region 1

Route	Local Roads (miles)[1]	Minor Arterials and Minor Collector Roads (miles)[1]	Principal Arterials and Major Urban Collectors (miles)[1]	State Highways (miles)[2]	County Roads (miles)[1]	U.S. Highways (miles)[2]	Interstates (miles)[2]
AR 1-A (Corresponds with APR Links 4, 5)	12.8	0.2	11.2	0	0	0	0
AR 1-B (Corresponds with APR Link 2)	5.4	0.1	1.4	0	0	0	0
AR 1-C (Corresponds with APR Link 2)	2.8	0.1	1.3	0	0	0	0
AR 1-D (Link 4)	7.2	0.1	0.3	0	0	0	0
APR Link 1	0	0	0	0	0	0	0
APR Link 2	2.1	0.3	2.7	0	0	0	0
APR Link 3	0	0	0	0	0	0	0
APR Link 4	1.0	0.1	0.3	0	0	0	0
APR Link 5	3.5	0.1	0.4	0	0	0	0

1 GIS Data Sources: TXDOT (2013), CSA (2007)
2 GIS Data Sources: BTS (2013)

The LOS of five roadway segments may decrease for the HVDC alternative routes beyond the Applicant Proposed Route, so a small potential exists for increased construction impacts on LOS in comparison to the Applicant Proposed Route within this area.

While the centerline for HVDC Alternative Route 1-A is located 1.3 miles from the Laverne Municipal Airport (Table 3.16-3), its transmission structures are not expected to exceed 200 feet in height, and the landscape in the area is relatively flat, so FAA review requirements are not anticipated. HVDC Alternative Routes 1-B, 1-C, and 1-D centerlines are not located within 4 miles of airports, airfields, or navigation aids.

3.16.6.3.2.1.2 Region 2

Table 3.16-29 provides a list of roadway segments in Region 2 where there are predicted decreases in LOS related to construction. During construction of the HVDC transmission line, trips added to the ROI are indicated to result in a decrease to LOS-B from LOS-A for segments of the following federal and state roadways: US-412, US-60, and SH-51, SH-58, and SH-8.

Table 3.16-29:
Roadways with LOS Decreases—Region 2

Roadway	Location	Map ID	Alternatives Impacted	Existing LOS	LOS with Project Construction
Class I					
SH-51	west of Hennessey, OK	499802732	APR	A	B
East Jack Choate Avenue	in Hennessey, OK	499803699	APR	A	B
SH-51	east of Hennessey	499803873	AR 2-B, APR	A	B
US-412	between US-281 and US-60/SH8	499825530	AR 2-A	A	B
US-412	between US-281 and US-60/SH8	499825532	AR 2-A	A	B
US-412	between US-281 and US-60/SH8	499825533	AR 2-A	A	B
US-412	between US-281 and US-60/SH8	499825643	AR 2-A	A	B
US-412	between US-281 and US-60/SH8	499825708	AR 2-A	A	B
US-412	between US-281 and US-60/SH8	499825716	AR 2-A	A	B
US-412	between US-281 and US-60/SH8	499825717	AR 2-A	A	B
SH-58	south of Fairview, OK	499826079	APR	A	B
SH-8	in Cleo Springs, OK	499827457	AR 2-A	A	B
SH-58	south of Ringwood, OK	499828846	AR 2-A	A	B
US-60	north of Seiling, OK	499829895	APR	A	B
US-412	between US-281 and US-60/SH8	499830219	AR 2-A	A	B
US-412	between US-281 and US-60/SH8	499830222	AR 2-A	A	B
US-412	between US-281 and US-60/SH8	499830228	AR 2-A	A	B
US-412	between US-281 and US-60/SH8	499830320	AR 2-A	A	B
US-412	between US-281 and US-60/SH8	499830387	AR 2-A	A	B
US-412	between US-281 and US-60/SH8	499830399	AR 2-A	A	B
South Main Street	in Fairview, OK	499830450	APR	A	B
US-60	in Fairview, OK	499830451	APR	A	B
US-60	north of Seiling, OK	499830588	APR	A	B
US-412	between US-281 and US-60/SH-8	499830616	AR 2-A	A	B

Table 3.16-29:
Roadways with LOS Decreases—Region 2

Roadway	Location	Map ID	Alternatives Impacted	Existing LOS	LOS with Project Construction
Class II					
East Jack Choate Avenue	in Hennessey, OK	499803699	APR	A	B
North 3rd Street	in Cleo Springs, OK	499829882	AR 2-A	A	B
South Main Street	in Fairview, OK	499830450	APR	A	B

Source: Clean Line (2014)

Table 3.16-30 provides a summary overview of impacts to roadway segments by alternative. The Applicant Proposed Route crosses three railroads and HVDC route alternatives cross two railroads in Region 2. Railroads are located along US-412 in Woodward County, Oklahoma; in a rural region of Major County, Oklahoma; and along US-81 in Garfield County, Oklahoma.

Table 3.16-30:
HVDC Transmission Line Roadway Impacts and Railroad Crossings by HVDC Alternative Routes—Region 2

Alternative	LOS Decrease—Number of Roadway Segments[1]	LOS Decrease—Number of Segments Not Present with APR[1,2]	Number of U.S. Highways Crossed[3]	Number of State Highways Crossed[3]	Railroad Crossings[3]
2-A	17	17	3	1	0
2-B	1	0	1	1	2

1 Source: Clean Line (2014)
2 This column is based on an assessment of the comparable APR links for each alternative segment and indicates where there are additional roadway segments that are predicted for a LOS decrease.
3 Source: OCGI (2012); GIS Data Sources: AHTD (2006a), TXDOT (2013), USCB (2013)

As shown in Table 3.16-31, HVDC Alternative Route 2-B centerline has fewer miles within 50 feet of roadways than corresponding Applicant Proposed Route Link 3.

Table 3.16-31:
Centerline within 50 feet of Roadways—Region 2

Route	Local Roads (miles)[1]	Minor Arterials and Minor Collector Roads (miles)[1]	Principal Arterials and Major Urban Collectors (miles)[1]	State Highways (miles)[2]	County Roads (miles)[1]	U.S. Highways (miles)[2]	Interstates (miles)[2]
AR 2-A (Corresponds with APR Link 2)	1.3	0.1	1.8	0	0	0	0
AR 2-B (Corresponds with APR Link 3)	2.1	0	0.3	0	0	0	0
APR Link 1	0.5	0	0.9	0	0	0	0
APR Link 2	1.7	0.2	0.8	0	0	0	0
APR Link 3	17.6	0	0.3	0	0	0	0

1 GIS Data Sources: TXDOT (2013), CSA (2007)
2 GIS Data Source: BTS (2013)

The more populated area of Enid, Oklahoma, may have bus and emergency routes that could be impacted by construction traffic.

Under LOS-B, impacts to roadways for HVDC Alternative Routes 2-A and 2-B would be temporary during construction. Although slight local variations would occur for specific HVDC alternative routes, the overall impacts to traffic from the proposed Project are expected to be similar in relation to the Applicant Proposed Route.

Mileages for HVDC Alternatives 2-A and 2-B are much less than the 17.6 miles of the corresponding Applicant Proposed Route link, so the impacts would be expected to be much less than the Applicant Proposed Route.

HVDC Alternative Route 2-A does not cross any railroads. No airports, airfields, or navigation aids are located within 4 miles of the route. HVDC Alternative Route 2-B crosses two railroads: one near EO550 Road and one near US-81. HVDC Alternative Route 2-B is located within 1 mile of the Steinert Lakes private airport (Table 3.16-3).

3.16.6.3.2.1.3 Region 3

Table 3.16-32 provides a list of roadway segments that are predicted to have a decrease in LOS during construction. During construction of the HVDC transmission line, trips added to the ROI could result in a decrease to LOS-B from LOS-A and to LOS-C from LOS-B for some segments.

Table 3.16-32:
Roadways with LOS Decreases—Region 3

Roadway	Location	Map ID	Alternatives Impacted	Existing LOS	LOS with Project Construction
Class I					
S Highway 48	south of Bristow, OK	9852388	AR 3-C	A	B
East 6th Avenue	east of Stillwater	424886892	AR 3-B, APR	B	C
SH-108	in Ripley, OK	424900156	AR 3-B, 3-C, APR	A	B
SH-108	in Ripley, OK	424900277	AR 3-B, 3-C, APR	A	B
North Little Avenue	in Cushing, OK	424901487	AR 3-C, APR	B	C
SH-33	between Perkins and Cushing, OK	424902311	AR 3-B, 3-C, APR	B	C
SH-33	between Perkins and Cushing, OK	424902390	AR 3-B, 3-C, APR	B	C
SH-33	between Perkins and Cushing, OK	424902415	AR 3-B, 3-C, APR	B	C
SH-33	between Perkins and Cushing, OK	424902447	AR 3-B, 3-C, APR	B	C
SH-99	southwest of Drumright, OK	425801393	AR 3-C, APR	A	B
SH-99	southwest of Drumright, OK	425801863	AR 3-C, APR	A	B
SH-99	southwest of Drumright, OK	425806148	AR 3-C, APR	A	B
SH-16	northwest of Bristow, OK	428309035	AR 3-C, APR	A	B
West 4th Avenue	in Bristow, OK	428311066	AR 3-C, APR	B	C
West 4th Avenue	in Bristow, OK	428311068	AR 3-C, APR	B	C
East 1st Avenue	in Bristow, OK	428311270	AR 3-C, APR	B	C
South Chestnut Street	in Bristow, OK	428311782	AR 3-C, APR	B	C
SH-66	between Stroud and Depew, OK	428313405	AR 3-C	A	B
Alt 75	south of Mounds, OK	428317448	APR	A	B
West Highway 16	north of Slick, OK	428317653	AR 3-C, APR	A	B

Table 3.16-32:
Roadways with LOS Decreases—Region 3

Roadway	Location	Map ID	Alternatives Impacted	Existing LOS	LOS with Project Construction
SH-16	in Slick, OK	428875984	AR 3-C, APR	A	B
Alt 75	south of Mounds, OK	439896010	APR	A	B
SH-33	between Perkins and Cushing, OK	439897933	AR 3-B, 3-C, APR	B	C
SH-66	in Bristow, OK	439903008	AR 3-C, APR	B	C
US-62	south of Haskell, OK	444814176	AR 3-C, 3-D, APR	A	B
US-64	in Haskell, OK	445475168	APR	B	C
US-64	between Webbers Falls and Gore, OK	499618847	AR 3-C, 3-D, 3-E, APR	A	B
North Hughes Avenue	in Morris, OK	499640718	AR 3-C	A	B
US-75 Bus	in Beggs, OK	499641185	AR 3-C, APR	B	C
US-75 Bus	in Beggs, OK	499641193	AR 3-C, APR	B	C
US-75 Bus	in Beggs, OK	499641199	AR 3-C, APR	B	C
US-75 Bus	in Beggs, OK	499641228	AR 3-C, APR	A	B
US-75 Bus	in Beggs, OK	499641245	AR 3-C, APR	A	B
SH-16	in Beggs, OK	499643392	AR 3-C, APR	A	B
US-64	in Gore, OK	499683838	AR 3-C, 3-D, 3-E, APR	B	C
US-64	in Gore, OK	499683842	AR 3-C, 3-D, 3-E, APR	B	C
SH-10	southeast of Gore, OK	499690169	AR 3-C, 3-D, 3-E, APR	A	B
SH-100	northeast of Gore, OK	516506775	APR	A	B
SH-100	northeast of Gore, OK	516506777	AR 3-C, 3-D, 3-E	A	B
US-64	southeast of Gore, OK	516507047	AR 3-C, 3-D, 3-E, APR	A	B
Class II					
Fairgrounds Road	east of Stillwater	424895827	AR 3-B, 3-C, APR	A	B

Source: Clean Line (2014)

Table 3.16-33 provides an overview of impacts to roadway segments by alternative. Although slight local variations would occur for specific alternatives, the overall impacts to traffic from the proposed Project are expected to be similar for all alternatives.

Table 3.16-33:
HVDC Transmission Line Roadway Impacts and Railroad Crossings by HVDC Alternative Routes—Region 3

Alternative	LOS Decrease—Number of Roadway Segments[1]	LOS Decrease—Number of Segments Not Present with APR[1, 2]	Number of U.S. Highways Crossed[3]	Number of State Highways Crossed[3]	Number of Railroads Crossed[3]
3-A	0	0	2	2	1
3-B	9	0	3	2	1
3-C	35	3	6	7	3
3-D	7	1	4	1	1
3-E	6	1	1	0	0

1 Source: Clean Line (2014)
2 This column is based on an assessment of the comparable APR links for each HVDC alternative route and indicates where there are additional roadway segments that are predicted for a LOS decrease.
3 Source: OCGI (2012); GIS Data Sources: AHTD (2006a), TXDOT (2013), USCB (2013)

As shown in Table 3.16-34, HVDC Alternative Routes 3-A and 3-B centerlines have fewer miles within 50 feet of roadways than the corresponding Applicant Proposed Link 1.

Table 3.16-34:
Centerline within 50 feet of Roadways—Region 3

Route	Local Roads (miles)[1]	Minor Arterials and Minor Collector Roads (miles)[1]	Principal Arterials and Major Urban Collectors (miles)[1]	State Highways (miles)[2]	County Roads (miles)[1]	U.S. Highways (miles)[2]	Interstates (miles)[2]
AR 3-A (Corresponds with APR Link 1)	1.9	0.1	0.5	0	0	0	0.1
AR 3-B (Corresponds with APR Link 1)	2.3	0.1	0.6	0	0	0	0.1
AR 3-C (Corresponds with APR Links 4, 5)	5.2	0.1	1.5	0	0	0	0.1
AR 3-D (Corresponds with APR Links 2, 3)	1.7	0	0.6	0	0	0	0
AR 3-E (Corresponds with APR Link 5)	0.4	0	0.3	0	0	0	0
APR Link 1	6.1	0.1	0.4	0	0	0	0.1
APR Link 2	0.1	0.1	0.1	0	0	0	0
APR Link 3	0.2	0	0.1	0	0	0	0
APR Link 4	3.6	0.4	1.0	0	0	0	0.1
APR Link 5	1.0	0	0.5	0	0	0	0
APR Link 6	0.5	0	0.4	0	0	0	0

1 GIS Data Sources: TXDOT (2013), CSA (2007)
2 GIS Data Source: BTS (2013)

The more populated areas of Stillwater and Muskogee, Oklahoma, may have bus and emergency routes that could be impacted by construction traffic.

HVDC Alternative Route 3-A would not individually result in an LOS decrease for any roadway segments in Region 3. 3-B would have decreases to LOS-B from LOS-A and to LOS-C from LOS-B. 3-C would have decreases to LOS-B from LOS-A and to LOS-C from LOS-B. These decreases are similar to the roadway segment decreases predicted for the Applicant Proposed Route.

HVDC Alternative Route 3-C would result in the LOS decrease of three additional roadway segments beyond the number of roadway segments predicted for the Applicant Proposed Route in the comparable area. 3-D would result in LOS decrease for one additional roadway segment beyond the number of roadway segments predicted for the Applicant Proposed Route. 3-E would result in the LOS decrease of one additional roadway segment beyond the number of roadway segments predicted for the Applicant Proposed Route. Therefore, the potential exists for increased construction impacts with HVDC Alternative Routes 3-C, 3-D, and 3-E for decreases in LOS in comparison to the Applicant Proposed Route. However, under LOS-B and LOS-C, impacts to roadways would be temporary during construction.

The Applicant Proposed Route would be parallel to and within 50 feet of 6.1 miles of local roads. HVDC Alternative 3-A mileage would be 1.9 miles. HVDC Alternative 3-B mileage would be 2.3 miles. HVDC Alternative 3-C mileage would be 5.2 miles. HVDC Alternative Route 3-D would be 1.7 miles. HVDC Alternative 3-D mileage would be less than 1 mile. These mileages are less than or comparable to the associated Applicant Proposed Route links and the impacts would be temporary during construction.

HVDC Alternative Routes 3-C, 3-D, and 3-E transmission structures would not be expected to exceed 200 feet in height, and the landscape in the area is relatively flat, so FAA review requirements are not anticipated. The exception would be for HVDC Alternative 3-E at the Arkansas River crossing where the height on the west bank could range from approximately 130 to 200 feet to maintain necessary clearance over the navigable channels. River traffic may be controlled, in coordination with the USACE, during the short time required to span the conductor across the Arkansas River under HVDC Alternative Routes 3-C, 3-D, or 3-E, and Applicant Proposed Route Link 6. However, no airports are located within 4 miles of the crossing area.

3.16.6.3.2.1.4 Region 4

Table 3.16-35 lists roadway segments where the LOS is predicted to decrease during construction of the Project. During construction of the HVDC transmission line, trips added to the ROI could result in a decrease to LOS-B from LOS-A, to LOS-C from LOS-B, and to LOS-D from LOS-C for some segments. Most of the LOS-D roadway segments are located in Clarkesville, Arkansas. Although an LOS-D would result in a decrease in roadway operation, the decrease would be temporary and would be minimally noticeable by motorists.

Table 3.16-35:
Roadways with LOS Decreases—Region 4

Roadway	Location	Map ID	Alternatives Impacted	Existing LOS	LOS with Project Construction
Class I					
SH-23	south of Ozark, AR	41455642	AR 4-E, APR	B	C
West Commercial Street	in Ozark, AR	41456033	AR 4-B, 4-E, APR	C	D
Ozark Franklin County Airport	in Ozark, AR	425748260	AR 4-B, 4-E, APR	A	B
SH-219	in Ozark, AR	425751612	AR 4-B, 4-E, APR	C	D
Highway 219	north of Ozark, AR	425753499	AR 4-B, 4-E, APR	A	B
North 6th Street	in Van Buren, AR	434179275	APR	A	B
Dora Road	west of Van Buren, AR	443274111	APR	A	B
East Cherokee Avenue	in Sallisaw, OK	495345002	APR	C	D
East Cherokee Avenue	in Sallisaw, OK	495345030	APR	C	D
SH-60	northwest of Alma, AR	496214037	APR	A	B
North Highway 71	north of Alma, AR	496214633	AR 4-A, 4-B, 4-D	B	C
Highway 282	northeast of Van Buren, AR	496215536	APR	A	B
South Rogers Street	in Clarkesville, AR	496232484	AR 4-E, APR	C	D
South Rogers Street	in Clarkesville, AR	496232533	AR 4-E, APR	C	D
South Rogers Street	in Clarkesville, AR	496235352	AR 4-E, APR	C	D
East Main Street	in Clarkesville, AR	496236784	AR 4-E, APR	C	D
US-64	in Webbers Falls, OK	499618847	AR 4-B	A	B

Table 3.16-35:
Roadways with LOS Decreases—Region 4

Roadway	Location	Map ID	Alternatives Impacted	Existing LOS	LOS with Project Construction
US-64	in Gore, OK	499683838	AR 4-B	B	C
US-64	in Gore, OK	499683842	AR 4-B	B	C
West Cherokee Avenue	in Vian, OK	499685764	AR 4-A, APR	B	C
US-59	northeast of Sallisaw, OK	499686807	AR 4-A, 4-B	A	B
South Thornton Street	in Vian, OK	499689658	AR 4-A, 4-B, APR	B	C
East Schley Street	in Vian, OK	499689764	AR 4-A, 4-B, APR	B	C
West Cherokee Avenue	in Sallisaw, OK	499690553	APR	C	D
US-59	in Sallisaw, OK	499691323	APR	C	D
West Cherry Street	in Alma, AR	508287883	APR	A	B
US-64	west of Ozark, AR	508624079	AR 4-B, APR	A	B
East Main Street	in Clarkesville, AR	508628771	AR 4-E, APR	B	C
SH-123	in Clarkesville, AR	508628790	AR 4-E, APR	A	B
West Main Street	in Clarkesville, AR	510341660	AR 4-E, APR	C	D
West Main Street	in Clarkesville, AR	510342226	AR 4-E, APR	C	D
US-59	in Sallisaw, OK	510587183	APR	B	C
North 11th Street	in Van Buren, AR	511174296	APR	A	B
US-64	southeast of Gore, OK	516507047	AR 4-B	A	B
Class II					
North 6th Street	in Van Buren, AR	434179275	AR 4-C, 4-D, APR	A	B
Dora Road	west of Van Buren, AR	443274111	AR 4-C, 4-D, APR	A	B
SH-60	northwest of Alma, AR	496214037	AR 4-A, 4-B, 4-C, 4-D, APR	A	B
Highway 282	northeast of Van Buren, AR	496215536	AR 4-A, 4-C, 4-D, APR	A	B
SH-10	northwest of Gore, OK	499622510	AR 4-B	A	B
SH-10	northwest of Gore, OK	499691530	AR 4-B	A	B
West Cherry Street	in Alma, AR	508287883	AR 4-A, 4-B, 4-D, APR	A	B
North 11th Street	in Van Buren, AR	511174296	AR 4-C, 4-D, APR	A	B

Source: Clean Line (2014)

Table 3.16-36 provides an overview of impacts to roadway segments by alternative. Although slight local variations would occur for specific alternatives, the overall impacts to traffic from the Project are expected to be similar for all alternatives.

The more populated area of Van Buren, Arkansas, may have bus and emergency routes that could be impacted by construction traffic.

Figure 3.16-1 in Appendix A provides additional details regarding existing roadways, railroads, and airports and airstrips within Region 4. Additional discussion for individual alternatives is provided in the sections below.

Table 3.16-36:
HVDC Transmission Line Roadway Impacts and Railroad Crossings by HVDC Alternative Routes—Region 4

Alternative	LOS Decrease—Number of Roadway Segments[1]	LOS Decrease—Number of Segments Not Present with APR[1, 2]	LOS Decrease to LOS-D or F[1]	Number of U.S. Highways Crossed[3]	Number of State Highways Crossed[3]	Number of Railroads Crossed[3]
AR 4-A	8	1	0	3	6	2
AR 4-B	17	8	2	3	9	2
AR 4-C	5	0	0	0	1	0
AR 4-D	7	1	0	2	5	1
AR 4-E	13	0	8	2	6	0

1 Source: Clean Line (2014)
2 This column is based on an assessment of the comparable APR links for each HVDC alternative route and indicates where there are additional roadway segments that are predicted for a LOS decrease.
3 Source: OCGI (2012); GIS Data Sources: AHTD (2006a), TXDOT (2013), USCB (2013)

Table 3.16-37 shows the centerline mileage within 50 feet of roadways for the HVDC alternative routes and the corresponding links of the Applicant Proposed Route.

Table 3.16-37:
Centerline within 50 Feet of Roadways—Region 4

Route	Local Roads[1] (miles)	Minor Arterials and Minor Collector Roads[1] (miles)	Principal Arterials and Major Urban Collectors[1] (miles)	State Highways[2] (miles)	County Roads[1] (miles)	U.S. Highways[2] (miles)	Interstates[2] (miles)
AR 4-A (Corresponds with APR Links 3, 4, 5, 6)	1.0	0	0.4	0.3	1.4	0.1	0.1
AR 4-B (Corresponds with APR Links 2, 3, 4, 5, 6, 7, 8)	0.9	0	0.3	0.4	3.9	0.2	0.1
AR 4-C (Corresponds with APR Link 5)	0	0	0	0.1	0.2	0	0
AR 4-D (Corresponds with APR Links 4, 5, 6)	0	0	0	0.2	1.4	0.1	0.1
AR 4-E (Corresponds with APR Links 8, 9)	0.2	0	0	0.4	4.2	0	0.1
APR (Link 1)	0.4	0.1	0.2	0	0	0	0
APR (Link 2)	0.2	0	0	0	0	0	0
APR (Link 3)	0.6	0.1	0.4	0	0.2	0	0
APR (Link 4)	0	0	0	0	0.1	0	0
APR (Link 5)	0	0	0	0.1	0.1	0	0
APR (Link 6)	0.2	0	0	0.2	1.8	0.1	0.4
APR (Link 7)	0	0	0	0.1	0.7	0	0
APR (Link 8)	0	0	0	0	0	0.1	0
APR (Link 9)	0	0	0	0.3	2.7	0	0

1 GIS Data Sources: AHTD (2006a), CSA (2007)
2 GIS Data Source: BTS (2013), USCB (2000)

HVDC Alternative Route 4-A would result in one decrease to LOC-C greater than the roadway segment decreases predicted for the Applicant Proposed Route. HVDC Alternative Route 4-B would result in a decrease from LOS-B to LOS-C; 4-C would result in a decrease from LOS-A from LOS-B; 4-D would result in a decrease from LOS-A to LOS-B and LOS-B to LOS-C; 4-E would result in a decrease from LOS-A from LOS-B, LOS-B to LOS-C, and LOS-C to LOS-D.

HVDC Alternative Route 4-A mileage would be 1.0 mile on local roads and 1.4 miles on county roads. HVDC Alternative Route 4-B mileage would be 0.9 mile for local roads and 3.9 miles for county roads. HVDC Alternative Route 4-C mileage would be less than 1 mile. HVDC Alternative Route D mileage would be 1.4 miles. The mileages for HVDC Alternative Routes 4-A, 4-B, 4-C, and 4-D would be comparable to the mileage of the corresponding Applicant Proposed Route links. HVDC Alternative 4-E mileage would be 4.2 miles, and this mileage is greater than the mileage of the corresponding Applicant Proposed Route links.

HVDC Alternative Routes 4-A, 4-B would cross two railroads, one near Marble City, Oklahoma, and one near I-540, and would require easements. HVDC Alternative Route 4-C would cross one railroad near I-540. HVDC Alternative Route 4-D would cross two railroads, one near Marble City, Oklahoma, and one near I-540, and would require easements. HVDC Alternative Route 4-E would not cross any railroads.

HVDC Alternative Route 4-A centerline is not located within 4 miles of any airports, airfields, or navigation aids. HVDC Alternative Route 4-B centerline is located 3.72 miles from the Ozark-Franklin County Airport (Table 3.16-3). This distance is considerably greater than the Applicant Proposed Route. HVDC Alternative Route 4-C centerline is located 3.9 miles from a private hospital heliport (Table 3.16-3). HVDC Alternative Route 4-D centerline is not located within 4 miles of any airports, airfields, or navigation aids. HVDC Alternative Route 4-E centerline is located within about 1 mile of the Clarksville Municipal Airport and is 3.9 miles from the Ozark-Franklin County Airport and within 4 miles of two public heliports. HVDC Alternative 4-E centerline is located 1.3 miles from the CZE NDB Clarksville navigation aid and is not expected to cause interference with the facility. Transmission structures for HVDC Alternative Routes 4-B, 4-C, and 4-E are not expected to exceed 200 feet in height, and the landscape in the area is relatively flat, so FAA review requirements are not anticipated. None of the HVDC Alternative Routes in Region 4 would span the Mississippi Region.

3.16.6.3.2.1.5 Region 5

Table 3.16-38 lists roadway segments where the LOS is predicted to decrease during construction. During construction of the HVDC transmission line, trips added to the ROI are predicted to result in a decrease from LOS-A to LOS-B for segments of the following roadways: SH-14, Edgemont Road, SR 124, Highway 9, and Blackland Road. During construction of the HVDC transmission line, trips added to the ROI are predicted to result in a decrease from LOS-B to LOS-C for segments of Little Rock Road. Under LOS-B and LOS-C, impacts to roadways would be temporary during construction.

During construction of the HVDC transmission line, trips added to the analysis area are predicted to result in a decrease from LOS-C to LOS-D for segments of Heber Springs Road W located northwest of Damascus, Arkansas.

Table 3.16-38:
Roadways with LOS Decreases—Region 5

Roadway	Location	Map ID	Alternatives Impacted	Existing LOS	LOS with Project Construction
Class I					
SH-14	near the intersection with US-67	444973582	AR 5-D	A	B
Little Rock Road	north of Rose Bud, AR	495086707	AR 5-B, 5-E, 5-F, APR	B	C
Edgemont Road	northeast of Quitman, AR	495087059	APR	A	B
SR 124	northeast of Russellville, AR	496275226	APR	A	B
Heber Springs Road W	south of Heber Springs, AR	515874130	APR	C	D
Highway 9	northwest of Damascus, AR	516208297	APR	A	B
Class II					
Blackland Road	in Pleasant Plains, AR	447212101	AR 5-D	A	B
Edgemont Road	northeast of Quitman, AR	495087059	APR	A	B
SR 124	east of Dover, AR	496275226	AR 5-A, APR	A	B
Highway 9	southwest of Choctaw, AR	516208297	AR 5-B, APR	A	B

Source: Clean Line (2014)

Table 3.16-39 provides an overview of impacts to roadway segments by alternative. Although slight local variations would occur for specific alternatives, the overall impacts to traffic from the Project are expected to be similar in relation to the Applicant Proposed Route. Additional discussion for individual alternatives is provided in the sections below.

Table 3.16-39:
HVDC Transmission Line Roadway Impacts and Railroad Crossings by HVDC Alternative Routes—Region 5

Alternative	LOS Decrease—Number of Roadway Segments[1]	LOS Decrease—Number of Segments Not Present with APR[1, 2]	LOS Decrease to LOS-D or F[1]	Number of U.S. Highways Crossed[3]	Number of State Highways Crossed[3]	Number of Railroads Crossed[3]
AR 5-A	1	0	0	0	1	0
AR 5-B	2	0	0	1	10	0
AR 5-C	0	0	0	0	2	0
AR 5-D	2	2	0	2	2	1
AR 5-E	1	0	0	0	6	0
AR 5-F	1	0	0	0	3	0

1 Source: Clean Line (2014)
2 This column is based on an assessment of the comparable APR links for each HVDC alternative route and indicates where there are additional roadway segments that are predicted for a LOS decrease.
3 Source: OCGI (2012); GIS Data Sources: AHTD (2006a), TXDOT (2013), USCB (2013)

Table 3.16-40 shows the centerline mileage within 50 feet of roadways for the HVDC alternative routes and the Applicant Proposed Route.

Table 3.16-40:
Centerline within 50 Feet of Roadways—Region 5

Route	Local Roads[1] (miles)	Minor Arterials and Minor Collector Roads[1] (miles)	Principal Arterials and Major Urban Collectors[1] (miles)	State Highways[2] (miles)	County Roads[1] (miles)	U.S. Highways[2] (miles)	Interstates[2] (miles)
AR 5-A (Corresponds with APR Link 1)	0	0	0	0.1	1.0	0	0
AR 5-B (Corresponds with APR Links 3, 4, 5, 6)	0.2	0	0	0.6	3.7	0.1	0
AR 5-C (Corresponds with APR Links 6, 7)	0	0	0	0.1	0.5	0	0
AR 5-D (Corresponds with APR Links 4, 5, 6)	0	0	0	0.1	1.7	0.2	0
AR 5-E (Corresponds with APR Link 9)	0	0	0	0.3	1.7	0	0
AR 5-F (Corresponds with APR Links 5, 6)	0	0	0	0.1	1.4	0	0
APR Link 1	0	0	0	0.1	0.8	0	0
APR Link 2	0	0	0	0.1	0.3	0	0
APR Link 3	0	0	0	0.3	2.3	0.1	0
APR Link 4	0	0	0	0.2	0.4	0	0
APR Link 5	0	0	0	0	1.1	0	0
APR Link 6	0	0	0	0.1	0.1	0	0
APR Link 7	0	0	0	0.1	0.3	0	0
APR Link 8	0	0	0	0	0.1	0	0
APR Link 9	0	0	0	0.2	1.8	0.2	0

1 GIS Data Sources: AHTD (2006a), USCB (2000)
2 GIS Data Source: BTS (2013)

HVDC Alternative Route 5-A would result a decrease from LOS-A to LOS-B. 5-B would result in a decrease from LOS-A to LOS-B and LOS-B to LOS-C. 5-C would not result in an LOS decrease for any roadway segments in Region 5. 5-D would result in a decrease from LOS-A to LOS-B and would also result in two LOS decreases that are not predicted for the Applicant Proposed Route, so the potential exists for this alternative to have greater effects on traffic than the Applicant Proposed Route. 5-E would result in a decrease from LOS-B to LOS-C. 5-F would result in decreases from LOS-B from LOS-C and LOS-C to LOS-D.

HVDC Alternative Route 5-A mileage would be 1 mile. 5-B would mileage would be 3.7 miles 5-C mileage would be less than 1 mile. 5-D mileage would be 1.7 miles. 5-E mileage would be 1.7 miles. 5-F mileage would be 1.4 miles. These mileages are comparable to the mileage of the corresponding Applicant Proposed Route links.

HVDC Alternative Routes 5-A, 5-B, 5-C 5-E, and 5-F do not cross any railroads. HVDC Alternative Route 5-D would cross one railroad near SH-367.

HVDC Alternative Route 5-A centerline is located 2.89 miles from a private airport (Table 3.16-3). Transmission structures for the alternative are not expected to exceed 200 feet in height and slope ratios in relation to the airport would not exceed 1:100. HVDC Alternative Route 5-B centerline is located within about 0.5 mile of two private airfields and within 1.2 to 2.8 miles of four private airports. HVDC Alternative Route 5-C centerline is located 2.7 miles from one private airfield. Transmission structures for HVDC Alternative Routes 4-B and 4-C are not expected to exceed 200 feet in height and slope ratios in relation to the airfield would not exceed 1:50. HVDC Alternative Route 5-D centerline is not located within 4 miles of any airports, airfields, or navigation aids. 5-E centerline is located within about 0.5 mile of two private airfields, and within 1.2 to 2.3 miles of 3 private airports. 5-F centerline is located within about 0.5 mile of two private airfields and within 1.2 to 1.8 miles of 2 private airports. Transmission structures for the alternative are not expected to exceed 200 feet in height and slope ratios in relation to the airports/airfields would not exceed 1:50, so FAA review requirements are not anticipated for any of these alternatives.

3.16.6.3.2.1.6 Region 6

Table 3.16-41 lists roadway segments where the LOS is predicted to decrease during construction. During construction of the HVDC transmission line, trips added to the ROI are predicted to result in a decrease from LOS-A to LOS-B for segments of the following roadways: Highway 14 E, SH-14, and Air Base Road. During construction of the HVDC transmission line, trips added to the 6-mile ROI could result in a decrease from LOS-B to LOS-C for segments of Highway 1. During construction of the HVDC transmission line, there are no roadway segments predicted to result in a decrease from LOS-C to LOS-D in the 6-mile ROI for Region 6.

Table 3.16-41:
Roadways with LOS Decreases—Region 6

Roadway	Location	Map ID	Alternatives Impacted	Existing LOS	LOS with Project Construction
Class I					
Highway 14 E	south of Newport, AR	41848771	AR 6-A, 6-B, APR	A	B
SH-14	east of Marked Tree, AR	445617713	AR 6-C, 6-D, APR	A	B
Highway 1	south of Cherry Valley, AR	495221858	APR	B	C
SH-14	north of Newport, AR	500360708	APR	A	B
Class II					
SH-14	north of Newport, AR	500360708	APR	A	B
Air Base Road	in Newport, AR	500363489	AR 6-B	A	B

Source: Clean Line (2014)

Table 3.16-42 provides an overview of impacts to roadway segments by alternative. Although slight local variations would occur for specific alternatives, the overall impacts to traffic from the Project are expected to be similar in relation to the Applicant Proposed Route. Additional discussion for individual alternatives is provided in the sections below.

Table 3.16-42:
HVDC Transmission Line Roadway Impacts and Railroad Crossings by HVDC Alternative Routes—Region 6

Alternative	LOS Decrease—Number of Roadway Segments[1]	LOS Decrease—Number of Segments Not Present with APR[1, 2]	Number of U.S. Highways Crossed[3]	Number of State Highways Crossed[3]	Number of Railroads Crossed[3]
AR 6-A	1	0	1	2	1
AR 6-B	2	1	0	3	0
AR 6-C	1	0	0	3	1
AR 6-D	1	0	0	0	0

1 Source: Clean Line (2014).
2 This column is based on an assessment of the comparable APR links for each HVDC alternative route and indicates where there are additional roadway segments that are predicted for a LOS decrease.
3 Source: OCGI (2012); GIS Data Sources: AHTD (2006a), TXDOT (2013), USCB (2013)

Table 3.16-43 shows the centerline mileage within 50 feet of roadways for the HVDC alternative routes and the corresponding links of the Applicant Proposed Route.

Table 3.16-43:
Centerline within 50 Feet of Roadways—Region 6

Route	Local Roads[1] (miles)	Minor Arterials and Minor Collector Roads[1] (miles)	Principal Arterials and Major Urban Collectors[1] (miles)	State Highways[2] (miles)	County Roads[1] (miles)	U.S. Highways[2] (miles)	Interstates[2] (miles)
AR 6-A (Corresponds with APR Links 2, 3, 4)	0	0	0	0.1	1.7	0.1	0
AR 6-B (Corresponds with APR Link 3)	0	0	0	1.5	1.2	0	0
AR 6-C (Corresponds with APR Links 6, 7)	0	0	0	0.2	4.3	0	0
AR 6-D (Corresponds with APR Link 7)	0	0	0	0	0.3	0	0
APR Link 1	0	0	0	0.1	0.7	0	0
APR Link 2	0	0	0	0	0.1	0	0
APR Link 3	0	0	0	0.1	3.5	0	0
APR Link 4	0	0	0	0.1	0.4	0.1	0
APR Link 5	0	0	0	0	0.3	0	0
APR Link 6	0	0	0	0.1	4.3	0	0
APR Link 7	0	0	0	0	0.8	0	0
APR Link 8	0	0	0	0.1	0.3	0	0

1 GIS Data Sources: AHTD (2006a), USCB (2000)
2 GIS Data Source: BTS (2013)

HVDC Alternative Route 6-A would result in a decrease from LOS-A to LOS-B and LOS-C to LOS-D. HVDC Alternative Route 6-B would result in a decrease from LOS-A to LOS-B, and for this route, one LOS decrease is predicted that is not predicted for the Applicant Proposed Route. HVDC Alternative Route 6-C would result in the decrease from LOS-A to LOS-B. 6-D would result in a decrease from LOS-A to LOS-B.

HVDC Alternative Route 6-A mileage would be 1.7 miles for county roads. 6-B mileage would be 1.2 miles for county roads and 1.5 miles for state highways. HVDC Alternative Route 6-D mileage would be less than 0.3 mile for local roads (county roads) and this mileage is less than the mileage of the corresponding Applicant Proposed Route links.

HVDC Alternative Route 6-A would cross one railroad near US-49. HVDC Alternative Route 6-B does not cross any railroads. HVDC Alternative Route 6-C would cross one railroad near SH-1. HVDC Alternative Route 6-D does not cross any railroads.

The HVDC Alternative Route 6-A centerline is located from 1.3 to 4.0 miles from nine private airfields. The HVDC Alternative Route 6-B centerline is located from 1.1 to 3.7 miles from seven private airfields. The HVDC Alternative Route 6-C centerline is located from 0.7 to 3.7 miles from eight private airfields. Transmission structures for the alternative are not expected to exceed 200 feet in height and slope ratios in relation to the airports/airfields would not exceed 1:50. FAA review requirements are therefore not anticipated. The HVDC Alternative Route 6-D centerline is not located within 4 miles of any airport, airfield, or navigation aid.

3.16.6.3.2.1.7 Region 7

Table 3.16-44 lists roadway segments where the LOS is predicted to decrease during construction of the Project.

Table 3.16-44:
Roadways with LOS Decreases—Region 7

Roadway	Location	Map ID	Alternatives Impacted	Existing LOS	LOS with Project Construction
Class I					
US-63	in Gilmore, AR	385533228	APR	C	D
Munford Avenue	in Munford, TN	474296840	AR 7-C, 7-D, APR	C	D
Kimbrough Avenue	in Munford, TN	474297271	AR 7-C, 7-D, APR	B	C
Atoka Idaville Road	in Atoka, TN	474297776	AR 7-C, 7-D, APR	C	D
Navy Road	in Millington, TN	477136664	AR 7-B, 7-C, 7-D, APR	C	D
Navy Road	in Millington, TN	477136700	AR 7-B, 7-C, 7-D, APR	C	D
Armour Road	east of Millington, TN	477136908	APR	A	B
Church Street	in Millington, TN	477137273	AR 7-B, 7-C, 7-D, APR	C	D
Raleigh Millington Road	in Millington, TN	477137862	AR 7-B, 7-C, 7-D, APR	C	D
SH-14	east of Millington, TN	477138707	AR 7-C, 7-D, APR	C	D
Singleton Pkwy	in Millington, TN	477140029	AR 7-B, 7-C, APR	C	D
Sledge Road	east of Millington, TN	477140121	APR	A	B
SH-14	southeast of Millington, TN	477143261	AR 7-C	C	D
Raleigh Millington Road	north edge of Memphis, TN	477144537	AR 7-C	C	D
Raleigh Millington Road	in north Memphis, TN	477147467	AR 7-C	C	D
US-61	south of Osceola, AR	496260011	AR 7-A	A	B

Table 3.16-44:
Roadways with LOS Decreases—Region 7

Roadway	Location	Map ID	Alternatives Impacted	Existing LOS	LOS with Project Construction
West Semmes Avenue	in Osceola, AR	496261166	AR 7-A	A	B
South Ermen Lane	in Osceola, AR	496267109	AR 7-A	B	C
Highway 63	in Gilmore, AR	507380920	APR	C	D
Class II					
Armour Road	east of Millington, TN	477136908	AR 7-B, 7-C, 7-D, APR	A	B
Sledge Road	east of Millington, TN	477140121	AR 7-C, 7-D, APR	A	B
Germantown Road	northeast of Bartlett, TN	477147065	AR 7-C	B	C
SH-135	in Lepanto, AR	495126627	AR 7-A	A	B

Source: Clean Line (2014)

Table 3.16-45 provides an overview of impacts to roadway segments by alternative. Additional discussion for individual alternatives is provided in the sections below.

The greater metropolitan area of Memphis, Tennessee, may have bus and emergency routes that could be impacted by construction traffic.

Table 3.16-45:
HVDC Transmission Line Roadway Impacts and Railroad Crossings by HVDC Alternative Routes—Region 7

Alternative	LOS Decrease—Number of Roadway Segments[1]	LOS Decrease—Number of Segments Not Present with APR[1, 2]	LOS Decrease to LOS-D or F[1]	Number of U.S. Highways Crossed[3]	Number of State Highways Crossed[3]	Number of Railroads Crossed[3]
AR 7-A	4	4	0	3	6	2
AR 7-B	6	0	4	0	0	0
AR 7-C	15	4	11	1	3	1
AR 7-D	10	0	7	1	0	1

1 Source: Clean Line (2014)
2 This column is based on an assessment of the comparable APR links for each HVDC alternative route and indicates where there are additional roadway segments that are predicted for a LOS decrease.
3 Source: OCGI (2012); GIS Data Sources: AHTD (2006a), TXDOT (2013), USCB (2013)

Table 3.16-46 shows the centerline mileages within 50 feet of roadways for the HVDC alternative routes and the corresponding links of the Applicant Proposed Route.

Table 3.16-46:
Centerline within 50 Feet of Roadways—Region 7

Route	Local Roads[1] (miles)	Minor Arterials and Minor Collector Roads[1] (miles)	Principal Arterials and Major Urban Collectors[1] (miles)	State Highways[2] (miles)	County Roads[1] (miles)	U.S. Highways[2] (miles)	Interstates[2] (miles)
AR 7-A (Corresponds with APR Link 1)	1.1	0	0	1.1	2.8	0.2	0.1
AR 7-B (Corresponds with APR Links 3, 4)	1.5	0	0	0	0	0	0

Table 3.16-46:
Centerline within 50 Feet of Roadways—Region 7

Route	Local Roads[1] (miles)	Minor Arterials and Minor Collector Roads[1] (miles)	Principal Arterials and Major Urban Collectors[1] (miles)	State Highways[2] (miles)	County Roads[1] (miles)	U.S. Highways[2] (miles)	Interstates[2] (miles)
AR 7-C (Corresponds with APR Links 3, 4, 5)	1.8	0	0	0.3	0	0.1	0.1
AR 7-D (Corresponds with APR Links 4, 5)	0.4	0	0	0.1	0	0	0
APR Link 1	0.1	0	0	0.6	4.4	0.2	0.1
APR Link 2	1.0	0	0	0	0	0	0
APR Link 3	0.4	0	0	0	0	0	0
APR Link 4	0.1	0	0	0	0	0	0
APR Link 5	0.6	0	0	0.2	0	0.2	0

1 GIS Data Sources: AHTD (2006a), USCB (2000)
2 GIS Data Source: BTS (2013)

HVDC Alternative Route 7-A would result in a decrease from LOS-A to LOS-B and a decrease from LOS-B to LOS-C. There are two LOS decreases for this route that are not predicted for the Applicant Proposed Route. HVDC Alternative Route 7-B would result in a decrease from LOS-A to LOS-B, from LOS-B to LOS-C, and from LOS-C to LOS-D. 7-C would result in a decrease from LOS-A to LOS-B, from LOS-B to LOS-C, and from LOS-C to LOS-D. This route has a greater number of LOS-C to LOS-D decreases than the Applicant Proposed Route. 7-D would result in a decrease from LOS-A to LOS-B, LOS-B to LOS-C, and LOS-C to LOS-D.

HVDC Alternative Route 7-A mileages would be 2.8 miles for county roads,1.1 miles for local roads, and 1.1 miles for state highways. The proximity of the route to these roadways might require roadway ROW permits and has the potential to impact traffic in these areas. 7-B mileage would be 1.5 miles for local roads and this mileage in combination is comparable to the mileage of the corresponding Applicant Proposed Route link. HVDC 7-C mileage would be 1.8 miles for local roads, and the proximity of the route to the roadway might require roadway ROW permits and has the potential to impact traffic in the roadway area during construction.

HVDC Alternative Route 7-A would cross two railroads, one near US-63 and one near US-61. 7-B would cross one railroad near US-51 North. 7-C would cross one railroad near US-51 North. 7-D would cross one railroad near US-51 North.

HVDC Alternative Route 7-A centerline would be located about 1 mile from the Marked Tree Municipal Airport and from 2 to 4 miles from a private airfield and a private airport (Table 3.16-3). Most transmission structures for the alternative are not expected to exceed 200 feet in height and slope ratios in relation to the airports/airfields would not exceed 1:50. However, the structure height at the Mississippi River crossing might reach 380 feet to maintain necessary clearance over the navigable channels and there is one private airport located approximately 3.6 miles from the south river crossing point for Route 7-A. Depending on the final design height of the transmission line, FAA review could be required for the alternative for the structures located at the river crossing. River traffic may be controlled, in coordination with the USACE, during the short time required to span the conductor across the Mississippi River under HVDC Alternative Route 7-A or Applicant Proposed Route Link 1. HVDC Alternative Route

7-B centerline is located 2.3 miles from the Millington Regional Jetport. Transmission structures for the alternative are not expected to exceed 200 feet in height and slope ratios in relation to the airports/airfields would not exceed 1:50.

HVDC Alternative Route 7-C centerline is located 2.1 miles from the Millington Regional Jetport and 3.5 miles from the Charles W. Baker Airport. The Ray private airport is located 0.4 mile from the Route 7-C centerline. Transmission structures for the alternative are not expected to exceed 200 feet in height and slope ratios in relation to the airports/airfields would not exceed 1:50. The HVDC Alternative 7-C representative centerline is located 3.4 miles from the MIG NDB Millington navigation aid and is not expected to cause interference with the facility. The 7-D centerline would be located about 2 miles from the Millington Regional Jetport and is located 0.4 mile from a private airport. Transmission structures are likely to be subject to FAA review due to their proximity to the Millington Regional Jetport.

3.16.6.3.2.2 Operations and Maintenance Impacts

Impacts during operations and maintenance would be similar to those described in Section 3.16.6.1.

3.16.6.3.2.3 Decommissioning Impacts

Impacts during decommissioning would be similar to those described in Section 3.6.6.2.1.

3.16.6.4 Best Management Practices

BMPs that could be implemented to reduce potential impacts to transportation are identified below:

- Accommodate existing and future planned transportation facility projects to the extent practicable into the final Project design, and coordinate with appropriate jurisdictions to avoid or minimize disruptions to trails, streets, or drainage/irrigation structures.
- In identified areas of traffic impact, conflicts between the Project traffic and background traffic such as movements of normal heavy trucks (dump trucks, concrete trucks, standard size tractor-trailers or flatbeds, etc.) would be minimized by scheduling (essential deliveries only) to the extent practicable during peak traffic hours/times and scheduling remaining heavy truck trips during off-peak traffic hours/times.
- To the extent practicable, staging activities and parking of equipment and vehicles will occur primarily within private ROW on private land.
- The Applicant would implement a Communications Plan described in Section 3.1.2.

3.16.6.5 Unavoidable Adverse Impacts

Impacts to traffic and roadway infrastructure would be avoided or minimized by meeting regulatory or jurisdictional requirements and implementing EPMs and BMPs. Despite these measures, unavoidable and temporary adverse impacts to local traffic would occur during construction on roadways where materials and equipment are hauled to construction areas. Construction activities associated with the crossing of roadways and railroads and potential encroachment along roadway ROW would also result in unavoidable temporary impacts to roadways and traffic.

3.16.6.6 Irreversible and Irretrievable Commitment of Resources

As a result of increased traffic associated with construction of the Project, a portion of the local roadway network capacity would be lost during the construction period. This loss would be irretrievable but short-term. The use of nonrenewable resources and resources that cannot be recycled would occur as a result of access roadway construction. This use of these resources would be irreversible.

3.16.6.7 Relationship between Local Short-term Uses and Long-term Productivity

The Project would increase the short-term uses of the local roadway network during construction but would have no impact on long-term productivity because roadways would be returned to their original condition and travel conditions would neither improve nor deteriorate during the operational life of the Project.

3.16.6.8 Impacts from Connected Actions

3.16.6.8.1 Wind Energy Generation

3.16.6.8.1.1 Construction

Estimated trips associated with three scenarios for wind farm construction within the WDZs are provided in Table 3.16-47. These three scenarios are not intended to represent an actual construction timeframe for the wind farm, but have been created to represent a range of the most conservative conditions for the traffic analysis. The traffic analysis uses trips associated with the scenario where nineteen 100MW wind farms are constructed within 1 year. This scenario includes 2,185 trips per day during construction of the 19 wind farms as documented in Appendix F. Construction of the 19 wind farms is considered a very conservative (maximum) construction scenario for a 1-year period because the design, permitting, and land acquisition process for such construction would be expected to stagger the construction of the wind farms over a period of greater than one year. Information for the scenario in which 38 wind farms and the AC collection system are under construction within 1 year is also presented as an improbable estimate of the upper limit of traffic impacts. It is much more likely that the 38 wind farms would be constructed over a period of 2 or more years due to the individual wind farm requirements for permitting, design, and land acquisition processes.

Table 3.16-47:
Connected Action—Trip Assumptions During Construction

Wind Farm Project	Trips per Day
One 100MW Wind Farm	
Workers	95
Delivery Trucks	20
Nineteen 100MW Wind Farms Constructed in 1 year, Total Trips (workers and delivery)	2,185
Thirty-eight 100MW Wind Farms Constructed in 1 year, Total Trips (workers and delivery)	4,370
Thirty-eight 100MW Wind Farms Constructed in 1 year along with AC Collection System Construction, Total Trips	4,643

Source: Clean Line (2013)

Major and local roadways in the WDZ ROI that could be affected by wind farm construction currently operate at an average daily LOS-B or better. LOS levels for most roadway segments in the WDZs would decrease from LOS-A to LOS-B during construction of the nineteen 100MW wind farms. No roadway segments in WDZ-B, -C, -G, and -H currently operate below LOS-A, and no roadway segments in these WDZs would decrease to LOS-C during wind farm construction. Table 3.16-48 provides a list of roadway segments with LOS-B to LOS-C decreases for the nineteen 100MW wind farm scenario in Table 3.16-48. Under LOS-B and LOS-C, impacts to roadways would be temporary during construction. Two roadway segments in the area of Perryton, Texas, are predicted to decrease by two LOS levels from LOS-A to LOS-C in the area of WDZ-A and -L. One roadway segment in the area of Spearman, Texas, is predicted to decrease by two LOS levels from LOS-A to LOS-C in the area of WDZ-L.

Table 3.16-48:
Roadways with LOS Decreases with Construction of 19 Wind Farms

MAP_ID	Roadway Segment	Location	WDZ	Existing LOS	LOS During Construction
444942827	State Hwy 15	Southwest of Perryton, TX	A, L	B	C
490233987	State Hwy 15	Northeast of Perryton, TX	A, K	B	C
444942983	State Hwy 15	Near Spearman, TX	L	A	C
502121390	State Hwy 70	South of Perryton, TX	A, L	A	C
490231684	State Hwy 70	South of Perryton, TX	L	A	C
507147928	US Hwy 83	South of Perryton, TX	A, L	B	C
493082833	US Hwy 83	North of Perryton, TX	J	B	C
493085008	US Hwy 83	North of Perryton, TX	J, K	B	C
490234026	N Main St	In Perryton, TX	A	B	C
494367614	N Main St	Guymon, OK	E, F	B	C
494367999	N Main St	Guymon, OK	E, F	B	C
494368599	S Main St	Guymon, OK	E, F	B	C
494356087	County Hwy 7	Near Hooker, OK	I	B	C
494364275	County Hwy 26	North of Guymon, OK	E, F	B	C
494365439	US Hwy 64	Near Guymon, OK	E, F	B	C
494369668	US Hwy 412	Northwest of Hardesty, OK	D, E, I	B	C
494369047	US Hwy 412	Near Guymon, OK	E, F	B	C
494369051	US Hwy 412	East of Guymon, OK	E, F	B	C
494369131	US Hwy 412	East of Guymon, OK	E	B	C
494369156	US Hwy 412	East of Guymon, OK	E	B	C
494368312	US Hwy 412	Near Guymon, OK	E, F	B	C
494368630	US Hwy 412	Near Guymon, OK	E, F	B	C
494368843	US Hwy 412	Near Guymon, OK	E	B	C
493084936	US Hwy 412	Northeast of Perryton, TX	J, K	B	C
493084941	US Hwy 412	Northeast of Perryton, TX	J, K	B	C
493084980	US Hwy 412	North of Perryton, TX	J, K	B	C

Source: Clean Line (2014)

LOS would not decrease below LOS-C even in the unlikely scenario where 38 wind farms and the AC collection system are under construction during 1 year, which further supports the conclusion that impacts during construction would be temporary.

Numerous local, state, and federal roads and highways are within the WDZs (see Table 3.16-5) and many are likely to be crossed by wind farm components including access roads, underground collection cables, and generation tie lines. Railroads are also present in the WDZs as listed in Table 3.16-6. Railroads are located within WDZ-A, -C, -F, -G, and -I. Airports and airstrips in the WDZ ROI are listed in Table 3.16-7. Airports are located in WDZ-A, -F, and -I. One navigation aid is located within WDZ-A. No airports or navigation aids are located within 4 miles of

WDZ-D, -H, -J, and -K. Wind turbines, including turbine blade tips can reach a height of up to 420 feet. FAA lighting requirements would apply to the wind turbines. In addition, these heights would require careful selection of specific turbine sites to avoid potential conflicts with airports and military airspace. In some cases, FAA notification requirements might be triggered.

3.16.6.8.1.2 Operation and Maintenance

As discussed in Section 3.13, operations and maintenance of the wind capacity build-out of 4,000MW would require 177 to 303 operations workers. Assuming an average family size of 3, the full build-out scenario is expected to result in a population increase of from 530 to 909. The population is anticipated to be spread among Sherman, Hansford, and Ochiltree counties in Texas; and Cimarron, Texas, and Beaver counties in Oklahoma; as well as surrounding counties in Texas, Oklahoma, and Kansas. If these people were spread evenly across the six-county area where the wind farms would be located, 152 people could potentially reside in each county. If these 152 people generated 456 additional round trips per day (a conservative estimate of three round trips per person), based on previous construction traffic analysis results, no roadway segments would incur a LOS decrease below LOS-C. Under LOS-B and LOS-C, impacts to traffic would be minimally noticeable to motorists. In addition, such trips would occur during limited times associated with peak daily commutes to and from the wind farms by workers from their homes; sporadic equipment and material deliveries, and localized maintenance activities at each wind farm. Indirect impacts to roadways would occur with typical local residential trips and family member commuting not directly associated with the wind farm operation.

3.16.6.8.1.3 Decommissioning

Decommissioning of a wind farm would involve removal and recycling of materials from turbines, electrical infrastructure, buildings, access roads, and foundations. Traffic from these activities likely would be similar to that for construction activities. The timeframe for decommissioning of a wind farm would depend on numerous factors such as the continued functioning of the power delivery infrastructure and economic factors associated with the wind farm. Wind farms might be re-powered with new equipment over the years. A scenario where all of the wind farms would be decommissioned at the same time is unlikely; decommissioning would more likely take place over many years. Therefore impacts to transportation associated with decommissioning are anticipated to be much less than those during construction.

3.16.6.8.2 Optima Substation

Impacts to transportation resources from the future Optima Substation would be similar to those described in Section 3.16.6.2.1 for the Oklahoma Converter Station Siting Area and the AC collection system. All public roadways within 6 miles of the Oklahoma Convertor Station Siting Area currently operate at an acceptable LOS-A. The future Optima Substation would involve less than the assumed additional construction trips estimated during construction of the converter station and the AC collection system where these are being constructed at the same time. Construction trips for the converter station alone, or in conjunction with the AC collection system, are not predicted to result in an LOS decrease for any roadway segments in the siting area ROI (see the Traffic Technical Report and supplement to the *Traffic Technical Report* [Clean Line 2013, 2014]).

No railroads are located at the future Optima Substation site. No airports, airstrips, or navigation aids are located within 4 miles of the future Optima Substation site.

3.16.6.8.3 TVA Upgrades

A precise ROI has not been identified for the TVA upgrades. Where possible, general impacts associated with the required TVA upgrades are discussed below.

The potential impacts to transportation from the required TVA upgrades could increase traffic as workers commute to work sites and construction vehicles haul materials and equipment, and could result in incidental congestion and delays. Construction-related traffic impacts are more likely to occur during construction of the new transmission line than during upgrades of existing substations or transmission lines. Evaluations for the Project typically resulted in a LOS decrease of one level and in some cases resulted in no decrease in LOS. The required upgrades, including construction of the new transmission line, would not be expected to result in localized changes in LOS because compared to the Project, they would involve similar though substantially reduced construction activities. The specific localized impacts to towns near the proposed TVA upgrades (including the new electric transmission line) would depend on the likely commuter and haul routes that would be taken during project construction and the existing levels of congestion on those routes.

3.16.6.9 Impacts Associated with the No Action Alternative

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not be constructed. Therefore, no impacts to transportation including impacts from additional traffic, interruption of traffic, roadway ROW encroachment, or requirements for new easement from railroads would result from the Project.

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Contents

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3.17 Vegetation Communities and Special Status Plant Species

3.17.1 Regulatory Background

Protection and management of vegetation communities and special status plan species occurs under a number of federal and state statutes, regulations and programs. Key legal authorities and programs of relevance to these resources are summarized in Table 3.17-1. For the purposes of this EIS, noxious weeds are considered to be a subset of the overall invasive plant species that may exist and exert an influence on economics or the environment. Weeds designated as legally noxious by federal, state, or county governments include plant species that are harmful to public health, recreational activities, agriculture, wildlife species and habitat, and properties (BLM 2010).

Table 3.17-1:
Legal Authorities and Programs Associated with Vegetation Management

Statute/Regulation/Agency	Key Elements
Federal	
Endangered Species Act (7 USC § 136; 16 USC § 1531)	The ESA is designed to protect critically imperiled species and the habitats in which they are found. The law requires federal agencies to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of listed species or result in adverse modification to designated critical habitat. Under Section 7(a)(2) of the ESA, a federal agency is required to consult with the USFWS where a proposed federal agency action is determined to likely adversely affect a listed species or designated critical habitat.
Plant Protection Act of 2000 (7 USC § 7701 *et seq.*)	Under the Plant Protection Act of 2000, which repealed and superseded the Federal Noxious Weed Act of 1974 (7 USC § 2801 *et seq.*), the federal government lists 137 regulated noxious weeds. States typically have their own noxious weed lists and county weed control boards or districts that monitor weed infestations and provide guidance on weed control.
Executive Order 13112, "Invasive Species"	EO 13112 (February 3, 1999; 2564 FR 6183, February 3, 1999) establishes the National Invasive Species Council, made up of 13 departments and agencies, to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause.
Oklahoma	
State of Oklahoma—Threatened and endangered plant species	The state of Oklahoma does not maintain a state list of threatened and endangered plant species with commensurate regulatory protections.
Oklahoma Noxious Weed Law and Rules—Section 3-220, Title 35, Chapter 30, Subchapter 34	A designated Oklahoma State University extension agent or the Department Agriculture determines the most appropriate treatment, control, or eradication method available to treat infestations (ODA 2000).
Oklahoma Natural Heritage Program (ONHP)	The ONHP maintains a tracking list of rare plants in the state. It includes approximately 548 species of plants. Accounts for each species include description, life history, habitat preference, distribution, causes of decline, recovery needs, field-identification characters, an illustration, and a map of current and historical sites (ONHP 2014).
Arkansas	
Plant Act of 1917 (Arkansas Statutes 77-101–77-116)	The act establishes the Arkansas State Plant Board. The Board is required to remain informed of the varieties of insect pests, diseases, and noxious weeds, the origin, locality, nature and appearance thereof, the manner in which they are disseminated, and approved methods of treatment and eradication (Arkansas Plant Board 1993).
Circular 10: Regulations on the Sale of Planting Seed in Arkansas, Arkansas State Plant Board (Arkansas Code Annotated 2-16-207 and 2-16-209)	The circular describes the requirements for licensing, reporting, and labeling of seeds, including sampling and analyzing, fees and services, and prohibitions (Arkansas Plant Board 2014a).
Arkansas State Plant Board—Noxious Weed List	The state of Arkansas maintains a list of 25 plants listed as noxious. (Arkansas Plant Board 2014b)
Arkansas Natural Heritage Commission	The ANHC maintains up-to-date and comprehensive information concerning plant species and high-quality natural communities for the state of Arkansas in a System of Natural Areas. Along

Table 3.17-1:
Legal Authorities and Programs Associated with Vegetation Management

Statute/Regulation/Agency	Key Elements
	with conservation of remnants of the original natural landscape, lands within the System of Natural Areas provide vital habitat for imperiled plant and animal species. ANHC has a tracking list for state rare plants that includes approximately 544 total species. (ANHC 2014)
Tennessee	
Tennessee Department of Agriculture (TDA) Division of Plant Industries, Pest Plant Regulations (Chapter 0080-6-24)	The regulations list 14 pest plants that are injurious to the agricultural, horticultural, silvicultural, or other interests of the state (TDA 2007).
Tennessee Department of Environment and Conservation (TDEC), Rare Plant Protection and Conservation Regulations (Chapter 0400-06-02)	These regulations provide for the implementation of The Rare Plant Protection and Conservation Act, which requires persons to obtain written permission from a landowner or manager before knowingly removing or destroying state-listed endangered plant species and requires nursery farmers to be licensed to sell state-listed endangered species (TDEC 2008).
Tennessee Natural Heritage Program (TNHP)—Rare Plant List	The Rare Plant Protection and Conservation Act of 1985 allows the Division of Natural Areas, Tennessee Natural Heritage Program to enter into agreements with other agencies to conserve rare plants. It also requires persons to obtain written permission from a landowner or manager before knowingly removing or destroying state-listed endangered plant species. The Tennessee Natural Heritage Commission website has a tracking list with approximately 531 total rare plant species for the state (TDEC 2014).
Texas	
Endangered, Threatened, and Protected Native Plants (Texas Administrative Code (TAC) 31-69.1–69.9	The regulations list laws regarding threatened and endangered native plant species.
Texas Parks and Wildlife Code, Wildlife and Plant Conservation, Chapter 88	The regulation establishes TPWD and identifies procedures for identifying, studying, and protecting endangered, threatened, or protected plants.
Texas Department of Agriculture, Noxious Weed List (TAC 4-19.300(a))	The state of Texas maintains a list of 29 plants listed as noxious (http://www.texasinvasives.org/plant_database/tda_results.php).

3.17.2 Data Sources

The data sources used for Vegetation Communities in this EIS are listed in Table 3.17-2. All sources are listed in Chapter 6.

Table 3.17-2:
Sources of Vegetation Community Data

Vegetation	Data Sources
Cover Types and Dominant Species	EPA Level I (EPA 2012) and III Ecoregions (GIS Data Source: EPA 2010) 2011 National Land Cover Database (GIS Data Source: Jin et al. 2013) NRCS Plants Database (USDA 2013) Flora of North America (eFlora 2013)
Special Status Plant Species	USFWS Endangered Species Program Threatened and Endangered Species Range Maps ((http://www.fws.gov/endangered/map/index.html)) USFWS Critical Habitat Portal (http://ecos.fws.gov/crithab/) Oklahoma Natural Heritage Inventory (http://www.oknaturalheritage.ou.edu/) Arkansas Natural Heritage Commission (http://www.naturalheritage.com/) Tennessee Department of Environment and Conservation Natural Heritage Inventory Program (http://www.tn.gov/environment/natural-areas/natural-heritage-inventory-program.shtml) Texas Parks and Wildlife Department Natural Diversity Database (http://www.tpwd.state.tx.us/huntwild/wild/wildlife_diversity/txndd/)

Table 3.17-2:
Sources of Vegetation Community Data

Vegetation	Data Sources
Designated Plant Conservation Areas	USGS National Gap Analysis Program Protected area Database (http://gapanalysis.usgs.gov/padus/data/) The Nature Conservancy Lands and Waters Dataset (http://maps.tnc.org/gis_data.html) Arkansas Natural Heritage Commission, Species Focal Areas (http://www.naturalheritage.com/) ANHC Areas of Conservation Interest (http://www.naturalheritage.com/)
Wetlands and Riparian Areas	National Wetlands Inventory—USFWS (http://www.fws.gov/wetlands/)
Listed Noxious Weeds	Oklahoma State Department of Agriculture, Plant Industry and Consumer Services Division Noxious Weed Information (http://www.oda.state.ok.us/cps-weed.htm) Arkansas State Plant Board Noxious Weed Information (Arkansas Plant Board 2014b) Tennessee Department of Agriculture Noxious Weed Information (http://www.invasive.org/species/list.cfm?id=58) Texas Department of Agriculture Noxious Weed Information (http://www.texasinvasives.org/plant_database/tda_results.php)

3.17.3 Region of Influence

For vegetation communities and special status plant species, the ROI for the Project and connected actions is the same as described in Section 3.1.1.

3.17.4 Affected Environment

The ROI crosses many ecosystems that support diverse vegetation communities. Section 3.17.5 describes existing vegetation communities by Project region (1 through 7), including the dominant vegetation types and dominant plant species as well as special status plant species, designated conservation or habitat protection areas, and listed noxious weed species that may occur within the ROI. Land cover is described in detail in Section 3.10 and contains tables that show land cover by Project region and component.

3.17.5 Regional Description

The descriptions of vegetation presented below were developed from information provided by the EPA for the Level III and IV ecoregions and the National Land Cover Database (NLCD) (Table 3.17-3).

Project Regions 1 through 3 are located within the Great Plains Level I ecoregion. Project Regions 4 through 7 are located within the Eastern Temperate Forests Level I ecoregion (EPA 2012). Level I ecoregions are further divided into Level II, Level III, and Level IV ecoregions to describe the more defined ecosystem boundaries that are often nested within broader ecological hierarchies. Level III and Level IV ecoregions within the ROI are identified and described in Table 3.17-3. Figure 3.17-1 (located in Appendix A) is a depiction of Level IV ecoregions mapped over the entire breadth of the Project.

Annual precipitation ranges from about 16 inches in the Oklahoma panhandle region to about 45–50 inches in eastern Oklahoma, across Arkansas to the Mississippi Valley region on the east end of the Project. The gradient of precipitation greatly influences the land cover types and vegetation in the ecoregions from the High Plains and Southwestern Tablelands in the Oklahoma and northern Texas panhandles to the Mississippi Alluvial Plain and Mississippi Valley Loess Plains in Arkansas and Tennessee (Tyrl et. al 2002). The grassland/herbaceous cover type is dominated by shortgrass and, to a lesser extent, midgrass prairie species in the semi-arid parts of Regions 1 and 2. As precipitation increases across Oklahoma (Regions 3 and 4), the species composition changes to more mixed grass prairie (midgrasses) and then to tall grass species through central and eastern Oklahoma and across Arkansas. Shrub/scrub cover types are more common in the more semi-arid western regions of the Project and decrease in abundance across Oklahoma as forest types become more common with increased precipitation. In Region 1 and parts of Region 2, shrubland areas of sand sagebrush (*Artemisia filifolia*) and shinnery oak (*Quercus harvardii*) are common. Farther east in the Project area, shrubland areas may be associated with early successional stages of either human or naturally disturbed areas.

Table 3.17-3:
EPA Level III and IV Ecoregions by State and Region/Project Component

Level III Ecoregion	Level IV Ecoregion	State(s)	Region/Project Component
High Plains	Canadian/Cimarron High Plains	Oklahoma and Texas	Region 1, AC Collection System
Southwestern Tablelands	Canadian/Cimarron Breaks		Region 1, Oklahoma Converter Station Siting Area and AC Interconnection Siting Area
Central Great Plains	Rolling Red Hills	Oklahoma	Regions 1 and 2
	Pleistocene Sand Dunes		Regions 1 and 2
	Gypsum Hills		Region 2
	Prairie Tableland		Regions 2 and 3
	Cross Timbers Transition		Region 3
Cross Timbers	Northern Cross Timbers	Oklahoma	Region 3
Central Irregular Plains	Osage Cuestas		Region 3
Boston Mountains	Lower Boston Mountains	Oklahoma and Arkansas	Regions 3 and 4
Arkansas Valley	Arkansas Valley Plains	Oklahoma and Arkansas	Region 4
	Arkansas Valley Hills	Arkansas	Regions 4 and 5, Arkansas Converter Station Alternative Siting Area
	Arkansas River Floodplain		Region 4
Mississippi Alluvial Plain	Western Lowlands Holocene Meander Belts		Regions 5 and 6
	Western Lowlands Pleistocene Valley Trains		Region 6
	St. Francis Lowlands		Region 6
	Northern Holocene Meander Belts	Arkansas and Tennessee	Region 7
	Northern Pleistocene Valley Trains	Arkansas	Region 7
	Northern Backswamps	Arkansas	Region 7
Mississippi Valley Loess Plains	Bluff Hills	Arkansas and Tennessee	Regions 6 and 7, Tennessee Converter Station Siting Area
	Loess Plains	Tennessee	Region 7, Tennessee Converter Station Siting Area

Sources: Griffith et al. (1998, 2004), Woods et al. (2004, 2005); GIS Data Source: EPA (2010)

Forest cover types (evergreen, deciduous, and mixed) occur along the entire Project but are most abundant in higher precipitation areas in the Cross Timbers, Central Irregular Plains, Boston Mountains, Arkansas Valley, Mississippi Alluvial Plain, Mississippi Valley Loess Plains ecoregions in Regions 3 through 7. Forested areas in the western semi-arid regions are limited to deciduous forests in floodplains or small areas of upland evergreen forests of pinyon-juniper woodlands. Across central Oklahoma, forested cover types become common and are composed largely of oaks in the Cross Timbers. In eastern Oklahoma, Arkansas, and western Tennessee, the forested cover types transition to deciduous forest of oaks, hickories, and other broadleaf trees and mixed forest of deciduous trees and evergreen trees such as short-leaf pine. Smaller evergreen forest of short-leaf pine also occurs on escarpments and drier south slopes. Cultivated cover types include cultivated crops or pasture/hay. Cultivated crops also vary across the Project with the precipitation gradient. Cultivated crops in the drier, western part of the Project are most likely to be dryland farms or irrigated fields (e.g., center-pivot). As precipitation increases to the east, irrigation becomes less important. Crops vary, but typically include annual species such as corn, soybeans, rice, cotton, and wheat. Several land cover types are classified as developed with different levels of development intensity. These areas typically contain a matrix of vegetation interspersed with human development (i.e., residential, commercial, and industrial). The type of vegetation within the developed cover type would reflect the location along the precipitation gradient and the potential vegetation that could occur there based on precipitation. Wetlands cover types occur throughout the ROI and may either be woody or emergent wetlands. Woody wetlands occur where forests or shrubs grow in soils periodically saturated with or covered by water. Vegetation in emergent wetlands is dominated by perennial herbaceous species.

3.17.5.1 Region 1

3.17.5.1.1 Ecoregional Descriptions

Region 1 is referred to as the Oklahoma Panhandle Region and includes the Applicant Proposed Route and HVDC Alternative Routes 1-A through 1-D, the AC collection system, and the Oklahoma Converter Station and AC Interconnection Siting Area. Region 1 is the most arid of the Project, and annual precipitation ranges from less than 16 inches to about 24 inches. The ROI in Region 1 largely crosses areas consisting of agriculture (including center-pivot irrigation) and open pasture interspersed with well fields. The land is flat and dry, and has few narrow riparian corridors associated with streams and rivers, such as Palo Duro Creek. East of Hollow N1150 Road, topography becomes more noticeable in areas. Small plateaus are even present between Oklahoma Route 46 and U.S. Route 183. The shrub/scrub cover type consists of semi-arid species such as sand sagebrush and shinnery oak. The grassland/herbaceous cover type consists primarily of shortgrass prairie species (blue grama [*Bouteloua gracilis*], buffalograss [*Buchloë dactyloides*], fringed sage [*Artemisia frigida*]) with some midgrasses (sideoats grama [*Bouteloua curtipendula*], western wheatgrass [*Pascopyrum smithii*], little bluestem [*Schizachyrium scoparium*]) as precipitation increases to the east. Forested cover types are limited in Region 1 and typically consists of deciduous forests (plains cottonwoods [*Populus deltoides* ssp. *monolifera*] and willows, such as peach-leaved willow [*Salix amygdaloides*]) in floodplains or small areas of pinyon-juniper woodland.

3.17.5.1.2 Special Status Plants

No federal or state threatened or endangered plants are known to occur in the ROI for the Applicant Proposed Route, the HVDC alternative routes, or the Oklahoma Converter Station Siting Area in Region 1 (USFWS 2013a, 2014; ODWC 2013).

3.17.5.1.3 Noxious Weeds

Region 1 is located in the states of Oklahoma and Texas. Oklahoma has three listed noxious weeds: musk thistle (*Carduus nutans*), Scotch thistle (*Onopordum acanthium*), and Canada thistle (*Cirsium arvense*). Desktop analysis has not yielded data with which to establish magnitude of occurrence for these three listed noxious weeds within the

ROI (ODA 2000; CISEH 2014). In addition, field reconnaissance has not been undertaken to substantiate the actual presence or absence of these three species in the ROI.

Twenty-seven plant species are designated as noxious weeds in the state of Texas (see Texas Administrative Code Title 4, Chapter 19). Two of these noxious species are confirmed to occur within Ochiltree County, Texas (field bindweed [*Convolvulus arvensis*]) and saltcedar [*Tamarix* spp.]). Field bindweed is also confirmed from both Sherman and Hansford counties, Texas. In addition to the two listed noxious weeds, a large number of other invasive plant species are confirmed for the three county area in north Texas where various portions of the AC collection system may be sited. Desktop analysis has not yielded data with which to establish magnitude of occurrence for state listed noxious weeds confirmed in the Texas counties where the various AC collection routes have been identified (CISEH 2014). In addition, field reconnaissance has not been undertaken to substantiate the actual presence or absence of listed noxious weeds in the various ROIs for the AC collection system.

3.17.5.2 Region 2

3.17.5.2.1 Ecoregional Descriptions

Region 2 is referred to as the Oklahoma Central Great Plains Region and includes the Applicant Proposed Route and HVDC Alternative Routes 2-A and 2-B. Annual precipitation in Region 2 ranges from about 24 to 32 inches. In Region 2, the ROI largely crosses areas consisting of agriculture and open pasture interspersed with well fields. Near Mooreland, Oklahoma, lands appear wetter where they are associated with the North Canadian River. From Oklahoma Route 50 south and east to the location that the ROI passes north of Canton Lake, forested areas are interspersed with open pasturelands and well fields. Between the city of Fairview and the town of Isabella, Oklahoma, land use changes to agriculture; however, east of Isabella, lands associated with the Cimarron River and floodplain are wetter and interspersed with forested tracts. The grassland/herbaceous cover type that is common in the ROI in Region 2 contains some short grass species, but more midgrasses and tall grass species (big bluestem [*Andropogon gerardii*], switchgrass [*Panicum virgatum*], Indiangrass [*Sorghastrum nutans*], and little bluestem) are present farther east. Region 2 also contains larger areas of deciduous and evergreen forest than did the more arid Region 1, including the western part of the Cross Timbers ecoregion.

3.17.5.2.2 Special Status Plants

No federal or state threatened or endangered plants are confirmed in the ROI for the Applicant Proposed Route or the HVDC alternative routes in Region 2 (USFWS 2013a, 2014; ODWC 2013).

3.17.5.2.3 Noxious Weeds

Oklahoma has three listed noxious weeds, as discussed under Region 1. Desktop analysis has not confirmed the magnitude of occurrence for these three species in the ROI. Field reconnaissance would be required to substantiate quantities and spatial distribution of these species within the ROI for the Project.

3.17.5.3 Region 3

3.17.5.3.1 Ecoregional Descriptions

Region 3 is referred to as the Oklahoma Cross Timbers Region and includes the Applicant Proposed Route and HVDC Alternative Routes 3-A through 3-E. Annual precipitation in Region 3 ranges from 32 inches in the west to about 44 inches in Muskogee County, Oklahoma. In Region 3, the ROI crosses areas consisting of agriculture and pastureland and small forested areas associated with creeks. East of Oklahoma Route 74, the land cover becomes wetter, with multiple waterbodies, including Otter Creek and Beaver Creek, and more forested areas associated with these creeks. East of Interstate 35, the ROI becomes more interspersed with forested lands and waterbodies, with a larger tract of forested area present southwest of Stillwater, Oklahoma. The ROI traverses the Cimarron River, associated tributaries, floodplains, and wetlands. East of the Cimarron River, the ROI becomes more densely forested, though not in contiguous tracts, as the forested and riparian areas are intermixed with shrub and pasture lands, as well as developed cities such as Bristow, Beggs, and Okmulgee, Oklahoma. East of Okmulgee, to Muskogee, the ROI traverses open pasture lands interspersed with oil well pads. The Cross Timbers Region contains larger areas of oak forest (deciduous forest) interspersed with grassland/herbaceous cover that is composed of mostly tall grass prairie species such as big bluestem, switchgrass, Indiangrass, and little bluestem. These two cover types, along with cultivated crops and pasture/hay, compose much of the vegetation in Region 3.

3.17.5.3.2 Special Status Plants

No federal or state threatened or endangered plants are known to occur in the ROI for the Applicant Proposed Route or the HVDC alternative routes in Region 3 (USFWS 2013a, 2014; ODWC 2013).

3.17.5.3.3 Noxious Weeds

Oklahoma has three listed noxious weeds as discussed under Region 1. Musk thistle is confirmed for Payne, Lincoln, Creek, and Okmulgee counties, which the ROI traverses.

3.17.5.4 Region 4

3.17.5.4.1 Ecoregional Descriptions

Region 4 is referred to as the Arkansas River Valley Region and includes the Applicant Proposed Route, including the Lee Creek Variation, and HVDC Alternative Routes 4-A through 4-E. Average annual precipitation in Region 4 varies from 44 inches in eastern Oklahoma to about 50 inches in Arkansas. In Region 4, the ROI crosses the Arkansas and Illinois rivers in Oklahoma, both of which have extensive tracts of forested lands. Through Sequoyah County, the northern portion of the ROI traverses larger tracts of forested areas, while the southern portion traverses lightly developed areas and pasture lands.

In Arkansas, land cover in Region 4 varies from north to south, with large tracts of forest common in the north, while there are more developed areas to the south associated with the city of Fort Smith. This difference between the northern and southern portions of the ROI continues through Franklin and Johnson counties. East of Clarksville, Arkansas, the ROI becomes more densely forested as it continues into Pope County.

Forested cover types are prevalent in Region 4; deciduous forest (oak-hickory) is the most common. Evergreen forests with pines are common in some locations. Grassland/herbaceous cover types are less prevalent than in the drier regions in Oklahoma but where present contain predominately tallgrass prairie species. Pasture/hay cover types are relatively abundant in this region and contain domestic forage species and some native species.

3.17.5.4.2 Special Status Plants

No federal or state threatened or endangered plants are known to occur in the ROI for the Applicant Proposed Route or the HVDC alternative routes within the portion of Region 4 within the state of Oklahoma (USFWS 2013a, 2014; ODWC 2013). Arkansas has a voluntary Endangered Species Protection Program with bulletins for each county.

Special status plant species potentially occurring in the ROI for the Applicant Proposed Route and the HVDC alternative routes in Region 4 in Arkansas are listed in Table 3.17-4.

Table 3.17-4:
State and Federally Designated Threatened and Endangered Plants Potentially Occurring in the ROI in Region 4 (by County)

Common Name	Scientific Name	Listing Status	Counties of Occurrence in the Region
Alabama snow-wreath	*Neviusia alabamensis*	ST	Pope
Appalachian filmy fern	*Trichomanes boschianum*	ST	Johnson
Bicknell's sedge	*Carex opaca*	SE	Franklin
Interrupted fern	*Osmunda claytoniana*	ST	Pope
Open-ground Whitlow-grass	*Draba aprica*	ST	Pope
Ovate-leaf catchfly	*Silene ovata*	ST	Crawford, Pope
Small-head pipewort	*Eriocaulon koernickianum*	SE	Franklin, Johnson, Pope
Tinytim	*Geocarpon minimum*	FT/SE	Franklin
Whorled dropseed	*Sporobolus pyramidatus*	ST	Franklin

FT = Federally Threatened SE = State Endangered ST = State Threatened
Source: ANHC (2014b)

The federally listed species tinytim (*Geocarpon minimum*) has confirmed elemental occurrence in Franklin County, Arkansas; however, no portions of the ROI have been specifically surveyed for this species, so its presence in the ROI is not confirmed. Tinytim is also listed as state endangered. Tinytim is typically found in eroded areas in saline soil prairies, called "slicks." Slicks are bare soils that occur over sandstone, and they are naturally high in sodium and magnesium. Slicks are ephemeral and can fluctuate greatly from year to year, causing tinytim populations to increase or decrease (Pittman 1993; ANHC 2011). To date, tinytim has not been found on any sandstone glades in Arkansas. Although the Ozark Highlands of Arkansas contain many sandstone glades that appear superficially similar to the tinytim-supporting glades of Missouri, no known sandstone glades are confirmed in Arkansas with the same mode of formation and chemical composition as the Missouri channel sand glades. All of the currently known Arkansas tinytim sites occur on saline soil prairies (NatureServe 2013). Factors that cause disturbances to natural plant successional phases are contributing to this species' decline. Threats include cattle grazing in and around sandstone-glade or saline soil prairie habitat, complete conversion of saline soil prairies, and off-road vehicular traffic (DeLay et al. 1993), although the current role of erosional disturbance is debatable. Other reasons given for this species' decline are climate change and changes in site-specific hydrology (USFWS 2009).

The state-threatened species, Alabama snow-wreath (*Neviusia alabamensis)*, has confirmed elemental occurrence in Pope County in Region 4 and also Conway and Faulkner County in Region 5. Alabama snow-wreath is a 3- to 6-foot-tall deciduous, thicket-forming shrub with bright green leaves. It is a clonal species that rarely reproduces by seeds. It may be found in forested bluffs, talus slopes, and streambanks on a variety of geologic substrates, soil types, and aspects, and under open- to completely closed-canopy conditions. Most typical habitat may be within forested areas on thin soil over limestone that is moist for part of the year (seasonal streambeds, margins of sinkholes, riverbluffs) (ANHC 2014b). It is most vulnerable to timber harvesting and other forms of disturbance.

The Appalachian filmy fern (*Trichomanes boschianum*) is a state listed threatened species in Arkansas and has confirmed elemental occurrence in Johnson County in Region 4 and Cleburne County in Region 5. Its presence within the ROI for the Applicant Proposed Route or the HVDC alternative routes cannot be confirmed without species specific surveys in these areas. The Appalachian filmy fern has a very limited distribution. The habitat for this species consists of places where humidity is constantly high and temperatures tend to be moderate throughout the year. This includes deep recesses and cracks in cliffs and rock shelters, and on boulders along streams or in deep narrow hollows. Appalachian filmy fern is usually found on sandstone or conglomerate, but can be on other non-calcareous rocks (Taylor 2014).

Bicknell's sedge (*Carex opaca*) is a state listed endangered plant species that has confirmed elemental occurrence in Franklin County in Region 4, Faulkner County in Region 5, and Poinsett County in Regions 6 and 7. Its presence within the ROI for the Applicant Proposed Route or the HVDC alternative routes cannot be confirmed without species specific surveys in these areas. Bicknell's sedge is a large (3-foot-tall) perennial sedge that grows in dense clumps. Its primary habitats are moist depressions, drainages, and swales in wet or mesic prairie; it also colonizes roadside ditches and railroad ROWs and often occurs on heavy, clayey soils. Habitat conversion and alteration of hydrologic regimes are primary threats as these habitats (wet or mesic prairie) lend themselves to alternative use.

The interrupted fern (*Osmunda claytonia*) is a state threatened species in Arkansas with confirmed elemental occurrence in Pope County in Regions 4 and 5. Its presence within the ROI for the Applicant Proposed Route or the HVDC alternative routes cannot be confirmed without species specific surveys in these areas. This fern species is distributed through eastern Canada and is rare but occurs in many states in the eastern and central United States. It is ranked as critically imperiled in Arkansas, which indicates that there are five or fewer known occurrences in the state (NatureServe 2014a; Meades et al. 2000).

Open-ground Whitlow-grass (*Draba aprica*) is an Arkansas state listed threatened species with confirmed elemental occurrence in Pope County in Regions 4 and 5 and in Faulkner County in Region 5. Its presence within the ROI for the Applicant Proposed Route or the HVDC Alternative Routes cannot be confirmed without species specific surveys in these areas. Open-ground Whitlow-grass is an annual, herbaceous plant, up to one foot tall, with dense clusters of small, white flowers. In Arkansas, populations tend to occur in barrens or glades on very thin soil (approximately 1.5-inch-tall), often on rocky glade/barren margins; sites include shale barrens. Loss of glade habitat is a threat to the species.

The ovate-leaf catchfly (*Silene ovata*) is an Arkansas state threatened plant species that has confirmed elemental occurrence from Crawford and Pope counties in Region 4 of the Project and Pope, Conway, Van Buren, and Cleburne counties in Region 5. Its presence within the ROI for the Applicant Proposed Route or the HVDC alternative routes cannot be confirmed without species specific surveys in these areas. The ovate-leaf catchfly is a state listed endangered species in Tennessee and is reported from Shelby County in Region 7. Ovate-leaf catchfly is a perennial herb approximately 2 to 6 inches tall, with opposite leaves that are rare throughout its range. It occurs in a variety of open or forested sandy or pebbly habitats including floodplains. Threats include logging, grazing (deer and feral hogs), trampling, road construction, and ROW maintenance. Soil disturbance is likely to have a negative effect on this species due to the resultant erosion.

The small-head pipewort (*Eriocaulon koernickianum*) is a state-listed endangered plant species. It is a small annual with a leafless flowering stem, approximately 2 to 3 inches tall, arising from a tuft of grass-like leaves. It has confirmed elemental occurrence in Arkansas in Franklin, Johnson, and Pope counties in Region 4 and Pope, Conway, and Van Buren counties in Region 5. Its presence within the ROI for the Applicant Proposed Route or the HVDC alternative routes cannot be confirmed without species specific surveys in these areas. In the western part of its range, including Arkansas, the small-head pipewort is found in or near sandy, permanently moist to wet acidic seepage areas, particularly upland sandstone glade seeps and sandy hillside seeps; in hillside seepage bogs, particularly the less densely vegetated, sandy bog margins; and (rarely) in wet prairies. Plants tend to occur in sparsely vegetated areas rather than among dense vegetation; the species is considered intolerant of shade and is probably early successional. Habitat loss resulting from wetland draining is a serious threat. Natural disturbances, such as periodic fire, are necessary to ensure this species' persistence via removal of competing vegetation.

Whorled dropseed (*Sporobolus pyramidatus*) is a grass species listed as threatened in the state of Arkansas. It has confirmed elemental occurrence from Franklin County in Region 4. Its presence within the ROI for the Applicant Proposed Route or the HVDC alternative routes cannot be confirmed without species specific surveys in these areas. Whorled dropseed is a warm season, tufted perennial grass typically growing from 4–19 inches in height. It grows in open, disturbed sites on sandy, saline and alkaline soil types. Its distribution includes Kansas to Colorado, south Texas, Louisiana, and Arizona, and in southern Florida (NRCS 2014). Whorled dropseed has a conservation rank in Arkansas of S2, which means the species is thought to have 6 to 20 element occurrences within the state (NatureServe 2014b; Kartesz 1999).

3.17.5.4.3 Noxious Weeds

Region 4 straddles the border between Oklahoma and Arkansas. Oklahoma has three listed noxious weeds, as discussed under Region 1, of which only musk thistle is confirmed in Sequoyah County, Oklahoma (Region 4). The ROI does traverse this county.

Thirty-eight noxious weeds are listed for Arkansas. Seventeen of the state-listed noxious weeds are confirmed in the four counties crossed by the ROI in Region 4 (Table 3.17-5).

Table 3.17-5:
Arkansas Listed Noxious Weeds-Region 4 (by County crossed within the ROI)

Common Name	Scientific Name	Crawford	Franklin	Johnson	Pope
Balloonvine	*Cardiospermum halicacabum*	X			
Banyardgrass	*Echinochloa crus-galli*		X		X
Bermudagrass	*Cynodon dactylon*	X	X	X	X
Buckthorn plantain	*Plantago lanceolata*	X	X	X	
Cheatgrass (Chess)	*Bromus racemosus*		X		
Cheatgrass (Chess)	*Bromus secalinus*		X	X	X
Corncockle	*Agrostemma githago*		X		X
Dock	*Rumex* spp.	X	X	X	X
Field bindweed	*Convolvulus arevensis*	X			X
Hedge bindweed	*Calystegia sepium*		X	X	
Johnsongrass	*Sorghum halepense*	X	X	X	X
Morning glory	*Ipomoea* spp.		X	X	X
Nutgrass	*Cyperus rotundus*		X		
Thistle	*Carduus* spp.			X	
Thistle	*Cirsium* spp.		X		
Thistle	*Silybum* spp.		X		
Wild onion and/or garlic	*Allium* spp.				X

Sources: Arkansas Plant Board (2014b), CISEH (2014)

3.17.5.5 Region 5

3.17.5.5.1 Ecoregional Descriptions

Region 5 is referred to as the Central Arkansas Region and includes the Applicant Proposed Route and HVDC Alternative Routes 5-A through 5-F. Annual precipitation in Region 5 is approximately 50 inches. Forested cover types are common in Region 5 and include deciduous (oak-hickory), mixed (oak-pine), and evergreen (pine). The pasture/hay cover type also is prevalent throughout the ROI. Grassland/herbaceous land cover types are not as common in Region 5 but comprise mostly tall grass species. In Region 5, the ROI traverses forested areas that are interspersed with waterways, such as the Illinois Bayou, and open pasture lands. From Route 105 to Route 95, the ROI traverses large tracts of forested lands and riparian corridors. As Region 5 continues through Conway, Van Buren, Faulkner, Cleburne, and White counties, the ROI consists of an evenly distributed mosaic of forested lands and open lands. In White County, the ROI crosses the Little Red River and its relatively wide riparian corridor. As the ROI continues northeast and into Jackson County, there are large contiguous tracts of forested lands, as well as areas of agriculture and pasture land. An abrupt change in land cover is evident near U.S. Route 67. To the west of U.S. Route 67, lands are largely forested, while to the east, as the ROI enters the floodplain of the White River, land use shifts to agricultural uses, with sparse forested areas that are associated with small creeks.

3.17.5.5.2 Special Status Plants

Special status plant species potentially occurring in the ROI in Region 5 in Arkansas are listed in Table 3.17-6.

Table 3.17-6:
State and Federally Designated Threatened and Endangered Plants Potentially Occurring in the ROI in Region 5 (by County)

Common Name	Scientific Name	Listing Status	Counties of Occurrence in the Region
Alabama snow-wreath	*Neviusia alabamensis*	ST	Pope, Faulkner
Appalachian filmy fern	*Trichomanes boschianum*	ST	Cleburne
Bicknell's sedge	*Carex opaca*	SE	Faulkner
Dwarf bristle fern	*Trichomanes petersii*	ST	Pope, Conway
French's shooting-star	*Primula frenchii*	ST	Cleburne
Interrupted fern	*Osmunda claytoniana*	ST	Pope
Open-ground Whitlow-grass	*Draba aprica*	ST	Pope, Faulkner
Ovate-leaf catchfly	*Silene ovata*	ST	Pope, Conway, Van Buren, Cleburne
Pondberry	*Lindera melissifolia*	FE/SE	Jackson, Poinsett
Purple fringeless orchid	*Platanthera peramoena*	ST	Faulkner, White
Small-head pipewort	*Eriocaulon koernickianum*	SE	Pope, Conway, Van Buren
Southern tubercled orchid	*Platanthera flava*	ST	Conway
Tall cinquefoil	*Drymocallis arguta*	ST	Faulkner

Key: FE = Federally Endangered SE = State Endangered ST = State Threatened
Source: ANHC (2014b)

Many of the Arkansas state listed plant species that occur in Region 5 also occur in Region 4. Those species are discussed in Section 3.17.5.4 under Region 4 special status plants. The species that do not occur in the regions previously discussed are described here.

The federally endangered plant species pondberry (*Lindera melissifolia*) has confirmed element occurrence in Jackson and Poinsett counties, Arkansas, but no species-specific surveys have been undertaken to document the presence or absence within the ROI in Regions 5, 6, or 7. Pondberry is a strongly aromatic shrub that grows in seasonally flooded wetlands and along the margins of ponds, depressions, and bogs (eFlora 2013; Devall et al. 2001). Exact census counts of this species are lacking; however, Arkansas has confirmed 10 populations (DeLay et al. 1993). The state of Arkansas has protected areas, known as “Natural Areas,” for pondberry within two counties crossed by the ROI. Swifton Sand Ponds Natural Area is located in Jackson County, and St. Francis Sunken Lands Natural Area is located in Poinsett County (ANHC 2009). Neither of these locations, however, is within the ROI.

Some populations of pondberry can appear quite large, but they may in fact be groupings of clones that produce numerous stems (Devall et al. 2001); this characteristic could add to the pondberry’s vulnerability. Pondberry has been rarely confirmed historically. This plant has been adversely affected by logging, wetland drainage, road construction, and habitat conversion (Pittman 1993). Other threats include over-spray of herbicides from adjacent agricultural operations and pollution of ponds by pesticides and fertilizers associated with farming practices (LDWF 2013).

Dwarf bristle fern (*Trichomanes petersii*), listed by the state of Arkansas as threatened, is a rare mat-forming fern resembling a moss with leaves that vary in size from approximately 0.2 inch to 1 inch in length. The dwarf bristle fern inhabits moist, sheltered rocks, predominantly sandstones, where the surrounding air is perpetually moist. In Region 5, the dwarf bristle fern is known from Pope and Conway counties.

French’s shooting-star (*Primula frenchii*) is a state listed threatened plant species in Arkansas that occurs in Cleburne County in Region 5. French’s shooting-star is a perennial herbaceous species that typically grows as a pioneer species, protected beneath sandstone overhangs, preferring north and east-facing exposures. The species grows in habitats that yield little competition from other plant species, often growing alone in bare soil. In Arkansas, it is found occasionally in large numbers in areas that have not been impacted by timber management. Removal of large shade trees negatively affects the species.

The purple fringeless orchid (*Platanthera peramoena*) is listed as threatened in the state of Arkansas and occurs in Faulkner and White counties in Region 5. It grows in moist forests, woodlands, meadows, and thickets, as well as in marshes and swamps. The purple fringeless orchid appears to benefit from natural disturbances that reduce overhead tree canopies and results in more light. The species has a restricted habitat, making it especially vulnerable to land-use conversion, habitat fragmentation, and forest management practices.

The southern tubercled orchid (*Platanthera flava*) is a state threatened species in Arkansas and occurs in Conway County in Region 5. The southern tubercled orchid occurs on sandy silt alluvium and rotting logs in bottomland (floodplain) forest and wet thickets. It also occurs in wet-mesic prairies and wet meadows. This species is threatened by habitat loss, especially in floodplain forests and wet prairies. The primary threat to the southern tubercled orchid is the destruction of wetland habitat through development, logging, drainage, beaver activity, and other hydrologic alterations. Also threatening to this species are over-collection of orchids, excessive grazing, and successional overgrowth of habitats by woody species.

Tall cinquefoil (*Drymocallis arguta*) is member of the rose family that is listed as threatened by the state of Arkansas. The species is reported from Faulkner County in Region 5. The herbaceous species can reach 3 feet in height. Little information is available for tall cinquefoil in Arkansas but in other locations is considered a prairie species on well-developed soils. Habitat conversion and disturbance is a potential threat.

3.17.5.5.3 Noxious Weeds

Arkansas has 43 listed noxious weeds. Sixteen of the 43 state-listed noxious weeds are confirmed to occur in the seven counties crossed by the ROI in Region 5 (Table 3.17-7).

Table 3.17-7:
Arkansas-Listed Noxious Weeds-Region 5 (by County Crossed within the ROI)

Common Name	Scientific Name	Pope	Conway	Van Buren	Faulkner	Cleburne	White	Jackson
Balloonvine	*Cardiospermum halicacabum*				X			
Banyardgrass	*Echinochloa crus-galli*	X			X			X
Bermudagrass	*Cynodon dactylon*	X	X		X	X		
Buckthorn plantain	*Plantago lanceolata*			X	X	X	X	
Cheatgrass (Chess)	*Bromus secalinus*	X	X		X			
Corncockle	*Agrostemma githago*	X	X		X			
Crotalaria	*Crotalaria* spp.							X
Dock	*Rumex* spp.	X	X	X	X	X		
Field bindweed	*Convolvulus arevensis*	X			X		X	
Hedge bindweed	*Calystegia sepium*							X
Johnsongrass	*Sorghum halepense*	X	X		X	X	X	X
Morning glory	*Ipomoea* spp.	X	X		X	X		
Nutgrass	*Cyperus rotundus*				X			
Thistle	*Carduus* spp.							
Thistle	*Cirsium* spp.		X	X		X		
Wild onion and/or garlic	*Allium* spp.	X			X	X		

Sources: Arkansas Plant Board (2014b), CISEH (2013)

3.17.5.6 Region 6

3.17.5.6.1 Ecoregional Descriptions

Region 6 is referred to as the Cache River and Crowley's Ridge Region and includes the Applicant Proposed Route and HVDC Alternative Routes 6-A through 6-D. Annual precipitation in Region 6 is approximately 50 inches. Region 6 occurs almost entirely within the Mississippi Alluvial Plain ecoregion. This ecoregion is fairly level and therefore provides good agricultural land. Agricultural crops (e.g., rice [*Oryza sativa*], soybeans [*Glycine max*], cotton [*Gossypium* spp.], corn [*Zea mays*], and wheat [*Triticum aestivum*]) represent a major cover type with Region 6. Because of the high precipitation levels, forest types that are present include deciduous and mixed types interspersed among the agricultural land or along riparian corridors. The western portion of the ROI is similar to the eastern end and consists of agriculture land with sloughs and narrow riparian corridors that continue to Route 37. In Region 6, the ROI traverses the Cache River, including its densely forested riparian corridor and associated wetlands. Immediately after traversing the forested areas of the Cache River, land use abruptly changes to agriculture and pasture lands and transitions to small forested areas that intersect Crowley's Ridge, which is densely forested with deciduous species (oak-hickory). Crowley's Ridge is a remnant elevated plain covered in loess soils and is part of the Mississippi Valley Loess Plains ecoregion. East of Crowley's Ridge, the ROI consists of agriculture and open land. Because Region 6 is located in the Mississippi Alluvial Plain ecoregion with a relatively high water table, woody wetlands, areas dominated by hydrophytic tree species with periodically saturated soils or standing water, also are more common.

3.17.5.6.2 Special Status Plants

Bicknells's sedge and pondberry, described under Regions 4 and 5 respectively, have documented element occurrence in Jackson and Poinsett counties, Arkansas (Table 3.17-8). No species-specific surveys have been conducted for these two species within the Applicant Proposed Route or the HVDC alternative routes in the ROI in Region 6. These two species also have documented element occurrence in previously discussed regions of the Project.

Table 3.17-8:
State and Federally Designated Threatened and Endangered Plants Potentially Occurring in the ROI in Region 6 (by County)

Common Name	Scientific Name	Listing Status	Counties of Occurrence in the Region
Bicknell's sedge	*Carex opaca*	SE	Poinsett
Pondberry	*Lindera melissifolia*	FE/SE	Jackson, Poinsett

Key: FE = Federally Endangered SE = State Endangered
Source: ANHC (2014a)

3.17.5.6.3 Noxious Weeds

Arkansas has 43 designated noxious weeds. Fifteen of the 43 state-listed noxious weeds are confirmed to occur in the three counties crossed by the ROI in Region 6 (Table 3.17-9).

Table 3.17-9:
Arkansas-Listed Noxious Weeds—Region 6 (by County crossed within the ROI)

Common Name	Scientific Name	Poinsett	Mississippi	Cross
Balloonvine	*Cardiospermum halicacabum*		X	
Banyardgrass	*Echinochloa crus-galli*	X	X	
Bermudagrass	*Cynodon dactylon*	X		X
Buckthorn plantain	*Plantago lanceolata*			
Cheatgrass (Chess)	*Bromus secalinus*	X		
Corncockle	*Agrostemma githago*	X		
Dock	*Rumex* spp.	X		X
Field bindweed	*Convolvulus arevensis*		X	X
Hedge bindweed	*Calystegia sepium*	X		
Johnsongrass	*Sorghum halepense*	X	X	
Morning glory	*Ipomoea* spp.		X	
Thistle	*Carduus* spp.		X	
Thistle	*Cirsium* spp.		X	
Thistle	*Salsola* spp.		X	
Wild onion/garlic	*Allium* spp.		X	X

Sources: Arkansas Plant Board (2014b), CISEH (2014)

3.17.5.7 Region 7

3.17.5.7.1 Ecoregional Descriptions

Region 7 is referred to as the Arkansas Mississippi River Delta and Tennessee Region and includes the Applicant Proposed Route, HVDC Alternative Routes 7-A through 7-D, and the Tennessee Converter Station and AC Interconnection Siting Area. The majority of the ROI in Arkansas consists of Mississippi River floodplain (Mississippi Alluvial Plain ecoregion), which is predominantly used for agricultural crops (e.g., rice, soybeans, and cotton). Annual precipitation is about 50 inches. The Project crosses the Mississippi River in Region 7. Immediately adjacent to the river is riparian forest. Woody wetlands are also relatively common in the region because of the high water table and precipitation, but they are patchy in distribution, so the routes may vary in the amount of wetlands within the ROI. Shrub/scrub cover types also may be more prevalent in Region 7 and in many cases may represent woody successional communities in areas that have been disturbed by human activities or periodic flooding. The eastern end of Region 7, where the Project terminates, is in Tennessee and occurs in the Mississippi Valley Loess Plains ecoregion. Vegetation is a mixture of cultivated land (crops and pasture/hay) and forests (deciduous and mixed).

3.17.5.7.2 Special Status Plants

Two special status plant species, Bicknell's sedge and pondberry, have documented element occurrence in Poinsett County in Arkansas (Table 3.17-10). Pondberry was discussed in detail in Region 5 and Bicknell's sedge was discussed in Section 3.17.5.4 for Region 4.

Table 3.17-10:
State and Federally Designated Threatened and Endangered Plants Potentially Occurring in the ROI in Region 7 (by County)

Common Name	Scientific Name	Listing Status	Counties of Occurrence in the Region
Bicknell's sedge	*Carex opaca*	SE	Poinsett
Pondberry	*Lindera melissifolia*	FE/SE	Poinsett

FE = Federally Endangered SE = State Endangered
Source: ANHC (2014a)

No plants designated as threatened or endangered under the ESA occur in the portion of the ROI for the Applicant Proposed Route or the HVDC alternative routes in Region 7 in Tennessee (USFWS 2013a, 2013b, 2013c, 2014). State-designated plant species have been confirmed in Shelby and Tipton counties, Tennessee (TDEC 2014). Table 3.17-11 identifies these special status plant species and documents the counties in Tennessee in which they occur.

Table 3.17-11:
State-Listed Threatened and Endangered Plants Potentially Occurring in the ROI in Region 7—Tennessee

Common Name	Scientific Name	Listing Status	Shelby County	Tipton County
Copper iris	*Iris fulva*	ST	X	
Earleaved false-foxglove	*Agalinis auriculata*	SE		X
Nodding rattlesnake-root	*Prenanathes crepidinea*	SE	X	X
Ovate-leaf catchfly	*Silene ovata*	SE	X	
Red starvine	*Schisandra glabra*	ST	X	X
Sweetbay magnolia	*Magnolia virginiana*	ST	X	

SE = State Endangered, ST = State Threatened
Source: TDEC (2014)

No species-specific field surveys for pondberry or any state-listed species in Arkansas or Tennessee have been undertaken to date within the ROI for the Applicant Proposed Route or the HVDC alternative routes in Region 7.

Copper iris (*Iris fulva*) is a state threatened species in Tennessee and has documented element occurrence in Shelby County, Tennessee. The copper iris is a perennial plant that grows from a rhizome. Habitats include wetlands and bottomland forests. Primary threats include habitat conversions and alteration of wetland hydrology.

The earleaved false-foxglove (*Agalinis auriculata*) is an annual herbaceous plant up to approximately 36 inches tall. It occurs primarily in mesic to dry prairies, fallow fields, tallgrass prairies, prairie-like glades and barrens. It is listed as endangered by the state of Tennessee and has been reported in Tipton County in Region 7 of the Project. Tennessee's Rare Plant Protection and Conservation Act requires persons to obtain written permission from a landowner or manager before knowingly removing or destroying state-listed endangered plant species. Primary threats for this species include habitat conversion, repeated mowing, and succession to woody species.

Nodding rattlesnake-root (*Prenanathes crepidinea*) is considered a state endangered plant species in Tennessee and reported from Shelby County in Region 7. It is a herbaceous perennial plant that is associated with wooded floodplains. Primary threats include changes to stream hydrology, logging of floodplain forests, and conversion to agriculture.

Red starvine (*Schisandra glabra*) is a twining, woody vine with deciduous leaves and occurs in locations in western Tennessee along loess bluffs in counties bordering the Mississippi River, including Shelby County in Region 7 of the Project. Red starvine is considered a threatened species by the state of Tennessee. Primary habitat includes moist woods in bottomlands or in the bluffs along creeks and rivers in sandy-silt-loam soils. Threats include competition from non-native invasive species such as Japanese honeysuckle, land use conversions, and forest management practices.

The sweetbay magnolia (*Magnolia virginiana*) is classified as a threatened species by the state of Tennessee, although it is relatively common in other regions in the eastern and southern United States. It is typically a shrub or small tree, evergreen to partly deciduous. The sweetbay magnolia has been reported in Shelby County in Region 7. The species is most common in wet woods, swamps, bogs, and floodplains. Primary threats include land use conversions and alteration of hydrology regimes.

3.17.5.7.3 Noxious Weeds

Tennessee has 14 designated noxious weed species (TDA 2007). Of this total, seven species are confirmed from counties crossed by the ROI (CISEH 2014). Table 3.17-12 presents the Tennessee noxious weed county occurrences.

Table 3.17-12:
Tennessee-Listed Noxious Weeds-Region 7 (by County crossed within the ROI)

Common Name	Scientific Name	Tipton	Shelby
Amur honeysuckle	*Lonicera maackii*		X
Autumn olive	*Elaeagnus umbellata*		X
Chinese privet	*Ligustrum sinense*	X	X
European privet	*Ligustrum vulgare*		X
Mimosa	*Albizia julibrissisn*	X	X

Table 3.17-12:
Tennessee-Listed Noxious Weeds-Region 7 (by County crossed within the ROI)

Common Name	Scientific Name	Tipton	Shelby
Multiflora rose	*Rosa multiflora*	X	X
Thorny olive	*Elaeagnus pungens*		X

Sources: TDA (2007), CISEH (2014)

3.17.5.8 Connected Actions

3.17.5.8.1 Wind Energy Generation

The land cover in each WDZ is summarized in Section 3.10. The ecoregional description and dominant vegetation types within the WDZs are the same as that of Region 1.

3.17.5.8.2 Optima Substation

The future Optima Substation would be constructed on approximately 160 acres partially within the area identified on Figure 2.1-3 in Appendix A as the AC Interconnection Siting Area. The land cover in the future Optima substation location is primarily grassland herbaceous, with some shrub/scrub and developed, open space. There are no structures or existing infrastructure on the 160-acre site, although there are roads and an operating wind farm nearby. Irrigated cropland is also in the vicinity.

3.17.5.8.3 TVA Upgrades

A precise ROI has not been identified for the TVA upgrades. Where possible, general impacts associated with the required TVA upgrades are discussed in the sections that follow.

3.17.6 Impacts to Vegetation Communities and Special Status Plant Species

3.17.6.1 Methodology

3.17.6.1.1 Impact Calculations

Vegetation communities and special status plant species are assessed for impacts based upon the current understanding of Project construction detail, standard operations and maintenance details, and possible scenarios for decommissioning. This assessment quantifies impacts to vegetation resources using estimated facility dimensions and associated land requirements by Project component as defined in Chapter 2 and Appendix F. The analysis conservatively assumes that the 200-foot width of the typical ROW would be cleared of existing vegetation during the construction of the transmission line. All values for acreage of impacts have been rounded to the nearest tenth of an acre.

3.17.6.1.2 Construction Impacts

Construction-related impacts to vegetation communities and special status plant species may be temporary, short-term, or long-term. The elements of the construction process that may cause impacts to vegetation communities and special status plant species include, but are not necessarily limited to, the following activities:

- Clearing and grading
- Placement of structural foundations
- Access road construction

- Excavation for grounding wires, fiber optic regeneration cables, and transmission line structural foundations
- Blasting
- Herbicide use
- Hazardous materials handling

In terms of duration of impacts, the potential for temporary or short-term impacts to vegetation communities and special status plant species from construction activities include:

- The mechanical damage to vegetation by heavy machinery.
- The compaction of soils on temporary construction laydown yards or temporary access roads, thereby reducing the soil's water-holding capacity and inhibiting plant growth.
- The alteration of hydrology from access road construction, which could affect plant growth. Impacts could be positive or negative depending on the type and duration of alteration.
- The contamination of vegetation from herbicide drift or runoff, and from accidental spills of hazardous substances, such as fuels and lubricants. These impacts may stunt plant growth or inhibit the onset of growth.

The potential long-term impacts to vegetation communities and special status plant species from Project construction include:

- Removal of vegetation by excavation for structure foundations.
- Removal of vegetation during construction of access roads.
- Long-term conversion of forests and shrublands to herbaceous cover type within the transmission ROW; this impact includes the effects of habitat fragmentation such as reduced gene flow, susceptibility to blow-down, and competition by invasive species.
- Introduction of invasive species from construction equipment or spread of existing invasive species on newly cleared land. Invasive species can compete with native vegetation and could result in long-term change to vegetation community diversity and structure.

A more detailed discussion of the potential impacts to vegetation communities and special status plant species from specific construction activities and the corresponding proposed avoidance and minimization measures are discussed in the following sections. Unless otherwise specified, the discussion of impacts provided below is common to all components of the Project, including converter stations and AC interconnections, the HVDC transmission line, AC collection system transmission lines, access roads, multi-use construction yards and other temporary construction areas, and communications sites. In cases where a specific component's impact may vary, additional detail is provided to distinguish between components.

3.17.6.1.2.1 Clearing and Grading

The analysis conservatively assumes that construction within the 200-foot width of the typical ROW would disturb existing vegetation either by removing it or by causing mechanical damage to it during the construction process. Grading, on the other hand, is expected to be much more focused in scope. Grading activities would likely take place at specific construction sites for structure foundations along some portion of the Project access road system, and at the converter station sites. Direct impacts would include removal of vegetation, mechanical damage to vegetation, the potential modification of plant community structure (e.g., removal of trees or shrubs and conversion to grassland/herbaceous land cover), and indirect impacts from compaction of soils and the resulting potential for increased erosion. Specific impacts are discussed below.

3.17.6.1.2.1.1 Removal of Vegetation

The removal of vegetation, as described in this section, includes blading or digging to physically remove plants, and also mechanical damage to plants that results in loss of vigor or death (e.g., crushing of above- and belowground biomass as heavy machinery or other equipment moves over the surface or is stored on the surface). Removal of vegetation can be either direct short-term or long-term impacts, depending on the vegetation cleared, and it would occur during clearing and grading activities. Removal of vegetation may be partial (e.g., aboveground tissue only) or complete. Vegetation removal can impact community structure and composition as well as alter soil moisture content and nutrient chemistry; however, impacts depend on the type and amount of vegetation removed and the rate of regeneration after construction. To reduce impacts from vegetation removal, the Applicant would minimize clearing of vegetation within the ROW (EPM GE-3) and would clearly demarcate (EPM FVW-3) and avoid or minimize impacts to environmentally sensitive vegetation (EPM FVW-1).

The greatest amount of localized vegetation removal would occur at the converter station sites, which would be long term in duration. Desktop analysis has not confirmed any special status plant species within the Oklahoma Converter Station Siting Area. The Oklahoma Converter Station Siting Area is predominately introduced vegetation. Similarly, the Tennessee Converter Station Siting Area is half cultivated cropland and half wooded areas, and no confirmed special status plant species are within this siting area based on desktop analysis. The ROI for the Arkansas Converter Station Alternative Siting Area includes the Cherokee WMA, but this WMA would not be considered a candidate for converter station siting. Wooded areas are present within the Arkansas Converter Station Alternative Siting Area, but much of the area has been cleared for pasture. Therefore, with the implementation of EPMs GE-6, FVW-1, and FVW-3, impacts from vegetation clearing at the converter station sites would be limited in size and would not involve the removal of environmentally sensitive plant species.

In contrast to the more localized vegetation removal at the converter station siting areas, vegetation removal at HVDC or AC structure footprints, along access roads, and in conjunction with temporary workspaces would be dispersed over a larger area. Although vegetation removal at structure footprints and along access roads would likely be long-term, vegetation along the remainder of the ROW and temporary access roads would be allowed to grow back to within certain parameters (i.e., height thresholds for transmission line safety). Conversion of forest along the transmission line ROWs would be considered a long-term impact, while clearing of forested areas for temporary work spaces would be considered a long-term impact. Where access occurs using overland driving instead of via existing improved or constructed roads, vegetation could be crushed, and although root materials would remain intact, allowing the vegetation to regenerate, this could also lead to the spread of invasive plants and noxious weed species, as discussed below. Therefore, the Applicant would restrict vehicular travel to the ROW and other established areas (EPM GE-6) to reduce this impact. Considering the dispersal of impacts over a larger region, these long-term impacts are considered to be minor.

3.17.6.1.2.1.1.1 Erosion

Removal of vegetation exposes topsoil to water and wind erosion. Removal of vegetation during Project construction could result in local erosion. Erosion can then cause increase runoff that removes downgradient vegetation or that causes sediment deposition over existing downgradient vegetation. Additionally, erosion could alter existing drainage patterns and affect vegetation resources that are not normally located in areas of flow. Minimizing vegetation removal, per EPM GE-3, would reduce the extent of erosion. In addition, the Applicant would develop and implement an SWPPP to ensure that both direct and indirect impacts related to erosion are minimized.

3.17.6.1.2.1.1.2 Fragmentation

Removal of vegetation during construction of the Project could result in habitat fragmentation. Habitat fragmentation is the physical separation of larger blocks of habitat into smaller blocks with newly created edge exposed. This fragmentation effect can occur naturally, or it can result from manmade actions. There is some degree of existing habitat fragmentation created by previous development that includes roads, oil and gas pipelines, and transmission lines that are already influencing the landscapes over which this Project would be built. Impacts resulting from vegetation removal within grassland and shrub communities, outside the footprint of the Project facilities and structures, would be short-term and less likely to contribute to long-term habitat loss, fragmentation, and degradation because these communities would be allowed to reestablish themselves following construction.

Habitat fragmentation in forested ecosystems is more visible, and its impact may be more pronounced. The construction of ROW corridors through forested tracts would create new, long edge habitats, susceptible to invasion by noxious weeds and other non-native vegetation species. As previously stated, the Applicant would minimize clearing of vegetation (EPM GE-3); however, if overstory vegetation were removed within forested ecosystems, these areas would not be allowed to reestablish following construction within the ROW due to the need to maintain the ROW for operational safety and system reliability, which would contribute to long-term habitat loss, fragmentation, and degradation. Forested vegetation could also be removed during construction in select tensioning and pulling sites, at temporary workspaces, and for temporary access roads. This vegetation would be allowed to reestablish following construction, but the recovery time would likely result in this activity being a long-term impact to vegetation resources.

3.17.6.1.2.1.1.3 Edge Effects

As described in the previous subsection, vegetation removal during the construction phase may result in habitat fragmentation, which exposes or creates new “edge” habitat, especially pronounced in forested areas. The creation of edge effects could increase competition among plant species due to changes in microclimate (e.g., increased light levels, decreased humidity, increased wind effects, etc.). This indirect impact would be long-term; however, per EPM FVW-1, the Applicant would avoid and/or minimize impacts on environmentally sensitive vegetation such that edge effects would be reduced.

3.17.6.1.2.1.1.4 Noxious Weeds

Invasive plant species and state listed noxious weeds occur within many counties in the ROI. The direct impact of removing vegetation can lead to the indirect impact of establishment of invasive plant species and listed noxious weeds, which can impact habitat quality by replacing native species. Replacement of native species, in turn, can lead to increased erosion, changes in soil nutrients, and lowering of existing wildlife habitat values.

Vegetation removal and soil disturbance during the construction phase of the Project would create disturbed substrates ideally suited to noxious weed establishment. EPMs GE-3 and FVW-2 (minimization of the spread of invasive species and noxious weeds) would reduce this impact. Additionally, construction vehicles and materials could disperse invasive plant seeds, resulting in their spreading and/or establishment in areas that may not have previously contained any invasive species. However, as stated above, restricting vehicular travel to the ROW and other established areas, per EPM GE-6, would also help to reduce this impact.

The Applicant would identify and implement measures to control and minimize the spread of non-native invasive species and noxious weeds based upon EPM FVW-2.

3.17.6.1.2.1.1.5 Soil Compaction

Construction of the Project would require the use of heavy equipment, which could cause soil compaction within the ROW and along access roads. Soil compaction could occur throughout the entire ROW for the ROI. Compaction of soils reduces pore space and soil aeration, decreasing soil permeability, thereby increasing runoff and altering water flow. This can alter vegetative communities and their ability to reestablish following construction. The Applicant would minimize compaction through appropriate use of construction equipment (EPM GE-27) and would develop and implement a restoration plan that would describe post-construction activities to reclaim disturbed areas not required for the operations and maintenance activities.

3.17.6.1.2.1.1.6 Herbicide Use

The Applicant would likely apply herbicides selectively to stumps and low-growing brush during clearing of the ROW. There would be mortality of targeted plant species that need to be removed. There would also be the potential for this type of activity to include accidental herbicide overspray and drift. Such an occurrence may cause adverse toxic effects to non-targeted terrestrial and aquatic vegetation, depending upon the type of herbicide used and the concentration. Impacts to non-targeted individual plants may be severe enough to cause mortality, whereas overall plant community impact may be localized and much less severe. To minimize potential impacts during construction, the Applicant would apply herbicides according to all label instructions and any federal, state, and local regulations (EPM GE-5).

3.17.6.1.2.1.1.7 Fuel and Lubricant Handling

Accidental spills of harmful fuels and lubricants used during construction could have unintended direct impacts on vegetation. Materials present during construction that could harm or cause mortality to vegetation include fuels, lubricants, antifreeze, detergents, paints, solvents, herbicides, and potentially other toxic fluids. In addition to the direct impact to the vegetation, cleanup of spills could also require the removal and disposal of vegetation. The Applicant would develop and implement an SPCCP to prevent, control, and clean up spills. The Applicant would keep emergency and spill response equipment on hand during construction (EPM GE-13) and would restrict the refueling and maintenance of vehicles and the storage of fuels and hazardous chemicals from within at least 100 feet of wetlands and waterbodies (EPM GE-14). These measures would ensure that any inadvertent spills would be cleaned up promptly and that impacts, including the potential for loss of vigor or mortality to plants, would be kept to a minimum.

3.17.6.1.2.2 Vegetation Cover Types of Special Concern

This section specifically discusses potential impacts from the Project's construction phase to vegetation cover types of special concern, including vegetation communities in designated conservation areas or sensitive habitats identified in the ROI. The potential impacts to vegetation in wetlands and riparian areas are discussed in Section 3.19.

In general, the potential Project impacts from construction of the HVDC and AC transmission lines to special vegetation cover types would be similar to those discussed for general vegetation cover types. While the siting area for the Arkansas Converter Station Alternative does include the Cherokee WMA, the Applicant would specifically site this station outside the boundary of the WMA. Neither the Oklahoma nor the Tennessee converter station siting areas contain vegetation of special concern. As a result, no impacts to special status plant species are anticipated.

Discussion of the potential construction impacts to vegetation communities within CRP lands are described under agricultural resources (Section 3.2).

3.17.6.1.2.2.1 Special Status Plant Species

Special status plant species are provided with special protection due to their rarity, uniqueness, and/or sensitivity. The USFWS has identified two federally protected plant species with potential to occur in the ROI. These two species are tinytim (*Geocarpon minimum*), which is federally listed as threatened, and pondberry (*Lindera melissifolia*), which is federally listed as endangered. Additional state-recognized special status plants may occur along the HVDC transmission line in Arkansas and Tennessee (as described for special status plants within Section 3.17.5).

Potential impacts to special status plant species from construction of the Project may include direct impacts from crushing by equipment or removal of federally or state-listed threatened or endangered plant species when clearing vegetation, and indirect impacts resulting from soil compaction from heavy construction equipment, which could inhibit water absorption and indirectly impact plant species survival. There may also be an increased potential for invasive plants and noxious weeds to encroach upon areas with special status plant species, causing short- and potentially long-term impacts to the plant communities in which the special status plants live. The use of herbicides to control noxious weed species could have the unwanted side effect of loss of non-target species, such as special status plants. Some potential for habitat fragmentation and edge effects exists in some plant communities in which special status plants may be found. Habitat fragmentation can lead to reduced gene flow within and between plant populations, reducing reproductive success for special status plants. Edge effects associated with habitat fragmentation can lead to special status plant species being outcompeted by early seral-stage plants that thrive in the edge environments. The edge position may also expose special status plants to more harsh or adverse microclimate conditions, reducing vigor or causing mortality.

The Applicant would plan and carry out special status plant surveys prior to any construction activities as necessary and appropriate. The Applicant would (EPMs FVW-1 and FVW-3) identify and clearly mark special status plant species such that impacts would be avoided and/or minimized to the maximum extent possible. The Applicant's Revegetation Plan would address the details of revegetating plant communities identified to contain special status plant species (EPMs FVW-1 and FVW-3).

3.17.6.1.3 Environmental Protection Measures

The Applicant has developed a comprehensive list of EPMs that would cover the measures necessary to avoid and minimize impacts to vegetation communities. Implementation of these EPMs is assumed throughout the impact analysis that follows for the Project. A complete list of EPMs for the Project is provided in Appendix F; those EPMs that would specifically minimize the potential for impact on vegetation and special status plant species are list below:

General EPMs relating to vegetation resources include the following:

- GE-3: Clean Line will minimize clearing vegetation within the ROW, consistent with a Transmission Vegetation Management Plan filed with NERC, and applicable federal, state, and local regulations.
- GE-4: Vegetation removed during clearing will be disposed of according to federal, state, and local regulations.
- GE-5: Any herbicides used during construction and operations and maintenance will be applied according to label instructions and any federal, state, and local regulations.

- GE-6: Clean Line will restrict vehicular travel to the ROW and other established areas within the construction, access or maintenance easement(s).
- GE-7: Roads not otherwise needed for maintenance and operations will be restored to preconstruction conditions. Restoration practices may include decompacting, recontouring, and re-seeding. Roads needed for maintenance and operations will be retained.

Vegetation-specific EPMs included the following:

- FVW-1: Clean Line will identify environmentally sensitive vegetation (e.g., wetlands, protected plant species, riparian areas, large contiguous tracts of native prairie) and avoid and/or minimize impacts to these areas.
- FVW-2: Clean Line will identify and implement measures to control and minimize the spread of non-native invasive species and noxious weeds.
- FVW-3: Clean Line will clearly demarcate boundaries of environmentally sensitive areas during construction to increase visibility to construction crews.
- FVW-5: If construction occurs during important time periods (e.g., breeding, migration, etc.) or at close distances to environmentally sensitive areas with vegetation, wildlife, or aquatic resources, Clean Line will consult with USFWS and/or other resource agencies for guidance on seasonal and/or spatial restrictions designed to avoid and/or minimize adverse effects.

The Applicant would also develop and implement the following plans to avoid or minimize impacts to vegetation resources from construction, operations and maintenance, and/or decommissioning, as appropriate:

- Restoration Plan: This plan would describe post-construction activities to reclaim disturbed areas. This plan should include information on integrated weed management to identify current noxious weed infestations, treat those areas during construction, and periodically monitor and continue treatment of infestations as needed.
- Transmission Vegetation Management Plan (TVMP): This plan would describe how the Applicant would conduct work on its ROW to prevent outages due to vegetation.

3.17.6.1.4 Operations and Maintenance Impacts

This section discusses potential impacts to vegetation resources associated with the operations and maintenance of Project converter stations and interconnects, HVDC and AC transmission lines, access roads, and fiber optic regeneration stations.

Operations and maintenance activities could impact vegetation resources, including special vegetation cover types, special status plant species, and noxious weeds. Potential impacts would include periodic maintenance of vegetation, soil compaction, introduction or spread of noxious weeds, and fire risk.

3.17.6.1.4.1 Vegetation Maintenance

The Applicant would maintain a 150- to 200-foot-wide typical ROW during operations and maintenance. Trees and brush would be periodically trimmed or removed within the ROW. Vegetation in the transmission ROW would be limited to low-growing vegetation to prevent interference with or damage to transmission lines. Vegetation management would be conducted as necessary to ensure compliance with NESC clearance requirements. The frequency of vegetation maintenance relates to the growth rates of the vegetation found within and near the ROW. More rapidly growing vegetation would require more frequent maintenance. The Applicant would develop and implement a TVMP describing vegetation maintenance. In addition to vegetation maintenance of the ROW, minor trimming of woody vegetation may be required along access roads that are maintained for operations and maintenance activities.

Maintenance activities are likely to result in periodic trampling of herbaceous vegetation. Maintenance vehicles would utilize established access roads to the extent practicable.

Limited vegetation clearing could occur during Project operations and maintenance for any necessary repairs required for Project components. Impacts from vegetation clearing would be similar to those outlined for the construction phase.

3.17.6.1.4.2 Soil Compaction

Soil compaction during operations and maintenance of the Project could occur from inspection and maintenance vehicles. Impacts from soil compaction would be similar in nature, but less likely to occur in the same volume when compared to those outlined for the construction phase. Maintenance vehicles would stay on established access roads to the extent practicable, thereby minimizing additional soil compaction. The Applicant would minimize compaction of soils and rutting (EPM GE-27).

3.17.6.1.4.3 Introduction/Spread of Noxious Weeds

The periodic use of maintenance and inspection vehicles over a period of many years would increase the likelihood of introduction and spread of invasive plant species, including noxious weeds. This potential would be heightened after the initial construction phase when habitats such as forested tracts are newly fragmented and susceptible to invasion by noxious weeds. The threat would be lessened during operations through careful adherence to EPMs, including FVW-2.

3.17.6.1.4.4 Fire Risk

The operations and maintenance of an active electric transmission system presents an inherent fire risk. The greatest potential would result from uncontrolled growth of vegetation either within the ROW under live wires, or vegetation outside of the ROW, that could fall into energized lines. Uncontrolled wildfire could cause mortality to both the vegetation adjacent to the ROW and to vegetation resources located at greater distances, depending on several variables. Wildfires are a threat to all vegetation cover types, but especially damaging to forested ecosystems. The duration, intensity, and spatial extent of the impacts would vary according to the ambient conditions of local climate and of the vegetation itself.

Vegetation management would be conducted as necessary to ensure compliance with NERC clearance requirements. The frequency of vegetation maintenance relates to the growth rates of vegetation found within and near the ROW. More rapidly growing vegetation requires more frequent maintenance. The Applicant would develop and implement a TVMP describing vegetation maintenance schemes that specifically seek to minimize fire risk.

3.17.6.1.5 Decommissioning Impacts

There is potential for the decommissioning of the Project to impact vegetation communities and special status plant species. Prior to any decommissioning activities, the Applicant would develop a Decommissioning Plan, for review and approval by appropriate state and federal resource agencies.

The Applicant would follow the same general and resource-specific EPMs during decommissioning that would be implemented during the construction and operations and maintenance phases of the Project. These measures would help to avoid and/or minimize impacts on vegetation communities and special status plant species.

At the end of the useful life of the facilities, decommissioning activities may include replacement of vegetation lost during construction. Potential impacts to vegetation communities and special status plant species during decommissioning are estimated to be similar to, but of less duration and severity, compared with the construction phase of the Project. It is assumed that the ROW would be allowed to revert back to pre-construction conditions, relieving the effects of habitat fragmentation, reducing or eliminating vehicle traffic and the issue of soil compaction, and reducing the threat of wildfire caused by transmission lines or maintenance vehicles in the ROW.

3.17.6.2 Impacts Associated with the Applicant Proposed Project

3.17.6.2.1 Converter Stations and AC Interconnection Siting Areas

3.17.6.2.1.1 Construction Impacts

3.17.6.2.1.1.1 Oklahoma Converter Station Siting Area and Associated AC Interconnection Siting Area

The dominant vegetation for the siting area for the Oklahoma converter station is grassland and herbaceous cover (605 acres). Construction impacts for the Oklahoma Converter Station Siting Area and Associated AC Interconnection Siting Area were calculated using estimated facility dimensions and associated land requirements as described in Section 3.17.6.1. It is yet to be determined how many tubular (impact of 0.001 acre each), H-frame (impact of 0.002 acre each), and fiber optic (impact of 0.009 acre per control building) structures and how many tensioning areas outside the ROW (impact of 2.58 acres each) would be needed. The discussion below focuses on impacts related to the transmission lines; the lattice structures, which are assumed to be the primary structures used; and the tensioning area inside the 200-foot representative ROW.

Forty-five to 60 acres of land would be cleared and graded for the station facility footprint, plus an additional 5 to 10 acres of land for the overall construction. The clearing and grading of the 45–60 acres would produce a long-term impact and the clearing, grading, and use of the additional 5–10 acres would produce a short-term impact. The latter would be revegetated using guidance within the Project’s Restoration Plan. In addition, one 35-foot-wide by 1-mile-long all weather access road would be needed. Clearing and grading activities for the road would cause approximately 4 acres of long-term impact to current vegetation.

A maximum 200-foot-wide by 2.7-mile-long interconnection ROW would result in approximately 65.5 acres of long-term impacts, including the initial clearing of the existing vegetation. The structural footprint for the lattice structures would be 28 feet by 28 feet, equaling 784 square feet (0.02 acre) of vegetation removal. The maximum number of lattice structures would be 21, or less than 1 acre of long-term impact to vegetation.

3.17.6.2.1.1.2 Tennessee Converter Station Siting Area and AC Interconnection Siting Area

The dominant vegetation for the siting area for the Tennessee converter station includes cultivated crop lands (394 acres) and pasture/hay (195 acres). As described in Section 3.17.6.2.1 for the Oklahoma converter station, the impact discussion for the Tennessee converter station focuses on impacts related to the ROW for the transmission lines; the lattice structures, which are assumed to be the primary structures used; and the tensioning area inside the 200-foot representative ROW.

Forty-five to 60 acres of land would be cleared and graded for the station facility footprint, plus an additional 5 to 10 acres of land for the overall construction. The clearing and grading of the 45–60 acres would produce a long-term impact and the clearing, grading, and use of the additional 5–10 acres would produce a short-term impact. The latter would be revegetated using guidance within the Project's Restoration Plan. One 35-foot-wide by 1-mile-long all weather access road would be needed. Clearing and grading activities for the road would cause approximately 4 acres of long-term impact based on the removal of current vegetation.

A maximum 200-foot-wide by 0.2-mile-long interconnection ROW would result in approximately 4.8 acres of long-term impacts to vegetation. The structural footprint for the lattice structures would be 28 feet by 28 feet, equaling 784 square feet (0.02 acre) of vegetation removal. The maximum number of lattice structures would be seven, and this would result in less than 1 acre of long-term impact to vegetation. Two tensioning sites would be needed, resulting in approximately 5 acres of potential temporary impact to vegetation. The latter would be revegetated using guidance within the Project's Restoration Plan.

3.17.6.2.1.2 Operations and Maintenance Impacts

3.17.6.2.1.2.1 Oklahoma Converter Station Siting Area and Associated AC Interconnection Siting Area

Vegetation removed during the construction of the converter station would not be replaced during the operations phase of the Project. Similarly, vegetation removed during the construction of the converter station access road would not be replaced during the operations and maintenance phase of the Project. Vegetation within the ROW of the AC interconnection would be maintained during the operations and maintenance phase of the Project in compliance with the TVMP. The projected acreage of vegetation to maintain in the ROW is 65.5 acres.

3.17.6.2.1.2.2 Tennessee Converter Station Siting Area and Associated AC Interconnection Siting Area

Vegetation removed during the construction of the converter station would not be replaced during the operations phase of the Project. Similarly, vegetation removed during the construction of the converter station access road would not be replaced during the operations and maintenance phase of the Project. Vegetation within the ROW of the AC interconnection would be maintained during the operations and maintenance phase of the Project in compliance with the TVMP. The projected acreage of vegetation to maintain in the ROW is 4.8 acres.

3.17.6.2.1.3 Decommissioning Impacts

The decommissioning impacts related to the Project would be similar in nature to the set of temporary impacts resulting from initial construction of the Project. These temporary impacts would involve use of construction machinery at each of the two converter stations (i.e., Oklahoma and Tennessee), as well as the ROW areas that would have been used for AC interconnection. The specific acreages for the footprints of the two converter stations total a projected maximum of 120 acres that would be reclaimed and revegetated according to the details that would be written into the Decommissioning Plan. The total ROW acreage projected to be temporarily impacted again during decommissioning of the two sites would equal a maximum value of 70.3 acres. It is likely these temporary impacts would only be crushing or matting of some portion of the overall ROW at each of the two sites, and the vegetation would naturally recover. For those areas that are more severely impacted, reseeding with native vegetation species may be required according to the Decommissioning Plan.

3.17.6.2.2 AC Collection System

3.17.6.2.2.1 Construction Impacts

Construction impacts for the AC collection system routes were calculated using estimated facility dimensions and associated land requirements as described in Chapter 2 and Appendix F. It is yet to be determined how many tubular (impact of 0.001 acre each), H-frame (impact of 0.002 acre each), and fiber optic (impact of 0.009 acre per control building) structures and how many tensioning areas outside the ROW (impact of 2.58 acres each) would be needed. The discussion below focuses on impacts related to the 200-foot representative ROW for the transmission lines. These impacts would include temporary mowing or long-term removal of vegetation. Additional impacts to vegetation would be consistent with those described in Section 3.17.6.1.3.The placement of structural foundations for the lattice structures (which are discussed here as an example) would involve approximately seven structures per mile on average, with 0.02 acres of impact per structural foundation set. This impact would be long-term in duration. The land requirements for all of the AC collection system routes are summarized in Table 3.17-13.

Table 3.17-13:
Total Temporary and Long-Term Construction Impact Area for AC Collection System Routes—200-Foot Representative ROW

Route	Impact Area
E-1 (Route = 28.9 miles in length)	
Initial ROW Clearing	28.9 miles/708.0 acres
Lattice Structural Foundations	202 structures/4.0 acres
E-2 (Route = 39.8 miles in length)	
Initial ROW Clearing	39.8 miles/974.4 acres
Lattice Structural Foundations	279 structures/5.6 acres
E-3 (Route = 40.0 miles in length)	
Initial ROW Clearing	40.0 miles/977.5 acres
Lattice Structural Foundations	280 structures/5.6 acres
NE-1 (Route = 30.1 miles in length)	
Initial ROW Clearing	30.1 miles/729.8 acres
Lattice Structural Foundations	211 structures/4.2 acres
NE-2 (Route = 26.3 miles in length)	
Initial ROW Clearing	26.3 miles/637.4acres
Lattice Structural Foundations	184 structures/3.7 acres
NW-1 (Route = 51.9 miles in length)	
Initial ROW Clearing	51.9 miles/1,265.4 acres
Lattice Structural Foundations	363 structures/7.3 acres
NW-2 (Route = 56.0 miles in length)	
Initial ROW Clearing	56.0 miles/1,365.0 acres
Lattice Structural Foundations	392 structures/7.8 acres
SE-1 (Route = 40.3 miles in length)	
Initial ROW Clearing	40.3 miles/979.4 acres
Lattice Structural Foundations	282 structures/5.6 acres
SE-2 (Route = 13.4 miles in length)	
Initial ROW Clearing	13.4 miles/325.4 acres
Lattice Structural Foundations	94 structures/1.9 acres

Table 3.17-13:
Total Temporary and Long-Term Construction Impact Area for AC Collection System Routes—200-Foot Representative ROW

Route	Impact Area
SE-3 (Route = 49.1 miles in length)	
Initial ROW Clearing	49.1 miles/1,193.6 acres
Lattice Structural Foundations	344 structures/6.9 acres
SW-1 (Route = 13.4 miles in length)	
Initial ROW Clearing	13.4 miles/325.6 acres
Lattice Structural Foundations	94 structures/1.9 acres
SW-2 (Route = 37.0 miles in length)	
Initial ROW Clearing	37.0 miles/901.4 acres
Lattice Structural Foundations	259 structures/5.2 acres
W-1 (Route = 20.7 miles in length)	
Initial ROW Clearing	20.7 miles/507.8acres
Lattice Structural Foundations	145 structures/2.9 acres

3.17.6.2.2.2 Operations and Maintenance Impacts

3.17.6.2.2.2.1 Route E-1

The ROW for AC Collection System Route E-1 is dominated by grassland/herbaceous land cover (542.7 acres). This route does not feature any forested cover types in the ROW, but does cross 50.9 acres of shrub/scrub land cover. The operations and maintenance for AC Collection System Route E-1 may involve some degree of trimming and/or mowing in the ROW, but with no real change to the dominant cover types. The TVMP would govern the degree of maintenance that is required in the shrub-scrub cover type.

3.17.6.2.2.2.2 Route E-2

Grassland/herbaceous land cover is the dominant land cover type (574.2 acres) in the ROW for AC Collection System Route E-2. There are also 298.6 acres of cultivated crops land cover in the ROW. Both land cover types may have some trimming or mowing impacts from operations and maintenance of the Project with no change to the dominant cover type. No forested cover type is present in the 200-foot-wide ROW for AC Collection System Route E-2. There are 74.5 acres of shrub/scrub cover in the ROW that may require trimming and/or mowing over the operational life of the Project. This impact would not likely cause a change to cover type.

3.17.6.2.2.2.3 Route E-3

The ROW for AC Collection System Route E-3 is dominated by grassland/herbaceous land cover type (650.3 acres). It is unlikely that the operations or maintenance of the line would impact this land cover type or cause other adverse effects. No forested land cover is present in the ROW for AC Collection System Route E-3. Shrub/scrub land cover equals approximately 47.1 acres in the ROW and may require some degree of trimming or mowing during operations and maintenance with no change likely to the dominant cover type.

3.17.6.2.2.2.4 Route NE-1

AC Collection System Route NE-1 is almost equally dominated by cultivated crops (247.2 acres) and by grassland/herbaceous land cover (291.1 acres) in the ROW. Both land cover types may have impacts from trimming or mowing during operations and maintenance of the Project ROW with no change to the dominant cover type. No forested land cover is present in the ROW for AC Collection System Route NE-1. There are approximately 40.7 acres of shrub-scrub land cover in the ROW that may require trimming and/or mowing over the operational life of the Project. This impact would not likely cause a change to cover type.

3.17.6.2.2.2.5 Route NE-2

Grassland/herbaceous land cover is the dominant land cover type (450.2 acres) in the ROW for AC Collection System Route NE-2. The grassland/herbaceous land cover may have trimming and mowing impacts during operations and maintenance of the Project with no change to the dominant cover type. There is no forested land cover in the ROW for AC Collection System Route NE-2. There are 32.1 acres of shrub/scrub that may require trimming and/or mowing over the operational life of the Project. This impact would not likely cause a change to cover type.

3.17.6.2.2.2.6 Route NW-1

Grassland/herbaceous land cover is the dominant land cover type (609.5 acres) in the ROW for AC Collection System Route NW-1. There are also 540.2 acres of developed open space land cover in the ROW. The grassland/herbaceous land cover may have trimming and mowing impacts during operations and maintenance of the Project with no change to the dominant cover type. No forested land cover is present in the ROW for AC Collection System Route NW-1. There are 15.6 acres of shrub/scrub vegetation that may require trimming and/or mowing over the operational life of the Project. This impact would not likely result in a change to cover type.

3.17.6.2.2.2.7 Route NW-2

Grassland/herbaceous land cover (629.3 acres) is the dominant land cover type in the ROW for AC Collection System Route NW-2. There are also 410.9 acres of cultivated crops land cover in the ROI. Both the grassland/herbaceous and cultivated crop land cover may have trimming and mowing impacts during operations and maintenance of the Project with no change to the dominant cover type. No forested land cover is present in the ROW for AC Collection System Route NW-2. There are approximately 26.1 acres of shrub/scrub land cover that may require trimming and/or mowing over the operational life of the Project. This impact would not likely result in a change to cover type.

3.17.6.2.2.2.8 Route SE-1

Grassland/herbaceous land cover is the dominant land cover type (513.2 acres) in the ROW for AC Collection System Route SE-1. There are also 340.0 acres of cultivated crops land cover in the ROW. Both the grassland/herbaceous and cultivated crop land cover may have trimming and mowing impacts during operations and maintenance of the Project with no change to the dominant cover type. No forested land cover is present in the ROW for AC Collection System Route SE-1. Fifty-nine acres of shrub/scrub land cover located within the ROW may require trimming and/or mowing over the operational life of the Project. This impact would not likely result in a change to cover type.

3.17.6.2.2.2.9 Route SE-2

Grassland/herbaceous land cover is the dominant land cover type (169.9 acres) in the ROW for AC Collection System Route SE-2. There are also 130.6 acres of cultivated crops land cover in the ROW. Both the grassland/herbaceous and cultivated crops land cover may have trimming and mowing impacts during operations and maintenance of the Project with no change to the dominant cover type. No forested land cover is present in the ROW for AC Collection System Route SE-2. There are approximately 4.4 acres of shrub/scrub land cover that may require trimming and/or mowing over the operational life of the Project. This impact would not likely result in a change to cover type.

3.17.6.2.2.2.10 Route SE-3

Grassland/herbaceous land cover is the dominant land cover type (565.7 acres) in the ROW for AC Collection System Route SE-3. There are also 483.9 acres of cultivated crops land cover in the ROW. Both the grassland/herbaceous and cultivated crop land cover may have trimming and mowing impacts during operations and maintenance of the Project with no change to the dominant cover type. No forested land cover is present in the ROW for AC Collection System Route SE-3. There are 59.6 acres of shrub/scrub land cover that may require trimming and/or mowing over the operational life of the Project. This impact would not likely result in a change to cover type. Approximately 14 acres of wetlands may be present in the ROW for AC Collection System Route SE-3.

3.17.6.2.2.2.11 Route SW-1

Grassland/herbaceous land cover is the dominant land cover type (312.8 acres) in the ROW for AC Collection System Route SW-1. This land cover may have trimming and mowing impacts during operations and maintenance of the Project with no change to the dominant cover type. No forested land cover is present in the ROW for AC Collection System Route SW-1. There are 2.6 acres of shrub/scrub land cover that may require trimming and/or mowing over the operational life of the Project. This impact would not likely result in a change to cover type.

3.17.6.2.2.2.12 Route SW-2

Grassland/herbaceous land cover is the dominant land cover type (733.0 acres) in the ROW for AC Collection System Route SW-2. There are also 122.7 acres of developed open space in the ROW. Both the grassland/herbaceous and the open space land cover may have trimming and mowing impacts during operations and maintenance of the Project with no change to the dominant cover type. No forested land cover is present in the ROW for AC Collection System Route SW-2. There are approximately 10.6 acres of shrub/scrub land cover that may require trimming and/or mowing over the operational life of the Project. This impact would not likely result in a change to cover type.

3.17.6.2.2.2.13 Route W-1

Grassland/herbaceous land cover is the dominant land cover type (377.0 acres) in the ROW for AC Collection System Route W-1. The grassland/herbaceous land cover may have trimming and mowing impacts during operations and maintenance of the Project with no change to the dominant cover type. No forested land cover is present in the ROW for AC Collection System Route W-1. There are approximately 11.5 acres of shrub/scrub land cover that may require trimming and/or mowing over the operational life of the Project. This impact would not likely result in a change to cover type.

3.17.6.2.2.3 Decommissioning Impacts

The decommissioning impacts related to the AC collection system would be similar in nature to the set of temporary impacts resulting from initial construction. These temporary impacts would result from use of construction machinery at the various alternative AC collection system sites of infrastructure (e.g., the lattice structures, tubular structures, H-frame structures, and fiber optic infrastructure) to remove aboveground material, and foundation material where required. Use of construction machinery would have the potential to crush or remove vegetation (primarily in grasslands or croplands), but these areas would be reseeded following removal of infrastructure. No long-term effects are judged to be likely from the decommissioning phase of the AC collection system. Revegetation would be guided by the Project's Decommissioning Plan.

3.17.6.2.3 HVDC Applicant Proposed Route

3.17.6.2.3.1 Construction Impacts

Construction impacts for the Applicant Proposed Route were calculated using estimated facility dimensions and associated land requirements as described in Section 3.17.6.1, Chapter 2, and Appendix F. It is yet to be determined how many lattice crossing (impact of 0.11 acre each), monopole (impact of 0.001 acre each), guyed (impact of 0.001 acre each), and fiber optic (impact of 0.009 acre per control building) structures and how many tensioning areas outside the ROW (impact of 3.44 acres each) would be needed. The discussion below focuses on impacts related to the representative 200-foot ROW for the transmission lines. These impacts would result from initial clearing of the ROW. This would include both potential removal of vegetation and mechanical damage to vegetation. There would be placement of foundations for the lattice structures (which are assumed to be the primary structures used) and which would involve approximately six structures per mile on average, with 0.02 acres of impact per structural foundation set. This impact would be long-term in duration. Additional impacts to vegetation in the ROW would be consistent with those described in Section 3.17.6.1.2.The placement of the transmission line would involve tensioning areas inside the 200-foot representative ROW (average of one tensioning site per two miles of transmission line). Tensioning impacts are estimated to be temporary in duration and might include trimming or mowing of vegetation, and/or crushing of existing vegetation by heavy machinery. The land requirements for the Applicant Proposed Route in Regions 1–7 are summarized in Table 3.17-14.

Table 3.17-14:
Total Temporary and Long-Term Construction Impact Acreage for the Applicant Proposed Route—200-Foot Representative ROW

Regional Description	Potential Impact Acreage Within ROW
Region 1	
Initial ROW Clearing (115.5 miles in length)	2,825.2 acres
Lattice Structural Foundations/693 structures	13.9 acres
Region 2	
Initial ROW Clearing (106 miles in length)	2,588.1 acres
Lattice Structural Foundations (636 structures)	13 acres
Region 3	
Initial ROW Clearing (161.7 miles in length)	3,949.1 acres
Lattice Structural Foundations (970 structures)	19.4 acres
Region 4	
Initial ROW Clearing (126.3 miles in length)	3,087.6 acres
Lattice Structural Foundations (758 structures)	15.2 acres
Lee Creek Variation in Region 4	
Initial ROW Clearing (3.4 miles in length)	84.4 acres
Lattice Structural Foundations (20 structures)	0.4 acres

Table 3.17-14:
Total Temporary and Long-Term Construction Impact Acreage for the Applicant Proposed Route—200-Foot Representative ROW

Regional Description	Potential Impact Acreage Within ROW
Region 5	
Initial ROW Clearing (112.8 miles in length)	2,759.5 acres
Lattice Structural Foundations (677 structures)	13.5 acres
Region 6	
Initial ROW Clearing (54.4 miles in length)	1,331.9 acres
Lattice Structural Foundations (326 structures)	6.5 acres
Region 7	
Initial ROW Clearing (42.8 miles in length)	1,048.0 acres
Lattice Structural Foundations (256 structures)	5.1 acres

3.17.6.2.3.2 Operations and Maintenance Impacts

Impacts from operations and maintenance of the Applicant Proposed Route would be similar to those from the AC collection system routes (see Section 3.17.6.2). These impacts may result from some degree of trimming and/or mowing in the ROW, with no real change to the dominant cover types. Within the transmission line ROW for each link of the Applicant Proposed Route, only the pole structures and the existing roads would remain. For lattice structures, the operational footprint would be four to six structures per mile, and each foundation would measure 28 feet by 28 feet (less than 0.02 acre). Each structure would be 75 to 180 feet tall. For monopole structures, the operational footprint would be five to seven structures per mile, each with a foundation of 7 feet by 7 feet (approximately 0.001 acre), up to 5 acres total. Each structure would be 120 to 160 feet tall. Lattice crossing structures, which would be required in limited situations, would each have a structural footprint of 70 feet by 70 feet (approximately 0.11 acre). Guyed structures would also be required in limited situations, and would each have a structural footprint (not including guy wires) of 7 feet by 7 feet (0.001 acre).

It is anticipated that all existing roads and existing roads with repairs/improvements would be retained for operations and maintenance of the Project. It is estimated that approximately 75 percent of the new overland roads with no improvements and 90 percent of the new overland roads with clearing and new bladed roads would be retained for operations and maintenance access. New overland roads that are utilized for operations and maintenance would result in long-term removal of vegetation. These roads would be up to 20 feet wide. Access roads that are not needed for operations and maintenance of the Project would be restored (EPM GE-7).

All other land in the ROW would be allowed to recover and return to its previously dominant vegetation types, with the exception of forested lands and shrublands, which would be maintained according to the TVMP. Vegetation within the wire zone would be limited to low-growing herbaceous vegetation including grasses, forbs, and short-stature shrubs in those locations where the conductor is 50 feet or less from the ground. Tall shrubs and short trees would be permitted in the border zone (i.e., to the edge of the ROW). Tree-trimming and brush removal would be conducted as needed to maintain the vegetation within the ROW.

During operations and maintenance of the Applicant Proposed Route, the transmission line would be inspected regularly and as necessary using fixed-wing aircraft, helicopters, ground vehicles, and/or personnel on foot.

Maintenance would be performed as needed. Maintenance activities would generally be smaller in scale and more localized than construction activities. Maintenance activities would cause long-term impacts to forested land cover, and may cause temporary impacts within the ROW to crops and other vegetation; the areas of impacts are summarized in Table 3.17-15.

Table 3.17-15:
Total Long-Term Operations and Maintenance Impact Areas for the Applicant Proposed Route—200-Foot Representative ROW

Applicant Proposed Route	Total Length of Route/Acres of Potential Vegetation Impact Within the ROW	Forested Land Cover Within ROW
Region 1		
APR Links 1–5	115.5 miles/2,825.2 acres	< 1 acre
Region 2		
APR Links 1–3	106.0 miles/2,588.1 acres	252.9 acres
Region 3		
APR Links 1–6	161.7 miles/3,949.1 acres	1,145.4 acres
Region 4		
APR Links 1–9	126.3 miles/3,087.6 acres	1,333.5 acres
Region 5		
APR Links 1–9	112.8 miles/2,759.5 acres	1,556.2 acres
Region 6		
APR Links 1–8	54.4 miles/1,331.9 acres	96.5 acres
Region 7		
APR Links 1–5	42.8 miles/1,048.0 acres	81.8 acres
Totals	719.5 miles/17,589.4 acres	4,466.3 acres

3.17.6.2.3.2.1 Region 1

The majority of land cover within the ROW for Region 1 is grassland/herbaceous (1,742.3 acres) and cultivated crops (748.8 acres). Less than 1 acre of the ROW for the Applicant Proposed Route in Region 1 contains forested lands, so very little trimming of trees is anticipated.

3.17.6.2.3.2.2 Region 2

Region 2 is dominated by grassland/herbaceous land cover (1,299.9 acres) and cultivated crop land cover (788.0 acres) within the ROW. Forested lands account for approximately 252.9 acres of cover within the ROW for this region, including evergreen, deciduous, and mixed forest types. The routine operations and maintenance for the Project would result in long-term impacts to some portion of these forested lands as governed by the TVMP.

3.17.6.2.3.2.3 Region 3

Region 3 operations and maintenance would occur in a ROW dominated by grassland/herbaceous vegetation (1,339.5 acres) and 1,145.4 acres of deciduous and evergreen land cover types. The routine operations and maintenance for the Project would result in long-term impacts to some portion of these forested lands as governed by the TVMP.

3.17.6.2.3.2.4 Region 4

Region 4 is dominated by pasture/hay land cover type (1,436.1 acres). This land cover type would likely require very little vegetation maintenance during the operational life of the Project. However, there are 1,333.5 acres of deciduous, evergreen, and mixed forest cover types in the ROW of Region 4. The routine operations and maintenance for the Project would result in long-term impacts to some portion of these forested lands as governed by the TVMP.

3.17.6.2.3.2.5 Region 5

Region 5 operations and maintenance would occur on lands dominated by deciduous forest (810.8 acres in the ROW) land cover. There are 1,556.2 total acres of deciduous, evergreen, and mixed forest cover types in the Region 5 ROW. The routine operations and maintenance for the Project would result in long-term impacts to some portion of these forested lands as governed by the TVMP.

3.17.6.2.3.2.6 Region 6

Region 6 operations and maintenance would occur on lands dominated by cultivated crops (1,056.5 acres) land cover. Very little impact is anticipated from operations and maintenance activities with regard to this cover type. Forested lands within the ROW for Region 6 are limited to 88.8 acres of deciduous forest and 7.7 acres of mixed forest land cover. The routine operations and maintenance for the Project would result in long-term impacts to some portion of these forested lands as governed by the TVMP.

3.17.6.2.3.2.7 Region 7

Region 7 operations and maintenance would occur on lands dominated by cultivated crops (691.8 acres). Little to no impact would result from operations and maintenance of the Project on this land cover type. The ROW for Region 7 has approximately 81.8 acres of deciduous, evergreen, and mixed forest land cover types. The routine operations and maintenance for the Project would result in long-term impacts to some portion of these forested lands as governed by the TVMP.

3.17.6.2.3.3 Decommissioning Impacts

The decommissioning impacts related to the Applicant Proposed Route would be similar in nature to the set of temporary impacts resulting from initial construction of the HVDC transmission line. These temporary impacts would result from use of construction machinery at the various sites of infrastructure (e.g., the lattice structures, lattice crossing structures, monopole structures, guyed structures, and fiber optic infrastructure) to remove aboveground material, and foundation material where required. Use of construction machinery would have the potential to crush or remove vegetation, but no long-term effects are judged to be likely from the decommissioning phase of the Project. Revegetation would be guided by the Project's Decommissioning Plan.

3.17.6.3 Impacts Associated with the DOE Alternatives

3.17.6.3.1 Arkansas Converter Station Alternative Siting Area and AC Interconnection Siting Area

3.17.6.3.1.1 Construction Impacts

Construction impacts for the Arkansas Converter Station Alternative Siting Area and associated AC Interconnection Siting Area were calculated using estimated facility dimensions and associated land requirements as described in

Chapter 2 and Appendix F. The dominant land cover type at the Arkansas Converter Station Alternative Siting Area is evergreen forest (7,894 acres), followed by deciduous forest (5,425.4 acres), and pasture/hay lands (4,563.4 acres). There are also 363 acres of wetlands within the overall siting area. This total of 363 acres includes 96 acres of palustrine wetlands, 76 acres of lacustrine wetlands, and 191 acres of riverine wetlands.

Forty-five to 50 acres of land would be cleared and graded for the station facility footprint, plus an additional 5 to 10 acres of land for the overall construction. The clearing and grading of the 45–50 acres would produce a long-term impact and the clearing, grading, and use of the additional 5–10 acres would produce a short-term impact. The latter would be revegetated using guidance within the Project's Restoration Plan. In addition, one 35-foot-wide by 1-mile-long all weather access road would be needed. Clearing and grading activities for the road would cause approximately 4 acres of removal of current vegetation.

Construction of the related Project facilities for the Arkansas converter station and interconnection facility would result in the following impacts to vegetation:

- Transmission line ROW: A maximum 200-foot-wide by 5-mile-long ROW would impact 121 acres of long-term impacts to vegetation.
- Lattice Structures: The maximum number of lattice structures would be 35, and this would equal approximately 1 acre of long-term impact to vegetation.
- Tubular Pole Structures: The maximum number of tubular pole structures would be 35, and this would equal less than 1 acre of long-term impact to vegetation.
- Interconnection Site: A 5-acre site would be required for the interconnection to an existing 500kV transmission line. An additional 5-acre area would be required during construction, resulting in a potential for 10 total acres of impact, split between 5 acres of long-term vegetation impacts and another 5 acres of temporary impact.

3.17.6.3.1.2 Operations and Maintenance Impacts

Vegetation removed during the construction of the converter station would not be replaced during the operations phase of the Project. Similarly, vegetation removed during the construction of the converter station access road would not be replaced during the operations and maintenance phase of the Project. Vegetation within the ROW of the AC interconnection would be maintained during the operations and maintenance phase of this Project in compliance with the TVMP. The projected acreage of vegetation to maintain in the ROW is 121 acres.

3.17.6.3.1.3 Decommissioning Impacts

The decommissioning impacts related to the Arkansas converter station and associated facilities would be similar in nature to the set of temporary impacts resulting from initial construction. These temporary impacts would involve use of construction machinery at the converter station site, as well as the ROW area that would have been used for AC interconnection. The specific acreage for the footprint of the converter station totals a projected maximum of 60 acres which would be reclaimed and revegetated according to the details that would be written into the Decommissioning Plan.

3.17.6.3.2 HVDC Alternative Routes

3.17.6.3.2.1 Construction Impacts

Construction impacts for the HVDC alternative routes were calculated using estimated facility dimensions and associated land requirements as described in Chapter 2 and Appendix F. It is yet to be determined how many lattice structures (impact of 0.11 acre each), monopoles (impact of 0.001 acre each), guyed structures (impact of 0.001 acre each), and fiber optic (impact of 0.009 acre per control building) structures, and how many tensioning areas outside the ROW (impact of 3.44 acres each) would be needed. Predicted impacts to vegetation in the ROW would be consistent with those described in Section 3.17.6.1.2. The land requirements for the HVDC alternative routes and the Applicant Proposed Route in Regions 1–7 are summarized in Table 3.17-16. The table also includes the acreage of potential vegetation impacts in the ROW, and the acres of potential forest impacts within the ROW.

Table 3.17-16:
Land Requirements for the HVDC Alternative Routes and the Applicant Proposed Route in Regions 1–7

Alternative	Length of Route/Acres of Potential Vegetation Impact Within ROW/Predominant Land Cover/Acres of Potential Forest Impact Within ROW	# of Lattice Structures/Acres of Potential Vegetation Impact Within ROW
Region 1		
AR 1-A	123.0 miles/3,003.1 acres/grassland and herbaceous cover/4.7 acres	738 structures/14.8 acres
APR Links 2–5	113.6 miles/2,777.7 acres/grassland and herbaceous cover/0.1 acres	682 structures/13.6 acres
AR 1-B	51.8 miles/1,268.4 acres/grassland and herbaceous cover/0.0 acres	311 structures/6.2 acres
APR Links 2–3	53.8 miles/1,316.0 acres/grassland and herbaceous cover/0.0 acres	323 structures/6.5 acres
AR 1-C	52.0 miles/1,272.5 acres/grassland and herbaceous cover/0.0 acres	312 structures/6.2 acres
APR Links 2–3	53.8 miles/1,316.0 acres/grassland and herbaceous cover/0.0 acres	323 structures/6.5 acres
AR 1-D	33.5 miles/819.2 acres grassland and herbaceous cover/0.0 acres	201 structures/4.0 acres
APR Links 3-4	33.6 miles/822.8 acres grassland and herbaceous cover/0.0 acres	202 structures/4.0 acres
Region 2		
AR 2-A	57.2 miles/1,396.3 acres/grassland and cultivated crops/144.5 acres	343 structures/6.9 acres
APR Link 2	54.4 miles/1,330.7 acres/grassland and cultivated crops/231.5 acres	326 structures/6.5 acres
AR 2-B	29.8 miles/727.7 acres/cultivated crops and grassland/16.6 acres	179 structures/3.6 acres
APR Link 3	31.2 miles/763.6 acres/cultivated crops and grassland/15.9 acres	187 structures/3.7 acres
Region 3		
AR 3-A	37.6 miles/919.1 acres/grassland, deciduous forest, and cultivated crops/194.3 acres	226 structures/4.5 acres
APR Link 1	40.0 miles/977.1 acres/grassland, deciduous forest, and cultivated crops/236.5 acres	240 structures/4.8 acres
AR 3-B	47.7 miles/1,166.6 acres/grassland, deciduous forest, and cultivated crops/229.0 acres	286 structures/5.7 acres
APR Links 1–3	49.9 miles/1,220.6 acres/grassland, deciduous forest, and cultivated crops/293.7 acres	299 structures/6.0 acres
AR 3-C	121.6 miles/2,967.5 acres/grassland, deciduous forest, and pasture/hay/878.3 acres	730 structures/14.6 acres
APR Links 3–6	118.6 miles/2,895.2 acres/pasture/hay, deciduous forest, and grassland/901.9 acres	712 structures/14.2 acres
AR 3-D	39.3 miles/958.8 acres/pasture/hay, deciduous forest, and grassland/185.0 acres	236 structures/4.7 acres
APR Links 5, 6	35.1 miles/856.8 acres/pasture/hay, grassland, and deciduous forest/167.4 acres	211 structures/4.2 acres

Table 3.17-16:
Land Requirements for the HVDC Alternative Routes and the Applicant Proposed Route in Regions 1–7

Alternative	Length of Route/Acres of Potential Vegetation Impact Within ROW/Predominant Land Cover/Acres of Potential Forest Impact Within ROW	# of Lattice Structures/Acres of Potential Vegetation Impact Within ROW
AR 3-E	8.5 miles/207.8 acres/pasture/hay, deciduous forest, and grassland/74.1 acres	51 structures/1.0 acre
APR Link 6	7.7 miles/189.7 acres/deciduous forest, pasture/hay, and grassland/80.8 acres	46 structures/0.9 acre
Region 4		
AR 4-A	58.4 miles/1,426.1 acres/deciduous forest and pasture/hay/749.1 acres	350 structures/7.0 acres
APR Links 3–6	60.4 miles/1,475.7 acres/pasture/hay and deciduous forest/521.6 acres	362 structures/7.2 acres
AR 4-B	78.6 miles/1,919.8 acres/deciduous forest and pasture/hay/1,239.4 acres	472 structures/9.4 acres
APR Links 2–8	81.3 miles/1,987.9 acres/pasture/hay and deciduous forest/758.4 acres	488 structures/9.8 acres
AR 4-C	3.4 miles/82.6 acres/deciduous forest and pasture/hay/56.8 acres	20 structures/0.4 acre
APR Link 5	2.2 miles/53.4 acres/deciduous forest and pasture/hay/35.1 acres	13 structures/0.3 acre
AR 4-D	25.3 miles/617.6 acres/pasture/hay and deciduous forest/276.6 acres	152 structures/3.0 acres
APR Links 4–6	25.4 miles/619.1 acres/pasture/hay and deciduous forest/157.1 acres	152 structures/3.0 acres
AR 4-E	36.7 miles/897.2 acres/pasture/hay and evergreen and deciduous forest/394.1 acres	220 structures/4.4 acres
APR Links 8–9	38.7 miles/946.7 acres/pasture/hay and evergreen and deciduous forest/464.6 acres	232 structures/4.6 acres
Region 5		
AR 5-A	12.6 miles/308.5 acres/evergreen and deciduous forest/226.6 acres	76 structures/1.5 acres
APR Link 1	12.3 miles/300.1 acres/evergreen and deciduous forest/224.0 acres	74 structures/1.5 acre
AR 5-B	71.0 miles/1,732.3 acres/pasture/hay and mixed forest/804.2 acres	426 structures/8.5 acres
APR Links 3–6	67.1 miles/1,641.6 acres/pasture/hay and mixed forest/880.6 acres	403 structures/8.1 acres
AR 5-C	9.2 miles/224.6 acres/deciduous forest, pasture/hay, and mixed forest/135.5 acres	55 structures/1.1 acre
APR Links 6–7	9.4 miles/229.9 acres/deciduous forest, pasture/hay, and mixed forest/138.6 acres	56 structures/1.1 acre
AR 5-D	21.7 miles/529.6 acres/deciduous forest, cultivated crops, and mixed forest/338.4 acres	130 structures/2.6 acres
APR Link 9	20.5 miles/499.9 acres/cultivated crops, deciduous forest, and pasture/hay/199.6 acres	123 structures/2.5 acres
AR 5-E	36.3 miles/885.1 acres/pasture/hay and mixed forest/395.0 acres	218 structure/4.4 acres
APR Links 4–6	33.1 miles/811.1 acres/pasture/hay and mixed forest/386.9 acres	199 structures/4.0 acres
AR 5-F	22.3 miles/544.5 acres/pasture/hay and deciduous forest/270.4 acres	134 structures/2.7 acres
APR Links 5–6	18.7 miles/459.1 acres/pasture/hay and deciduous forest/266.5 acres	112 structures/2.2 acres
Region 6		
AR 6-A	16.2 miles/395.7 acres/cultivated crops/0.0 acres	97 structures/1.9 acres
APR Links 2, 3, 4	17.7 miles/432.8 acres/cultivated crops/0.1 acre	106 structures/2.1 acres
AR 6-B	14.1 miles/343.7 acres/cultivated crops/0.0 acres	85 structures/1.7 acres
APR Link 3	9.6 miles/235.7 acres/cultivated crops/0.1 acre	58 structures/1.2 acre
AR 6-C	23.1 miles/565.6 acres/cultivated crops/52.5 acres	139 structures/2.8 acres
APR Links 6–7	24.8 miles/606.5 acres/cultivated crops/95.0 acres	149 structures/3.0 acres
AR 6-D	9.2 miles/223.6 acres/cultivated crops/4.0 acres	55 structures/1.1 acre
APR Link 7	8.6 miles/209.4 acres/cultivated crops/1.7 acres	52 structures/1.0 acre

Table 3.17-16:
Land Requirements for the HVDC Alternative Routes and the Applicant Proposed Route in Regions 1–7

Alternative	Length of Route/Acres of Potential Vegetation Impact Within ROW/Predominant Land Cover/Acres of Potential Forest Impact Within ROW	# of Lattice Structures/Acres of Potential Vegetation Impact Within ROW
Region 7		
AR 7-A	43.2 miles/1,052.0 acres/cultivated crops/0.5 acre	259 structures/5.2 acres
APR Link 1	28.6 miles/697.7 acres/cultivated crops/0.7 acre	172 structures/3.4 acres
AR 7-B	8.6 miles/209.9 acres/cultivated crops, deciduous forest, and shrub/scrub/43.6 acres	52 structures/1.0 acre
APR Links 3–4	8.4 miles/205.1 acres/cultivated crops, deciduous forest, and shrub/scrub/53.5 acres	50 structures/1.0 acre
AR 7-C	23.8 miles/578.6 acres/cultivated crops, pasture/hay, and deciduous forest/62.4 acres	143 structures/2.9 acre
APR Links 3–5	13.2 miles/323.5 acres/cultivated crops, deciduous forest, and scrub/shrub/81.0 acres	79 structures/1.6 acres
AR 7-D	6.5 miles/159.5 acres/cultivated crops and pasture/hay/16.1 acres	39 structures/0.8 acre
APR Links 4–5	6.4 miles/157.0 acres/cultivated crops, pasture/hay, and deciduous forest/27.5 acres	38 structures/0.8 acre

3.17.6.3.2.2 Operations and Maintenance Impacts

Impacts from operations and maintenance of the HVDC alternative routes would be similar to those from the Applicant Proposed Route (see Section 3.17.6.2.3). No long-term impacts are described for access roads because the location of access roads has not yet been determined. Maintenance activities would cause long-term impacts to pre-construction forested land cover. Some forested lands (including evergreen forests, hardwood forests, and mixed forests) would need to be cut and maintained according to the TVMP and would not be allowed to regrow for line safety and integrity reasons. There may also be temporary impacts within the ROW to crops and other vegetation. Grasslands/herbaceous, cultivated crops, and other low-profile land covers may have trimming and mowing impacts during operations and maintenance of the Project. The land area for long-term impacts to forested land cover are summarized in the Table 3.17-16, including a comparison of impacts to the Applicant Proposed Route, by region. These long-term impacts may include the pruning or removal of shrubs and trees, where necessary according to the TVMP. In the table, total forested land cover includes the sum of deciduous, evergreen, and mixed forest cover types.

3.17.6.3.2.3 Decommissioning Impacts

The decommissioning impacts relative to the alternative routes would be similar in nature to the set of temporary impacts resulting from initial construction. These temporary impacts would result from use of construction machinery at the various sites of infrastructure (e.g., the lattice structures, lattice crossing structures, monopole structures, guyed structures, and fiber optic infrastructure) to remove aboveground material, and foundation material where required. Use of construction machinery would have the potential to crush or remove vegetation, but no long-term effects are judged to be likely from the decommissioning phase of the Project. Revegetation would be guided by the Project's Decommissioning Plan.

3.17.6.4 Best Management Practices

A complete list of EPMs for the Project is provided in Appendix F; those EPMs that would specifically avoid or minimize the potential for impacts on vegetation communities are summarized in Section 3.17.6.1. The Applicant would consider the development of site-specific BMPs that may be necessary after consultation with appropriate federal and state agencies.

3.17.6.5 Unavoidable Adverse Impacts

Unavoidable adverse impacts to vegetation and special status plant species from the Project may include the following:

- Removal of vegetation in the footprints of new transmission line support structures, access roads, regulator stations, and other associated infrastructure
- Conversion of structural types of vegetation (e.g., forest conversion to grassland or forest to low-stature shrublands)
- Changes to plant species diversity with the general trend likely to be a diminishment of vegetation species diversity in disturbed areas
- Potential lower yields in croplands that are disturbed during construction and operations and maintenance

3.17.6.6 Irreversible and Irretrievable Commitment of Resources

A commitment of resources is irreversible when its primary and secondary impacts limit the future options for a resource. An irretrievable commitment refers to the use or consumption of a resource that is neither renewable nor recoverable for use by future generations.

Both short- and long-term disturbance to vegetation would be minimized through appropriate application of the Project's Restoration Plan. Once the Project has been decommissioned, there is potential for all of the approximately 2,600 acres of vegetation to be recovered. Therefore, it is predicted that there would be no irreversible or irretrievable commitment of vegetation resources.

3.17.6.7 Relationship Between Local Short-term Uses and Long-Term Productivity

Removal of vegetation, mechanical damage to vegetation, and reduced plant water availability due to compaction of soils are all potential local short-term use effects on vegetation that could result from construction of the Project. The short-term impacts would be minimized through the use of multiple EPMs incorporated into the Project. The impact of short-term uses on long-term productivity to vegetation resources would be limited to those areas where (1) structural foundations are left in place until decommissioning, or (2) instances where vegetation structure is altered from forested to herbaceous structural types. In this second specific case, the functions of wildlife habitat maintenance, biodiversity, and recreational opportunities could be diminished. The EPMs listed in Section 3.19.6.1 should limit these changes in long-term productivity.

3.17.6.8 Impacts from Connected Actions

3.17.6.8.1 Wind Energy Generation

Although site-specific layouts of wind energy generation facilities in the 12 WDZs have yet to be designed or proposed, impacts from these potential wind energy generation facilities on vegetation communities were evaluated using the methodology described in Section 3.17.6.1.

Based on the maximum capacity of the Project and information from wind energy developers, it is estimated that 20-30 percent of the potentially suitable land, or between 216,400 and 324,600 acres, would actually be developed for wind energy facilities using transmission capacity from the Project.

It is estimated that during the construction phase approximately 2 percent of land within a wind energy facility is affected (Denholm et al. 2009). Assuming up to 30 percent build-out of the WDZs, up to 6,492 acres would be temporarily disturbed during construction. This would include the construction of access roads, turbine pads and foundations, underground collection lines, collector substation, and often a generation tie line. An operations and maintenance building and at least one or two meteorological towers are also typically included.

During the operations and maintenance phase of wind energy facilities, approximately 1 percent or less of the land would be affected. Once construction has been completed, temporary construction areas would revert to their previous uses. Only turbines, access roads, generation tie-lines (if necessary), substations, and operations and maintenance buildings would remain. This would equate to approximately 3,246 acres. Existing land uses, including agricultural croplands, would be expected to return to almost all areas of the facilities, unless deemed incompatible with the operations of a wind farm.

Temporary impacts during construction may result from increased dust entrainment that can settle on surrounding vegetation causing a reduction in photosynthetic capability of plants. It is also likely that there would be mowing or potential removal of vegetation in ROWs for generation tie-lines, access roads, and electrical collection lines that are placed underground. Long-term impacts may result to vegetation where it is removed to facilitate construction of substation facilities.

Impacts to pasture and cultivated crops may also occur during construction in the WDZs. Construction may temporarily prevent the existing uses in the construction area, including growing crops. Wind energy developers typically coordinate with landowners to minimize impacts to agricultural operations, such as timing construction to begin after crops are harvested; and specifying types of seed to use during revegetation. The land cover distribution for the 12 WDZs is presented in Table 3.10-12 in Section 3.10.

Wind lease agreements typically include provisions to minimize the losses, including minimizing soil compaction and revegetating temporary work areas. In addition, the agreements typically stipulate compensation for landowners for any losses of crops, landscaping, and trees. Once construction has been completed, agricultural operations would be able to continue in most of the wind farm. Agricultural activities such as cultivating crops are generally permitted up to the wind turbine pads, so only a very minimal area of existing agricultural land would be removed from production. Access roads may change the configuration of fields for crops.

3.17.6.8.2 Optima Substation

The future Optima Substation is anticipated to be constructed on 160 acres of currently undeveloped land near an operating wind energy facility. The land cover of the site is primarily grassland/herbaceous. Vegetation within this area would be expected to be removed for the construction of the substation. Impacts associated with removal of vegetation are described in Section 3.17.6.1.2. No special status plant species have documented elemental occurrences within the substation site.

3.17.6.8.3 TVA Upgrades

A precise ROI has not been identified for the TVA upgrades. Where possible, general impacts associated with the required TVA upgrades are discussed below.

Much of the following discussion is relevant for the new 500kV transmission line, or for certain upgrades associated with the 161kV transmission lines. The required TVA upgrades to existing facilities (including existing transmission lines and existing substations) should have no impact to vegetation resources. The construction, operation, and maintenance of the new 500kV transmission line would have impacts similar to the Project although on a smaller scale. These impacts may include mechanical damage and/or removal of vegetation by heavy machinery, reduced water-holding capacity and inhibition of plant growth, due to compaction of soils, introduction of invasive species from construction equipment or spread of existing invasive species on newly cleared land, alteration of hydrology during road construction, which could affect plant growth, long-term conversion of forested and shrublands to herbaceous cover type within ROWs, and contamination from herbicide drift or runoff or from accidental spills of fuels or lubricants that could stunt plant growth or inhibit the onset of growth.

Many construction-related impacts would be short-term, but vegetation loss in areas of new structures and access roads would be long-term. During operations, vegetation could reestablish on most disturbed areas; in ROWs for the new electric transmission line vegetation would be managed so maintenance activities would not be affected, especially in any forested areas where trees could restrict access or affect operations if allowed to reestablish. Depending on the locations of the required TVA upgrades, federally protected plant species and state-recognized special status plants may occur. Special status plant species could be impacted the same as other vegetation unless, as is planned for the Project, plant surveys are carried out prior to construction activities and TVA marks special status species and avoid them as practicable.

3.17.6.9 Impacts Associated with the No Action Alternative

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not be constructed. No impacts on vegetation or special status plant species on private, federal, state, or tribal lands, or their corresponding land management policies and regulations would occur. The existing diversity, structure, and function of vegetation within the ROW would be expected to continue to evolve under the influence of natural processes such as succession and as a result of other human-related disturbances.

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Tables

Figures Presented in Appendix A

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3.18 Visual Resources

This section describes the affected environment and assesses the impact of the Project on visual resources, which are defined as visible features of the landscape (e.g., land, water, vegetation, animals, structures, and other features) (BLM 2010).

The methodology used to identify and assess the potential impacts of the Project on visual resources is based on the Bureau of Land Management (BLM) Visual Resource Management (VRM) inventory and contrast rating systems although the Project does not cross lands administered by the BLM. The BLM VRM system provides a systematic approach for evaluating the potential changes to visual resources that may result from the Project. The major concepts of the BLM VRM methodologies that this visual resource analysis follows are described below:

- Establish an understanding of the existing visual character and qualities of the landscape environment of the Project area
- Determine areas from which the Project would be visible
- Estimate the visual expectations and response of the viewers to visual changes resulting from the Project
- Identify the visual contrast resulting from changes to the existing landscape character and qualities in the Project area as a result of the Project

The overall visual resource assessment methodology is graphically shown in a flowchart in Figure 3.18-1 (located in Appendix A). The methodologies for conducting the visual resources inventory and impact assessment are described in more detail in Sections 3.18.4 and Section 3.18.6, respectively.

3.18.1 Regulatory Background

Goals, objectives, policies, implementation strategies, and guidance for visual resources are typically contained in resource management plans, and comprehensive plans. Regulations and guidance documents that focused the analysis presented in this section are identified in Table 3.18-1.

Table 3.18-1:
Visual Laws and Regulations Applicable to the Project

Statute/Regulation	Agency	Applicability to the Project
Federal		
National Environmental Policy Act of 1969, as amended (NEPA)	Council of Environmental Quality (CEQ)	The CEQ implementing regulations for NEPA require that EISs (including DEISs) discuss the environmental consequences to aesthetic resources (40 CFR 1508.8). Aesthetic resources under NEPA include park lands, wild and scenic rivers and other ecologically critical areas that may be affected by major federal actions that may include activities entirely or partially financed, assisted, conducted, or approved by federal agencies. NEPA's focus is on the environment of the area(s) to be affected by the alternatives under consideration. In December 2012, DOE published the NOI to prepare an EIS to analyze the potential environmental impacts of the Project. Several of the scoping comments received in response to this NOI addressed potential effects of the Project on specific aesthetic resources including impacts on scenic vistas such as Gloss Mountain and the Mississippi River, Ozark Mountains, Ozark National Forest, Trail of Tears, Honey Springs Battlefield/State Park, scenic highways, and National Scenic Byways.

Table 3.18-1:
Visual Laws and Regulations Applicable to the Project

Statute/Regulation	Agency	Applicability to the Project
Federal Land Policy and Management Act of 1976 (FLPMA) (43 USC § 1701 et. seq.)	National Forest Service (NFS)	FLPMA was enacted for the purpose of establishing a unified, comprehensive, and systematic approach to managing and preserving public lands in way that protects “the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archaeological values.” In the context of FLPMA, public lands consist of federally-owned lands (i.e., BLM, NPS, and USFS lands). The following sections of FLPMA are applicable to visual resources: Section 102 (a)(8). States that “…the public lands be managed in a manner that will protect the quality of the …scenic…values…” Section 103(c). Identifies “scenic values” as one of the resources for which public land should be managed. Section 505(a). Requires that “Each right-of-way shall contain terms and conditions which will…minimize damage to the scenic and aesthetic values…” HVDC Alternative Route 4-B crosses the Ozark-St. Francis National Forest (Figure 3.10-1 in Appendix A). The Ozark-St. Francis National Forests Revised Land and Resource Management Plan was updated in 2005 to provide a framework for managing the forests’ natural resources by establishing long-range goals and management areas with specific objectives. The Land and Resource Management Plan identifies the following scenery management priorities (USFS 2005a): • Maintain or enhance the visual character of the forests by using the USFS Scenery Management System (SMS) to achieve Scenic Integrity Objectives (SIO) • Manage landscapes and built elements in order to achieve scenic integrity objectives • Promote the planning and improvement of infrastructure along scenic travel routes. Use the best environmental design practices to harmonize changes in the landscape and to advance environmentally sustainable design solutions • Restore landscapes to reduce visual effects of nonconforming features • Manage scenic restoration to be consistent with other management area objectives • Maintain the integrity of the expansive, natural landscapes, and traditional cultural features that provide the distinctive character of places Maintain the character of key places in order to maintain their valued attributes.
National Historic Preservation Act of 1966, as amended (NHPA) (16 USC § 470 et seq.) (implementing regulations at 36 CFR 800.5)		The NHPA includes language protecting the visual integrity of sites listed or eligible for the NRHP: “Examples of adverse effects…include…introduction of visual, atmospheric, or audible elements that diminish the integrity of the property’s significant historic features…” (36 CFR 800.5). Visual resources protected by the NHPA are discussed in Section 3.9.6.
The National Trails System Act (16 USC § 1241)	National Park Service (NPS)	National Trails were established under the National Trail System Act of 1968 (16 USC §§ 1241–51), designating and protecting national scenic trails, national historic trails, and national recreational trails. National trails are administered by the BLM, NPS, and USFS. These agencies provide coordination and oversight for the entire length of a trail. However, because these trails traverse both public and private lands as well as lands controlled by various agencies, on-site management activities are performed by the jurisdictional agency, the state, or the landowner (16 USC §§ 1241–51, as amended 2009). Portions of the Applicant Proposed Route and HVDC Alternative Routes 4-A, 4-B, 4-C, 4-D, 4-E, and 7-A in Regions 4 and 7 cross the Trail of Tears. The Trail of Tears in Region 4 is a multi-branched linear resource management corridor and was used during the forced relocation of Native American peoples indigenous to the

Table 3.18-1:
Visual Laws and Regulations Applicable to the Project

Statute/Regulation	Agency	Applicability to the Project
		southeastern United States to Indian Territory (now Oklahoma) in the 1830s. Greatly expanded in 2009, the Trail of Tears National Historic Trail consists of several separate branches that cross, and in one case terminate in, Arkansas. The ROI for the Project (see Section 3.18.3) intersects the branch of the Trail of Tears now called the Bell-Drane Route between western Crawford County and south-central Johnson County. Generally following the old Little Rock-to-Fort Gibson Road up the northern side of the Arkansas Valley as far west as Fort Smith, this trail segment is typically described as approximating the present route of U.S. Route 64. From the vicinity of Fort Smith, the Bell-Drane Route turns north and approximates State Route 59 to Evansville, in southwestern Washington County near the Arkansas-Oklahoma line. The NPS does not exercise regulatory authority over any portion of Trail of Tears crossed by the Project. The role of the NPS is to lead a group of federal, state, local, non-governmental, and private stakeholders with interests in the identification, preservation, interpretation, and promotion of the Trail of Tears National Historic Trail and associated properties.
National Scenic Byways Program (23 USC § 162) Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA; Public Law 102-240).	The Federal Highway Administration (FHA)	A scenic byway is a public road with special scenic, historic, recreational, cultural, archaeological, and/or natural qualities that have been recognized as such through legislation or official declaration. Easements associated with scenic byway ROWs may prohibit construction of transmission structures or other structures that degrade the scenic quality of the road. The National Scenic Byways Program establishes the framework for identifying and managing highways that have “outstanding scenic, historic, cultural, natural, recreational, and archaeological qualities.” Additionally, the FHWA’s May 18, 1995, interim policy (60 FR 26759, May 18, 1995 [FHWA Docket No. 95-15]) sets forth the procedures for the designation of certain roads as National Scenic Byways or All-American Roads by the U.S. Secretary of Transportation. The interim policy also requires the preparation of a corridor management plan to provide guidance for the conservation and enhancement of the byways’ intrinsic qualities.
State		
Oklahoma Scenic Rivers Act (Oklahoma Statute 82-1451–1471)	Oklahoma Water Resources Board (OWRB)	In Oklahoma, state scenic rivers were established under the Oklahoma Scenic Rivers Act designating certain free-flowing rivers that possess unique natural scenic beauty and outdoor recreational values for the benefit of present and future inhabitants of the state. The intent of this act is to preserve state-designated scenic rivers in their natural scenic state. There are five streams protected under the program in Oklahoma, including Lee Creek and Little Lee Creek. No other rivers designated under the Oklahoma Scenic Rivers Act occur within the ROI.
Arkansas Natural and Scenic Rivers Act (Arkansas Code Annotated 15-23-301)	Arkansas	In Arkansas, state scenic rivers are established under the Arkansas Natural and Scenic Rivers System Act, designating certain rivers of the state that possess “outstanding natural, scenic, educational, geological, recreational, historical, fish and wildlife, scientific, and cultural values of great present and future benefit to the people”. The intent of this act is to balance the alterations of man and the protection of the natural landscape along certain rivers. The act establishes a process for designating and managing state-designated scenic rivers.
Scenic Highway Designations (Arkansas Code Annotated 27-67-203)	Arkansas Highway Commission	State-designated scenic highways are established under the Arkansas Code Title 27-67-203. Byways are nominated for scenic status and are officially designated by the State General Assembly (AHTD 2007). For a highway to be declared scenic, a group interested in preserving the scenic, cultural, recreational, and historic qualities of the route must be created. Once a scenic highway has been designated, the Arkansas State Highway, Transportation Department, and respective counties must place appropriate signs indicating these highways have been designated; however, the state does not identify additional regulations for protecting state-designated scenic highways.

Table 3.18-1:
Visual Laws and Regulations Applicable to the Project

Statute/Regulation	Agency	Applicability to the Project
Tennessee Scenic Rivers Act (Tennessee Administrative Code 11-13)	Tennessee Department of Environment and Conservation—Division of Natural Areas	In Tennessee, state scenic rivers are established under the Tennessee Scenic Rivers Act of 1968, designating certain rivers that “possess outstanding scenic, recreational, geological, fish and wildlife, botanical, historical, archaeological, and other scientific values of great present and future benefit to the people” as scenic rivers. This act establishes three classes of scenic rivers and the management requirements for each classification, including permitted land uses. The intent of this act is to protect scenic, historic, archaeological, and scientific features of state-designated scenic rivers, regardless of classification.
Tennessee Scenic Highway System Act of 1971 (Tennessee Administrative Code 54-17)	Tennessee Department of Transportation (TNDOT)	The Tennessee Scenic Highway System Act of 1971 establishes the criteria to designate, recover, and conserve natural scenic beauty along designated scenic highways, and preserve routes of historical significance. This act recommends designation of specific highways, and provides strategies for promoting the scenic highway system.

3.18.2 Data Sources

Potential visual resources were identified through a desktop analysis of readily available information, research, and reports; information received directly from regulatory agencies and other stakeholders during the DOE scoping process and stakeholder outreach; and data obtained through GIS databases. Table 3.18-2 lists the GIS databases that were used to compile visual resource data. GIS source data included federal, state, and municipal governments, and non-governmental organizations.

Table 3.18-2:
Summary of GIS Data Sources

Information/Resources	Data Sources	Region of Influence Extent of Data Collection[1]
Existing Visual Character of the Landscape		
Land Type, including Forest, Grassland, Barren (rock/sand/clay)	GIS Data Sources: Jin et al. (2013), Tetra Tech (2014b)	Within 15 miles
Water, including state-identified as Outstanding, Exceptional, or Extraordinary Resource Waters, or other state-specific designations that may relate to aesthetics or recreational use	Oklahoma Water Resource Board Appendix B Waters (High Quality Waters) Outstanding Resource Waters (Extraordinary Resource Waters, Natural and Scenic Waterways) (ADEQ 2012) Tennessee Division of Water Pollution Control Exceptional Tennessee Waters and Outstanding National Resource Waters (TDEC 2013) Texas Water Development Board High Water Quality/Exceptional Aquatic Life/High Aesthetic Value Designated Streams (GIS Data Source: TWDB 2013)	Within 15 miles
Digital Elevation Data	GIS Data Sources: USGS (1999), Tetra Tech (2014b)	Within 15 miles
Land Use (Developed, Residential, Agriculture, Parks, Roads, Railroads)	GIS Data Sources: Jin et al. (2013), Clean Line (2013a)	Within 15 miles
Potential Visual Resources/Viewpoints		
National Wild and Scenic Rivers	GIS Data Source: IWSRCC (1999), National Wild and Scenic Rivers dataset	Within 15 miles

Table 3.18-2:
Summary of GIS Data Sources

Information/Resources	Data Sources	Region of Influence Extent of Data Collection[1]
Schools	GIS Data Sources: Clean Line (2013a, 2013b); Tetra Tech (2014a)	Within 3 miles
Churches	GIS Data Sources: Clean Line (2013a, 2013b), Tetra Tech (2014a)	Within 3 miles
Cemeteries	GIS Data Sources: Clean Line (2013a, 2013b,; Tetra Tech (2014a), ESRI (2013)	Within 3 miles
Federal Lands and Wilderness Areas	USFWS (2012), ESRI (2010); GIS Data Sources: ESRI (2013), USFS (2014a, 2014b, 2014c)	Within 15 miles
State Parks (Oklahoma Tourism and Recreation Department, Arkansas Department of Parks and Tourism, Tennessee Department of Environment and Conservation [TDEC], Division of Parks and Conservation, and Texas Parks and Wildlife Department [TPWD])	ESRI (2010), TDEC (2011), TPWD (2011); GIS Data Source: AHTD (2006c)	Within 15 miles
State-Owned WMAs (owned by ODWC, AGFC, Tennessee Wildlife Resources Agency, and TPWD)	GIS Data Sources: OSU (2003), AGFC (2005) (ongoing), TWRA (2007)	Within 15 miles
Arkansas WMAs (leased by AGFC)	AGFC (2013)	Within 3 miles
Cities and Town Boundaries	ESRI (2010)	Within 3 miles
County, City, and Town owned Lands that are managed for conservation or recreation	ESRI (2010); DOE Scoping Comments (Appendix E)	Within 3 miles
Scenic Byways and Trails	GIS Data Sources: NPS (2013), Clean Line (2013f)	Within 15 miles
National Register of Historic Places Sites	GIS Data Source: NPS (2013)	Within 3 miles
Residential Structures	GIS Data Sources: Tetra Tech (2014), Clean Line (2013a, 2013b)	Within 0.5 mile on either side of the referenced centerline of the Applicant Proposed Route and HVDC Alternative Routes).

1 Measured from representative centerlines of transmission line routes or the boundary of the converter station siting areas.

Structures within 0.5 mile of the transmission line routes were digitized and categorized from aerial photography, and a structure data layer was created (GIS Data Sources: Clean Line 2013a, 2013b; Tetra Tech 2014a). These data were field verified and updated accordingly. Aerial reconnaissance was also conducted following development of the Applicant Proposed Route and HVDC alternative routes.to verify the feasibility of the routes. Additional structures noted during the aerial reconnaissance were also included in the structure inventory.

In addition to the desktop research and initial field reconnaissance, field investigation at Key Observation Point (KOP) locations was conducted in February and March 2014 to assess contrast and visual impacts and provide photographs for visual simulations.

3.18.3 Region of Influence

3.18.3.1 Region of Influence for the Project

The ROI for visual resources was established through a combination of field reconnaissance and in consideration of the BLM distance zones. For the purpose of this analysis, a 1,000-foot-wide corridor was identified by Clean Line (Clean Line 2013). A representative ROW (a 200-foot-wide corridor associated with the transmission lines) was created within this 1,000-foot-wide corridor. Although theoretically the transmission line and associated ROW could be located anywhere within these corridors, it would be difficult to assess the transmission line from an infinite number of possibilities. Assessment of the line from the center of the corridors (referenced centerline), therefore, provides consistency throughout the assessment. The ROI for visual resources for the transmission line is defined as 6 miles (3 miles on either side of the referenced centerline of the Applicant Proposed Route, HVDC alternative routes, AC interconnection lines, and AC collection system). The reference centerlines are located within the 1,000-foot-wide corridor (which is the "standard" ROI for the Applicant Proposed Route and HVDC alternative routes) and within the center of each corridor identified for the AC interconnection routes and AC collection system. The ROI for visual resources also includes the converter station siting areas and the interconnection siting areas and a 3-mile buffer from the boundaries of those siting areas.

These visual resource ROIs encompass the 3 miles on either side of the reference centerline for the transmission lines and from the boundary of the converter station siting areas, encompasses the foreground/middleground (FG/MG) as defined by the BLM VRM system. In the FG/MG, Project components might be viewed in detail. Some viewing locations may occur outside the defined ROI (between 3 and 15 miles) and may include areas such as communities, scenic vistas from a national or state park, trails, etc. that were identified during agency consultation and/or the public scoping process.

Based on the foregoing, the ROI for visual resources is as follows:

- Applicant Proposed Project
    - Oklahoma Converter Station Siting Area: A 620-acre siting area and a 3-mile buffer from the boundary of the siting area in Texas County, Oklahoma.
    - Texas County AC Interconnection Siting Area: A 3-mile buffer from the boundary of an approximate 870-acre corridor.
    - AC Collection System Corridors: Six miles (3 miles either side) of the referenced centerline (explained above). The referenced centerlines for the AC Collection System are located in the center of thirteen 2-mile-wide corridors in Oklahoma (Beaver, Cimarron, and Texas counties) and Texas (Hansford, Ochiltree, and Sherman counties).
    - Tennessee Converter Station Siting Area: A 740-acre siting area and a 3-mile buffer from the boundary of the siting area in Shelby County and Tipton County, Tennessee.
    - Applicant Proposed Route: Six miles (3 miles either side) of the referenced centerline (explained above).
- DOE Alternatives
    - Arkansas Converter Station Alternative Siting Area: A 20,000-acre siting area and a 3-mile buffer from the boundary of the siting area in Pope County and Conway County, Arkansas.
    - Arkansas Converter Station Alternative AC Interconnection Siting Area: Six miles (3 miles either side) of the referenced centerline. The referenced centerline is located in the center of a 2-mile-wide corridor.

- o HVDC alternative routes: Six miles (3 miles either side) of the referenced centerline (explained above). Region of Influence for Connected Actions

3.18.3.1.1 Wind Energy Generation

The WDZs are areas that have been identified within a 40-mile radius of the Oklahoma Converter Station Siting Area with adequate wind resources and within which future development of wind energy facilities could occur. The ROI for wind energy generation has been set at 30 miles from the boundary of each WDZ.; The ROI for wind energy generation includes approximately 1,700 square miles, or 1,385,000 acres in Oklahoma (Beaver, Cimarron, and Texas counties) and Texas (Hansford, Ochiltree, and Sherman counties). Sensitive visual resources in the ROI for WDZs G, H, and I also include communities in Kansas.

3.18.3.1.2 Optima Substation

The ROI for the future Optima Substation includes a 3-mile buffer around the boundary of the substation site. The future Optima Substation would be constructed within 160 acres and is located approximately 2.3 miles east of the Oklahoma Converter Station Siting Area in Texas County, Oklahoma.

3.18.3.1.3 TVA Upgrades

As described in Section 3.1.1, a precise ROI has not been identified for the TVA upgrades.

3.18.4 Affected Environment

The affected environment includes the visual resources described for the ROI in Regions 1 through 7. The methodology for conducting the visual resources inventory is graphically shown in a flowchart in Figure 3.18-2 in Appendix A.

To inventory and characterize the affected environment for visual resources, scenery and viewing locations, including KOPs, were considered. The following tasks were undertaken to inventory visual resources in the ROI:

- Documentation of existing landform, vegetation and water features (scenery) at the regional scale (see Ecoregion descriptions sections 3.18.4.1 through 3.18.4.10) and at the project-specific scale (see Regional descriptions section 3.18.5.1 through 3.18.5.7)
- Identification of viewing locations including KOPs (viewing locations)

Scenery

Scenery is the aggregate of features that give character to the landscape (BLM 1984). Landscapes encompass varying levels of landform, vegetation, existence of water, color, scarcity, adjacent scenery, and cultural modifications. Cultural modifications are defined as human modifications to the landscape. All of these elements combine to form landscape character (BLM 2010). The existing landscape character provides the context for assessing the effects of changes to the landscape caused by the Project. Regional-level landscape character creates a sense of place and describes the generalized visual image of a specific geographic area. To assess impacts to the landscape's visual character, it is important to establish the context for the visual environment at both a regional level and at a project-specific level.

Regional Level Scenery

EPA Level III ecoregions were used to develop a description of the existing landscape character in Regions 1 through 7 (EPA 2012). Ecoregions provide an appropriate foundation for describing visual character at the regional level because they are defined based on elements similar to those used in the BLM's VRM for inventorying and assessing scenic quality (BLM 2010). These factors include physiographic elements of landform, vegetation, water, and cultural modifications. Level III ecoregions that cross the Project ROI include the Arkansas Valley, Boston Mountains, Central Great Plains, Central Irregular Plains, Cross Timbers, High Plains, Mississippi Alluvial Plain, Mississippi Valley Loess Plains, Ozark Highlands, and Southwestern Tablelands. Level III ecoregions are depicted in Figure 3.17-1 in Appendix A and detailed descriptions are provided in Sections 3.18.4.1 through 3.18.4.10.

Project-Specific Level Scenery

An inventory of the existing landscape character within the ROI was conducted to provide the context for assessing the effects of changes to the landscape at a level of detail consistent with the scale and dimensions of the Project and gain a broad understanding of the types of landscapes potentially crossed by the Project. The factors used to describe the visual character of the Level III ecoregions (topography, vegetation, water, and cultural modifications) were reviewed in further detail within the ROI and mapped using GIS. The factors were ranked and combined into 3 categories that were determined based on the frequency of occurrence of the factor in the Project area and the anticipated impacts to each type:

- Distinct—Landscapes where characteristic features of landform, water, and vegetation are distinctive or unique in the context of the surrounding areas. These features occur infrequently within the ROI and are typically associated with intact natural landscapes with minimal cultural modifications.
- Common—Landscapes where characteristic features of landform, water, and vegetation occur frequently within the ROI. These features are typically associated with croplands and rangelands with cultural modifications limited primarily to rural residential structures and ancillary facilities associated with farms (e.g., barns, silos, fences).
- Developed—Landscapes with a greater occurrence of cultural modifications than the surrounding areas. Cultural modifications in the landscape include roads, buildings (residential, commercial, industrial), utility lines, and other infrastructure and are typically associated with villages, towns, and cities.

To map the three categories within the ROI the landscape factors (topography, vegetation, water, and cultural modifications) were assigned a numeric value based on the criteria included in Table 3.18-3.

Table 3.18-3:
Landscape Category Inventory and Evaluation Rating

Landscape Inventory Factor	Rating Criteria and Score		
Landform	Terrain with slopes 26 percent or greater. High vertical relief as expressed in prominent hills, mountains, cliffs, or rock outcrops; or severe surface variation or highly eroded formations. Terrain features which are dominant or are exceptional. Score 5	Terrain with slopes ranging from 11-25 percent. Hills, canyons, ravines, or terrain with interesting erosional patterns. Terrain features that are interesting but not dominant or exceptional. Score 3	Terrain with slopes ranging from 0 to 10 percent. Flat gently rolling terrain with few or no interesting landscape features. Score 1

Table 3.18-3:
Landscape Category Inventory and Evaluation Rating

Landscape Inventory Factor	Rating Criteria and Score		
Vegetation	Forests, wetlands and National Forest lands. Exhibit a variety of vegetation types and are relatively untouched, natural/intact landscapes. Score 5	Crops/pasturelands. Vegetation types which occur most often in the landscape. Variety of vegetation is limited to only one or two major types. Score 3	Developed and barren land. Vegetation is either absent due to development or little or no variety of vegetation types. Score 1
Water	Lakes, reservoirs, and rivers. Features that are present and are a dominant factor in the landscape. Score 8 (derived from combination of landform, vegetation, and cultural modification rankings)	None	None
Cultural Modifications	Protected/scenic lands, parks, and trails. Cultural modifications add favorably to visual variety while promoting visual harmony. Cultural modifications may include picnic areas, trailheads, boat launches, trails and trail signage. Score 2	Cultural modifications add little or no visual variety to the area; and introduce no discordant elements. Score 0	Developed lands. Cultural modifications dominate the landscape; and may include moderate and high-density residential, commercial and/or industrial development or infrastructure such as roadways and utilities. Score -4

The sum of the numeric values for these factors determines the landscape category. Lands categorized as Distinct received a score of 9 or more, lands categorized as Common received a score of 3 to 8, and Developed lands received a score of 2 or less. Landscape categories are depicted in Figure 3.18-3 in Appendix A.

KOPs are viewing locations that are representative of visually sensitive areas used to assess visual impacts. The description of landscape categories from each KOP focuses on the view from the KOP out over the landscape; therefore, a KOP may be located within a certain landscape category but the view might be towards another. For example, a KOP located in a town would be in a landscape categorized as Developed, but the view from the KOP could a landscape categorized as Common. Descriptions of the landscape category for each KOP are included in Sections 3.18.5.1 through Section 3.18.5.7.

Visual Sensitivity

BLM defines visual sensitivity as a measure of viewer concern for the scenic resource and potential changes to the resource. The level of viewer concern relates to the importance of maintaining the scenic quality or viewshed from a specific viewing location; and varies for different viewers or groups of viewers depending on viewer activities (Clean Line 2014). For example, scenic routes are typically associated with viewers who have a high degree of concern for maintaining the scenic quality or viewshed because the landscape setting is a key component to the scenic designation. In contrast, viewing locations associated with a state route would have a lower sensitivity because viewers travel at a higher rate of speed and concern for aesthetics is generally secondary to commuting.

Viewing locations are defined as public and private areas (including KOPs) within the landscape where the Project could be visible, and where concern for changes to the landscape exists. Viewing locations are typically associated with residences, travel routes, and recreation areas; however, other viewers can have concern for changes to the landscape and include public facilities, such as schools and religious institutions and resorts. DOE and Clean Line identified viewing locations within the ROI through a desktop analysis of relevant, publicly available information and GIS databases. Additional viewing locations were identified outside the ROI and included viewing locations identified during agency consultation, stakeholder meetings, or public scoping (Clean Line 2014). These additional viewing locations were included in the visual analysis.

Visual sensitivity for each identified viewing location was based on the following factors: (1) volume of use, (2) frequency of views (i.e., how often the view is experienced), and (3) viewing duration.

Key Observation Points

KOPs represent a critical or representative viewpoint within or along an identified viewing location, used to assess visual impacts of a proposed project. A process for ranking all potential visual resources was developed to help select the most appropriate KOPs to complete the visual impact analysis. The process for ranking visual resources to identify KOPs involved the following steps:

- Identifying all visual resources in the ROI.
- Ranking visual resources using the KOP ranking criteria and formula described below, including resources identified through agency consultation, public scoping, or stakeholder outreach (Clean Line 2014).
- Selecting visual resources with values ranging from moderate high to high (Clean Line 2014).
- Reviewing Google Earth aerial imagery in combination with Google Earth Streetview and line-of-site tools (i.e., using .kmz files) to identify more precise locations of the selected visual resources, evaluate their potential visibility, and identify the best typical or representative views, as well as views from sensitive resources. Using these tools and professional judgment, the list of resources was narrowed to identify the best potential KOPs for field investigations (Clean Line 2014).

DOE and Clean Line identified KOPs for the Project from the list of visual resources by applying the following selection criteria:

- Visibility: If any portion of the Project is potentially visible from the KOP based on terrain.
- Distance: If the Project would potentially be visible within FG or MG distance zones (i.e., within 3 miles) of the KOP. The Project may be visible in the BG distance zone for some unique KOPs that receive high use and have high visual sensitivity and/or were identified during scoping or public or stakeholder outreach (e.g., an overlook at a state park within 15 miles of the Project).
- Visual Sensitivity: If the KOP is identified to have moderate–high visual sensitivity (Clean Line 2014).

KOPs are depicted in Figures 3.18-3 in Appendix A. To document the existing conditions of the landscape viewed from the selected KOPs consistently, inventory forms were used for KOPs on federal, state, and private lands (see Visual Contrast Rating Worksheets in Appendix K).

3.18.4.1 Arkansas Valley

The Arkansas Valley ecoregion is characterized by undulating plains with scattered hills, open low mountains, ridges, cuesta, and level to undulating floodplains and terraces associated with the Arkansas River. The broad floodplain valley of the Arkansas River includes low terraces, meander scars, oxbows, swales and natural levees. This ecoregion also contains perennial and intermittent streams and several large reservoirs and lakes. Elevations range from 100 to 1,500 feet AMSL. Vegetation types consist of oak savanna and oak-hickory-pine forests with maple, beech, elm and red cedar in upland areas. Dense deciduous forests occupy broad areas along streams and within floodplains and consist largely of bottomland oaks, sycamore, sweetgum, willow, eastern cottonwood, green ash and elm. Cultural features in this ecoregion consist primarily of croplands and pasturelands. Cropland occurs extensively in floodplain areas and consists largely of soybeans, grain sorghum, wheat, alfalfa, and corn. Poultry and livestock farming also occur within this ecoregion. Other cultural modifications include coal mining, natural gas production facilities, distribution and high-voltage transmission lines, paved and unpaved roadways, scattered rural residences, and farms and associated appurtenances (e.g., barns, silos, fences, other out buildings, etc.).

The ROI in Regions 4 and 5 crosses the Arkansas Valley ecoregion (Figure 3.17-1 in Appendix A).

3.18.4.2 Boston Mountains

The Boston Mountains ecoregion is characterized by low rugged mountains typically capped by sandstone, high rounded hills, and deeply dissected mountainous plateaus. Outcrops are common within this ecoregion. The area contains a high density of intermittent and perennial streams, several of which are designated as wild and scenic. Elevations range from 475 to 1,700 feet AMSL. Vegetation types consist primarily of oak-hickory forests with shortleaf pine and red cedar found in many lower areas. On north-facing slopes and in ravines, dominant vegetation includes sugar maple, beech, red oak, basswood and hickory. Bottomlands contain riparian hardwood forests dominated by birch, sycamore, cottonwood, elm, and willow. This region is sparsely populated and recreation and forestry are the primary land uses. The Ozark National Forest occupies much of this ecoregion and logging and recreation are common activities. Livestock farming, pastures and hayland occupy some of the flatter areas. Croplands are rare within this ecoregion. Other cultural modifications include electric distribution lines, paved and unpaved roads, and rural residences.

The ROI in Regions 4 and 5 crosses the Boston Mountains ecoregion (Figure 3.17-1 in Appendix A).

3.18.4.3 Central Great Plains

The Central Great Plains ecoregion is characterized by broad alluvial valleys, level to gently rolling plains, dissected gently to steeply rolling hills, ravines, low escarpments, and some sand dunes. Water is generally limited to ephemeral and intermittent streams, often with incised channels, that occur in the area. Some larger rivers with braided sandy channels also cross the ecoregion including Beaver River/North Canadian River and Cimarron River. Elevations range from 750 to 2,700 feet AMSL. Much of the vegetation within this ecoregion has been converted to croplands. Natural vegetation that occurs within the ecoregion includes scattered grasslands consisting of short-, mixed-, and tallgrass prairie; oak savanna and eastern red cedar in some upland areas; and cottonwood, willow, walnut, ash, and elm in scattered riparian areas. Cultural features in this ecoregion consist mostly of dryland and irrigated croplands, including corn, grain sorghum, alfalfa, and cotton. Other cultural modifications common to this ecoregion include natural gas and oil fields, distribution and high-voltage transmission lines, paved and unpaved roadways, scattered rural residences, and farms and associated appurtenances.

The ROI in Regions 1, 2, and 3 crosses the Central Great Plains ecoregion (Figure 3.17-1 in Appendix A).

3.18.4.4 Central Irregular Plains

The Central Irregular Plains ecoregion is characterized by rolling and irregular plains with intermittent low hills and cuestas, which are ridges with a steep face on one side (usually on the eastern side) and a gentle slope on the other. Perennial streams are common within this ecoregion and in some areas many are channelized. Some larger streams, reservoirs, and rivers, such as the Arkansas River, occur in this ecoregion. Elevations range from 500 to 1,050 feet AMSL. Vegetation types consist of tall grass prairie with oak-hickory woodlands in upland and more rugged areas. Wooded riparian areas occur in wet bottomlands and consist largely of box elder, maple, oak, cottonwood, willow, walnut, pecan, hackberry, elm, and sycamore. Cultural features in this ecoregion consist of a mosaic of cropland, woodland, and grassland. Croplands consist largely of wheat, soybeans, grain sorghum, and alfalfa. Other cultural modifications include oil and gas and coal mining production facilities, distribution and high-voltage transmission lines, paved and unpaved roadways, scattered rural residences, and farms and associated appurtenances.

The ROI in Region 3 crosses the Central Irregular Plains ecoregion (Figure 3.17-1 in Appendix A).

3.18.4.5 Cross Timbers

The Cross Timbers ecoregion is characterized by gently rolling hills with some ridges and ledges. Small perennial streams are common and in some areas many are channelized. Some larger streams, reservoirs, and lakes also occur within this ecoregion. Elevations range from 600 to 1,300 feet AMSL. Vegetation types consist of oak savanna, oak-hickory woodlands, and eastern red cedar interspersed with openings of tall grass prairie in upland areas. Scattered riparian areas consist of cottonwood, willow, walnut, ash, elm, and sycamore. Cultural features in this ecoregion consist primarily of rangeland and pastureland with some croplands. Where cropland occurs, it consists largely of corn, soybeans, hay, and grain sorghum. Other cultural modifications include natural gas and oil fields with associated facilities, distribution and high-voltage transmission lines, paved and unpaved roadways, scattered rural residences, and farms and associated appurtenances.

The ROI in Region 3 crosses the Cross Timbers ecoregion (Figure 3.17-1 in Appendix A).

3.18.4.6 High Plains

The High Plains ecoregion is characterized by nearly level gently rolling terrain, with some sand plains and hills and scattered playa depressions. Playas are flat-bottom depressions typically found in arid and semiarid regions that are seasonally covered by water. In addition to playas, other water sources that occur within this ecoregion primarily include intermittent and ephemeral streams. Elevations range from 2,400 to 4,800 feet AMSL. Vegetation types are mostly short and midgrass prairie, with other types of vegetation including Harvard shin oak, fourwing saltbush, sand sagebush, and yucca. Riparian vegetation such as cottonwood and willow can be found scattered along riparian areas. Cultural features in this ecoregion include cropland and grazing land. Croplands largely consist of winter wheat and grain sorghum. Center-pivot irrigation is widely used. Concentrated hog feeding operations and natural gas and oil development facilities are common within this ecoregion. Other cultural modifications include distribution and high-voltage transmission lines, wind farms, paved and unpaved roadways, scattered rural residences, and farms and associated appurtenances

The ROI in Region 1 crosses the High Plains ecoregion (Figure 3.17-1 in Appendix A).

3.18.4.7 Mississippi Alluvial Plain

The Mississippi Alluvial Plain ecoregion is characterized primarily by broad, flat to nearly flat floodplains and river terraces threaded with numerous drainages. Several large streams and rivers flow and wind generally south, including the White, Cache, and Mississippi rivers. Many of the waterways have been channelized and several flood-control levees installed. Elevations range from 100 to 275 feet AMSL. Vegetation consist primarily deciduous hardwood forest, forested wetlands, and wetlands. Forests are comprised of hickory, maple, oak, ash and bald cypress, tupelo, sweetgum, sycamore in wetter areas. Cropland occurs extensively in floodplain areas and consists largely of soybeans, rice, grain sorghum, corn, cotton, and wheat. Other cultural modifications include distribution and high-voltage transmission lines, paved and unpaved roads, scattered rural residences, and farms and associated appurtenances, and commercial catfish and crawfish farms.

The ROI in Regions 5, 6, and 7 crosses the Mississippi Alluvial Plain ecoregion (Figure 3.17-1 in Appendix A).

3.18.4.8 Mississippi Valley Loess Plains

The Mississippi Valley Loess Plains ecoregion is characterized primarily by low, steeply to gently sloping ridges and low terraces dissected by numerous small ravines and intermittent streams. Few lakes occur within this ecoregion. Elevations range from 200 to 500 feet AMSL. Vegetation types consist of mixed deciduous forests consisting of oaks, hickories and loblolly and shortleaf pines. Crops include soybeans, cotton, corn, and wheat. Other cultural modifications that occur within this ecoregion include distribution and high-voltage transmission lines, paved and unpaved roads, rural residences, and farms and associated appurtenances.

The ROI in Regions 6 and 7 crosses the Mississippi Valley Loess Plains ecoregion (Figure 3.17-1 in Appendix A).

3.18.4.9 Ozark Highlands

The Ozark Highlands ecoregion is characterized by gently rolling plains to moderate and highly dissected hilly plateaus, small steep valley, and sharp narrow ridges. Perennial and intermittent streams are common in this ecoregion as are ponds, lakes, and reservoirs. Elevations range from 300 to 1,850 feet AMSL. Vegetation types consist of upland forest dominated by oak, hickory, and pine. Forests are most common and dense on north-facing slopes and ravines. Cultural modifications in this ecoregion include pasturelands, typically found in flatter areas at the periphery of the ecoregion. Grazing, logging and recreation are common activities in this ecoregion. Croplands are not prevalent in this ecoregion. Other cultural modifications include mining facilities, distribution and high-voltage transmission lines, paved and unpaved roads, and scattered rural residences.

The ROI in Region 4 crosses the Ozark Highlands ecoregion (Figure 3.17-1 in Appendix A).

3.18.4.10 Southwestern Tablelands

The Southwestern Tablelands ecoregion is characterized by broad, flat elevated tablelands with red-hued shallow canyons, mesas, badlands, gorges, and dissected river breaks. Water is generally scarce, limited mostly to ephemeral and intermittent streams. Elevations range from 1,900 to 3,450 feet AMSL. Vegetation types consist mostly of shortgrass prairie, wheat grass, western wheatgrass, bluestem, and dropseed, with some occurrences of sagebrush, yucca, and cholla. Juniper-pinyon woodlands occur in some areas. Scattered riparian areas consist of cottonwoods, willow, elm, and hackberry. Cultural features in this ecoregion consists mostly of semiarid range land with some cropland areas. Croplands largely consist of winter wheat, grain sorghum, corn, and alfalfa. Other cultural modifications include natural gas and oil fields with associated facilities such as pump jacks, storage tanks, and piping, wind farms, distribution and high-voltage transmission lines, paved and unpaved roadways, scattered rural residences, and farms and associated appurtenances.

The ROI in Region 1 crosses the Southwestern Tablelands ecoregion (Figure 3.17-1 in Appendix A).

3.18.5 Regional Description

3.18.5.1 Region 1

Region 1 is referred to as the Oklahoma Panhandle Region and includes the Applicant Proposed Route Links 1 through 5, HVDC Alternative Routes I-A through I-D, Oklahoma converter station siting area and associated AC interconnection siting area, and AC collection system. The ROI in Region 1 crosses the following Level III ecoregions: High Plains, found within the western portion of the region; Southwestern Tablelands, found in the central and eastern portion; and Central Great Plains, found in the far eastern portion of the region. The landscape character within the ROI is predominantly agricultural and rural with open rangeland, grassland, and some cropland. The flat, open terrain allows for expansive views across the landscape (GIS Data Sources: Clean Line 2013a, 2013b; Tetra Tech 2014a). Other topographic features found within the ROI include small canyons, ravines, low escarpments, bluffs and rocky outcrops; however these features are scarce. The ROI traverses the Beaver River/North Canadian River and several intermittent streams, creeks, and dry washes. Vegetation consists primarily of grasses with riparian species found along rivers and other drainageways and in wetland areas. In addition, trees associated with residential development are common within the landscape and can be seen clustered around rural residential homes and along fields and roads. Cultural modifications include agriculture and croplands, farms and associated appurtenances, local roads and highways, wind farms, and high-voltage transmission lines. Several small communities are located within and/or adjacent to the ROI including the towns of Hardesty, Laverne, May, and Fort Supply, and the communities of Balko, Bryans Corner, and Elmwood.

Visual resources identified in the ROI include rural residences and residential areas associated with the towns and other small communities, Lake Schultz State Park, Beaver Dune State Park, several NWRs, Palo Duro and Kiowa creeks and Beaver River/North Canadian River, and historic landmarks.

3.18.5.1.1 Landscape Character Description by KOP

Fort Supply WMA Recreation Area Applicant Proposed Route (identified as Proposed Route [PR] in Appendix K). This KOP represents views from recreational users near the northern edge of the Fort Supply Reservoir. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from a community recreation area. The strong concern refers to the public concern for the state of the environment as defined in environmental aesthetic philosophy. The landscape viewed from this KOP is characterized by gently rolling terrain and dense deciduous and evergreen forest. In addition, a large reservoir dominates many views from within the recreation area. Given the variation in vegetation and the dominant water feature, this landscape is categorized as Distinct. Cultural modifications include recreational facilities associated with the Fort Supply WMA Recreation Area, including playground equipment and picnic shelters.

Hardesty Alternative Route (AR). This KOP represents views from residential areas along the southern boundary of Hardesty, Oklahoma. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residential areas. The landscape viewed from this KOP consists primarily of grasslands and cultivated croplands with scattered rural residences; and was therefore categorized as Common. Cultural modifications include chain-link fences and electric distribution lines associated with scattered rural residences.

Lake Schultz State Park AR. This KOP represents views to the north from recreational users near the west entrance to the Lake Schultz State Park and WMA. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from a public park and WMA. The landscape viewed from this KOP consists of level to gently rolling terrain, sloping down towards Shultz Lake, a shallow depression in the landscape. Vegetation includes low grasses and shrubs, including Yucca, with dense stands of trees concentrated in the bottom of the depression. Water is not present year round within the lake. Given the variation in vegetation, presence of water and the State Park designation, this landscape is categorized as Distinct. Cultural modifications that are visible to the north include scattered rural residential structures in the BG.

Lake Schultz State Park PR. This KOP represents views to the south from recreational users near the west entrance to the Lake Schultz State Park and WMA. Similar to the Lake Schultz State Park AR KOP, visual sensitivity at this KOP is also high and was categorized as Distinct given the variation in vegetation, presence of water, and the State Park designation. Cultural modifications that are visible from this KOP include fences and a high-voltage transmission line in the FG/MG.

Laverne AR. This KOP represents views from a residential neighborhood in Laverne, Oklahoma. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residential areas. The landscape viewed from this KOP is characterized by flat terrain with vegetation consisting primarily of low grasses. Vegetation includes trees planted along roadways and around rural residential structures. Croplands and grasslands are typical within the region; therefore, this landscape is categorized as Common. Cultural modifications include light poles, electric distribution lines, and residential structures.

Local Historical Marker AR/PR. This KOP represents views to the south from a local historical marker located on the northern side of Route 3/270. Visual sensitivity at this KOP is moderate because of the low level of use and short viewing durations and the fact that, besides the historical markers, there are no other facilities. The landscape viewed from this KOP is characterized by relatively level to gently rolling terrain covered primarily with grasses and scattered trees; therefore, this landscape is categorized as Common. Cultural modifications visible from this KOP include low wire fences, unpaved roads, and distribution and high voltage transmission lines. The lack of variation in terrain allows panoramic views of the surrounding landscape to the south Cultural modifications visible from this KOP include electric distribution lines.

May PR. This KOP represents residential views to the south from the community of May, Oklahoma. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residential areas. The landscape viewed from this KOP is characterized by relatively level to gently rolling terrain with stands of deciduous trees clustered around rural residential structures or dense stands within open fields. Grasslands and scattered rural residential developments are typical within the region; therefore, this landscape is categorized as Common. Cultural modifications include scattered residential structures, sheds and storage buildings, low fences, and electric distribution lines.

Optima NWR AR. This KOP represents views from the southern edge of the Optima NWR, which primarily serves as an access point for hunters. Visual sensitivity at this KOP is high because of the long viewing durations from a National Wildlife Refuge. The landscape viewed from this KOP is characterized as gently rolling to low hills with vegetation consisting primarily of grasses. Although there is some variation in the terrain, there is very little variation in vegetation and the area is primarily grasslands that are typical within the region; therefore, this landscape is categorized as Common. Cultural modifications include multiple electric distribution lines in the FG/MG.

3.18.5.2 Region 2

Region 2 is referred to as the Oklahoma Central Great Plains Region and includes the Applicant Proposed Route Links 1 through 3 and HVDC Alternative Routes 2-A and 2-B. The ROI in Region 2 traverses Woodward, Major, and Garfield counties in Oklahoma. The ROI crosses only one Level III ecoregion, Central Great Plains. The landscape character within the ROI in Region 2 is predominantly rangeland and cropland. The relatively flat to gently rolling terrain allows for expansive views across much of the landscape (GIS Data Sources: Clean Line 2013a, 2013b; Tetra Tech 2014a). Other topographic features found within the ROI include low escarpments, terraced buttes, ravines, sand dunes, and rocky outcrops, although these features are scarce. The Cimarron River and Turkey Creek traverse the ROI along with several smaller creeks, drainages, and washes. Several man-made impoundment ponds occur along drainages in the ROI. Vegetation consists primarily of grasses, low shrubs, oak savanna, and riparian species scattered along streams, washes, and other drainageways and wetlands. In addition, trees associated with residential development are common within the landscape and can be seen clustered around rural residential homes and along fields and roads. Cultural modifications include agriculture, croplands, farms and associated appurtenances, wind farms, natural gas and oil facilities, hog and poultry operations, feed lots, roads, highways, high-voltage transmission lines, and rural residences. Several communities are located within and/or adjacent to the ROI including the cities of Fairview and Woodward; the towns of Ames, Cleo Springs, and Mooreland; and the communities of Bison and Waukomis.

Visual resources identified in the ROI include rural residences and residences associated with cities, towns, and other small communities; Gloss Mountain State Park; Boiling Springs State Park; several State Conservation Areas, and Cimarron River and Turkey Creek.

3.18.5.2.1 Landscape Character Description by KOP

Ames PR/AR. The Ames KOP represents residential views in Ames, Oklahoma, as well as representative views from the historic Cimarron River Branch Cattle Trail. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residential areas and the historical designation and long viewing duration of visitors and tourists engaged in leisure activities of the trail. The landscape viewed from this KOP is characterized by nearly level to low rolling hills covered with grasses and with scattered trees and grasses in the FG/MG and denser stands of trees in the BG. Grasslands are typical within the region; therefore, this landscape is categorized as Common. Cultural modifications include electric distribution lines.

Bison AR. This Bison AR KOP is located on the northern side of Bison, Oklahoma and represents typical residential views. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residential areas. The landscape viewed from this KOP is categorized as Developed in the FG because of cultural modifications associated with Bison and the landscape in the MG is characterized as Common because of the level terrain and lack of vegetation. Cultural modifications include fences, residential structures, storage sheds, silos, street lights and electric distribution lines.

Bison PR. This Bison AR KOP is located on the southern side of Bison, Oklahoma and represents typical residential views. The landscape viewed from this KOP is categorized as Developed in the FG because of cultural modifications associated with Bison and the landscape in the MG is categorized as Common because it consists of grasslands and croplands with scattered rural residences typical within the region. Cultural modifications include fences and residential structures, storage structures, and electric distribution lines.

Boiling Springs State Park PR. This KOP represents views from the Boiling Springs State Park recreation area. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from a state park recreation area. The landscape viewed from this KOP consists of level to gently rolling terrain with grasses and scattered areas of dense trees and shrubs. Small lakes occur within the park but are not dominant features. Given the variation in vegetation, presence of water and the State Park designation, this landscape is categorized as Unique.

Canton WMA and Lake Recreation Area PR. This KOP represents views from a Canton Lake. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from a community recreation area. The landscape viewed from this KOP is characterized by level terrain in the immediate FG, a large expansive lake in the FG/MG, and dense vegetation along the northern edge of the lake in the BG. Given the dominance of the water feature and variation in vegetation around the lake, this landscape is categorized as Distinct. Cultural modifications include recreational elements associated with Canton Lake Recreation Area.

Cimarron River Crossing AR. This KOP represents the crossing of a major river. Visual sensitivity at this KOP is moderate because a concern for aesthetics is generally secondary to commuting from this location, even though it represents a major water body. The landscape viewed from this KOP consists of level terrain sloping down to a wide, flat sandy river bottom. Water meanders along the sandy bottom creating a braided pattern. Dense stands of riparian species occur along the banks of the river. Due to the dense stands and variety of vegetation and presence of water, this landscape is categorized as Distinct. Cultural modifications include a bridge and guard rails, fences and a distribution line in the FG and a transmission line in the MG.

Cimarron River Crossing PR. This KOP represents views of the Cimarron River crossing from a local road. Visual sensitivity at this KOP is moderate because a concern for aesthetics is generally secondary to commuting from this location, even though it represents a major water body. The landscape viewed from this KOP consists of a wide, flat sandy river bottom. When the river is not flowing full, water meanders along the sandy bottom creating a braided pattern. Dense stands of riparian vegetation occur along the banks of the river. Cultural modifications are limited to the road and bridge crossing the river, guardrails and road signs. Due to the presence of water, the variety of vegetation and lack of cultural modifications, this landscape is categorized as Distinct.

Cleo Springs AR. This KOP represents views to the south from residential areas along the southern boundary of Cleo Springs, Oklahoma. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residential areas. From this KOP the landscape in the FG is categorized as Developed because of cultural modifications associated with Cleo Springs, and the landscape in the MG is categorized as Common because it consists primarily of grasslands, rural residences, and scattered stands of trees. Cultural modifications include residential structures, outbuildings (e.g., sheds, barns) associated with farms, communications structures, and transmission lines.

Fairview PR. This KOP represents a view looking south from along the southern boundary of Fairview, Oklahoma. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residential areas and a public park. From this KOP, the landscape in the FG is categorized as Developed because of cultural modifications associated with Fairview, and the landscape in the MG is categorized as Common because it consists primarily of croplands, rural residences, and scattered stands of trees. Cultural modifications include ball fields, fences, light poles, and electric distribution lines in the FG and residential structures, electric distribution lines, and a communication tower in the MG.

Gloss Mountain State Park AR. This KOP is representative of the view looking northeast from the north overlook at Gloss Mountain State Park. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from a state park. The landscape viewed from this KOP consists of mesas, with steep slopes and flat tops surrounded by level to gently rolling terrain. Erosion over time has caused the sides of the mesas to erode, leaving v-shaped slopes that are deep red/rust in color. Vegetation is limited to grasses and shrubs on the mesas and the adjacent area. Dense stands of trees are visible in the MG/BG and are associated with the Cimarron River to the north. This landscape is categorized as Distinct due to the tall, steep rugged landforms and color, which are not typical features in the region. Cultural modifications include scattered oil and gas facilities and transmission structures.

Gloss Mountain State Park APR. This KOP is representative of the view looking southwest from an overlook in Gloss Mountain State Park. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from a state park. The landscape viewed from this KOP consists of mesas, with steep slopes and flat tops surrounded by level to gently rolling terrain. Erosion over time has caused the sides of the mesas to erode, leaving v-shaped slopes that are deep red/rust in color. Vegetation is limited to grasses on the mesas; the surrounding plains are covered with grasses and scattered shrubs and trees. This landscape is categorized as Distinct. Cultural modifications are limited to primarily roads within the FG/MG.

Mooreland PR. This KOP is representative of the view from a ball field on the southern edge of the community of Mooreland, Oklahoma. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from a community park and residential areas. The landscape viewed from this KOP is characterized by gently rolling terrain with grasses and scattered evergreen and deciduous trees. This landscape is categorized as Developed because of cultural modifications associated with Mooreland including fences, light poles, structures associated with the ball field, and residential structures. The rolling terrain and vegetation surrounding the ball field obstructs views beyond the MG.

State Road (SR) 60 West of Fairview PR. This KOP represents views from along eastbound SR 60 west of Fairview, Oklahoma. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residential areas along the roadway and because it was identified as an important resource during public scoping (Clean Line 2014). This landscape is characterized by gently rolling terrain, grasslands, and large fields cleared for agricultural activities, with evergreen and deciduous trees clustered around rural residences. This type of landscape is typical within the region and was therefore categorized as Common. Cultural modifications visible from this KOP include residential structures and outbuildings associated with an adjacent farm, wood H-frame transmission structures, a distribution line that parallels the southern side of SR 60, and a communication tower in the BG. Views of the surrounding landscape are open due to the lack of variation in terrain and vegetation.

Waukomis AR. This KOP represents typical views from a residential area along the southern edge of Waukomis, Oklahoma. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residential areas. The landscape viewed from this KOP consists primarily of cultivated croplands with evergreen and deciduous trees clustered around rural residences; therefore this landscape was categorized as Common. Cultural modifications include short wire fences around fields, a distribution line and residential structure in the FG and a communication tower and transmission lines in the MG.

3.18.5.3 Region 3

Region 3 is referred to as the Oklahoma Cross Timbers Region and includes the Applicant Proposed Route Links 1 through 6 and HVDC Alternative Routes 3-A through 3-E. The ROI in Region 3 traverses Garfield, Kingfisher, Logan, Payne, Lincoln, Creek, Okmulgee, and Muskogee counties in Oklahoma. The ROI crosses three Level III ecoregions: Central Irregular Plains, found within the western portion of the region; Cross Timbers, found in the central portion; and Central Great Plains, found within the eastern portion of the region. The landscape character within the ROI is predominantly rangeland, cropland, and pastureland with some woodland and grassland areas. The relatively flat to gently rolling terrain found primarily in the western portion of the region allows for expansive views across much of the landscape (GIS Data Sources: Clean Line 2013a, 2013b; Tetra Tech 2014a). The terrain transitions to more steeply rolling hills interspersed with ravines, low escarpments, sand dunes, and cuestas in the central and eastern portion of the ROI. In these areas, the varied terrain and forested areas limit distant views. The ROI traverses the Cimarron and Arkansas rivers and several small ephemeral streams. Other surface waters in the region include wetlands, impoundment ponds, reservoirs, and lakes (i.e., Lake Carl Blackwell, Lake McMurtry, Lake Perry, Okmulgee Lake, and Lake Cushing). Vegetation consists primarily of grasses and shrubs, oak savanna, oak-hickory woodland, eastern red cedar, and riparian species along streams, at the edges of lakes and reservoirs and in wetland areas. In addition, rows of trees along fields and roadways are common within this region. Cultural modifications include agriculture, croplands, farms and associated appurtenances, wind farms, natural gas and oil facilities, hog and poultry operations, feed lots, roads, highways, high-voltage transmission lines, and rural residences. Several large and small communities occur within and/or adjacent to the ROI including the cities of Crescent, Stillwater, Perkins, Cushing, Drumright, Bristow, Stroud, Beggs, Okmulgee, and Muskogee and the towns of Marshall, Ripley, Shamrock, Winchester, Haskell, Wainwright, Oktaha, Summit, Rentiesville, and Webbers Fall.

Visual resources identified in the ROI include rural residences and residences associated with towns and cities, several state and National Wildlife Conservation areas, Robert S. Kerr Reservoir, Cimarron and Arkansas rivers, and several historic landmarks, such as Tank Farm Loop Route 66 Roadbed, Irvings Castle, and Little Deep Fork Creek Bridge.

3.18.5.3.1 Landscape Character Description by KOP

Agra AR. This KOP represents views from a residential area near the southern boundary of Agro, Oklahoma. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residential areas. The landscape viewed from this KOP is characterized by gently rolling terrain with grasses and dense stands of evergreen and deciduous trees. This landscape is categorized as Developed because of cultural modifications associated with Agra including wood and chain-link fences, light poles, electric distribution lines and commercial structures.

Beggs AR. This KOP represents residential views from the southern edge of the Beggs, Oklahoma. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residential areas. The landscape viewed from this KOP is characterized by gently to moderately rolling terrain in the FG with larger, steeper hills in the MG. Large dense stands of evergreen and deciduous trees cover the landscape in the FG and MG. Given the variation in terrain and vegetation, this KOP is categorized as Distinct. Cultural modifications include residential structures, low wire fences and a distribution line. Views from this KOP are limited by the rolling terrain and dense stands of trees.

Beggs PR. This KOP represents views from a school and an environmental education facility located near the northern boundary of Beggs, Oklahoma. Visual sensitivity at this KOP is moderate because of the low level of use and activities are directed inward to the wetlands features within the environmental education facility. The view from this KOP consists of grasslands with dense stands of evergreen and deciduous trees clustered around rural residences and man-made retention ponds. Grasslands are typical within the region, so this landscape was categorized as Common. Cultural modifications include a boardwalk and picnic pavilion associated with the environmental interpretive center and a chain-link fence around the facility in the FG and residential structures in the MG.

Boynton AR. Views from this KOP represent residential views from the western edge of Boynton, Oklahoma. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residential areas. The landscape viewed from this KOP is categorized as Common because it consists of grasslands and croplands with scattered rural residences with deciduous and evergreen trees clustered around residences and along roadways. Cultural modifications include residential structures, low wire fences, and a distribution line. The level terrain allows for open views of the MG/BG; however, views may be limited by dense stands of trees.

Bristow and Route 66 AR. This KOP represents views from residences located along the southern edge of the town of Bristow, Oklahoma. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residential areas. The view from this KOP is categorized as Common within the FG because it consists of grasslands with pockets of wooded areas interspersed around cleared fields typical within the region. Cultural modifications include electric distribution lines and existing wood H-frame transmission line structures. Views from this KOP are limited by a dense wooded area within the FG.

Cimarron River Crossing PR. This KOP represents the crossing of a major river from a local roadway. Visual sensitivity at this KOP is moderate because from this route, concern for aesthetics is generally secondary to commuting. The landscape viewed from this KOP consists of a wide flat sandy river bottom with riparian vegetation along the banks of the river in the FG and grasslands with scattered trees and small pockets of wooded areas in the MG. Due to the presence of water and variety of vegetation, this landscape is categorized as Distinct. Cultural modifications include a transmission line in the FG (crossing the river) and the MG, and structures associated with agricultural activities. Views from along this roadway are partially limited by the dense riparian vegetation along the banks of the river.

Council Hill AR. This KOP represents views to the north from a residential area along the northern boundary of Council Hill, Oklahoma. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residential areas. From this KOP, the landscape in the immediate FG is categorized as Developed because of cultural modifications associated with Council Hill, and the landscape in the MG is categorized as Common because it consists primarily of grasslands with small pockets of wooded areas. Cultural modifications include fences, barn structures and a distribution line. Views are limited due to the small wooded areas and vegetation along roadways.

Cushing PR. This KOP represents views from a rural residential area northwest of Cushing, Oklahoma. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residential areas. The view from this KOP is characterized as gently to moderately rolling grasslands and croplands with pockets of wooded areas and small man-made retention areas typical within this region, so this landscape is categorized as Common. Cultural modifications include fences, residential structures, out structures associated with farms (e.g., barns, sheds, corrals), in the FG and a communication tower and transmission line in the MG.

Depew and Route 66 AR. This KOP represents views to the northeast from a rural residential area near the northern boundary of Depew, Oklahoma. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residential areas. From this KOP the landscape in the immediate FG is categorized as Developed because of cultural modifications associated with Depew, and the landscape in the MG is categorized as Common because it consists of grasslands/agricultural fields, rolling hills, and pockets of wooded areas. Cultural modifications include residential and commercial buildings. Vegetation screens much of the view past the immediate FG from this KOP, with intermittent views of the MG.

Heyburn Lake PR. This KOP represents views to the southwest from recreational users on the northern side of Heyburn Lake. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from a public park and recreational area. The landscape viewed from this KOP is characterized by a large lake surrounded by riparian vegetation along the edge of the lake. Given the variation in vegetation and the dominant water feature, this landscape is categorized as Distinct. Cultural modifications include recreational facilities associated with the recreation area, including playground equipment and picnic and camping areas. Views from this KOP are limited by the dense vegetation along the southern side of the lake.

Honey Springs Battlefield Historic Site and Rentiesville AR South. This KOP represents views north from the southern boundary of the historic Honey Springs Battlefield site. Visual sensitivity at this KOP is high due to the historic designation of the site. The landscape viewed from this KOP is characterized by level terrain—open fields with pockets of wooded areas. There is a small, narrow stream that meanders through the landscape; however, this water feature does not dominate the landscape. This type of landscape is typical within this region, so this landscape is categorized as Common. Cultural modifications include structures associated with the interpretive facilities including a small bridge, rock interpretive shelter and several stone monuments, and a distribution line.

Honey Springs Battlefield Historic Site AR North. This KOP represents views north from the northern boundary of the historic Honey Springs Battlefield site. Visual sensitivity at this KOP is high due to the historic designation of the site. The landscape viewed from this KOP is characterized by level open fields with pockets of wooded areas around the fields typical within this region, so this landscape is categorized as Common. Cultural modifications include small interpretive signs and a transmission line.

Lake Carl Blackwell AR. This KOP represents views south from the southern side of Lake Carl Blackwell. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from a recreational area. The landscape viewed from this KOP is characterized by level to gently rolling terrain and a large lake with dense stands of riparian vegetation along the banks. Given the variation in vegetation and the dominant water feature, this landscape is categorized as Distinct. Cultural modifications include recreational facilities associated with the recreation area, including picnic shelters, campers, and docks; and a communication tower, cell phone tower and transmission line in the MG.

Marshall AR. This KOP represents a view looking north from a residential area near the northern edge of Marshall, Oklahoma. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residential areas. The view from this KOP is characterized as flat croplands with vegetation along the edge of fields and clustered around residential development typical within this region, so this landscape is categorized as Common. Cultural modifications include small wire fences, residential structures, and a distribution line.

Marshall PR. This KOP represents a view southwest from the southern edge of Marshall, Oklahoma. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residential areas. The view from this KOP is characterized as level to gently rolling terrain and croplands with vegetation along the edge of fields and clustered around residential structures and along small streams that traverse the landscape. Croplands and rural residences are typical within this region, so this landscape is categorized as Common. Cultural modifications consist of residential structures, electric distribution lines, and oil and gas features (i.e., tanks and pump jacks) in the MG and a communication tower in the BG.

McLain AR. This KOP represents the view south from a rural country road near the community of McLain, Oklahoma. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residential areas. The view from this KOP is characterized as level to gently rolling terrain in the FG transitioning to larger hills in the MG. Vegetation includes evergreen and deciduous trees along the edge of fields and clustered around residential structures. The landscape is categorized as Common because it consists primarily of grasslands with small pockets of wooded areas, typical within the region. Cultural modifications include wire fences, residential structures and storage sheds, and a wood H-frame transmission line.

McLain PR. This KOP represents a view east from a rural country road near the community of McLain, Oklahoma. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from a residential area. The view from this KOP is characterized as moderately rolling terrain with open fields and patches of wooded areas typical in the region, so this landscape is categorized as Common. Cultural modifications include wire fences, residential structures, a distribution line paralleling the road and a high-voltage transmission line.

Mehan AR. This KOP represents views north from the eastern edge of Mehan, Oklahoma. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residential areas. The landscape viewed from this KOP is categorized as Common as it consists of open and agricultural fields with pockets of wooded areas and vegetation clustered around rural residences. Cultural modifications include rural residential structures, oil rigs, and transmission lines in the MG.

Mehan PR. This KOP represents views south from the eastern edge of Mehan, Oklahoma. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residential areas. The landscape viewed from this KOP is categorized as Common, because it consists of open and agricultural fields with pockets of wooded areas and vegetation clustered around rural residences. In addition there is a small man-made retention pond. Cultural modifications include rural residential structures, oil rigs and tanks, and a distribution line.

Mulhall AR. This KOP represents views north from the center of Mulhall on the main road through town (Highway 77). Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residences in and near the town center. The landscape viewed from this KOP is categorized as Developed because of the cultural modifications associated with Mulhall, including commercial and residential structures, light poles, a railroad, and distribution line. Views are limited to the FG by the existing buildings and vegetation in and around the town center.

Mulhall PR. This KOP represents views south-southwest from the southern edge of Mulhall, Oklahoma. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from a residential area. The landscape viewed from this KOP is categorized as Common because it consists of gently to moderately rolling grasslands/croplands with pockets of wooded areas, typical within the region. Cultural modifications include short wire fences, residential structures, and structures associated with farming (e.g., barns, storage sheds), and a distribution line.

Okmulgee AR. This KOP represents views to the north from the northern edge of Okmulgee, Oklahoma. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residential areas. The landscape viewed from this KOP is characterized by level terrain in the immediate FG transitioning to moderately rolling in the MG. Agricultural fields with trees lined around the perimeter are visible in the FG and forested hills are visible in the MG. This landscape is typical within the region, so it is categorized as Common. Cultural modifications include low wire fences, gas and oil facilities (pumps and tanks), and a distribution line.

Oktaha School AR. This KOP represents views southeast from a school and baseball field located on the eastern edge of Oktaha, Oklahoma. Visual sensitivity at this KOP is moderate because concern for aesthetics is not the primary focus of viewers associated with the school or ball field, where activities are focused more internally in the park. The landscape viewed from this KOP is categorized as Common because it consists of open grassy fields with small pockets of wooded area and vegetation along drainageways. Cultural modifications include a low wire fence, light poles, gravel parking area, and a transmission line.

Orlando AR. This KOP represents views looking south from the southern edge of Orlando, Oklahoma. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residential areas. Views from this KOP are open due to the level terrain and lack of vegetation. The landscape is categorized as Common because it consists of open fields and croplands with vegetation occurring along roadways and clustered along drainageways; which is typical within the region. Cultural modifications include low wire fences around fields, residential structures, and electric distribution lines in the FG and a transmission line in the MG.

Perkins AR. This KOP represents views looking east from the southeastern edge of Perkins, Oklahoma. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residential areas. The landscape viewed from this KOP is characterized by level open fields in the FG transitioning to moderately rolling wooded hills in the MG. This landscape is typical within the region, so it is categorized as Common. Cultural modifications include low wire fences around fields, residential structures, and electric distribution lines.

Preston AR. This KOP represents views south from the Jim Waller Sports Complex in Preston, Oklahoma. Visual sensitivity at this KOP is moderate because concern for aesthetics is not the primary focus of viewers associated with the sports complex, where activities are focused internally within the complex. The landscape viewed from this KOP is characterized by open fields and small pockets of wooded areas, typical within the region, so this landscape is categorized as Common. Cultural modifications include low fences, residential structures, sheds, and electric distribution lines.

Ripley PR. This KOP represents a view looking northeast from the eastern edge of Ripley, Oklahoma. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residential areas. The landscape viewed from this KOP is characterized by level rangelands and scattered trees in the FG and rolling forested hills in the MG, typical within the region, so this landscape is categorized as Common. Cultural modifications include low fences around rangelands and a distribution line. Views from this KOP are open due to the level terrain and lack of vegetation in the FG.

Shamrock AR. This KOP represents views to the southwest from the western edge of Shamrock, Oklahoma. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residential areas. The landscape from this view is characterized by open fields and scattered trees in the FG and dense wooded areas in the MG. Typical of the region, this landscape setting is categorized as Common. Cultural modifications include low wire fences, residential structures, and electric distribution lines. Views from this KOP are open due to the level terrain and lack of vegetation in the FG.

Shamrock PR. This KOP represents views to the northwest from the western edge of Shamrock, Oklahoma. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residential areas. The landscape from this view is characterized by open fields and scattered trees in the FG and dense wooded areas in the MG. Typical to the region, this landscape setting is categorized as Common. Cultural modifications include low fences. Views from this KOP are open due to the level terrain and lack of vegetation in the FG.

Stillwater PR/AR. This KOP represents views looking south from a residential subdivision in the southern portion of Stillwater, Oklahoma. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from a residential area. From this KOP the landscape is categorized as Developed because of cultural modifications associated with Stillwater. Cultural modifications include residential structures and a communication tower. Views from this KOP are limited because of the dense vegetation surrounding the residential development in the FG.

Summit PR. This KOP represents views southwest from the southern edge of Summit, Oklahoma. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from a residential area. The landscape viewed from this KOP is characterized by open fields and scattered trees, which are typical in this region, so this landscape setting is categorized as Common. Cultural modifications include low wire fences around fields, residential structures, storage buildings, and a transmission line that is a dominant feature in the immediate FG. Views from this KOP are open due to the level terrain and lack of vegetation in the FG.

Taft PR. This KOP represents views south from the southern edge of Taft, Oklahoma. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from a residential area. From this KOP, the landscape is categorized as Developed because of cultural modifications associated with Taft, including a church, commercial and residential structures, light poles, and electric distribution lines. Views from this KOP are limited to the immediate FG by dense wooded areas along the southern edge of the community.

Webbers Falls Reservoir PR/AR. This KOP represents views looking south from the southern side of the Webbers Falls Reservoir. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from a recreation area. The landscape viewed from this KOP is characterized by level terrain and a portion of the reservoir and is surrounded by dense vegetation. Because of variation in vegetation and the presence of the reservoir, this landscape is categorized as Distinct. Cultural modifications are limited to features associated with the recreation area including a playground, road and shelters. Views from this KOP are limited by the dense vegetation in the immediate FG.

3.18.5.4 Region 4

Region 4 is referred to as the Arkansas River Valley Region and includes the Applicant Proposed Route Links 1 through 9 and HVDC Alternative Routes 4-A through 4-E as well as the Lee Creek Variation. The ROI in Region 4 traverses Muskogee and Sequoyah counties in Oklahoma and Crawford, Franklin, Johnson, and Pope counties in Arkansas. The ROI crosses three Level III ecoregions: Arkansas Valley, found primarily along the southern portion of the region; Boston Mountains, found primarily along the northern portion; and a small portion of the Ozark Highlands, located within the northwestern portion of the region. The landscape character within the ROI is predominantly rugged natural areas, mountains, and forested land in the northern portion, which transitions to undulating plains, terraces, cuestas and floodplains associated with the Arkansas River in the southern portion. The rugged hills, mountains, rolling hills, and forested landscapes in the northern portion of the ROI limit distant views, whereas in the southern portion of the ROI the less varied terrain and lack of vegetation allow for expansive view across the landscape (GIS Data Sources: Clean Line 2013a, 2013b; Tetra Tech 2014a). The ROI traverses the Arkansas and Illinois rivers and intermittent and perennial streams such as Little Lee Creek, Lee Creek, Frog Bayou, Illinois Bayou, Mulberry River and Big Penny Creek. Other surface waters in the region include wetlands, impoundment ponds, reservoirs, and several lakes (i.e., Tenkiller Lake, Marble City Lake, Brushy Lake, Reagan Lake, and Ozark Lake). Vegetation consists primarily of oak-hickory forests in the hills to the north and oak-hickory forest, dense deciduous hardwood riparian forest, and scattered prairies in the bottomlands to the south. Cultural modifications include agriculture, croplands, farms and associated appurtenances, natural gas and oil facilities, mining operations, poultry and livestock operations, recreation development, roads, highways, high-voltage transmission lines, and rural residences. Several communities occur within and/or adjacent to the ROI including the towns of Gore and Vain and cities of Marble City and Sallisaw in Oklahoma, the town of Dyer, and the cities of Cedarville, Van Buren, Alma, Kibler, Mulberry, Ozark, Wiederkehr Village, Clarksville, and Lamar in Arkansas.

Visual resources identified in the ROI include rural residences and residences associated with towns and cities, Tenkiller Ferry and Pine Creek Cove State Parks, Sallisaw State Park, Ozark National Forest, Trail of Tears, Arkansas River, Mulberry and Big Piney Creek (both designated as an Arkansas Wild and Scenic River), Little Lee Creek and Lee Creek (both designated as an Oklahoma Scenic River), scenic byways (i.e., Route 21, 23, 71, and

220, State Routes 59 and 282, and Interstates 40 and 540), and several state and national wildlife conservation areas, local and municipal parks, and historic landmarks. Other recreation areas identified within this region include Frog Bayou, Illinois Bayou, Robert S. Kerr, Webbers Fall and Brushy Creek reservoirs, and Marble, Brushy, and Tenkiller lakes.

3.18.5.4.1 Landscape Character Description by KOP

Alma AR. This KOP represents views to the southwest from residences in Alma, Arkansas. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residential areas. The landscape viewed from this location includes wood power poles, wetlands, scattered trees and a low ridge with dense forest in the distance (BG?. Because of the vegetation and terrain visible from this location, this landscape is categorized as common.

Arkansas River at Gore PR/AR. This KOP is the view northwest from a historic ferry crossing and boat launch ramp at Summers Ferry Park Historical Site on the eastern side of the Arkansas River. Visual sensitivity at this KOP is high due to the extended viewing times associated with the historic site and recreational use of the river. Nearby cultural modifications include a picnic and recreation area, parking lot, and boat launch. Looking across the river the dense vegetation along the river banks can be seen as well as a low ridge in the distance. Because the landscape presents unobstructed views of open water, and because of the historic designation and recreational use of the area, this landscape is categorized as Distinct.

Arkansas River PR/AR. This KOP represents the view from the east bank for the Arkansas River west of Gore. The visual sensitivity at this KOP is moderate because, while it represents a major water body, the landscape has already been heavily impacted by cultural modifications. Looking across the river, dense vegetation is visible on the other side with a low bluff in the BG. Cultural modifications in this view include several large existing transmission structures in view. While the river itself has high scenic integrity, due to the proximity to cultural modifications such as nearby dam and existing transmission structures in view, this area is categorized as Common.

Aux Arc Park PR. This KOP represents the view from Aux Arc Park and campground along the southwestern edge of the Arkansas River. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from a public park. The landscape viewed from this location includes open water with low hills and ridges and dense tree growth along the river bank. Cultural modifications include numerous buildings and other structures are visible on the far shore. Open water is dominant from this view and since this represents a scarce resource in the area this landscape is categorized as Distinct.

Big Piney Creek PR. This KOP represents the view looking northeast from a recreation and access point at Big Piney Creek just downstream from the Highway 164 crossing. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from a public recreation area. The landscape viewed from this KOP consists of open water and dense vegetation on either side of the river with a low ridgeline in the distance. From this view, the bridge where Highway 164 crosses Big Piney Creek is also visible, but the landscape is generally free of cultural modifications. Because this area has been primarily left in its natural form and water is a dominant element in view, this landscape is categorized as Distinct.

Bluff Hole Park PR/AR. This KOP represents views looking north from the entrance to Bluff Hole park and picnic area. The visual sensitivity at this KOP is considered high because of the concern for aesthetics and generally long viewing durations associated with a public park and recreation area. While the surrounding park is relatively natural, the landscape being viewed at this KOP contains cultural modifications including various signs and fences as well as both wood and metal power poles with an elevated roadway in the MG. Although this is a recreation area, this particular view contains several cultural modifications and is categorized as Common.

Boys and Girls Camp AR. This KOP represents the view looking north from a youth camp. Since this is a recreation area, the visual sensitivity is high because of the concern for aesthetics and long viewing durations associated with this type of use. The landscape viewed from this location consists of an open field with tall grasses bordered by dense forest. Cultural modifications in view include an existing transmission line and low barbed-wire fence. Because of the vegetation in the area and existing cultural modifications, this landscape is categorized as common.

Brushy Creek Reservoir and Sallisaw State Park PR/AR. This KOP represents the view from the recreational area at Brushy Creek Reservoir. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from a recreation area. The FG view contains picnic benches and grills along the shore of the reservoir. The MG consists of open water bordered by a low ridge with dense trees in the BG. This area has a relatively low amount of cultural modifications, and because water is present and the area is used recreationally, it is categorized as a Distinct landscape.

Cedarville AR. This KOP represents views looking southeast from a partially developed subdivision in Cedarville, Arkansas. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations associated with residences. The view from this KOP is of a small open field in the FG enclosed by rolling hills with dense vegetation in the MG and BG. This KOP is located near developed land, but looks out to a more typical landscape for the region, so the landscape at this KOP is classified as Common.

City Park/Ball Fields and Rudy PR/AR. This KOP is representative of views from a community ball field in Rudy, Arkansas. Visual sensitivity is high from this KOP because of the long viewing durations associated with a public park and recreation area. Looking north, the FG landscape consists of a small open field with several residential structures, garages and utility poles. Large trees are mixed in with the residential area in the MG. Looking southwest from this KOP, the FG views are dominated by various structures and cultural modifications associated with the park. Because this area contains numerous cultural modifications and residential structures, the landscape is classified as Developed.

Clarksville PR/AR. This KOP represents the view looking southeast from the northern edge of the community of Clarksville, Arkansas. Visual sensitivity is high from this KOP because of the long viewing durations associated with residential areas. The landscape viewed from this KOP includes open grassy fields and barbed wire fences in the FG. The MG and BG consist primarily of low, rolling hills with scattered residences. Additional cultural modifications visible on the landscape include several existing transmission structures. Because of vegetation and the agricultural nature of the landscape at this KOP, it is categorized as Common.

Clear Creek Park PR. This KOP represents views from the Clear Creek Park and boat launch area. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from a recreation area. The view looking to the north and northeast looks out across a parking lot in the FG with open water, scattered trees and shrubs in the MG. Beyond that, a dense line of trees can be seen on the far side of the stream bank. Although there are cultural modifications such as picnic areas, signs, and light poles, the surrounding area is in its natural state. These modifications, combined with the presence of a large body of water, resulted in a classification of Distinct.

Coal Hill AR. The KOP at Coal Hill represents views from the northern edge of the community. Visual sensitivity is high from this KOP because of the long viewing durations associated with residential areas to the north. The FG views contain cultural modifications including wood power poles, several residences and outbuildings, and a school bus parking area. In the MG and BG, the landscape consists of rolling hills with scattered trees and residences. The landscape in this area contains some cultural modifications in the FG, but the MG and BG landscape is typical of the area, so it is categorized as Common.

Dyer PR. This KOP represents views from the southeastern edge of the town of Dyer, Arkansas. Visual sensitivity is high from this KOP because of the concern for aesthetics and typically long viewing durations associated with residential areas. This view is looking out over a large, open agricultural field with a dense line of trees and forested ridge in the distance. Also in the vicinity of the KOP are single–family residences. The rural landscape free of heavy cultural modification visible from this KOP is typical of the area and categorized as Common.

East Side City Park PR. This KOP represents views from a community park on the bank of a small body of water. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a community park. Standing on the bank, the view of the landscape consists of open water in the FG and residences and densely forested banks in the MG. Cultural modifications in view include metal power poles and residential structures. There are cultural modifications in view, but because of the presence of water and natural surroundings of the area, the landscape is classified as Distinct.

Field of Dreams PR/AR. This KOP represents views from the Field of Dreams ball field. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a recreation area. In the FG view, the landscape contains multiple fences and tall metal light poles are visible along with wood H-frame transmission structures. Also present are wood shelters and structures associated with the baseball fields. This is a heavily modified area and is categorized as Developed.

Fire Tower Lookout AR. This KOP is representative of views from a recreational area in a National Forest. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a National Forest and recreation area. Looking out from here the landscape consists of a small field surrounded by dense vegetation and varied terrain creating very enclosed views. Because this area is free of cultural modifications and in an area designated as National Forest, it is categorized as Distinct.

Frog Bayou Creek AR. This KOP represents the view looking west from Highway 282, overlooking Frog Bayou Creek. Visual sensitivity is high at this location because it represents a major water body being viewed from a scenic byway. Looking out from an elevated viewing location, the landscape is primarily rolling hills covered in dense trees in the BG, and dense riparian vegetation in the FG/MG. In the MG is a creek that winds through open fields with very few cultural modifications. Because of the elevated viewing location, views are nearly panoramic and bordered by rolling hills covered in dense trees. Immediately behind this viewpoint is Interstate 540, a designated scenic byway. The landscape in this area has been left mostly natural; combined with the presence of a major water body, it is categorized as Distinct.

Hagarville PR/AR. This KOP represents views from the southern edge of Hagarville, Arkansas. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a residential area. The landscape viewed from this location consists of an open field in the FG with multiple large metal buildings and scattered residences. In the MG and BG the landscape turns to high, rolling hills covered in dense vegetation. Because the landscape in this area is not highly developed and contains vegetation and terrain typical for the region, it is categorized as Common.

Highway 10 PR. This KOP is representative of views from a well-traveled highway used by recreationists travelling to and from recreation areas along the Arkansas River. Visual sensitivity is moderate from this location because of the relatively short viewing durations associated with traveling along a highway. Looking to the northwest, the landscape consists of open fields with rolling hills covered in dense trees. The landscape being viewed from this location contains vegetation and landform typical to the area and is categorized as common. Visible cultural modifications are limited to wood transmission poles and the paved road.

Highway 21 Scenic Byway AR. This KOP represents views from Highway 21. Visual sensitivity at this KOP is moderate because from this route, concern for aesthetics is generally secondary to commuting. The landscape viewed to the south/southwest consists of a tall chain-link fence, wood power poles lining the road, and nearby residences in the FG. The MG contains large stands of trees transitioning to rolling hills covered in dense vegetation. The landscape viewed from this location contains typical terrain and vegetation for the area and few cultural modifications and is categorized as Common. It should be noted that this particular section of Highway 21 is not designated as a Scenic Byway.

Highway 82 PR/AR. This KOP represents the views from a highway that is well travelled by recreationist traveling to and from Tenkiller Reservoir and nearby parks. Visual sensitivity at this KOP is moderate because from this route, concern for aesthetics is generally secondary to travelling to a destination. The landscape viewed from this KOP consists of dense vegetation on either side of the highway that traverses the rolling hills. Vegetation and terrain is consistent with the region and this landscape is categorized as Common.

Highway 82 AR 4-B. This KOP represents the views from a highway that is well travelled by recreationalists traveling to and from Tenkiller Reservoir and nearby parks. Visual sensitivity at this KOP is moderate because from this route, concern for aesthetics is generally secondary to travelling to a destination. The landscape viewed from this KOP consists of dense vegetation on either side of the highway that traverses the rolling hills. The landscape viewed in the BG consists of low rolling hills covered in dense tree growth. Vegetation and terrain is consistent with the region and this landscape is categorized as Common. Cultural modifications consist of rural residences and wood power poles.

Horsehead Lake Recreation Area PR. This KOP is representative of the view looking south near the boundary of the Ozark National Forest. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a recreational area in a national forest. The landscape viewed from this location is rolling hills in the MG and a meandering stream surrounded by riparian vegetation in the FG. Because this is national forest land and has been left in its natural state is categorized as Distinct.

Hunt PR. This KOP represents the view looking southeast from the town of Hunt, Arkansas. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a residential area. The landscape being viewed from this location consists of single family residences in the FG and rolling hills with tall stands of trees in the MG and BG. The only cultural modifications in view are the residential structures and the terrain and vegetation is consistent with the region, so the landscape at this KOP is categorized as Common.

Interstate 40 (Scenic Highway) Rest Stop PR. This KOP represents the view looking north from a developed rest stop on westbound Interstate 40, which is a state-designated scenic highway. The visual sensitivity at this KOP is moderate due to the relatively short viewing duration associated with a highway rest area and associated travel. In the FG, the landscape being viewed is a large, open grassy field enclosed in the MG by tall trees. Because the vegetation and landform at this KOP is typical for the region, the landscape is categorized as Common.

Lake Ludwig PR. This KOP represents the view looking south from a recreation area at Lake Ludwig. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a recreation area. The immediate FG includes open water surrounded by dense tree growth that rises to low densely vegetated trees in the MG. Because the view from this KOP is free from any cultural modifications combined with the presence of a large body of water, the landscape is categorized as Distinct.

Lamar AR. This KOP represents a view near the southern edge of the community of Lamar, Arkansas. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a residential area. The landscape in the FG of this view is of agricultural fields with scattered trees and residential structures and barns. Other cultural modifications in the FG are a small church and metal sheds. The BG of this view is rolling hills with dense trees. Although there are some cultural modifications present in view, the landscape is primarily agricultural fields with grasses and pockets of wooded areas and is therefore categorized as Common.

Lee Creek PR. This KOP represents the view from a boat launch and fishing pier at a lake on Lee Creek. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a recreation area. Looking to the north, the landscape consists of open water with a dock leading to a parking lot in the FG surrounded by dense forest creating enclosed views in the MG. Several cultural modifications are present including a dock, light poles and a restroom facility, but because this area is adjacent to open water, which is a unique landscape feature in the area, the landscape is categorized as Distinct.

Little Lee Creek (Scenic River) AR. This KOP represents a view looking northeast from a bridge crossing Little Lee Creek, a designated scenic river. Visual sensitivity from this KOP is high because of long viewing durations associated with the viewing of a scenic river. The landscape viewed from here consists of the river and riparian vegetation covering the banks on either side. In the BG, a ridgeline covered in dense trees is visible. The landscape in this area is in its natural state and the presence of water represents a scarce resource; therefore, the landscape is categorized as Distinct.

Marble City AR. This KOP represents a view from the edge of Marble City, Oklahoma. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a residential area. Looking to the southeast, the FG view consists of single family residences surrounded by open fields with scattered trees in the FG. The MG and BG views consist of rolling hills covered in dense vegetation. Because the landscape being viewed from this KOP consists of vegetation and terrain typical for the region and does not contain cultural modifications other than a few residential structures, the landscape is categorized as Common.

Mulberry. This KOP represents views looking west from a park in Mulberry, Arkansas. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a public park and recreation area. The immediate FG contains playground equipment and an open field bordered by a line of scattered trees. Beyond the trees is an open agricultural field with a line of dense tree growth in the distance. This landscape is categorized as Common because it consists of vegetation and terrain consistent with the region and is free of cultural modifications other than park equipment.

Mulberry River and Trail of Tears PR/AR. This KOP represents views of the Mulberry River from the Trail of Tears. Visual sensitivity at this KOP is high because of the strong concern for aesthetics due to the historical designation. The landscape in the FG view consists of a rocky bank sloping down into open water bordered by riparian vegetation on either side. Looking out to the MG is an open field bordered by a dense line of trees with low rolling hills covered in dense trees. Cultural modifications are limited to a transmission line that crosses the river in the MG. Because the water that is dominant in view represents a scarce resource combined with the lack of cultural modification, the landscape in this area is categorized as Distinct.

Mulberry River AR. This KOP represents a view from the east bank of the Mulberry River. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a public recreation area. The view is dominated by open water in the FG with banks covered in dense trees on either side. A low ridge covered in dense trees is visible in the MG/BG. This is an area free of cultural modification with views of open water and interesting terrain and is therefore categorized as Distinct.

Ozark City Boat Launch PR. This KOP represents the view from the boat launch ramp at the northwestern corner of Ozark City Lake. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a public recreation area. The FG of the landscape being viewed is dominated by open water with the vegetated berm of the dam clearly visible. Across the lake the terrain rises into a low ridge covered in dense trees. This landscape is categorized as Distinct because of the presence of open water and varied vegetation.

Ozark AR. This KOP represents views from the northern edge of the community of Ozark, Arkansas. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a residential area. The landscape being viewed consists of agricultural land in the FG with low forested hills in the MG and BG. Cultural modifications in view are a rural dirt road bordered by wood power poles and scattered rural residences. This landscape consists of agricultural land and vegetation consistent with the region, so it is categorized as Common.

Robert S. Kerr Reservoir PR. This KOP represents views from the Sallisaw Creek Public Use Area at the Robert S. Kerr Reservoir. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a public recreation area. The landscape viewed from the KOP includes picnic structures and scattered trees in the FG. Beyond that, the terrain slopes down slightly to the edge of the water, providing views across open water to forested hills in the MG. Because this landscape is in an area free of major cultural modification and adjacent to a major water body, it is classified as Distinct.

Route 21 (Scenic Byway). This KOP represents views along the scenic byway of Route 21. Visual sensitivity is high from this KOP because of the concern for aesthetics associated with a scenic byway. Looking north, the landscape being viewed from this point consists of a rural road with a few single family residences and small power poles paralleling the road. Dense trees line the road as it transitions to densely vegetated rolling hills in the MG and BG. This landscape is classified as Distinct because it consists of varied terrain and vegetation and has a low number of cultural modifications. Route 21 is also a scenic byway that is used to access a National Forest.

Route 71 (Scenic Byway) AR. This KOP represents views along the scenic byway of Route 71. Visual sensitivity is high from this KOP because of the concern for aesthetics associated with a scenic byway. The landscape being viewed looking south is an agricultural landscape with groupings of trees and slightly rolling terrain. Cultural modifications in the area include wood power poles and scattered residences with surrounding agricultural use buildings. Because this landscape contains vegetation, terrain, and cultural modifications consistent with the region, it is categorized as Common.

Route 220 (Scenic Byway) AR. This KOP represents views looking north along the Route 220 scenic byway. Visual sensitivity is high from this KOP because of the concern for aesthetics associated with a scenic byway. In the FG, a rural road winds through a dense forest with views of rolling hills in the BG. The dense vegetation and rolling terrain create enclosed views of the landscape. Because this landscape consists of a variety of vegetation and interesting terrain with few cultural modifications, it is categorized as Distinct.

Sallisaw PR. This KOP represents the view looking north-northeast along Highway 59 in the community of Sallisaw. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a residential area. The landscape being viewed from here consists of gently rolling terrain with open fields and agricultural lands scattered with groupings of large trees in the FG and MG. In the BG, the landscape consists of rolling hills covered in dense vegetation. Cultural modifications in view include wood power poles, small fences and scattered residences. Because the landscape and vegetation features at this KOP are consistent with the region, it is categorized as Common.

Scott Farm AR. This KOP represents a view from the Scott Farm subdivision near Highway 59. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a residential area. The landscape being viewed to the south consists of gently rolling grassy terrain with cultural modifications including a large wrought iron fence and several residences in the FG and MG. In the BG, a high bluff covered in dense vegetation is visible. Although there are several cultural modifications in view from this KOP, the terrain is somewhat unique to the region, so the landscape is categorized as Common.

Scott Farm PR. This KOP represents a view from the Scott Farm subdivision near Highway 59. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a residential area. The landscape being viewed to the north consists of gently rolling grassy terrain with cultural modifications including a large wrought iron fence and several residences in the FG and MG. In the BG, the landscape consists of rolling hills covered in tall trees. Cultural modifications including communications towers and residences are also visible. Although there are several cultural modifications in view from this KOP, the terrain is somewhat unique to the region, so the landscape is categorized as Common.

Sequoyah NWR Boat Launch PR. This KOP represents views from the boat launch area at the Sequoyah National Wildlife Refuge. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a wildlife refuge. Looking to the north, the landscape being viewed includes open grasslands, wetlands and agricultural fields bordered by dense trees in the BG. This area contains few cultural modifications and the vegetation and terrain are consistent with the region, so the landscape is categorized as Common.

Sequoyah's Cabin. This KOP represents the view looking to the south from Sequoyah's Cabin historic site. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a historic site. The grounds contain interpretive exhibits and historic features including a historic cabin, offices, classrooms, information and gift center and picnic facilities. The view beyond the FG is mostly screened by large trees. Because of the sensitive nature of a historic site, this landscape is categorized as Distinct.

Tenkiller State Park PR/AR. This KOP is located in the southern end of Tenkiller State Park near the water's edge. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a state park and recreation area. Looking out over the open water in the FG, low ridges with dense vegetation are visible in the distance. There are no noticeable cultural modifications in view. Because of the lack of cultural modifications to the landscape, the unique presence of water in the region, and the state park designation, this landscape is categorized as Distinct.

Trail of Tears (Highway 352) PR/AR. This KOP represents views from Highway 352 and the Trail of Tears. Visual sensitivity is high from this KOP because of the sensitive nature of the Trail of Tears. The landscape being viewed includes open agricultural fields and scattered groupings of trees. The landscape in the BG consists of rolling hills covered in dense vegetation. Crossing the road in the FG is an existing wood H-frame transmission line. The rural agricultural nature of this landscape combined with few cultural modifications categorizes this landscape as Common.

Trail of Tears (Route 59) AR. This KOP is representative of the Trail of Tears along Route 59. Visual sensitivity is high from this KOP because of the sensitive nature of the Trail of Tears. Looking north, the landscape consists of open fields with groupings of dense trees in the FG. Densely forested hills rise up in the BG. Cultural modifications present are limited to wood power poles and the highway. The landscape here contains few modifications and has a variety of vegetation and interesting terrain features and is therefore categorized as Distinct.

Trail of Tears and Scenic Highway 220 AR. This KOP represents views from Scenic Highway 220. Visual sensitivity is high from this KOP because of the concern for aesthetics associated with a scenic highway. The landscape being viewed consists of agricultural fields in the FG bordered by a line of dense trees. Cultural modifications include a low fence and wood power poles. In the MG and BG, the landscape consists of rolling hills covered in tall dense trees. Because the terrain and vegetation in view are consistent with the region, the landscape is categorized as Common.

Trail of Tears Route 100 PR. This KOP represents views from the Trail of Tears along SR 100. Visual sensitivity is high from this KOP because of the concern for aesthetics associated with a scenic highway and historic trail. The view from here is dominated by a road lined with dense trees and wood power poles. There are limited cultural modifications to the landscape and the terrain and vegetation are consistent with the region, so the landscape is categorized as Common.

Trail of Tears Wire Road PR. This KOP represents views from the Trail of Tears along Wire Road. Visual sensitivity is high from this KOP because of the concern for aesthetics associated with an historic trail. The landscape being viewed from this KOP consists of open agricultural fields bordered by scattered trees. Cultural modifications present are limited to wood power poles and rural residences and associated agricultural buildings. Because the landscape is made up of elements typical of the region, it is categorized as Common.

Uniontown Highway (Scenic Highway) AR. This KOP is representative of views looking south from Uniontown Highway. Visual sensitivity is high from this KOP because of the concern for aesthetics associated with a scenic highway. The landscape being viewed in this area is of open agricultural fields with scattered trees in the FG transitioning into rolling hills covered in dense vegetation in the MG. The vegetation and terrain at this KOP is typical to the region and cultural modifications visible are limited to a low fence, so the landscape is categorized as Common.

Van Buren PR/AR. This KOP represents views looking northwest from nearby residences in the community of Van Buren, Arkansas. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a residential area. The landscape viewed from this location consists of grassy fields bordered by stands of tall deciduous trees. Cultural modifications include wood power poles and scattered residences and associated outbuildings. Because the landscape elements in this area are typical to the region, the landscape is categorized as Common.

Vian AR. This KOP represents views looking north and northeast from the edge to the community of Vian, Oklahoma. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a residential area. The landscape being viewed in the FG consists of open agricultural fields with scattered trees and low shrubs. In the BG, the landscape consists of low rolling hills covered in dense vegetation. Cultural modifications present include low, barbed wire fences and wood H-frame transmission structures. Because the agricultural landscape in this area is typical of the region, it is categorized as Common.

Vian Lake PR. This KOP represents views from the western edge of Vian Lake. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a recreation area. Looking to the northeast, views are of open water with densely vegetated rolling hills on the opposite side. Cultural modifications present on the landscape include a lattice structure transmission line. The presence of water in this region represents a scarce resource, so this landscape is categorized as Distinct.

Vine Prairie Park PR. This KOP represents views from a park and boat launch area. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a recreation area. The FG view includes a parking area and open water with tall trees and riparian vegetation bordering the banks. In the MG and BG are low, rolling hills covered in dense tree growth. This area is free from cultural modifications other than those associated with the park and the presence of water is a scarce resource, so the landscape is categorized as Distinct.

West Side City Park APR. This KOP represents the view from West Side City Park in Ozark. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a public park and recreation area. Looking north, the FG landscape consists of an open, grassy field bordered by tall coniferous and deciduous trees. Cultural modifications in view include a small shed, metal bleachers and a wood H-frame transmission line. The landscape at this KOP is typical for the region and is therefore categorized as Common.

White Oak AR. This KOP represents views from a small rural road running between the communities of Cravens and White Oak, Arkansas. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a residential area. Looking north, the landscape consists of an open field in the FG bordered by tall trees in the MG and BG. Cultural modifications present consist of a few small structures and a low barbed-wire fence. Because the vegetation, landform, and cultural modifications are typical of the region, this landscape is categorized as Common.

White Oak PR. This KOP represents views from a small rural road running between the communities of Cravens and White Oak, Arkansas. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a residential area. Looking south, views are enclosed by large trees in the FG. Cultural modifications present consist of a few small structures visible through the trees. Because the vegetation, landform, and cultural modifications are typical of the region, this landscape is categorized as Common.

White Oak Park PR. This KOP represents views from the edge of a lake. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a public park and recreation area. The landscape being viewed in the FG consists of a small dock leading out into a large, open water body. In the MG, the lake is bordered by dense tree growth. The BG landscape consists of low, rolling hills with dense vegetation. Because this area represents a recreation area and water body and is free of heavy cultural modification, it is categorized as Distinct.

Wiederkehr Village and Highway 186 PR/AR. This KOP represents the view along Highway 186 looking northwest. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a residential area. The landscape viewed consists of an open, agricultural field in the FG. In the MG, there are residential and agricultural structures with scattered trees. The BG landscape consists of rolling hills with dense vegetation. The landscape and vegetation features at this KOP are typical for the region, so the landscape is categorized as Common.

3.18.5.5 Region 5

Region 5 is referred to as the Central Arkansas Region and includes the Applicant Proposed Route Links 1 through 9, HVDC Alternative Routes 5-A through 5-F, and the Arkansas Converter Station Alternative Siting Area and AC interconnection siting area. The ROI in Region 5 traverses Pope, Conway, Van Buren, Faulkner, Cleburne, White, and Jackson counties in Arkansas. The ROI crosses three Level III ecoregions: Arkansas Valley, which covers the majority of the region; Boston Mountains, which covers a small portion of the region in the north; and a small portion of the Mississippi Alluvial Plain, which covers the southeastern portion of the region. The landscape character within the ROI consists of varied terrain with low rugged hills, mountains, and benches in the northern portion transitioning to undulating plains, terraces, cuestas, and floodplains associated with the Arkansas River in the south. Generally, views are restricted in the northern portion of the ROI because of the rugged terrain and forested landscapes. In the southern portion of the ROI, the level to nearly level floodplains and pastureland and agricultural fields allow more expansive views in some areas. Views are limited primarily by rows of trees planted along fields and roads and riparian vegetation along waterways and drainages (GIS Data Sources: Clean Line 2013a, 2013b; Tetra Tech 2014a). The southwestern portion of the ROI crosses the Arkansas River, and the eastern portion of the ROI crosses the Little Red River and White River along with several smaller rivers and creeks such as Illinois Bayou and Cadron Creek. Other surface waters in the region include wetlands, impoundment ponds, and some small lakes and reservoirs, and the larger Greers Ferry Lake to the north. Vegetation consists primarily of oak-hickory forests, dense deciduous hardwood riparian forest, and scattered prairies and oaks in the south. Cultural modifications include croplands, poultry and livestock operations, farms and associated appurtenances, recreation development, natural gas facilities, logging and mining operations, roads and highways, electric distribution lines and several high-voltage transmission lines, and rural residences and suburban residential developments. Several communities occur within and/or adjacent to the ROI including the towns of Dover, Hector, Damascus, Guy, Twin Groves, Rose Bud, and Letona and the cities of Quitman and Bradford.

Visual resources identified in the ROI include rural residences and residences associated with towns and cities, Ozark National Forest, Woody Hollow State Park, Bald Knob NWR, Greers Ferry Lake, scenic byways (i.e., Applicant Proposed Route Links 5, 7, 9, 16, 25, 27, and 65), several state wildlife conservation areas, local and municipal parks, and historic landmarks.

3.18.5.5.1 Landscape Character Description by KOP

Boy Scout Campground PR/AR. This KOP represents the view from the eastern side of a Boy Scout campground. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a public park and recreation area. The landscape in this area is a mostly natural area with rolling terrain and dense trees. Views are enclosed due to the dense vegetation in the FG. Nearby cultural modifications include a campground and recreational facilities associated with the Boy Scout camp. This landscape consists of vegetation and terrain features typical to the region and is categorized as Common.

Bradford. This KOP represents views looking northwest from a residential area north of the community of Bradford, Arkansas. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a residential area. The landscape being viewed from this KOP consists of grassy open areas with scattered trees and residential structures in the FG and groupings of dense trees in the MG and BG. Because the vegetation and cultural modifications at this KOP consist of vegetation and terrain typical for the region, it is categorized as Common.

Damascus AR. This KOP is representative of views from a residential area near the southern edge of the community of Damascus, Arkansas. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a residential area. Looking to the southwest, views of the landscape consist of open fields with groupings of dense tree growth and scattered rural, single family homes. The terrain and vegetation is consistent with the region, so the landscape is categorized as Common.

Damascus PR. This KOP is representative of views from a residential area near southern edge of the community of Damascus, Arkansas. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a residential area. Looking to the north/northwest, views of the landscape consist of open agricultural fields in the FG with scattered trees and rural, single family homes. The BG landscape consists of rolling hills covered in dense vegetation. The terrain and vegetation is consistent with the region, so the landscape is categorized as Common.

Dover and J.P. Lovelady Ball Park PR/AR. This KOP represents views from a park on the northern side of the rural community of Dover. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a public park and recreation area. The landscape viewed in the FG includes agricultural fields with groupings of trees. Cultural modifications to the landscape include residences, wood power poles, fences, and a roadway. In the BG are low, forested ridges. Since the vegetation, landform and cultural modifications in view from this KOP are typical to the region, the landscape is categorized as Common.

Guy PR/AR. This KOP represents typical views from the north central part of the community of Guy, Arkansas. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a residential area. The landscape viewed consists of rolling hills with dense trees and multiple residences. Cultural modifications include wood power poles and residential structures. The vegetation and landform in this area is consistent with the region, so the landscape is categorized as Common.

Hector PR/AR. This KOP represents views from a residential area on the southern edge of Hector, Arkansas. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a residential area. The landscape viewed from this KOP consists of a road lined with tall, densely growing trees. Cultural modifications in view include wood power poles and scattered residential and commercial structures. The landscape in this area contains landform and vegetation typical of the region and so is categorized as Common.

Highway 7 (Scenic Byway) AR. This KOP represents the view looking north from the Highway 7 Scenic Byway. Visual sensitivity is high from this KOP because of the high level of concern for aesthetics associated with a Scenic Byway. Views are of scattered rural residences surrounded by small agricultural fields and rolling hills with dense trees. Cultural modifications to the landscape include small power poles, barbed-wire fences, and scattered residential homes. The landscape at this KOP consists of vegetation and landform consistent with the region and is categorized as Common.

Highway 7 (Scenic Byway) PR. This KOP represents the view looking north from the Highway 7 Scenic Byway. Visual sensitivity is high from this KOP because of the high level of concern for aesthetics associated with a Scenic Byway. The landscape being viewed consists of a rural highway lined with tall trees and dense vegetation. The views are mostly enclosed, but a low ridgeline can be seen in the distance through breaks in the trees. Because the vegetation, landform and cultural modifications are consistent with the region, this landscape is categorized as Common.

Highway 9 (Scenic Highway) AR. This KOP represents the view looking south from the Highway 9 Scenic Highway. Visual sensitivity is high from this KOP because of the high level of concern for aesthetics associated with a scenic highway. Views are of low rolling terrain consisting of open agricultural fields and scattered groupings of trees with a forested ridge in the BG. Cultural modifications visible include scattered residences, barns, sheds and commercial business structures. The landscape viewed from this KOP consists of vegetation and terrain typical to the region and without extensive cultural modification, and is therefore categorized as Common.

Highway 9 (Scenic Highway) PR. This KOP represents the view looking south from the Highway 9 Scenic Highway. Visual sensitivity is high from this KOP because of the high level of concern for aesthetics associated with a scenic highway. Views are of low rolling terrain consisting of open agricultural fields with groupings of dense trees. Cultural modifications are limited to a low fence and wood power poles. The landscape viewed from this KOP consists of vegetation and terrain typical to the region without extensive cultural modification, and is therefore categorized as Common.

Highway 16 (Scenic Highway) AR. This KOP represents a view looking south from the Highway 16 Scenic Highway. Visual sensitivity is high from this KOP because of the high level of concern for aesthetics associated with a scenic highway. Views are of flat, open agricultural fields with dense patches of trees. This landscape has vegetation and terrain typical to the region and so is categorized as Common.

Highway 16 (Scenic Highway) AR/PR. This KOP represents views looking south from the Highway 16 scenic highway. Visual sensitivity is high from this KOP because of the high level of concern for aesthetics associated with a scenic highway. Views include a rural landscape with rolling hills, low ridges, open fields, and dense trees. Cultural modifications include residential structures and metal barns visible in the FG. The landscape viewed from this KOP consists of vegetation and terrain typical of the region without extensive cultural modification, and is therefore categorized as Common.

Highway 25 Scenic Highway. This KOP represents views looking south from Highway 25. Visual sensitivity is high from this KOP because of the high level of concern for aesthetics associated with a scenic highway. The landscape viewed from this KOP contains cultural modifications including scattered residences and commercial buildings in the FG. Vegetation in the FG consists of scattered trees and a low ridgeline with dense trees is visible in the BG. Because the landscape elements are typical for the region, this landscape is categorized as Common.

Letona PR. This KOP represents views looking from the community of Letona, Arkansas. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a residential area. In the FG view are numerous cultural modifications including scattered residences, roads, and wood power poles. Vegetation in the FG consists primarily of scattered trees. In the MG/BG, dense trees and ridgelines are visible. The landscape in this area has considerable cultural modifications when compared to the rest of the region and so is categorized as Developed.

Pope County Residential Cluster PR/AR. This KOP represents views looking north/northwest from a cluster of residences in Pope County, Arkansas. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a residential area. Views are of a small open field with groupings of trees in the FG bordered by residences and a small church. In the MG, there is a high ridge covered in dense trees. Because the landscape being viewed from this KOP contains interesting terrain features and a low number of cultural modifications, it is categorized as Distinct.

Quitman PR/AR. This KOP is the view looking south from the southern edge of the community of Quitman, Arkansas. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a residential area. The landscape being viewed in the FG consists of an open agricultural field and a road lined with wood power poles. In the MG, several residences and scattered trees are visible. The landscape in the BG is low hills covered in dense vegetation. Because the landform and vegetation are typical for this region, the landscape is categorized as Common.

Rose Bud City Park PR/AR. This KOP represents the view looking north from a city park near the southern edge of the community of Rose Bud, Arkansas. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a public park and recreation area. The landscape in view consists of an open field with scattered trees and contains cultural modifications including a small picnic pavilion and a chain-link fence. Beyond the park in the MG, residential and commercial structures with scattered trees and shrubs are visible.

The views are enclosed in the BG by a line of dense trees. The landscape at this KOP contains a high number of cultural modifications not typical in this region and is categorized as Developed.

Steprock PR/AR. This KOP represents views looking south-southeast from the community of Steprock, Arkansas. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a residential area. The FG views consist of gently rolling terrain with scattered groupings of trees. Cultural modifications in view include several residences, sheds, and an existing high-voltage 500kV lattice structure transmission line. Because of the existing cultural modifications, this landscape is characterized as Developed.

Twin Groves PR/AR. This KOP represents views from rural residences near the edge of the community of Twin Groves, Arkansas. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a residential area. The views from this location are enclosed by dense trees that line a small road. Cultural modifications are limited to street signage and wood power poles. This type of terrain and vegetation is typical of the region and so is characterized as Common.

White River AR. This KOP represents views looking northeast from the south bank of the White River, near Jackson Road 177. Visual sensitivity is high from this KOP because of the concern for aesthetics associated with a scarce resource such as a major water body. The FG view is dominated by open water with dense riparian vegetation lining each bank. This is a major water body and is not typical for this region. Because of the uniqueness of the vegetation and the presence of water, combined with no cultural modifications in view, this landscape is categorized as Distinct.

White River PR. This KOP is representative of views looking southeast from the Highway 67 bridge crossing the White River. Visual sensitivity is high from this KOP because of the concern for aesthetics associated with a scarce resource such as a major water body. Views are of a flat landscape with open water bordered by a mix of low vegetation and trees. In the MG, an open field is visible with a row of dense trees in the BG. Because water represents a unique landscape in this region, and the area is free of cultural modifications, this landscape is categorized as Distinct.

Wonderview School AR. This KOP represents the view looking south-southwest from the school and nearby residences. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a residential area. Views of the BG include dense trees and gently rolling hills with scattered residences. The view includes open agricultural fields in the FG with scattered groupings of trees. Cultural modifications in view include wood power poles, street signs, and structures associated with rural residences. The terrain and vegetation viewed from this KOP are typical of the region and it is categorized as Common.

Wonderview School PR. This KOP represents views looking north from the school and nearby residences. Visual sensitivity is high from this KOP because of the concern for aesthetics and long viewing durations associated with a residential area. The view from this KOP consists of a row of tall trees in the FG that provide some screening, but looking through the trees gives views of a broad valley in the MG with rolling hills and dense trees. In the BG, the landscape consists of rolling hills covered in dense vegetation. The variety of vegetation and somewhat unique terrain for the region, combined with the low number of cultural modifications, gives this landscape the categorization of Distinct.

3.18.5.6 Region 6

Region 6 is referred to as the Cache River and Crowley's Ridge Region and includes the Applicant Proposed Route Links 1 through 8 and HVDC Alternative Routes 6-A through 6-D. The ROI in Region 6 traverses Jackson, Cross, and Poinsett counties in Arkansas. The ROI crosses two Level III ecoregions: Mississippi Alluvial Plain, which covers the majority of the region, and Mississippi Valley Loess Plains, which run north and south through the central portion of the ROI and are associated with the South Francis River. The landscape character within the ROI is predominately agricultural, croplands, and natural areas including riparian woodlands and wetlands. The terrain is relatively flat to gently undulating with several meandering streams, branching channels, and other drainages. Views are generally open given the level terrain, although wooded areas and trees planted along the edges of field and roadways can limit expansive views in some areas (GIS Data Sources: Clean Line 2013a, 2013b; Tetra Tech 2014a). In the western portion of the region, the ROI crosses the White and Cache rivers, and in the east, the ROI crosses the Little River. The ROI crosses other surface waters including oxbow lakes, wetlands, impoundment ponds, lakes, reservoirs, and several small intermittent and perennial streams. Many of the streams are channelized and flood-control structures are common in this region. Vegetation consists of oak-hickory forests in the northern portion of the ROI and deciduous hardwood riparian forest and tall grass prairies and oaks to the south. Cultural modifications include croplands, poultry and livestock operations, farms and associated appurtenances, residential and commercial development, natural gas facilities, logging and mining operations, roads and highways, electric distribution lines and several high-voltage transmission lines, and rural residences and suburban residential developments. Several communities occur within and/or adjacent to the ROI including the towns of Fisher, Weldon, and Amagon and the cities of Cherry Valley and Marked Tree.

Visual resources identified in the ROI include rural residences and residences associated with towns and cities, Lake Poinsett State Park, Cache River NWR, Crowley's Ridge Parkway National Scenic Byway (State Route 163), and several state conservation areas and historic landmarks.

3.18.5.6.1 Landscape Character Description by KOP

Amagon AR. This KOP represents views west and southwest from the center of Amagon, Arkansas. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from commercial and residences in and near the town center. The landscape viewed from this KOP is categorized as Developed because of cultural modifications associated with Amagon, including commercial buildings and residential structures, light poles, and electric distribution lines. Views are limited to the FG by the existing buildings and vegetation in and around the town center.

Cherry Valley PR. This KOP represents views north from the northern edge of Cherry Valley, Arkansas. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from a residential area. From this KOP, the landscape is categorized as Common because it consists of agricultural fields lined with deciduous trees, typical within the region. Cultural modifications include storage buildings associated with agricultural lands and electric distribution lines.

Crowley's Ridge Scenic Byway AR. This KOP represents views southeast from Crowley's Ridge Scenic Byway (southbound). Visual sensitivity at this KOP is high due to the road's scenic designation. The landscape viewed from this KOP is categorized as Common because it consists of open fields lined with vegetation and pockets of wooded areas (such as the one that borders the roadway to the west), typical within the region. Cultural modifications include electric distribution lines. Views to the east and southeast from this KOP are open in the FG/MG due to the level terrain and lack of vegetation; views are limited to the west due to the dense wooded area in the immediate FG.

Crowley's Ridge Scenic Byway PR. This KOP represents the view looking north from the Crowley's Ridge Scenic Byway. Visual sensitivity at this KOP is high due to the road's scenic designation. The roadway is adjacent to a ridge and winds through dense forests on both sides. The landscape viewed from this KOP is not typical within the area; therefore it is categorized as Distinct. Cultural modifications include a distribution line. Views in this area are enclosed and limited to the immediate FG due to the terrain and dense vegetation.

Fisher and Park AR. This KOP represents views looking south from the entrance of a community park near the southern edge of Fisher, Arkansas. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residences. The landscape viewed in the immediate FG from this KOP is categorized as Developed because of cultural modifications associated with Fisher; views in the MG are categorized as Common because they consist of open fields and pockets of wooded areas. Cultural modifications include residential structures, light poles, and electric distribution lines.

Fisher and Park PR. This KOP represents views looking east from the entrance of a community park near the southern edge of Fisher, Arkansas. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residences. The landscape viewed from this KOP is categorized as Developed because of cultural modifications associated with Fisher. Cultural modifications include residential and commercial structures, storage structures, chain-link fences, a playground, and electric distribution lines.

Highway 14 Scenic Highway AR. This KOP represents the view looking east along Highway 14 west of Amagon, Arkansas. Visual sensitivity at this KOP is high due to the roads scenic designation. The landscape viewed from this KOP is categorized as Common because it consists of open fields and scattered rural residences and wooded areas typical within the region. Cultural modifications include residential structures and electric distribution lines in the FG/MG, and a communication tower in the BG. Views are open due to the level terrain and lack of vegetation in the FG.

Weldon PR/AR. The Weldon KOP represents views looking north from Highway 17 near the northern edge of Weldon, Arkansas. The view consists primarily of flat agricultural land with few cultural modifications such as wood power poles and an existing steel monopole transmission line. Scattered trees dot the landscape with a row of dense trees in the distance. This landscape has some modification and is categorized as Developed.

3.18.5.7 Region 7

Region 7 is referred to as the Arkansas Mississippi River Delta and Tennessee Region and includes the Applicant Proposed Route Links 1 through 5, HVDC Alternative Routes 7-A through 7-D, and the Tennessee converter station siting area. The ROI in Region 7 traverses Poinsett and Mississippi counties in Arkansas and Tipton and Shelby counties in Tennessee. The ROI crosses two Level III ecoregions: Mississippi Alluvial Plain, which covers the eastern portion of the region, and Mississippi Valley Loess Plains, which cover the western portion of the region. The landscape character within the ROI is predominantly agricultural and natural with some developed areas in Tennessee. The terrain primarily consists of flat, level floodplains associated with the Mississippi River in the western and central portion of the ROI that transition to gently undulating plains and low hills in the eastern portion of the ROI. Although the terrain is primarily flat within this region, views are typically limited given the numerous forested areas, vegetation associated with surface waters, waterways, drainages, wetlands, and trees planted along agricultural fields and along roadways (GIS Data Sources: Clean Line 2013a, 2013b; Tetra Tech 2014a). The ROI traverses the Mississippi River and its tributaries from north to south. The ROI crosses other surface waters including wetlands, several small streams, levees, drainage channels, and impoundment ponds. Vegetation consists primarily of riparian woodland and wetland species with smaller patches of hardwood forests dispersed throughout the region. Cultural modifications include croplands, pastures, agricultural operations, roads and highways, electric distribution lines and several high-voltage transmission lines, and rural residences and suburban residential developments. Dispersed rural residence and several small communities in Arkansas occur within and adjacent to the ROI in the western and eastern portion of Region 7 including towns of Tyronza, Dyess, Bassett, Birdsong, Marie, and Wilson and the cities of Joiner and Marked Tree. In the eastern portion of the ROI in Tennessee, larger communities are concentrated closer to one another and there is more dense mixed development including the town of Atoka and Tipton and cities of Millington and Munford. In addition, large private estates are common in the eastern portion of the ROI. The Naval Air Station Memphis at Millington is also located within the eastern portion of the ROI.

Visual resources identified in the ROI include rural residences and residences associated with towns and cities, Hampson-Archeological Museum State Park, Meeman-Shelby Forest State Park, Mississippi River (including a scenic trail), St. Francis River, Lower Hatchie NWR, Trail of Tears, Scenic Route 61, Scenic Byway 63, and several state wildlife conservation areas and municipal parks.

3.18.5.7.1 Landscape Character Description by KOP

Atoka PR/AR. This KOP represents views from the edge of a residential neighborhood in Atoka, Tennessee. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residences. The landscape viewed from this KOP is categorized as Common because it consists of agricultural fields surrounded by wooded areas, typical within the region. Cultural modifications include a lattice communication tower in the MG.

Atoka Community Park PR/AR. This KOP represents views from a community park and recreation area in Atoka, Tennessee. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from a community recreation area and nearby residences. From this KOP, the landscape in the FG is categorized as Developed because of cultural modifications associated with the recreation facility. Cultural modifications include ball fields, light poles, fences, and covered picnic areas, and a playground. Views from this KOP are limited to the immediate FG due to the dense wooded area surrounding the park.

Aycock Park and Millington AR. This KOP represents views from a community park and recreation area in Millington, Tennessee. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from a community recreation area and nearby residences. The landscape viewed from this KOP is categorized as Developed because of the cultural modifications associated with Millington. Cultural modifications include ball fields and backstops, playground fences, electric distribution lines, light poles, a church, and a highway. Views from this KOP are limited to the immediate FG because a dense wooded area surrounds the park.

Birdsong PR. This KOP represents views from the northern edge of the small rural community of Birdsong, Arkansas. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from a residential area. The landscape viewed from this KOP is characterized by agricultural fields lined with trees and pockets of wooded areas. This type of landscape is typical within the region and was therefore categorized as Common. Cultural modifications are limited to residential structures and electric distribution lines.

Dyess AR. This KOP represents views looking south from the southern edge Dyess, Arkansas. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from a residential area. The landscape viewed from this KOP is characterized by agricultural fields lined with trees and scattered residences. This type of landscape is typical within the region and was therefore categorized as Common. Cultural modifications include residential structures and electric distribution lines. Views from this KOP are open due to lack of vegetation in the FG/MG.

Edmund Orgill Park PR/AR. This KOP represents views from the southern edge of a lake in Edmund Orgill Park. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from a community park and recreation area. The landscape viewed from this KOP is characterized by level terrain in the immediate FG and a large expansive lake in the FG/MG and dense vegetation along the northern edge of the lake. Given the dominance of the water feature and the variation in vegetation around the lake, this landscape is categorized as Distinct. Cultural modifications include recreational elements associated with the park, including a boat launch, a small picnic shelter and low wood fences.

Harold Park and Millington AR. This KOP represents views west from a park in the town of Millington, Tennessee. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from a community park and residential area. The landscape viewed from this KOP is categorized as Developed because of cultural modifications associated with Millington. Cultural modifications include residential structures and electric distribution lines. Views from this KOP are limited to the FG by the vegetation that surrounds residences and wooded areas in the MG.

Harold Park and Millington PR/AR. This KOP represents views north from a park in the town of Millington, Tennessee. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from a community park and residential area. The landscape viewed from this KOP is categorized as Developed because of cultural modifications associated with Millington. Views are similar to those described from the Harold Park and Millington AR KOP above.

Highway 61 (Scenic Byway) PR. This KOP represents views looking northeast from Highway 61 Scenic Byway near the northern edge of Frenchmans Bayou, Arkansas. Visual sensitivity at this KOP is high due to the scenic designation of the roadway. The landscape viewed from this KOP is categorized as Common, as the area consists of agricultural fields surrounded by trees, rural residents, and small pockets of wooded areas. Cultural modifications include residential structures and electric distribution lines.

Johnny Cash Home AR. This KOP represents the view looking south from Johnny Cash's childhood home near Dyess, Arkansas. The house is an Arkansas State University Heritage site. Visual sensitivity at this KOP is high due to the historic designation. The landscape viewed from this KOP is categorized as Common, as the area consists of agricultural fields surrounded by trees and small pockets of wooded areas. Cultural modifications include the historic home and electric distribution lines. Views from this KOP are open due to the lack of vegetation in the FG/MG.

Joiner PR. This KOP represents views looking south from the southern edge of Joiner, Arkansas. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from a residential area. The landscape viewed from this KOP is categorized as Common, as the area consists of agricultural fields surrounded by trees and small pockets of wooded areas. Cultural modifications include residential structures and electric distribution lines. Views from this KOP are open due to the lack of vegetation in the FG/MG.

Lower Hatchie NWR AR. This KOP represents views to the southeast from the Lower Hatchie NWR just east of the Mississippi River in Tennessee. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from national wildlife refuge. The landscape viewed from this KOP is characterized by gently to moderately rolling terrain and small ponds in the FG, wooded areas in the MG, and low forested hills in the BG. Given the variation in vegetation, landform, and the presence of water; this landscape is categorized as Distinct. Views are open due to limited vegetation in the FG/MG.

Marked Tree PR/AR. This KOP represents views from a municipal park in the community of Marked Tree, Arkansas. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from a community park and nearby residential area. The landscape viewed from this KOP is categorized as Developed because of cultural modifications associated with Marked Tree. Cultural modifications include residential and commercial structures, ball fields, chain-link fences, light poles, and electric distribution lines. Views from this KOP are limited by development and vegetation in the immediate FG.

McGavock-Grider Park AR. This KOP represents the view from a small memorial park on State Route 61 south of Osceola, Arkansas. Visual sensitivity at this KOP is moderate because this is a small park with no recreational facilities; viewing durations are not anticipated to be very long. The landscape viewed from this KOP is categorized as Common, because the area consists of agricultural fields surrounded by trees and wooded areas. Cultural modifications include electric distribution lines and transmission lines in the MG. Views are generally open due to the lack of vegetation in the FG/MG.

Millington East AR. This KOP represents views looking southeast from the edge of a residential neighborhood in Millington, Tennessee. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residential areas. The landscape viewed from this KOP is categorized as Common because it consists of agricultural fields surrounded by trees and small pockets of wooded areas. Cultural modifications include a transmission line in the MG. Views are typically limited to the FG due to the dense vegetation around agricultural fields.

Millington USA Baseball Stadium AR. This KOP represents views south and west from a large baseball park complex in Millington, Tennessee. Visual sensitivity at this KOP is moderate because concern for aesthetics is not the primary focus of viewers associated with the ball field, where activities are focused inside the park. The landscape viewed from this KOP is categorized as Developed because of cultural modifications associated with Millington. Cultural modifications include ball fields, dugouts, restroom facilities, light poles, chain-link fences, commercial and residential structures, and electric distribution lines; a communication tower is visible in the MG. Views from this KOP are limited to the FG due to development, dense wooded areas to the south and vegetation surrounding residential homes to the west.

Mississippi River and Trail of Tears AR. This KOP represents views from the southern bank of the Mississippi River looking northeast. Visual sensitivity at this KOP is high as it represents a view from a scenic recreation area and national historic trail. The landscape viewed from this KOP consists of the Mississippi River, a dominant water feature in the landscape, bordered by dense vegetation along the northern bank. Due to the presence of water, the variety of vegetation this landscape is categorized as Distinct. Cultural modifications include a transmission line that crosses the river.

Mississippi River and Trail of Tears PR. This KOP represents views looking northwest from a local road near the Mississippi River and Trail of Tears. Visual sensitivity at this KOP is high as it represents a view from a scenic recreation area and historic trail. The view is dominated by open agricultural fields bordered by wooded areas, typical within the region, so this landscape is categorized as Common. The Mississippi River is visible in the distance but is not a dominant feature in the landscape. Cultural modifications include irrigation equipment silos and storage garage for farming equipment. Views from this KOP are open due to the lack of vegetation in the FG/MG.

Munford PR/AR. This KOP represents views southwest from a mixed residential and commercial area in southern Munford, Tennessee. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residents in the area. The landscape viewed from this KOP is categorized as Developed because of cultural modifications associated with Munford including residential and commercial structures, chain-link fences, electric distribution lines and a transmission line. Views from this KOP are limited to the FG due to dense wooded areas surrounding the community.

Rhodes Estates AR. This KOP represents views northeast from a residential area near Tipton, Tennessee. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residents in the area. The landscape viewed from this KOP is categorized as Developed because of cultural modifications associated with Rhodes Estates including residential structures, wooden fences, electric distribution lines and a transmission line. Views from this KOP are limited due to trees clustered around residences and wooded areas in the MG.

Rhodes Estates PR. This KOP represents views southeast from a residential area near Tipton, Tennessee. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residents in the area. The landscape viewed from this KOP is similar to the landscape viewed for the Rhodes Estates AR KOP in that it is categorized as Developed because of cultural modifications associated with Rhodes Estates including residential structures, wooden fences, and electric distribution lines. Views from this KOP are also limited due to trees clustered around residences and wooded areas in the MG.

Rockyford Park AR. This KOP represents views from a neighborhood park in a residential area in northern Bartlett, Arkansas. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residents and park users. The landscape viewed from this KOP is categorized as Developed because of cultural modifications associated with the Rockyford subdivision including a man-made pond, residential structures, benches, signs, a trail, light poles, and electric distribution lines. Views from this KOP are limited to the FG due to residential structures, scattered trees and wooded areas surrounding the subdivision.

Tyronza AR. This KOP represents views looking northwest from the western edge of Tyronza, Arkansas. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from a residential area. The view from this KOP consists of croplands with vegetation along the edge of fields and wooded areas. Croplands are typical within this region, so this landscape is categorized as Common. Cultural modifications include electric distribution lines. Views from this KOP are open due to the level terrain and lack of vegetation in the FG/MG.

Tyronza PR. This KOP represents views looking northwest from the western edge of Tyronza, Arkansas. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from a residential area. The landscape viewed from this KOP is categorized as Developed because of cultural modifications associated Tyronza, including residential and commercial structures, fence posts, chain-link fences, and electric distribution lines. Views are open due to open fields and the lack of vegetation in the immediate FG.

Wilkinsville AR. This KOP represents views south-southeast from the southern edge of Wilkinsville, Tennessee. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residential areas. The landscape viewed from this KOP is categorized as Common, because the area consists of agricultural fields with pockets of wooded areas in the MG. Cultural modifications include irrigation equipment. Views from this KOP are open due to lack of vegetation in the immediate FG.

Wilkinsville AR. This KOP represents views southeast from the eastern edge of Wilkinsville, Tennessee. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from residential areas. The landscape viewed from this KOP is categorized as Common, because the area consists of agricultural fields with small clumps of vegetation in the FG and pockets of wooded areas in the MG. Cultural modifications include residential structures, irrigation equipment, electric distribution lines and communication towers. Views are partially obstructed due to scattered vegetation in the immediate FG.

Wilson Park AR. This KOP represents views from Hudson Wren Memorial Park near the northwestern edge of Wilson, Arkansas. Visual sensitivity at this KOP is high because of the strong concern for aesthetics and long viewing durations from nearby residential areas and this public park. The landscape viewed from this KOP is categorized as Common, as the area consists of agricultural fields with pockets of wooded areas in the MG/BG and vegetation concentrated around scattered rural residences. Cultural modifications include electric distribution lines and residential structures in the MG. Views from this KOP are open due to the lack of vegetation in the FG.

3.18.5.8 Connected Actions

3.18.5.8.1 Wind Energy Generation

Wind energy development is a connected action to the Project. To assist in evaluating the potential environmental impacts of that wind energy development, the Applicant attempted to identify the likely locations of the wind energy development that would utilize the capacity on the HVDC transmission line. The Applicant identified thirteen WDZs, each within a 40-mile-radius of the Texas County Converter Station Siting Area with adequate wind resource and within which future development of wind energy facilities could occur. (see Figure 3.17-1 in Appendix A). The WDZs include approximately 1,700 square miles, or 1,082,000 acres in Oklahoma (Beaver, Cimarron, and Texas counties) and Texas (Hansford, Ochiltree, and Sherman counties). According to the BLM sponsored study “Wind Turbine Visibility and Visual Impact Threshold Distances in Western Landscapes” (Sullivan et al. 2011), given the right conditions, wind turbines can be visible at more than 36 miles and may be noticeable to the casual observer at distances up to 20 miles. Because of these findings, the ROI for the wind energy generation has been set at 30 miles from the boundary of each WDZ. Consistent with the Project, EPA Level III ecoregions were used to develop a description of the existing landscape character.

3.18.5.8.1.1 WDZ-A

WDZ-A falls primarily within the High Plains ecoregion. This ecoregion is characterized by gently rolling terrain with occasional sand plains and hills along with scattered playa depressions. Vegetation is primarily short and midgrass prairie scattered with other types of vegetation including Harvard shin oak, fourwing saltbush, sand sagebrush, and yucca. The generally flat, open landscape provides largely unobstructed panoramic views and the horizontal lines of the landform are occasionally interrupted with vertical elements such as grain silos, transmission structures, and scattered rural residences and farms, which can be visible from long distances.

The far western portion of WDZ-A transitions in the Southwestern Tablelands ecoregion and is characterized by broad, elevated tablelands with shallow canyons, mesas, badlands, gorges, and dissected river breaks. Vegetation in the region consists primarily of shortgrass prairie with some scattered riparian areas. The open landscape of this ecoregion offers broad panoramic views with strong horizontal lines and provides typical views similar to the High Plains ecoregion.

Cultural modifications within the ROI are primarily cropland and grazing land with associated buildings and that is occasionally interrupted with paved and unpaved roads. In addition, livestock feeding operations and oil and natural gas facilities are common.

Sensitive visual resources in the ROI include Perryton, Texas; Spearman, Texas; Hardesty Oklahoma and other small communities, Optima NWR, Schultz WMA, Lake Schultz State Park, as well as various local parks and recreation areas.

3.18.5.8.1.2 WDZ-B

WDZ-B is characterized primarily by the High Plains ecoregion transitioning into the Southwestern Tablelands ecoregion on the eastern edge and has similar landscape and vegetation characteristics as WDZ-A. The open landscape of both ecoregions offers largely unobstructed panoramic views and the horizontal lines of the landform are occasionally interrupted with vertical elements such as grain silos, transmission structures, and scattered rural residences and farms, which can be visible from long distances.

Cultural modifications within the ROI are primarily cropland and grazing land with associated buildings and large areas utilizing center pivot irrigation and scattered paved and unpaved roads. In addition, livestock feeding operations and oil and natural gas facilities are common.

Sensitive visual resources in the ROI include Gruver Texas; Perryton, Texas; Spearman, Texas; Hardesty, Oklahoma and other small communities, Optima NWR, Schultz WMA as well as various local parks and recreation areas.

3.18.5.8.1.3 WDZ-C

WDZ-C is characterized primarily by the High Plains ecoregion transitioning into the Southwestern Tablelands ecoregion and has similar landscape and vegetation characteristics as the previous WDZs. As described previously, the open landscape of both of these ecoregions offers largely unobstructed panoramic views and the horizontal lines of the landform are occasionally interrupted with vertical elements such as grain silos, center pivots, transmission structures, and scattered rural residences and farms, which can be visible from long distances.

Cultural modifications within the ROI are primarily cropland and grazing land with associated buildings and large areas utilizing center pivot irrigation. Scattered paved and unpaved roads, concentrated livestock feeding operations, and oil and natural gas facilities are common.

Sensitive visual resources in the ROI include Rita Blanca National Grassland (administered by Cibola National Forest), Lake Schultz Sate Park, Shultz Wildlife Management area, Optima NWR, local parks and recreation areas, and the towns of Cactus, Texas; Goodwell, Oklahoma; Guymon, Oklahoma; Hardesty, Oklahoma; Sunray, Texas and Texahoma, Oklahoma.

3.18.5.8.1.4 WDZ-D

WDZ-D falls within the Southwestern Tablelands ecoregion and is characterized by broad, elevated tablelands with shallow canyons, mesas, badlands, gorges, and dissected river breaks. Vegetation in the region consists primarily of shortgrass prairie with some scattered riparian areas. The open landscape offers largely unobstructed panoramic views and the horizontal lines of the landform are occasionally interrupted with vertical elements such as wind turbines, steel and wood transmission and distribution structures, center pivots, and scattered rural residences and farms, which can be visible from long distances.

Cultural modifications within the ROI are primarily cropland and grazing land with associated buildings, scattered paved and unpaved roads, livestock feeding operations, and oil and natural gas facilities are common and groupings of wind turbines can be found the southwestern area of the ROI.

Sensitive visual resources in the ROI include Hardesty, Texas; Goodwell, Oklahoma; Guymon, Oklahoma; Optima, Oklahoma; Lake Schultz State Park, Optima NWR, Optima WMA, Schultz WMA and local parks and recreation areas.

3.18.5.8.1.5 WDZ-E

WDZ-E is primarily within the High Plains ecoregion transitioning to Southwestern Tablelands along the southern and northeastern edges. Vegetation and landscape characteristics are as described in WDZ-A, and similar to the previously described WDZs the open landscape offers largely unobstructed panoramic views and the horizontal lines of the landform are occasionally interrupted with vertical elements such as center pivots, transmission structures, scattered rural residences and farms, as well as wind turbines, which can be visible from long distances.

Cultural modifications within the ROI are primarily grazing land and cropland with center pivot irrigation and associated buildings, scattered paved and unpaved roads, livestock feeding operations, oil and natural gas facilities are common and groupings of wind turbines can be found the southern portion of the WDZ.

Sensitive visual resources in the ROI include Guymon, Texas; Hardesty, Texas; Optima, Oklahoma; Goodwell Oklahoma, Hooker, Oklahoma; Optima NWR, Optima WMA, Lake Schultz State Park, Schultz WMA, Rita Blanca National Grassland (administered by Cibola National Forest), Cimarron National Grassland, local parks and recreation areas.

3.18.5.8.1.6 WDZ-F

WDZ-F is primarily within the High Plains ecoregion transitioning to Southwestern Tablelands along the boundary of the WDZ. Vegetation and landscape characteristics are as described in WDZ-A, and similar to the previously described WDZs the gently rolling terrain and open landscape offers largely unobstructed panoramic views and the horizontal lines of the landform are occasionally interrupted with vertical elements such as center pivots, transmission structures, and scattered rural residences and farms, which can be visible from long distances.

Cultural modifications within the ROI are primarily grazing land and cropland with center pivot irrigation and associated buildings, scattered paved and unpaved roads, transmission structures, livestock feeding operations, and oil and natural gas facilities are common.

Sensitive visual resources in the ROI include Goodwell, Oklahoma; Guymon Texas; Texhoma, Oklahoma; Optima, Oklahoma, Optima NWR, Rita Blanca National Grassland (administered by Cibola National Forest), and Cimarron National Grassland and local parks and recreation areas.

3.18.5.8.1.7 WDZ-G

WDZ-G is characterized primarily by the High Plains ecoregion which is characterized by gently rolling terrain with occasional sand plains and hills along with scattered playa depressions. Vegetation is primarily short and midgrass prairie scattered with other types of vegetation including Harvard shin oak, fourwing saltbush, sand sagebrush, and yucca. The generally flat, open landscape provides largely unobstructed panoramic views and the horizontal lines of the landform is intermixed with occasional vertical elements such as transmission structures, grain silos, and scattered rural residences and farms, which can be visible from long distances.

Cultural modifications within the ROI are primarily grazing land and cropland with associated buildings, scattered paved and unpaved roads, transmission structures, livestock feeding operations, and oil and natural gas facilities are common.

Sensitive visual resources in the ROI include Cimarron National Grassland, Comanche National Grassland, Rita Blanca National Grassland (administered by Cibola National Forest), and the communities of Elkhart, Kansas; Keyes, Oklahoma; Boise City, Oklahoma; and local parks and recreation areas.

3.18.5.8.1.8 WDZ-H

WDZ-H consists of the High Plains ecoregion transitioning into the Southwestern Tablelands ecoregion near the southeastern and northern borders and has similar landscape and vegetation characteristics as previously described WDZs. The open landscape of both of these ecoregions offers largely unobstructed panoramic views and the horizontal lines of the landform are mixed with vertical elements such as grain silos, transmission structures, and scattered rural residences and farms, which can be visible from long distances.

Cultural modifications within the ROI are primarily cropland and grazing land with associated buildings and large areas utilizing center pivot irrigation and scattered paved and unpaved roads. In addition, livestock feeding operations and oil and natural gas facilities are common.

Sensitive visual resources in the ROI include Rita Blanca National Grassland (administered by Cibola National Forest), Cimarron National Grassland, Comanche National Grassland, local parks and recreation areas, and the communities of Elkhart, Kansas; Goodwell, Oklahoma; Guymon, Oklahoma; and Texhoma, Oklahoma.

3.18.5.8.1.9 WDZ-I

WDZ-I is characterized primarily by the High Plains ecoregion which is characterized by gently rolling terrain with occasional sand plains and hills along with scattered playa depressions. Vegetation is primarily short and midgrass prairie scattered with other types of vegetation including Harvard shin oak, fourwing saltbush, sand sagebrush, and yucca. The generally level, open landscape provides unobstructed panoramic views and the horizontal lines of the landform is intermixed with occasional vertical elements such as transmission structures, grain silos, and scattered rural residences and farms, which can be visible from long distances.

Cultural modifications within the ROI are primarily grazing land and cropland with associated buildings, scattered paved and unpaved roads, transmission structures, livestock feeding operations, and oil and natural gas facilities are common.

Sensitive visual resources in the ROI include with the communities of Hooker, Texas; Optima, Oklahoma; Hardesty, Oklahoma; Liberal, Kansas; Tyrone, Oklahoma; Optima NWR, Optima WMA, Beaver River WMA, Lake Schultz State Park, Schultz WMA, and Rita Blanca National Grassland (administered by Cibola National Forest), and local parks and recreation areas.

3.18.5.8.1.10 WDZ-J

WDZ-J is characterized by the Southwestern Tablelands ecoregion in the west and the High Plains ecoregion to the east. The landscape and vegetation in these regions is similar to that described in previous WDZs. The open landscape of both of these ecoregions offers unobstructed panoramic views and the horizontal lines of the landform are occasionally interrupted with vertical elements such as grain silos, transmission structures, and scattered rural residences and farms, which are visible from long distances.

Cultural modifications within the ROI are primarily grazing land and cropland with associated buildings, scattered paved and unpaved roads, transmission structures, livestock feeding operations, and oil and natural gas facilities are common.

Sensitive visual resources in the ROI include the Beaver River WMA, Lake Schultz State Park, Schultz WMA, Beaver Dunes State Park, Optima WMA, Optima NWR, local parks and recreation areas, and the communities of Beaver, Oklahoma; Forgan, Oklahoma; and Perryton, Texas.

3.18.5.8.1.11 WDZ-K

WDZ-K is characterized by the Southwestern Tablelands ecoregion in the southern portion and transitioning to the High Plains ecoregion in the north. The landscape and vegetation in these regions is similar to that described in previous WDZs. The open landscape of both of these ecoregions offers unobstructed panoramic views and the horizontal lines of the landform are occasionally interrupted with vertical elements such as grain silos, transmission structures, and scattered rural residences and farms, which are visible from long distances.

Cultural modifications within the ROI are primarily grazing land and cropland with associated buildings, scattered paved and unpaved roads, transmission structures, livestock feeding operations, and oil and natural gas facilities are common.

Sensitive visual resources in the ROI include the communities of Booker, Texas; Beaver, Oklahoma; Darrouzett, Texas; Perryton, Texas; Beaver Dunes State Park, Beaver River WMA, and local parks and recreation areas.

3.18.5.8.1.12 WDZ-L

WDZ-L falls within the High Plains ecoregion to the west, transitioning into the Southwestern Tablelands ecoregion on towards the eastern border of the WDZ, and has similar landscape and vegetation characteristics as WDZ-A. The open landscape of both of these ecoregions offers largely unobstructed panoramic views and the horizontal lines of the landform are occasionally interrupted with vertical elements such as grain silos, transmission structures, and scattered rural residences and farms, which can be visible from long distances.

Cultural modifications within the ROI are primarily cropland and grazing land with associated buildings and large areas utilizing center pivot irrigation and scattered paved and unpaved roads. In addition, livestock feeding operations and oil and natural gas facilities are common.

Sensitive visual resources in the ROI include with the communities of Spearman, Texas; Gruver, Texas; Perryton, Texas; Booker, Texas; Borger, Texas; Canadian, Texas; Darrouzett, Texas; Stinnet, Texas, Gene Howe WMA. Pat Murphy Unit, Lake Meredith National Recreation Area, Lake Schultz State Park, Optima NWR, Optima WMA, Schultz WMA, Lake Fryer/Wolf Creek Park and various local parks and recreation areas.

3.18.5.8.2 Optima Substation

The ROI for the future Optima Substation is located entirely within the Southwestern Tablelands ecoregion and is characterized by relatively flat terrain that is bisected by drainages in the northern portion of the ROI, causing the landscape to appear gently rolling. Vegetation consists primarily of grasses and low shrubs with some scattered riparian vegetation occurring along drainages in the northern portion of the ROI and croplands in the southern portion. The level terrain and low vegetation allows for unobstructed panoramic views across the landscape.

Cultural modifications within the ROI for the future Optima Substation are primarily cropland and grazing land with associated buildings, paved and unpaved roads, oil and natural gas facilities, transmission lines, electric distribution lines, and several turbines located in the southwestern portion of the ROI.

Sensitive visual resources within the ROI include travelers along Highway 207 and local roads; however, visual sensitivity is low because concern for aesthetics is generally secondary to commuting to and from work or work activities. No other sensitive visual resources are identified with the ROI. The closest sensitive visual resource with moderate or high sensitivity includes recreational users associated with the Optima National Wildlife Refuge, located approximately 2.5 miles northeast of the substation ROI.

3.18.5.8.3 TVA Upgrades

A precise ROI has not been identified for the TVA upgrades. Where possible, general impacts associated with the required TVA upgrades are discussed in the impact sections that follow.

3.18.6 Impacts to Visual Resources

3.18.6.1 Methodology

This section describes the methods used to assess impacts to visual resources as a result of the construction and operations and maintenance of the Project. The methodology for assessing impacts is graphically shown in a flowchart in Figure 3.18-4 in Appendix A.

Regulations or guidance for managing visual resources that is applicable to all lands (federal, state, and municipal) within the ROI were not found during initial research efforts. Therefore, the visual impact assessment methodology was developed using concepts from the BLM VRM system. The BLM VRM system outlines a systematic process for analyzing potential visual impacts of proposed projects and activities by analyzing the visual contrast created between the existing landscape without the Project, and the same landscape after a proposed project has been implemented (BLM 1986). The concept of contrast, the process for analyzing contrast, and the methodology employed to identify impacts to visual resources are described in the subsequent section.

To conduct the impact assessment for visual resources, information collected in the inventory process (see Section 3.18.4 and Figure 3.18.1 in Appendix A) was used to perform a contrast analysis for the Project and identify initial impacts to scenery and viewers from KOPs.

3.18.6.1.1 Assessing Contrast

Contrast is the degree of visual change that occurs in the landscape due to the construction and operations and maintenance of a project (BLM 1986). Visual contrast introduced by the Project would result from (1) landform modifications that are necessary to prepare ROWs for construction, (2) removal of vegetation to construct and maintain transmission lines, roads, and converter stations, (3) construction of temporary and permanent access roads required to erect and maintain transmission lines and converter stations, and (4) introduction of transmission lines and converter station facilities into the landscape setting. Contrast in the landscape is determined by comparing visual elements (form, line, color, and texture) of the existing landscape with the visual elements of the Project (i.e., transmission structures, converter stations, access road, etc.). The following are descriptions of each of the visual elements:

- Form—the shape and mass of landforms or structures which appear unified
- Line—the edge of shapes or masses in the landscape (edges, bands, silhouettes)
- Color—the property of reflecting light of a particular intensity and wavelength that the eye can see
- Texture—the aggregation of small forms or color mixture into a continuous surface pattern

Using this method for each KOP, Project components (transmission line alternatives and converter station siting areas) were assigned one of the following five contrast levels:

- Strong—contrast demands attention and is dominant in the landscape
- Moderate-Strong—contrast begins to demand attention and is still moderately dominant in the landscape
- Moderate—contrast attracts attention but is co-dominant in the landscape
- Moderate-Weak—contrast begins to attract attention and is moderately subordinate in the landscape
- Weak—contrast can be seen but does not attract attention

Modified BLM Contrast Rating Worksheets (Form 8400-4) were used to document and assess the existing conditions, the proposed changes, and potential impacts for each KOP (Appendix K). The contrast level was then used when considering impacts to scenery and viewers depending on the distance of the viewer from the Project (FG, MG, or BG distance zones).

Impacts were identified based on the Project description and the associated EPMs (Appendix F). The primary effects to visual resources that are described throughout this section are assessed and disclosed based on the assumption that the EPMs would be implemented and over time they would reduce impacts to scenery and viewers.

Environmental Protection Measures applicable to minimizing impacts on visual resources were identified in the Visual Resource Technical Report (Clean Line 2014) and include the following:

- GE-3: Clean Line will minimize clearing vegetation within the ROW, consistent with a Transmission Vegetation Management Plan (TVMP) filed with the NERC and applicable federal, state, and local regulations.
- GE-6: Clean Line will restrict vehicular travel to the ROW and other established areas within the construction, access, or maintenance easement(s).
- GE-7: Roads not otherwise needed for maintenance and operations will be restored to preconstruction conditions. Restoration practices may include decompacting, recontouring, and re-seeding. Roads needed for maintenance and operations will be retained.
- GE-10: Clean Line will work with landowners to repair damage caused by construction, operation, or maintenance activities of the Project. Repairs will take place in a timely manner, weather and landowner permitting.
- GE-11: Clean Line will conduct construction, operation, and maintenance activities to minimize the creation of dust. This may include measures such as limitations on equipment, speed, and/or travel routes utilized. Water, dust palliative, gravel, combinations of these, or similar control measures may be used. Clean Line will implement measures to minimize the transfer of mud onto public roads.
- LU-3: Clean Line will work with landowners to avoid and minimize impacts to residential landscaping.
- LU-4: Clean Line will coordinate with landowners to site access roads and temporary work areas to avoid and/or minimize impacts to existing operations and structures.
- LU-5: Clean Line will make reasonable efforts, consistent with design criteria, to accommodate requests from individual landowners to adjust the siting of the ROW on their properties. These adjustments may include consideration of routes along or parallel to existing divisions of land (e.g., agricultural fields and parcel boundaries) and existing compatible linear infrastructure (e.g., roads, transmission lines, and pipelines), with the intent of reducing the impact of the ROW on private properties.

The anticipated visual impacts that would result from construction and operation of the Project are described as follows:

- High Impacts—Where Project components are dominant or readily apparent from KOPs. Project components would introduce form, line, color, and texture changes that are inconsistent with the existing landscape.
- Moderate Impacts—Where Project components are co-dominant with existing landscape features, and moderately apparent from viewing KOPs. Project components would mimic form, line, color, and texture of similar features within the existing landscape.

- Low Impacts—Project components are subordinate in the landscape and not readily apparent from KOPs. Project components would parallel existing high-voltage transmission lines or features with similar form, line, color, and texture.

3.18.6.1.2 Impacts to Scenery

Impacts to scenery were determined based on the comparison of the contrast associated with the Project (e.g., transmission lines, converter stations, access roads, etc.) and the factors that compose the existing landscape (e.g., vegetation, landform, water, and cultural modifications) as described in section 3.18.4. Impacts to the existing landscape were assessed by reviewing the landscape category (Distinct, Common, Developed) combined with the anticipated Project contrast. It is anticipated that Distinct or Common landscapes that would be substantially altered by the Project (i.e., where similar facilities do not exist in the landscape) would result in high impacts. Moderate to low impacts are anticipated in Common or Developed landscapes where similar features may be present and the introduction of Project features would result in low levels of modification to the existing landscape. Landscape Scenery Impact ratings are shown in Table 3.18-4.

Table 3.18-4:
Landscape Scenery Impacts Matrix

Landscape Category	Project Contrast				
	Strong	Moderate–Strong	Moderate	Moderate–Weak	Weak
Distinct	High	High	Moderate–High	Moderate	Moderate
Common	High	Moderate–High	Moderate	Moderate	Moderate–Low
Developed	Moderate	Moderate	Moderate–Low	Low	Low

3.18.6.1.3 Impacts to Sensitive Viewers

Impacts to sensitive viewers were determined based on an assessment of contrast, sensitive/user concern level (moderate or high), distance from the Project (0 to 0.5 mile, 0.5 to 3 miles, greater than 3 miles), and visibility of the Project. Table 3.18-5 summarizes how user concern impacts were assessed and demonstrates how concern levels vary depending on how close the viewer is to the Project. High impacts are anticipated to occur where the Project is dominant within a view and highly noticeable by the casual observer, or where the Project introduces a high level of contrast to the existing landscape. Low impacts are anticipated to occur in the BG distance zone where, because of the distance of the viewer from the Project, Project components would be subordinate in the landscape and not readily apparent to the casual observer.

Table 3.18-5:
Viewer Concern Impacts Matrix

Viewer Concern Level	Distance Zones								
	Foreground (FG) (0–0.5 mile) Contrast Level			Middleground (MG) (0.5–3 miles) Contrast Level			Background(BG) (3–15 miles) Contrast Level		
	Strong	Moderate	Weak	Strong	Moderate	Weak	Strong	Moderate	Weak
High	High	Moderate–High	Moderate	Moderate–High	Moderate	Low	Moderate–High	Moderate	Low
Moderate	Moderate–High	Low	Moderate–Low	Moderate	Moderate–Low	Low	Moderate	Moderate–Low	Low
Low	Moderate	Moderate–Low	Low	Low	Low	Low	Low	Low	Low

3.18.6.1.4 Overall Project Impacts

The landscape scenery impacts were combined with the viewer concern impacts, resulting in overall Project impact. Table 3.18-6 summarizes how the overall impacts from the Project were assessed. Overall Project impacts are described for each KOP in Sections 3.18.6.2 and 3.18.6.3.

Table 3.18-6:
Overall Project Impacts Matrix

Landscape Scenery Impacts	Viewer Concern Impacts				
	High	High-Moderate	Moderate	Moderate–High	Low
High	High	High	Moderate–High	Moderate	Moderate
Moderate–High	High	Moderate–High	Moderate–High	Moderate	Moderate
Moderate	Moderate–High	Moderate–High	Moderate	Moderate–Low	Moderate–Low
Moderate-Low	Moderate	Moderate	Moderate–Low	Moderate–Low	Low
Low	Moderate	Moderate	Moderate–Low	Low	Low

3.18.6.1.5 Photographic Simulations

Photographic simulations were created to depict impacts resulting from the Project at specific viewing locations. DOE and Clean Line selected 56 KOPs to represent each viewing location type (residences, recreation areas, and travel routes), associated concern level, and distance from the Project. Photographic simulations were developed to support the contrast rating and impact analysis by simulating changes associated with the Project and to disclose anticipated representative effects of the Project. Photographic simulations are included in Appendix K.

3.18.6.2 Impacts Associated with the Applicant Proposed Project

3.18.6.2.1 Converter Stations and AC Interconnection Siting Areas

3.18.6.2.1.1 Construction Impacts

Construction would result in the short-term visual intrusion of construction vehicles, equipment, materials, and a work force in staging areas, and final converter station location. Vehicles, heavy equipment, structure components, ancillary facility components and materials, and workers would be visible during converter station construction and modification, clearing and grading, structure erection, and cleanup and restoration would create short-term and local contrast within the areas of the ROW for the AC interconnection where construction is taking place. It should also be noted that lighting of construction yards and work areas would create temporary visual impacts to night skies where construction is taking place. Affected viewers would be aware of the temporary nature of the Project construction impacts, which should decrease their concern about the impact.

3.18.6.2.1.2 Operations and Maintenance Impacts

3.18.6.2.1.2.1 Oklahoma Converter Station Siting Area and AC Interconnection Siting Area

The Oklahoma Converter Station Siting Area would be located southwest of Hardesty. The surrounding area is primarily flat, open agricultural lands that offer panoramic views. The converter station and associated structures would contrast the rural landscape and be visible on the horizon from large distances. This area is already impacted by numerous vertical structures such as wind turbines and existing transmission lines, and there are no notable visual resources, so visual concern is low. The converter station and associated structures would add additional contrast to the landscape, but in this area overall visual impacts would be low due to existing modification to the landscape and low number of sensitive viewers.

3.18.6.2.1.2.2 Tennessee Converter Station Siting Area and AC Interconnection Siting Area

The Tennessee Converter Station Siting Area would be located northeast of the existing Shelby Substation. The area is primarily rural and undeveloped in nature with flat to rolling terrain and areas of dense vegetation. Most of the existing development is residential, and the residents in the developments would represent most of the sensitive viewers. While the region is largely undeveloped, there is an existing substation in close proximity that would reduce the overall visual contrast and impacts of the Project. Two KOPs were identified for this converter station, Shelby 1 and Shelby 2, as described below and detailed in Table 3.18-7.

Table 3.18-7:
Visual Impact Summary of KOPS—AC Interconnection Siting Areas

KOP	Converter Station	Distance (Miles)	Viewer Sensitivity	Landscape Category	Visibility	Contrast	Overall Impact
Shelby 1	TN	0.2	High	Developed	Yes	Strong	Moderate–High
Shelby 2	TN	0.5	High	Common	Yes	Moderate	Moderate -High

Shelby 1. Looking southwest from this KOP, the Tennessee converter station would be located 0.2 mile away in the FG. Terrain may screen portions of the converter station, but at this distance it would become a dominant feature on the landscape. The form and line of the converter station would be similar to the existing substation, but appearing at a larger scale because it is closer to the viewer. The Project would result in strong contrast at this location; however, due to the existing substation, which has introduced similar modifications to the landscape setting, the overall visual impact would be moderate-high.

Shelby 2. Depending on final siting decisions, the Tennessee converter station would be located 0.5 mile to the north of this location. The broad profile of the substation would be visible in the FG and contrast with the existing environment. Some elements of the substation may be visible above the tree line, silhouetted against the sky, but appearing similar in form as existing structures. The Project would result in moderate contrast and moderate–high overall visual impacts at this location.

3.18.6.2.1.3 Decommissioning Impacts

Project facilities would be removed at the end of the operational life of the converter station. Structures and related facilities would be removed and foundations removed to below the ground surface level. There would be residual visual impacts for many years after the Project has been decommissioned and structures removed such as vegetative cutbacks, cut-and-fill scars from construction activities, and access roads, all of which would have added to the visual impact, though these impacts would be at ground level. There would also be temporary visual impacts during decommissioning. These impacts would diminish over time as vegetation returned to the ROW or as redevelopment occurred.

3.18.6.2.2 AC Collection System

3.18.6.2.2.1 Construction Impacts

Construction would result in the short-term visual intrusion of construction vehicles, equipment, materials, and a work force in staging areas, along access roads, and along the new transmission line ROW. Vehicles, heavy equipment, structure components, and workers would be visible during transmission line construction and modification, access and spur road clearing and grading, structure erection, conductor stringing, and cleanup and restoration. However, disturbance from construction activities would be transient and of short duration as activities progress along the transmission line route. Affected viewers would be aware of the temporary nature of Project construction impacts, which may decrease their concern to the impact. The structures and cables (transmission lines) would cause the major long-term change in scenery.

3.18.6.2.2.2 Operations and Maintenance Impacts

The AC collection system routes are located in a sparsely populated area in a landscape that is primarily flat agricultural lands offering open panoramic views. The region does not contain a high number of sensitive viewers or sensitive resources, so impacts would be expected to be low-moderate. The AC collection system routes are located in a largely open and undeveloped landscape, and the introduction of large vertical elements such as a transmission line, would have the potential to affect viewers over a large viewing area. Thirteen viewing locations/KOPs were identified for the AC collection system routes as summarized in Table 3.18-8.

Table 3.18-8:
Visual Impact Summary of KOPS—AC Collection System Routes

KOP	Route	Distance (Miles)	Viewer Concern	Landscape Category	Visibility	Contrast	Overall Impact
Farnsworth	SE-3	4	High	Common	Yes	Weak	Low
Goodwell	W-1	1.3	High	Common	Yes	Moderate	Moderate
Guymon East	NE-1, NW-2	3.7	High	Developed	Yes	Weak	Low
Guymon West	NW-1	3.2	High	Common	Yes	Weak	Low
Hardesty	E-1	0.5	High	Common	Yes	Moderate	Moderate
Hooker	NE-1, NE-2	2.5	High	Developed	Yes	Weak	Low
Lake Schultz State Park	E-3	1.2	High	Distinct	Yes	Strong	High
Lake Schultz State Park South	E-2, SE-1, SE-3	1	High	Distinct	Yes	Moderate	Moderate–High
Optima	NE-1, NW-2	2.4	High	Developed	Yes	Weak	Low
Optima NWR	E-1	1.3	High	Common	Yes	Moderate	Moderate
Perryton-Leatherman Park	SE-3	5	High	Common	Yes	Weak	Low

Table 3.18-8:
Visual Impact Summary of KOPS—AC Collection System Routes

KOP	Route	Distance (Miles)	Viewer Concern	Landscape Category	Visibility	Contrast	Overall Impact
Spearman	SE-1	5.6	High	Developed	Yes	Weak	Low
Waka	SE-1	2	High	Common	Yes	Weak	Low

Farnsworth. This KOP is located on the southeastern edge of the community of Farnsworth, Texas. Looking to the east, AC Collection System Route SE-3 would be located 4 miles away. The transmission line would be faintly visible and would appear as a pattern of vertical elements spaced across the horizon. The transmission line structures would result in weak contrast at this location and the overall visual impact would be low.

Goodwell. AC Collection System Route W-1 would be located 1.3 miles south of this KOP. The landscape in this area is open, providing panoramic views and the transmission line structures would appear as vertical objects on the horizon, when not screened by FG trees and elements. At this distance, the structures would appear small, but there is not a lot of development in this area, so the introduction of additional vertical elements on the landscape would result in moderate visual contrast and Moderate overall visual impact.

Guymon East. AC Collection System Routes NE-1 and NW-2 would be located 3.7 miles to the east of this KOP. Transmission line Structures may be visible on the horizon, but at this distance they would appear as small objects on the horizon and would add to the irregular line of the horizon, resulting in weak contrast and low overall visual impacts.

Guymon West. AC Collection System Route NW-1 would be located 3.2 miles to the southwest of this KOP. At this distance, the structures would appear as small vertical objects on the horizon and would have a similar impact as the existing structures in view, resulting in weak visual contrast and low overall visual impacts.

Hardesty. AC Collection System Route E-1 would be located 0.5 mile to the northwest of this KOP. The structures in the open field would be visible and introduce a repeating pattern of tall vertical elements on the landscape. The structures would be a dominant feature on the open landscape and visual contrast would be moderate. The overall visual impact would be moderate.

Hooker. AC Collection System Route NE-1 and NE-2 would be located 2.5 miles south of the town of Hooker. Transmission line structures would be visible on the horizon and appear as vertical elements similar to existing structures in view. The overall visual contrast would be weak and overall visual impact low.

Lake Schultz State Park. AC Collection System Route E-3 would be located 1.2 miles to the northwest of Lake Schultz State Park. The transmission line structures would introduce vertical elements to the landscape that is currently very natural and intact. At this distance, they would not be a dominate feature, but they would result in strong contrast and high overall visual impact because of the existing scenic integrity of the area.

Lake Schultz State Park South. AC Collection System Routes E-2, SE-1, and SE-3 would be located 1 mile to the south of this KOP. The transmission line structure would be parallel to the existing 345kV line and would introduce additional vertical structures to the environment. The proposed structures would be slightly larger in scale than the existing and would result in moderate visual contrast and moderate-high overall visual impact.

Optima. From the Optima KOP, AC Collection System Routes NE-1 and NW-2 would be located 2.4 miles to the west. The transmission line structures would appear on the horizon as a row of vertical objects, but would not attract attention at this distance, resulting in weak contrast. AC Collection System Route NE-2 would be located 3.5 miles to the east and have similar visual impacts.

Optima NWR. AC Collection System Route E-1 would be located 1.3 miles southwest of the Optima NWR. The transmission line structures would be visible on the open landscape and add additional vertical structures to the existing transmission line in view. The addition of these structures would add moderate visual contrast and result in moderate overall visual impact.

Perryton-Leatherman Park. AC Collection System Route SE-3 would be 5 miles to the west of this KOP. At this distance, the transmission line structures would be barely visible and would not be distinguishable as structures, but they would add to the irregular line of the horizon and existing vertical elements and resulting in weak contrast and low visual impact.

Spearman. AC Collection System Route SE-1 would be located 5.6 miles to the east and would be barely visible on the horizon. The transmission line structures would add small vertical elements to the horizon line similar to existing structures resulting in weak contrast and low visual impact.

Waka. AC Collection System Route SE-1 would be located 2 miles to the west of this KOP. The transmission line structures would appear as vertical objects on the horizon that add to the existing elements in view and resulting in weak contrast. The overall visual impact at this location would be low.

3.18.6.2.2.3 Decommissioning Impacts

Project facilities would be removed at the end of the operational life of the transmission line. Conductors, structures, and related facilities would be removed. Foundations would be removed to below the ground surface level. There would be residual visual impacts for many years after the Project has been decommissioned and structures removed such as vegetative cutbacks, cut and fill scars from construction activities, and access roads, which all add to the visual impact, though these impacts would be at ground level. These areas would be apparent after the removal of structures but are expected to diminish over time as vegetation returns to the ROW.

3.18.6.2.3 HVDC Applicant Proposed Route

3.18.6.2.3.1 Construction Impacts

Construction would result in the short-term visual intrusion of construction vehicles, equipment, materials, and a work force in staging areas, along access roads, and along the new transmission line ROW. Vehicles, heavy equipment, structure components, and workers would be visible during transmission line construction and modification, access and spur road clearing and grading, structure erection, conductor stringing, and cleanup and restoration. However, disturbance from construction activities would be transient and of short duration as activities progress along the transmission line route. Affected viewers would be aware of the temporary nature of Project construction impacts as well as existing structures in the area adjacent to the Project, which may decrease their concern to the impact. It should be noted that there would be short term impacts during the decommissioning of the Project which are similar in nature to the construction impacts described above.

3.18.6.2.3.2 Operations and Maintenance Impacts

3.18.6.2.3.2.1 Region 1

The landscape category in Region 1 is primarily Common, categorized by agricultural and grasslands and broad panoramic views. A portion of the Applicant Proposed Route in this region would parallel an existing 345kV transmission line, a 138kV transmission line, and several small electric distribution lines in other areas. The tall vertical geometric form of the proposed structures would result in strong contrast with the horizontal lines of the relatively flat landscape. Contrast would be reduced in areas where the Applicant Proposed Route would parallel or be seen in context with existing transmission and electric distribution lines; the level of contrast would depend on the form, line, color and texture of the existing structures and the distance the existing structures are from the Applicant Proposed Route. In addition, transmission lines in this landscape category are typically visible for long distances because the terrain lacks variation and dense stands of trees and the structures are silhouetted against the sky. Changes to the landscape and vegetation due to construction of access roads and ROW clearing may be visible, but changes would generally not be noticeable in the MG and BG; changes may, however, be noticeable to viewers where the Applicant Proposed Route is located in the FG and where the line crosses areas of varied terrain or dense vegetation. Contrast could be reduced in areas where existing access roads would be used and where the Applicant Proposed Route would parallel an existing transmission line corridor where vegetation clearing has previously occurred.

The visual impacts for the Region 1 KOPs are listed in Table 3.18-9 described below.

Table 3.18-9:
Visual Impact Summary of KOPs—Applicant Proposed Route—Region 1

KOP	APR Link	Distance (Miles)	Viewer Concern	Landscape Category	Visibility	Contrast	Overall Impact
Lake Schultz State Park PR	2	1	High	Distinct	Yes	Moderate	Moderate–High
Local Historical Marker PR	4	0.6	Moderate	Common	Yes	Moderate	Moderate-Low
Fort Supply WMA Recreation Area	5	6.4	High	Distinct	No	No Contrast/Not Visible	No Impact
May	5	0.6	High	Common	Yes	Moderate	Moderate

3.18.6.2.3.2.1.1 Applicant Proposed Route Link 2

Lake Schultz State Park. Applicant Proposed Route Link 2 would be located 1 mile to the south and would appear in the MG just beyond the nearest tree line. Applicant Proposed Route Link 2 would be seen in the context of the existing Hitchland to Woodward 345kV transmission line, which would parallel the Applicant Proposed Route Link 2. Proposed structures would appear wider and taller than existing structures; however, since the existing transmission line has already introduced vertical elements similar in form, line, color, and texture into the landscape setting contrast would be moderate. Overall visual impacts to high sensitivity viewers associated with this KOP would be moderate-high.

3.18.6.2.3.2.1.2 Applicant Proposed Route Link 4

Local Historical Marker. Applicant Proposed Route Link 4 would be located 0.6 mile to the south and would parallel an existing 345kV transmission line. Although the existing transmission line has introduced vertical elements into the landscape setting, the taller, wider lattice structures of the Applicant Proposed Route Link 4 would result in moderate contrast in form, line, and texture to the existing structures. Overall impacts to moderate sensitive viewers associated with this KOP would be moderate–low.

3.18.6.2.3.2.1.3 Applicant Proposed Route Link 5

Fort Supply WMA Recreation Area. Applicant Proposed Route Link 5 would be located 6.4 miles north of this KOP. Overall visual impacts are not anticipated at this location because the Project would be completely screened by terrain and vegetation.

May. The Applicant Proposed Route Link 5 would be located 0.6 miles to the south and would appear on the horizon as a row of vertical elements. Applicant Proposed Route Link 5 would be seen in the context of existing electric distribution lines in the FG and transmission lines in the BG, which have already introduced vertical elements into the landscape setting. However, the taller, wider lattice structures of the Applicant Proposed Route Link 5 would result in moderate contrast in form, line, and texture to the existing structures, creating moderate contrast. Moderate contrast to high sensitivity viewers associated with this KOP would result in moderate impacts.

3.18.6.2.3.2.2 Region 1 Conclusion

Region 1 contains a low density of sensitive viewers and is primarily associated with small rural communities and scattered rural residences. Visual impacts are anticipated to be mostly moderate to moderate-low for high sensitivity viewers where the Project is visible in the MG or BG and would be seen in the context of existing vertical structures. Moderate–high impacts are anticipated for high sensitivity viewers associated with Lake Schultz State Park where the Applicant Proposed Route would cross a landscape categorized as Distinct in the MG.

3.18.6.2.3.2.3 Region 2

The landscape category in Region 2 is primarily Common, and similar to Region 1, is characterized by agricultural and grasslands and broad panoramic views. In Region 2, the Applicant Proposed Route is located near several existing transmission lines near Mooreland and Boiling Springs State Park. In addition, the Applicant Proposed Route would parallel 30 miles of the existing Okeene to Mooreland 115kV transmission line. The contrast introduced by the Applicant Proposed Route and visibility are similar to those described in Region 1 (see Section 3.18.6.2.3.2). The visual impacts for the Region 2 KOPs are listed in Table 3.18-10 and described below.

Table 3.18-10:
Visual Impact Summary of KOPs—Applicant Proposed Route—Region 2

KOP	Link	Distance (Miles)	Viewer Concern	Landscape Category	Visibility	Contrast	Overall Impact
Boiling Springs State Park	1	0.9	High	Distinct	Yes	Moderate	Moderate–High
Mooreland	1	1.8	High	Developed	No	No Contrast/Not Visible	No Impact
Canton WMA and Lake Recreation Area	2	6.5	High	Distinct	No	No Contrast/Not Visible	No Impact
Cimarron River Crossing	2	0	Moderate	Distinct	Yes	Strong	High
Fairview	2	3.3	High	Common	Yes	Weak	Low

Table 3.18-10:
Visual Impact Summary of KOPs—Applicant Proposed Route—Region 2

KOP	Link	Distance (Miles)	Viewer Concern	Landscape Category	Visibility	Contrast	Overall Impact
Gloss Mountain State Park	2	11	High	Distinct	No	No Contrast/Not Visible	No Impact
SR 60 West of Fairview	2	1	High	Common	Yes	Strong	High
Ames	3	2.5	High	Common	Yes	Weak	Moderate–Low
Bison	3	1.4	High	Common	Yes	Weak	Low

3.18.6.2.3.2.3.1 Applicant Proposed Route Link 1

Boiling Springs State Park. Applicant Proposed Route Link 1 would be located 0.9 mile to the northeast. The rolling terrain and vegetation in the area would only offer visitors to the park sporadic views of the transmission line structures through breaks in the vegetation. There are existing vertical elements in the landscape, and the additional transmission line structures would result moderate contrast. Because Boiling Springs is a state park, it is considered a sensitive area, so the overall visual impact would be moderate-high.

Mooreland. Applicant Proposed Route Link 1 would be located 1.8 miles to the north, but terrain would block potential views from this location, so there would be no contrast and no overall visual impact would occur at this location.

3.18.6.2.3.2.3.2 Applicant Proposed Route Link 2

Canton WMA and Lake Recreation Area. Applicant Proposed Route Link 2 would be located 6.5 miles to the north of this KOP. Looking across the lake, the Project would most likely not be visible because of the large distance and dense vegetation on the other side of the lake. With no visibility, there would be no contrast and no overall visual impacts would occur at this location.

Cimarron River Crossing. Applicant Proposed Route Link 2 would cross the Cimarron River in the immediate FG. Viewers at this location would see the transmission line running parallel to the road, crossing the river in a very rural area with little development and has moderate visual concern due to low numbers of viewers. The transmission line would be highly visible and dominant in view at this location. The large metal structures would be the only vertical elements on the landscape, resulting in strong contrast. The overall visual impact would be high. A visual simulation for this KOP is provided in Appendix K.

Fairview. Applicant Proposed Route Link 2 would be located 3.3 miles to the south. Visitors to the park and fairgrounds may be able to see the transmission line structures appearing as a row of vertical objects on the distant horizon, where it is not blocked by vegetation. Because of the large distance, these proposed structures would appear smaller than the existing structures in view and there would be no change to landform or vegetation, resulting in weak visual contrast. The overall visual impact at this location would be low.

Gloss Mountain State Park. The HVDC Applicant Proposed Route Link 2 would be located 11 miles to the south and would not be visible to park visitors without the use of binoculars or other magnification resulting in no contrast. For this reason, there would be no overall visual impact. A visual simulation for this KOP is provided in Appendix K.

SR 60 West of Fairview. Applicant Proposed Route Link 2 would run parallel to the existing 115kV line as it crosses the landscape at a distance of 1 mile. The proposed transmission line structures would be larger in scale and differ in form, color, and texture than the existing wood structures of the 115kV line, and be dominant in FG views becoming less visible as it recedes in into the BG zone. This KOP represents residential viewers, so visual concern is high. Modifications to vegetation would also be visible as the line crosses the highway and would result in strong visual contrast. The overall visual impacts at this location would be high.

3.18.6.2.3.2.3.3 Applicant Proposed Route Link 3

Ames. Applicant Proposed Route Link 3 would be visible and appear as small objects 2.5 miles to the southwest where it is not blocked by vegetation or terrain. The tall structures would introduce a new vertical element to the landscape, but at this distance, the transmission line would only introduce a weak level of contrast and the overall visual impact is low.

Bison. Applicant Proposed Route Link 3 would appear as small vertical elements on the horizon 1.4 miles to the south. The added structures would be taller and larger in form than the existing structures (as described in Section 3.18.5.2.1) in view, but would result in weak visual contrast due to existing cultural modifications to the landscape. The overall visual impact would be low.

3.18.6.2.3.2.4 Region 2 Conclusion

Region 2 contains a low density of sensitive viewers primarily associated with small rural communities and scattered rural residences. Visual impacts are anticipated to be mostly moderate–low to low for high sensitivity viewers where the Project is visible in the MG or BG distance zone. Higher impacts could occur for high sensitivity viewers associated with the community of Fairview where the Applicant Proposed Route would be located in the FG. Higher impacts could also occur for high sensitivity viewers associated with State Parks and other recreation areas (such as Boiling Springs State Park and the Cimarron River) within the region; however, views from some recreation areas, like Gloss Mountain State Park, would be obstructed due to variation in terrain and/or existing vegetation associated with these facilities.

3.18.6.2.3.2.5 Region 3

The landscape category in Region 3 is primarily Common, and is characterized by relatively level terrain in the western portion of the region transitioning to gently and moderately rolling hills in the western portion of the region. Vegetation also becomes varied transitioning from primarily grasses with low shrubs and scattered trees to wooded areas in the eastern portion of the region. Views are generally open within the western portion of the region where there is little variation in terrain and vegetation; and become more limited when hilly terrain and wooded areas become more prevalent in the eastern portion. In Region 3, the Applicant Proposed Route would parallel several medium and large transmission lines including a 69kV line (approximately 7 miles); 115kV line (approximately 4.5 miles); three 138kV lines (approximately 11 miles, 4 miles, and 30 miles); and a 345kV line (approximately 10 miles). The Applicant Proposed Route would also cross several transmission lines (138kV and 345kV) located throughout the region. The contrast introduced by the Applicant Proposed Route and visibility are similar to those described in Region 1 for the western portion of Region 3 (see Region 1 Conclusions Section 3.18.6.2.3.2). As noted above, visibility within the eastern portion of Region 3 becomes more limited with the increasing variation in terrain and wooded areas which can screen (partially or completely) transmission structures from viewers. The visual impacts for the Region 3 KOPs are listed in Table 3.18-11 and described below.

Table 3.18-11:
Visual Impact Summary of KOPs—Applicant Proposed Route—Region 3

KOP	Link	Distance (Miles)	Viewer Concern	Landscape Category	Visibility	Contrast	Overall Impact
Marshall	1	3.1	High	Common	Yes	Weak	Low
Mullhall	1	1	High	Common	Yes	Moderate	Moderate
Stillwater	1	2	High	Developed	No	No Contrast/Not Visible	No Impact
Meehan	3	0.4	High	Common	Yes	Strong	High
Beggs	4	1.6	High	Common	Yes	Moderate	Moderate
Cimarron River Crossing	4	0	Moderate	Distinct	Yes	Strong	High
Cushing	4	1.4	High	Common	Yes	Moderate	Moderate
Heyburn Lake	4	4.3	High	Distinct	No	No Contrast/Not Visible	No Impact
Ripley	4	0.7	High	Common	Yes	Moderate	Moderate
Shamrock	4	1.2	High	Common	Yes	Moderate	Moderate
Summit	5	0.15	High	Common	Yes	Moderate	Moderate–High
Taft	5	3.5	High	Common	No	No Contrast/Not Visible	No Impact
McLain	6	0.2	High	Common	Yes	Weak	Low
Webbers Falls	6	1.5	High	Distinct	No	No Contrast/Not Visible	No Impact

3.18.6.2.3.2.5.1 Applicant Proposed Route Link 1

Marshall. Applicant Proposed Route Link 1 would be faintly visible on the horizon 3.1 miles to the south and would appear smaller in scale than existing vertical elements. Because of the distance, the proposed structures would highly noticeable resulting in weak contrast and low overall visual impact.

Mulhall. Applicant Proposed Route Link 1 would be located 1 mile to the south-southwest and would be visible as the transmission structures extend above the horizon line. Portions of the transmission line structures not screened by vegetation would appear as vertical elements spaced across the distant horizon above the vegetation, resulting in a moderate increase in contrast. This KOP represents a residential area with high visual concern and the overall visual impacts for this landscape would be moderate.

Stillwater. Applicant Proposed Route Link 1 would be located 2 miles to the south, but views would be screened by vegetation and houses in the FG, resulting in no visual impact. A visual simulation for this KOP is provided in Appendix K.

3.18.6.2.3.2.5.2 Applicant Proposed Route Link 3

Meehan. Applicant Proposed Route Link 3 would be located 0.4 mile to the south, just on the other side of the transmission line of trees in the FG. The height of the proposed structures would cause the upper portion to be clearly visible above the horizon line and larger in scale than the existing vertical elements, creating strong contrast and a high overall visual impact.

3.18.6.2.3.2.5.3 Applicant Proposed Route Link 4

Beggs. The transmission line would be located Visitors to this site would have views of Applicant Proposed Route Link 4, 1.6 miles to the north. Where the transmission line structures are not screened by FG vegetation, they would be visible on the horizon and would add moderate contrast to the landscape. The overall visual impacts would be moderate.

Cimarron River Crossing. Applicant Proposed Route Link 4 would cross the river at this point, running parallel to the existing line in view, but would be much larger in scale and highly visible in the FG. This KOP represents a major water body, but the number viewers in this location would be low, so there would be moderate visual concern. In addition, vegetation would need to be cleared for the ROW, which would add to the strong visual contrast on the landscape. The overall visual impact at this location would be high.

Cushing. Applicant Proposed Route Link 4 would be located 1.4 miles to the southwest. The visual concern in this location is high because it represents a residential area. Portions of the transmission line structures would be visible on the horizon and would appear as dark vertical elements, resulting in moderate contrast. The visual impacts at this location would be moderate.

Heyburn Lake. Applicant Proposed Route Link 4 would be located 4.3 miles from this KOP. Because of distance and existing vegetation and terrain, structures would not be visible. There would be no visual impact at this location.

Ripley. Applicant Proposed Route Link 4 would be visible 0.7 mile to the northeast in the MG and appear as a row of objects on the horizon. Portions of the transmission line would be screened by vegetation and existing structures. Transmission line structures that are visible would be noticeably different from the existing landscape and result in moderate contrast. This KOP represents a residential area with high visual concern and the overall visual impact on the landscape would be moderate.

Shamrock. Applicant Proposed Route Link 4 would be located 1.2 miles to the northwest of this KOP. The visible transmission line structures would appear as dark objects, creating a repeating pattern across the forested ridgeline on the horizon. This is a residential area and visual concern is high and the vertical elements of the transmission line would be noticeable with no other existing vertical features, resulting in moderate contrast. Overall visual impacts would also be moderate.

3.18.6.2.3.2.5.4 Applicant Proposed Route Link 5

Summit. Applicant Proposed Route Link 5 would be 0.15 mile to the south and would run parallel to the existing lattice transmission structure. From this view, the transmission line structures would be located and the near side of the existing line, so it would appear larger in scale and be more prominent in view, but with similar form. When added to the landscape, the additional structures would result in moderate contrast due to existing structures in view and the overall visual impact would be moderate-high.

Taft. Applicant Proposed Route Link 5 is located 3.5 miles to the south and would be screened by vegetation and terrain resulting in no visual impact at this location.

3.18.6.2.3.2.5.5 Applicant Proposed Route Link 6

McLain. Applicant Proposed Route Link 6 would run parallel to the existing 345kV line in view from this location and would first come into view about 0.7 mile to the east. The transmission line would have similar form and visibility as the existing lattice structures, adding weak visual contrast and low overall visual impacts.

Webbers Falls. The Applicant Proposed Route Link 6 would be located 1.5 miles to the southwest. Given the distance and existing vegetation, the transmission line structures would not be visible from this location and there would be no visual impact.

3.18.6.2.3.2.6 Region 3 Conclusion

Region 3 contains a moderate density of sensitive viewers primarily associated with rural communities, scattered rural residences, and recreation areas. Visual impacts are anticipated to be mostly moderate for high sensitivity viewers where the Project is visible in the MG distance zone. The Applicant Proposed Route may be partially screened by vegetation and/or seen within the context of existing transmission lines. Low or no impacts are anticipated for high sensitivity viewers where the Project is located in the BG distance zone, where contrast would be weak due to viewing distance or the Project would be completely screened by existing terrain and/or vegetation. Higher impacts are anticipated for high sensitivity viewers associated with communities or recreation areas where the Project is located within the FG and is not seen in the context of other transmission lines.

3.18.6.2.3.2.7 Region 4

The landscape category in Region 4 is primarily Common and is characterized by varied terrain including undulating plains, rolling hills and terraces in the southern portion of the region. Landscapes categorized as Distinct occur throughout the region and are associated with more natural rugged terrain in the northern portion of the region and near water features (such as the Arkansas River, lakes and reservoirs). The rugged hills, mountains, rolling hills, and forested landscapes in the northern portion of the region limits distant views, whereas in the southern portion of the region the less varied terrain and lack of vegetation allows for expansive view across the landscape. In Region 4, the Applicant Proposed Route would parallel several medium and large existing transmission lines, including a 345kV line for approximately 5.5 miles north of Vian; a 138kV line for approximately 5 miles near the Oklahoma-Arkansas border; a 138kV line for approximately 5 miles northeast of Widerkerhr Village; a 138kV line for approximately 25 miles between Hunt and Big Piney Creek (this line would be between 0.25 and 0.5 miles away from the Applicant Proposed Route); and a 138kV line for approximately 3 miles north of Big Piney Creek. The Applicant Proposed Route would also cross or be located near several medium and large existing transmission lines that vary in size between 115kV and 345kV transmission lines.

The tall vertical geometric forms of the proposed structures would result in strong contrast with the horizontal lines of the relatively flat landscape found within the southern portion of the region. Contrast would be reduced in areas where the Applicant Proposed Route would parallel or be seen in context with existing transmission and electric distribution lines; the level of contrast would depend on the form, line, color and texture of the existing structures and the distance the existing structures are from the Applicant Proposed Route. In the northern region, transmission structures are often only visible in the FG/MG and tend to be partially obstructed by terrain and vegetation; however, structures often protrude above the terrain and trees and are silhouetted against the sky drawing viewer’s attention. The presence of other similar structures would reduce the contrast. Changes to the landscape and vegetation due to construction of access roads and ROW clearing may be visible but changes would generally not be noticeable in the MG and BG where terrain and vegetation may obscure these changes. In some instances, however, the Project may become visible as the viewer is elevated or as the transmission line traverses hilly terrain, ridges, or open spaces. Changes may also be noticeable to viewers where the Applicant Proposed Route is located in the FG in relatively flat terrain with minimal vegetation to obscure views. Contrast could be reduced in areas where existing access roads would be used and where the Applicant Proposed Route would parallel an existing transmission line corridor where vegetation clearing has previously occurred and additional clearing for the Project would make an existing corridor look wider. The visual impacts for the Region 4 KOPs are listed in Table 3.18-12 and described below.

Table 3.18-12:
Visual Impact Summary of KOPs—Applicant Proposed Route—Region 4

KOP	Link	Distance (Miles)	Viewer Concern	Landscape Category	Visibility	Contrast	Overall Impact
Arkansas River	1	0.2	Moderate	Common	Yes	Moderate	Moderate
Arkansas River and Gore	1	3	High	Distinct	Yes	Weak	Moderate–Low
Highway 10	1	0.2	Moderate	Common	Yes	Strong	High
Tenkiller State Park	1	4	High	Distinct	No	No Contrast/Not visible	No Impact
Trail of Tears State Route 100	1	0.2	High	Common	Yes	Strong	High
Brushy Creek Reservoir and Sallisaw State Park	3	2.8	High	Distinct	No	No Contrast/Not Visible	No Impact
Field of Dreams	3	2.6	High	Developed	No	No Contrast/Not Visible	No Impact
Highway 82	3	0.3	Moderate	Common	Yes	Weak	Moderate-Low
Lee Creek	3	0.5	High	Common	Yes	Strong	High
Robert S Kerr Reservoir	3	7	High	Distinct	No	No Contrast/Not Visible	No Impact
Sallisaw	3	0.5	High	Common	Yes	Moderate	Moderate
Sequoyah NWR Boat Launch	3	5	High	Common	No	No Contrast/Not Visible	No Impact
Sequoyah's Cabin	3	1.2	High	Distinct	Yes	Weak	Moderate–Low
Van Buren PR	3	1.8	High	Common	Yes	Weak	Low
Vian	3	0.7	High	Common	Yes	Moderate	Moderate
Vian Lake	3	0.2	High	Distinct	Yes	Strong	High
Van Buren AR/PR	4, 5	2	High	Common	No	No Contrast/Not Visible	No Impact
Scott Farm	5	0.3	High	Common	Yes	Moderately High	Moderate–High
Alma	6	0.5	High	Common	Yes	Moderate	Moderate
Bluff Hole Park	6	1.7	High	Common	Yes	Weak	Low
City Park/Ball Fields and Rudy	6	2	High	Developed	No	No Contrast/Not Visible	No Impact
Clear Creek Park	6	1.4	High	Distinct	No	No Contrast/Not Visible	No Impact
Dyer	6	0.3	High	Common	Yes	Strong	High
Mulberry Park	6	0.3	High	Common	Yes	Strong	High
Mulberry River and Trail of Tears	6	0.4	High	Distinct	Yes	Strong	High
Trail of Tears Wire Road	6	0.2	High	Common	Yes	Strong	High
Vine Prairie Park	6	1.5	High	Distinct	Yes	Weak	Moderate–Low
Aux Arc Park	7	2.8	High	Distinct	Yes	Weak	Moderate-Low
East Side City Park	7	2.1	High	Distinct	No	No Contrast/Not Visible	No Impact
Interstate 40 Rest Stop	7	0.04	Moderate	Common	Yes	Strong	Moderate–High
Ozark	7	0.8	High	Common	Yes	Weak	Low
Ozark City Boat Launch	7	0.6	High	Distinct	No	No Contrast/Not Visible	No Impact
West Side City Park	7	2	High	Common	No	No Contrast/Not Visible	No Impact
White Oak	7	1.5	High	Common	No	No Contrast/Not Visible	No Impact
White Oak Park	7	3	High	Distinct	No	No Contrast/Not Visible	No Impact
Trail of Tears (Highway 352)	8	0.028	High	Common	Yes	Strong	High

Table 3.18-12:
Visual Impact Summary of KOPs—Applicant Proposed Route—Region 4

KOP	Link	Distance (Miles)	Viewer Concern	Landscape Category	Visibility	Contrast	Overall Impact
Wiederkehr Village and Highway 186	8	0.7	High	Common	Yes	Weak	Low
Big Piney Creek	9	0.2	High	Distinct	Yes	Moderate	Moderate–High
Clarksville	9	2.5	High	Common	No	No Contrast/Not Visible	No Impact
Hagarville	9	1	High	Common	Yes	Moderate	Moderate
Horsehead Lake Recreation Area	9	2.1	High	Distinct	No	No Contrast/Not Visible	No Impact
Hunt	9	0.2	High	Common	Yes	Strong	High
Lake Ludwig	9	0.9	High	Distinct	Yes	Weak	Moderate–Low
Route 21 (Scenic Byway)	9	0.1	High	Distinct	Yes	Strong	High

3.18.6.2.3.2.7.1 Applicant Proposed Route Link 1

Arkansas River. Applicant Proposed Route Link 1 would be located 0.2 mile away, running parallel to the existing transmission. Viewers at this location would be able to clearly see the lattice structures as well as a ROW cleared of vegetation on the river banks. The proposed transmission line structures would be located on the near side of the existing structures, and would appear more dominant in view. Since this is already a heavily impacted site, the proposed structures would be repeating form, line, color and texture and result in moderate contrast. The overall visual impacts at this location would be moderate.

Arkansas River and Gore. Applicant Proposed Route Link 1 would be located 3 miles to the northwest. Portions of the structures may appear above the tree line in the distant MG, but would only be faintly noticeable, producing weak contrast. This KOP represents a major waterbody and recreation area with high visual concern. Overall visual impacts at this location would be moderate–low. A visual simulation for this KOP is provided in Appendix K.

Highway 10. Applicant Proposed Route Link 1 would be clearly visible as the line crosses the open field to the northwest and spans the highway. The structures would be a dominant element on the landscape and introduce new line, form, color, and texture. In addition, the clearing of vegetation near the sides of the highway would be clearly visible to motorists, introducing additional contrast. This view represents a scenic highway, so visual concern is high. The transmission line structures would result in strong contrast and high overall visual impact at this location. A visual simulation for this KOP is provided in Appendix K.

Tenkiller State Park. Applicant Proposed Route Link 1 would be located about 4 miles to the south of this location. From this vantage point, terrain and vegetation would screen all views of the transmission line and would result in no visual impact.

Trail of Tears State Route 100. Applicant Proposed Route Link 1 would be located 0.2 mile from this KOP. Transmission line structures would be clearly visible above tree line as the route crosses the highway and Trail of Tears. The Trail of Tears locations mapped by the NPS are representative of the historic location of the trail and the extent of the trail at each crossing location is not known. Transmission line structures would introduce new vertical elements into the landscape, becoming dominant as motorists approach, and the transmission line conductors would be visible crossing over the highway, resulting in strong contrast. In addition, ROW clearing would be visible to motorists as they approach the crossing, resulting in additional contrast. The overall visual impact at this location would be high.

3.18.6.2.3.2.7.2 Applicant Proposed Route Link 3

Brushy Creek Reservoir and Sallisaw State Park. Applicant Proposed Route Link 3 would be located 2.8 miles to the south, but would not be visible due to distance, terrain, and vegetation. There would be no visual impact.

Field of Dreams. Proposed Route Link 3 would be located 2.6 miles to the north of the Field of Dreams ball field. Dense trees in the FG would obscure views of the Project from this location, resulting in no visual impact.

Highway 82. Applicant Proposed Route Link 3 would cross the highway 0.3 mile to the southwest. The Project would run parallel to an existing transmission line and the proposed transmission line would repeat the line, form, scale, and color. The proposed structures would be noticeable to viewers at this location, but since they would be additions to the existing structures, the contrast would be weak. The visual concern in this area is moderate and the overall visual impact would be moderate-low.

Lee Creek. Applicant Proposed Route Link 3 would be located 0.5 mile to the north of this location. Recreationists standing at the boat launch or on the docks would most likely not see any of the structures due to vegetation and terrain. Once visitors were out on the lake, however, both the structures and vegetation clearing for the ROW would be clearly visible. The transmission line structures would introduce new vertical elements that would be visible above tree line and a cleared ROW would introduce lines in the vegetation inconsistent with the current natural landscape. The visual contrast from many areas on or around the lake would be strong and the overall visual impact would be high.

Robert S. Kerr Reservoir. Applicant Proposed Route Link 3 would be located 7 miles to the north. From this location, the line would not be visible due to distance and FG terrain and vegetation. There would be no visual impact from this location.

Sallisaw. Applicant Proposed Route Link 3 would be located 0.5 mile to the north-northeast and be visible crossing the open field in the MG. Some of the structures would extend above tree line and be prominent in view. There are existing vertical elements, so the additional structures would result in moderate contrast. This KOP represents a residential area with high visual concern and the overall visual impact would be moderate.

Sequoyah NWR Boat Launch. Applicant Proposed Route Link 3 would be located 5 miles to the north, but would not be visible given the dense vegetation. There would be no overall visual impact at this location.

Sequoyah's Cabin. Applicant Proposed Route Link 3 would be located 1.2 miles to the south. The majority of the views from the historic site grounds would be screened by FG vegetation, but some transmission line structures would be visible on the horizon, extending above the trees. The transmission line structures would introduce some vertical elements to the landscape, but they would not be dominant elements. The visual contrast would be weak and overall visual impact would be moderate–Low, since it is a sensitive historic site. A visual simulation for this KOP is provided in Appendix K.

Van Buren. Applicant Proposed Route Link 3 would be located about 1.8 miles to the northwest from this residential area with high visual concern. The rolling terrain and dense vegetation would screen views of the transmission line structures. If visible through breaks in the FG vegetation, the structures would appear as small dark objects extending above the trees on the horizon and would result in weak contrast. The overall visual impact would be low.

Vian. Applicant Proposed Route Link 3 would be located about 0.7 mile to the north-northeast. There are several transmission line structures visible from this location, and the Project would be located parallel to the existing lattice structures that are just barely visible in the MG. The proposed structures would be similar in form to the existing lattice, but larger in scale introducing weak moderate contrast to the scene. This is a residential area, so visual concern is high and the overall visual impact would be moderate.

Vian Lake. Applicant Proposed Route Link 3 would be visible running parallel to the existing transmission line on the far side of the lake, 0.2 mile away. Because of the dense vegetation in the area, large amounts of trees would be cleared for the ROW, leaving open views of the existing structures as well as the proposed. This KOP represents a view from a recreational area and has high visual concern and extended viewing times. The combination of vegetation clearing and introduction of new vertical elements in the landscape would result in strong contrast and high overall visual impact. A visual simulation for this KOP is provided in Appendix K.

3.18.6.2.3.2.7.3 Applicant Proposed Route Link 4

Van Buren. Applicant Proposed Route Link 4 would be located 2 miles to the north of this KOP. Large trees and rolling terrain would obscure views of the transmission line structures from this location, resulting in no visual impact.

3.18.6.2.3.2.7.4 Applicant Proposed Route Link 5

Scott Farm. Applicant Proposed Route Link 5 would be located 0.3 mile to the north. Residents of the subdivision would be able to see the transmission line structures clearly from both the entrance and several of the residences. The subdivision is on high ground, so residents looking down towards the transmission line structures would see the structures at a reduced contract because of the backdrop of existing vegetation. There are several other vertical structures such as communications structures and antennas on the existing landscape that reduce the impact of the added contrast, resulting in a moderate contrast overall. This is a residential area with high visual concern and the visual impact at this location would be moderate-high. A visual simulation for this KOP is provided in Appendix K.

Van Buren. See description for Applicant Proposed Route Link 4.

3.18.6.2.3.2.7.5 Applicant Proposed Route Link 6

Alma. Applicant Proposed Route Link 6 would be visible crossing the open field 0.5 mile to the north. The transmission line structures would be visible just in front of the dense line of trees in the MG and would extend above tree line, adding vertical elements to the irregular line of the horizon. The transmission line structures would be visible to motorists and residents of Alma and would result in moderate contrast. This is a residential area with high visual concern and the overall visual impact would be moderate.

Bluff Hole Park. Applicant Proposed Route Link 6 would be located about 1.7 miles to the north. Most views of the transmission line structures would be screened by FG vegetation, but if they were visible, they would appear as small dark objects and likely would not attract the attention of visitors to the park. This is a recreation area, so visual concern is high and the overall visual contrast would be weak and visual impacts low.

City Park Ball Fields and Rudy. Applicant Proposed Route Link 6 would be located 2 miles to the southwest of the City Park Ball Fields in Rudy. People at the park would not be able to see any of the structures due to vegetation and terrain in the FG. There would be no visual impact at this location.

Clear Creek Park. Dense trees in the FG view from Clear Creek Park would screen all views of the Applicant Proposed Route 1.4 miles to the north. There would be no visual impact at this location.

Dyer. Applicant Proposed Route Link 6 would be clearly visible in the FG as it crosses the open field 0.3 mile to the southeast. The transmission line structures would introduce large vertical elements to an open landscape free of heavy modification, creating a dominant feature and resulting in strong visual contrast. This is a residential area, so visual concern is high and the overall visual impact would be high.

Mulberry Park. Applicant Proposed Route Link 6 would be located 0.3 mile away and be clearly visible as it crosses the open field past the FG trees. The transmission line structures would be dominant in the view to the west, extending above the distant tree line and introducing a new vertical form to the landscape that is currently void of heavy modification. This is a public park, so visual concern is high and viewing times would be long duration. The overall visual contrast would be of strong and overall visual impacts would be high at this location.

Mulberry River and Trail of Tears. Applicant Proposed Route Link 6 would cross the river 0.4 mile from this location. Most of the transmission line structures would be screened because of the dense vegetation in the area, but when they were visible through breaks in vegetation, they would be clearly visible across the open field to the east. The proposed transmission line structures would be noticeably different than existing structures in view, introducing new form and line to the landscape. Since this is a sensitive viewpoint representing a historic trail, the proposed structures would result in strong contrast and high overall visual impact. A visual simulation for this KOP is provided in Appendix K.

Trail of Tears Wire Road. Applicant Proposed Route Link 6 would be located 0.2 mile to the southwest. The proposed transmission line would be the dominate view as the line crosses the highway and different in form than existing structures as well as much larger in scale. The level of visual contrast would be strong and overall visual impact high.

Vine Prairie Park. Applicant Proposed Route Link 6 would be located 1.5 miles to the northwest of this park and boat launch area. Visitors using these facilities may be able to see the tops of the transmission line structures extending above the tree line, but they would appear as small dark objects, adding to the already irregular line of the horizon, resulting in weak contrast. This area does represent a recreational area in a scenic quality Class A landscape, so overall visual impacts would be moderate–low.

3.18.6.2.3.2.7.6 Applicant Proposed Route Link 7

Aux Arc Park. Applicant Proposed Route Link 7 would be across the river, 2.8 miles to the north of Aux Arc Park. The HVDC Applicant Proposed Route would be visible on the far shore by visitors to the park, but would exist with multiple other cultural modifications and would only add weak visual contrast to the landscape. This KOP represents a recreation area so visual concern is high, but because of distance and weak level of contrast added, overall visual impacts would be low.

East Side City Park. Applicant Proposed Route Link 7 would be located 2.1 miles from East Side City Park, but would not be visible due to dense vegetation in the FG. There would be no visual impact at this location.

Interstate 40 Rest Stop. Applicant Proposed Route Link 7 would be located 200 feet to the north of this location as it crosses the field in the near FG. This KOP represents views from a scenic highway, so visual concern is high. The transmission line would dominate the view of anyone stopping at this rest stop and the clearing of the ROW would be clearly visible, resulting in strong visual contrast and high overall visual impact. A visual simulation for this KOP is provided in Appendix K.

Ozark. Applicant Proposed Route Link 7 would be located 0.8 mile to the north. People in the area may be able to see tops of the structures extending about the trees on the horizon, but the majority of the transmission line structures would be screened by dense vegetation and the low ridgeline in the MG. Any structures extending above the horizon would be visible as small dark objects adding weak contrast to the irregular line and form of the existing vegetation. The overall visual impact would be low.

Ozark City Lake Boat Launch. Applicant Proposed Route Link 7 would be located 0.6 mile from the boat launch at Ozark City Lake. The dense trees and ridgeline on the far side of the lake would likely block all views of the transmission line structures from recreationists on the lake. Because there is no visibility, there would be no visual impacts at this location.

West Side City Park. Applicant Proposed Route Link 7 would be located 2 miles from this KOP. Tall trees and terrain in the FG/MG would obscure views of the transmission line structures from this park, resulting in no visual impact.

White Oak. Applicant Proposed Route Link 7 would be located 1.5 miles to the south. Dense trees line the road in this area and would screen all potential views of the transmission line structures, resulting in no visual impact.

White Oak Park. Applicant Proposed Route Link 7 would be located 3 miles to the north of White Oak Park. The dense vegetation on the banks surrounding the lake would obscure all views of the HVDC Applicant Proposed Route, resulting in no visual impact.

3.18.6.2.3.2.7.7 Applicant Proposed Route Link 8

Trail of Tears (Highway 352). Applicant Proposed Route Link 8, would cross Highway 352 and the Trail of Tears 150 feet to the northwest. The Trail of Tears locations mapped by the NPS are representative of the historic location of the trail and the extent of the trail at each crossing location is not known. The transmission line would run parallel to the existing H-frame structures and be highly visible to people in this area. This KOP represents views from a historic trail and visual concern is high. The proposed structures would be much larger in scale and introduce a new dominant form to the landscape that would result in strong contrast and high overall visual impacts.

Wiederkehr Village and Highway 186. Applicant Proposed Route Link 8 would be located 0.7 mile to the northwest of Wiederkehr Village. Viewers in this location may be able to see the transmission line structures extending above the tree line, appearing as small dark objects. The structures would not be very noticeable because of terrain and vegetation, however, and would result in weak contrast. This KOP represents views from a residential area, so visual concern is high and the overall visual impacts would be low.

3.18.6.2.3.2.7.8 Applicant Proposed Route Link 9

Big Piney Creek. Applicant Proposed Route Link 9 would cross Big Piney Creek 0.2 mile to the northeast. Recreationists on the creek may see the tops of the structures extending about tree line, but these structures would be co-dominant with the existing line that crosses in the same place. In addition to the structures, vegetation would be cleared along the banks of the river, resulting in additional contrast as well as exposure to the proposed and current transmission lines. This KOP represents a sensitive area in a primarily natural landscape. Because the proposed transmission line structures would be adding contrast to existing, similar structures in view, the overall visual contrast would be moderate. The overall visual impact would be moderate-high because it is considered a Class A landscape used by recreationists with high visual concern. A visual simulation for this KOP is provided in Appendix K.

Clarksville. Applicant Proposed Route Link 9 would be located 2.5 miles to the north of the Clarksville KOP. Due to the large amount of dense vegetation and rolling hills between the viewer and Project, there would be no visibility from this location and, therefore, no visual impact.

Hagarville. Applicant Proposed Route Link 9 would be 1 mile to the northeast, and much of the transmission line would be screened by terrain and vegetation. As the transmission line crossed the open fields, the structures would be highly visible and have different form than other structures in the area, resulting in moderate contrast. This KOP represents views from residences and has high visual concern. The overall visual impact would be moderate.

Horsehead Lake Recreation Area. Applicant Proposed Route Link 9 would be 2.1 miles to the south. High ridges and dense vegetation border this dry lake bed and would screen views of the transmission line structures. There would be no visual impact at this location.

Hunt. Applicant Proposed Route Link 9 would be located 0.2 mile to the southeast. The tops of the transmission line structures would be visible above the tree line in the MG and different in form and scale than the existing H-frames which are barely visible through the trees. This is a residential area, so visual concern is high and the proposed structures would result in strong contrast and high overall visual impact.

Lake Ludwig. Applicant Proposed Route Link 9 would be located 0.9 mile to the north. Looking out over the lake from the northern side, the transmission line structures would be visible extending above the tree line, appearing as dark vertical elements on the horizon. Many of the structures would be screened by the dense vegetation, and the portion extending about the trees would result in weak visual contrast. This KOP represents a recreation area, so visual concern is high and the overall visual impacts would be moderate–low.

Route 21 (Scenic Byway). Applicant Proposed Route Link 9 would cross this scenic byway 0.1 mile to the north. The transmission line structures would be clearly visible to motorists traveling on the scenic byway. The tall structures would introduce a new element to the rural landscape and dominate the view where the line crosses the highway. In addition, the ROW clearing would be visible on the sides of the highway and the Project would result in strong visual contrast at this location. This KOP represents views from a Scenic Byway, so visual concern is high and the overall visual impact would be high.

3.18.6.2.3.2.8 Region 4 Conclusion

Region 4 contains a high density of visual resources primarily associated with rural and suburban communities, scattered rural residences, creeks, bayous, lakes, and reservoirs associated with recreation areas, wild and scenic rivers, scenic byways, NWR, national forests, state and local parks and historic landmarks. Visual impacts are anticipated to be mostly moderate–low for high and moderate sensitive viewers where the Project is located in the MG/BG distance zone. Typically, the Applicant Proposed Route is either seen in the context of other existing transmission lines or viewers are partially to completely obstructed by terrain and/or vegetation. Higher impacts are anticipated for high sensitivity viewers associated with communities or recreation areas where the Applicant Proposed Route is located within the FG and is not seen in the context of other transmission lines.

3.18.6.2.3.2.9 Region 5

The landscape category in Region 5 is primarily Common and is characterized by varied terrain with low rugged hills, mountains, and benches in the northern portion transitioning to undulating plains, terraces, cuestas, and floodplains associated with the Arkansas River in the south. Landscapes categorized as Distinct occur throughout the region and are associated with more natural rugged terrain in the northern portion of the region and the Arkansas River. In Region 5, existing transmission lines are not common within the landscape setting; therefore, the Applicant Proposed Route would cross and/or parallel fewer transmission lines than in Regions 1 through 4. The Applicant Proposed Route would parallel a 138kV line for approximately 1 mile and a 500kV line for approximately 4 miles and would cross two 161kV transmission lines. The contrast introduced by the Applicant Proposed Route and the visibility are similar to the conditions described for Region 4 in Section 3.18.6.2.3.2.

The visual impacts for the Region 5 KOPs are listed in Table 3.18-13 and described below.

Table 3.18-13:
Visual Impact Summary of KOPs—Applicant Proposed Route—Region 5

KOP	Link	Distance (Miles)	Viewer Concern	Landscape Category	Visibility	Contrast	Overall Impact
Dover and JP Lovelady	1	2.8	High	Common	No	No Contrast/Not Visible	No Impact
Hector	1	2.5	High	Common	No	No Contrast/Not Visible	No Impact
Highway 7 (Scenic Byway)	1	0.1	High	Common	Yes	Strong	High
Pope Co. Residential Cluster	1, 2	0.8	High	Distinct	Yes	Weak	Moderate-Low
Boy Scout Campground	3	0.5	High	Common	No	No Contrast/Not Visible	No Impact
Damascus	3	0.7	High	Common	Yes	Moderate	Moderate
Guy	3	2.8	High	Common	No	No Contrast/Not Visible	No Impact
Highway 9 Scenic Highway	3	0.2	High	Common	Yes	Strong	High
Twin Groves	3	3	High	Common	No	No Contrast/Not Visible	No Impact
Wonderview School	3	1.8	High	Distinct	Yes	Weak	Moderate-Low
Quitman	4	0.2	High	Common	Yes	Strong	High
Rose Bud City Park	4	3.4	High	Developed	No	No Contrast/Not Visible	No Impact
Letona	5	0.6	High	Developed	Yes	Moderate	Moderate–High
Highway 16 (Scenic Highway)	6	0.3	High	Common	Yes	Strong	High
Steprock	7, 8	0.6	High	Developed	Yes	Weak	Low
Bradford	9	0.9	High	Common	No	No Contrast/Not Visible	No Impact
White River	9	0.06	Moderate	Distinct	Yes	Strong	High

3.18.6.2.3.2.9.1 Applicant Proposed Route Link 1

Dover and JP Lovelady Ball Park. Applicant Proposed Route Link 1 would be located 2.8 miles to the north-northwest. Looking out from the ballpark in Dover, the transmission line structures would be screened from view given the low forested ridges in the distance and the dense vegetation in the FG. There would be no visual impact at this location.

Hector. Looking south from Hector, Applicant Proposed Route Link 1 would be located 2.5 miles away at its closest point. Dense vegetation in the FG/MG would screen all views of the HVDC Applicant Proposed Route at this location, resulting in no visual impact.

Highway 7 (Scenic Byway). Applicant Proposed Route Link 1 would cross the highway 0.1 mile to the north. Motorists traveling on the Highway 7 would have clear views of the transmission line structures as the line crossed the highway. The structures would extend above tree line and introduce large vertical elements that would differ greatly from anything on the current landscape in this area. When approaching the line, motorists would have clear views of the vegetation clearing for the ROW, creating additional impact. The overall visual contrast would be strong and overall visual impacts high at this location.

Pope County Residential Cluster. Applicant Proposed Route Link 1 would be located 0.8 mile to the north of this KOP. Views would likely be screened by terrain and vegetation, but if visible, the transmission line structures would appear as dark vertical elements extending above the trees in the distance as the line goes down the ridge and into the valley. This KOP represents views from a residential area, so visual concern is high, but because views would be very limited, the visual contrast would be weak and overall visual impacts Moderate–Low because it is considered a Distinct landscape with high visual sensitivity.

3.18.6.2.3.2.9.2 Applicant Proposed Route Link 2

Pope County Residential Cluster. Views looking north-northwest from this location, towards Applicant Proposed Route Link 2, would be screened by FG vegetation, resulting in no visual contrast.

3.18.6.2.3.2.9.3 Applicant Proposed Route Link 3

Boy Scout Campground. Applicant Proposed Route Link 3 would be located 0.5 mile to the north of the Boy Scout Campground. Dense vegetation in the FG and MG would screen all potential views of the Project, resulting in no visual impact at this location.

Damascus. This KOP represents views looking north-northwest from the community of Damascus and represents residential views, so visual concern is high. Applicant Proposed Route Link 3 would be located in the MG 0.7 mile to the north. The transmission line structures would be visible crossing open fields and extending above existing structures and appear as a repeating vertical element on the rural landscape. The structures would introduce a new form to the existing elements of the landscape (as described in Section 3.18.5.5). The area does have some existing transmission line structures and other cultural modifications, so the proposed transmission line structures would result in moderate contrast and moderate overall visual impact at this location.

Guy. Applicant Proposed Route Link 3 would be located 2.8 miles to the north. A low ridge line covered in dense vegetation would screen all views of the transmission line structures from this location resulting in no visual impact. A visual simulation for this KOP is provided in Appendix L.

Highway 9 Scenic Highway. Applicant Proposed Route Link 3 would be located 0.2 mile to the south, where it crosses over Highway 9. The transmission line structures would be highly visible above trees and where the lines cross the highway. The structures would be dominant in the FG view and would introduce new form and line to the landscape at a much larger scale than existing features (as described in Section 3.18.5.5.1). This KOP represents views from a scenic highway, so visual concern is high and the transmission line would result in strong contrast and high overall visual impact.

Twin Groves. Applicant Proposed Route Link 3 would be located 3 miles north of the Twin Groves KOP. Dense vegetation and terrain features in the FG/MG would screen all views of the Project, resulting in no visual impact.

Wonderview School. Applicant Proposed Route Link 3 would be located 1.8 miles to the north. Viewers in this location may be able to see the transmission line structures in the valley through breaks in the trees. The structures would be mostly screened by vegetation and terrain, with the possibility of some structures extending above trees. This KOP represents views from a residential area, so visual concern is high, but because the structures would not be highly noticeable, the resulting contrast would be weak and overall visual impacts moderate–low.

3.18.6.2.3.2.9.4 Applicant Proposed Route Link 4

Quitman. Applicant Proposed Route Link 4 would be visible crossing the open field 0.2 mile to the south. Due to scale and form, the transmission line structures would be a dominant feature in the FG. The structures would be different in line and form than existing elements on the landscape (as described in Section 3.18.5.5.1 and would result in strong visual contrast and high overall visual impact. A visual simulation for this KOP is provided in Appendix K.

Rose Bud City Park. Applicant Proposed Route Link 4 would be located 3.4 miles north of the Rose Bud City Park KOP. Views of the transmission line structures from this location would be screened by tall trees and rolling terrain, resulting in no visual impact.

3.18.6.2.3.2.9.5 Applicant Proposed Route Link 5

Letona. Applicant Proposed Route Link 5 would be located 0.6 mile to the north and would be partially visible through breaks in trees and extending above tree line in places. The structures would introduce a new form to the landscape that is noticeably different than existing forms on the landscape (as described in Section 3.18.5.5.1), resulting in moderate contrast and moderate-high overall visual impact.

3.18.6.2.3.2.9.6 Applicant Proposed Route Link 6

Highway 16 (Scenic Highway). The Applicant Proposed Route Link 6 would cross Scenic Highway 16, 0.3 mile from this KOP. Transmission line structures would be clearly visible and noticeable across the open field in the FG and extended above tree line introducing new, vertical elements to the landscape. This KOP represents views from a scenic highway, so visual concern is high and because of the scale of the structures, at this distance they would be a dominant form on the landscape and result in strong contrast and high overall visual impact.

3.18.6.2.3.2.9.7 Applicant Proposed Route Link 7

Steprock. Applicant Proposed Route Link 7 would be located 0.6 mile to the south. Dominant in the view at this location is an existing 500kV transmission line. The proposed transmission line structures would be similar in form and scale, but farther away and partially screened by FG trees causing them to appear subordinate on the landscape, resulting in weak contrast and low overall visual impact.

3.18.6.2.3.2.9.8 Applicant Proposed Route Link 8

Steprock. See description of Steprock KOP for Applicant Proposed Route Link 7. Distance and visibility are the same.

3.18.6.2.3.2.9.9 Applicant Proposed Route Link 9

Bradford. Applicant Proposed Route Link 9 would be located 0.9 mile to the north. Tall trees, dense vegetation, and rolling terrain in the FG would block all potential views of the transmission line structures from this location, resulting in no visual impact.

White River. Applicant Proposed Route Link 9 would be located 300 feet to the southeast and would run parallel to the highway. The transmission line would be highly visible above existing FG vegetation as it crosses the river and open fields. Because the transmission line would introduce new elements into a natural landscape, the large metal structures would become a dominant feature. This KOP represents the crossing of a waterbody, but because of low numbers of potential views, the visual concern is moderate. The Project would result in strong visual contrast and high overall visual impact.

3.18.6.2.3.2.10 Region 5 Conclusion

Region 5 contains a moderate density of sensitive viewers primarily associated with rural communities, scattered rural residences, the Ozark National Forest, recreation areas (state and local parks), scenic byways, and conservation and wildlife management areas. Visual impacts are anticipated to be mostly moderate–low for high sensitivity viewers where the Applicant Proposed Route is located in the MG distance zone. No visual impacts are anticipated for many sensitive viewers where the Project is located in the edge of the MG and BG and views would be completely obstructed given the variation in terrain and heavily wooded areas. Higher visual impacts are anticipated to occur within this region though they would typically occur where the Project crosses scenic byways or is located in the FG distance zone.

3.18.6.2.3.2.11 Region 6

The landscape category in Region 6 is primarily Common and is characterized by predominately agricultural, croplands, and natural areas including riparian woodlands and wetlands. The terrain is relatively flat to gently undulating with several meandering streams, branching channels, and other drainages. Views are generally open given the level terrain, although wooded areas and trees planted along the edges of field, roadways, and drainages and channels can limit expansive views in some areas. In Region 6, existing transmission lines are not common within the landscape setting; however, the Applicant Proposed Route crosses two 161kV transmission lines and parallels another 161kV transmission line for approximately 2 miles.

The tall vertical geometric forms of the proposed structures would result in strong contrast with the horizontal lines of the relatively flat landscape found throughout most of the region. Contrast would be reduced in areas where the Applicant Proposed Route would parallel or be seen in context with existing transmission and electric distribution lines; the level of contrast would depend on the form, line, color and texture of the existing structures and the distance the existing structures are from the Applicant Proposed Route. Views of structures in some areas are limited to the upper portions that extend above tree lines and other vegetation. Changes to the landscape and vegetation due to construction of access roads and ROW clearing may be visible but changes would generally not be noticeable in the MG and BG where terrain and vegetation may obscure these changes. Changes may be noticeable to viewers where the Applicant Proposed Route is located in the FG in relatively flat terrain with minimal vegetation to obscure views. Contrast could be reduced in areas where existing access roads would be used and where the Applicant Proposed Route would parallel an existing transmission line corridor where vegetation clearing has previously occurred. The visual impacts for the Region 6 KOPs are listed in Table 3.18-14 and described below.

Table 3.18-14:
Visual Impact Summary of KOPs—Applicant Proposed Route—Region 6

KOP	Link	Distance (Miles)	Viewer Concern	Scenic Quality	Visibility	Contrast	Overall Impact
Weldon	1	2.6	High	Common	Yes	Weak	Low
Crowley's Ridge Byway	3	0.1	High	Distinct	Yes	Strong	High
Fisher and Park	4	1	High	Developed	Yes	Moderate	Moderate–Low
Cherry Valley	6	0.9	High	Common	Yes	Moderate	Moderate

3.18.6.2.3.2.11.1 Applicant Proposed Route Link 1

Weldon. Applicant Proposed Route Link 1 would be located 2.6 miles to the north. The flat open landscape would allow for multiple visible transmission-line structures, but at a distance of 2.6 miles, they would appear as a row of dark vertical elements and would be co-dominant with the existing structures on the landscape. This KOP represents views from residential area, so visual concern is high. The overall visual contrast would be weak and result in low overall visual impact.

3.18.6.2.3.2.11.2 Applicant Proposed Route Link 3

Crowley's Ridge Scenic Byway. Applicant Proposed Route Link 3 would cross the byway 0.1 mile to the north. The large scale of the structures would make them visible above the FG trees and dominate the view. As motorists approach, ROW vegetation clearing would become visible for a short duration as they traveled past, creating sharp lines and large cleared areas in this natural environment. This KOP represents views from a Scenic Byway, so visual concern is high and the additional structures would result in strong contrast and high overall visual impact.

3.18.6.2.3.2.11.3 Applicant Proposed Route Link 4

Fisher and Park. Applicant Proposed Route Link 4 would be located 1 mile to the east. Vegetation in the FG would screen some of the transmission line structures, but the structures would be visible across the open land just on the other side of the trees. There are existing vertical elements on the landscape, so combined with the partial screening, the contrast would be moderate. This KOP represents views from a park with high visual concern and extended viewing times and the overall visual impact would be moderate–low. The impact may be higher, however, in other locations in town where there is no screening.

3.18.6.2.3.2.11.4 Applicant Proposed Route Link 6

Cherry Valley. Applicant Proposed Route Link 6 would be located 0.9 mile to the north of town. A line of dense vegetation would partially screen the transmission line structures, but due to the large scale of the structures they would be clearly visible above tree line, creating a pattern of vertical elements on the irregular line of the horizon and resulting in moderate contrast at this location and moderate overall visual impact.

3.18.6.2.3.2.12 Region 6 Conclusion

Region 6 contains a low density of sensitive viewers primarily associated with rural communities and scattered rural residences, recreation areas and scenic byways. Visual impacts are anticipated to be mostly moderate–low for high sensitivity viewers where the Project is located in the MG distance zone and would either be seen in the context of existing transmission structure or would be partially screened by existing vegetation. Higher impacts are anticipated to occur for Distinct landscapes associated with Crowley's Ridge, where the Applicant Proposed Route would be located in the FG and would introduce vertical elements into the landscape setting creating strong contrast.

3.18.6.2.3.2.13 Region 7

The landscape category in Region 7 is primarily Common and is characterized by flat floodplains associated with the Mississippi River in the western and central portions and transitioning to gently undulating plains and low hills in the eastern portion. Although the terrain is primarily flat within this region, views are typically limited given the numerous forested areas, vegetation associated with surface waters, waterways, drainages, wetlands, and trees planted along agricultural fields and along roadways. In Region 7, the Applicant Proposed Route crosses two 161kV and one 500kV transmission lines and parallels a 161kV transmission line for approximately 2 miles.

The tall vertical geometric forms of the proposed structures would result in strong contrast with the horizontal lines of the relatively flat landscape found within the southern portion of the region. Contrast would be reduced in areas where the Applicant Proposed Route would parallel or be seen in context with existing transmission and electric distribution lines; the level of contrast would depend on the form, line, color and texture of the existing structures and the distance the existing structures are from the Applicant Proposed Route. Views of structures in some areas are limited to the upper portions that extend above tree lines and other vegetation. Changes to the landscape and vegetation due to construction of access roads and ROW clearing may be visible but changes would generally not be noticeable in the MG and BG where terrain and vegetation may obscure these changes. Changes may be noticeable to viewers where the Applicant Proposed Route is located in the FG in relatively flat terrain with minimal vegetation to obscure views. Contrast could be reduced in areas where existing access roads would be used and where the Applicant Proposed Route would parallel an existing transmission line corridor where vegetation clearing has previously occurred. The visual impacts for the Region 7 KOPs are listed in Table 3.18-15 and described below.

Table 3.18-15:
Visual Impact Summary of KOPs—Applicant Proposed Route—Region 7

KOP	Link	Distance (Miles)	Viewer Concern	Landscape Category	Visibility	Contrast	Overall Impact
Birdsong	1	0.4	High	Common	Yes	Strong	High
Highway 61 (Scenic Byway)	1	0.4	High	Common	Yes	Strong	High
Joiner	1	1.7	High	Common	Yes	Weak	Low
Marked Tree	1	2.2	High	Developed	No	No Contrast/Not Visible	No Impact
Mississippi River and Trail of Tears	1	0.7	High	Common	Yes	Strong	High
Tyronza	1	2	High	Developed	Yes	Weak	Low
Wilkinsville	4	0.1	High	Common	Yes	Strong	Moderate–High
Atoka	5	0.7	High	Common	No	No Contrast/Not Visible	No Impact
Atoka Community Park	5	4	High	Developed	No	No Contrast/Not Visible	No Impact
Edmund Orgill Park	5	1	High	Distinct	Yes	Weak	Moderate-Low

Table 3.18-15:
Visual Impact Summary of KOPs—Applicant Proposed Route—Region 7

KOP	Link	Distance (Miles)	Viewer Concern	Landscape Category	Visibility	Contrast	Overall Impact
Harold Park and Millington	5	2	High	Developed	No	No Contrast/Not Visible	No Impact
Munford	5	2	High	Developed	No	No Contrast/Not Visible	No Impact
Rhodes Estates	5	0.6	High	Developed	Yes	Moderate	Moderate-Low

3.18.6.2.3.2.13.1 Applicant Proposed Route Link 1

Birdsong. Applicant Proposed Route Link 1 would be located 0.4 mile to the north. The transmission line structures would be highly noticeable crossing the open field. The tall vertical structures would create a pattern on the landscape different in form from existing structures (as described in Section 3.18.5.7.1) and much larger in scale, resulting in strong visual contrast and high overall visual impact.

Highway 61 Scenic Byway. Applicant Proposed Route Link 1 would cross the Highway 61 Scenic Byway 0.4 mile to the northeast. The FG vegetation would partially screen the transmission line structures in this view, but due to their large scale, they would be visible extending above tree line. As motorists travelling the Scenic Byway approached the highway crossing, the structures would be a dominant feature on the landscape because of their scale and form, resulting in strong visual contrast and high overall visual impacts. Since most viewers in this location would be traveling on the highway, views would be primarily of short duration.

Joiner. Applicant Proposed Route Link 1 would be located 1.7 miles to the south and would appear as a pattern of vertical elements along the horizon, where not screened by FG vegetation. This KOP represents views from a residential area, so visual concern is high and the visual contrast at this distance would be weak and overall visual impact low.

Marked Tree. Applicant Proposed Route Link 1 would be located 2.2 miles to the south. Foreground vegetation and structures would screen all views of the transmission line structures, resulting in no visual impact.

Mississippi River and Trail of Tears. Applicant Proposed Route Link 1 would cross the open field 0.7 mile at the closest point. The transmission line structures would be highly visible and introduce a repeating geometric form to the landscape. Structures on either side of the river crossing would also be visible from this location and add additional contrast at night because of FAA lighting requirements. This KOP represents a major waterbody, crossing, which is also identified as a water route of the Trail of Tears, but would not have a high number of viewers, so visual concern is moderate. The Trail of Tears locations mapped by the NPS are representative of the historic location of the trail and the extent of the trail at each crossing location is not known. At this location, the visual contrast would be strong and overall visual impacts high. A visual simulation for this KOP is provided in Appendix K.

Tyronza. Applicant Proposed Route Link 1 would be located 2 miles southwest of the Tyronza KOP, which represents rural residential views, so visual concern is high. The transmission line structures would be visible through openings in the FG vegetation and extend above the trees in the MG. The structures would appear as dark vertical objects on the horizon at this distance and would result in weak visual contrast and low overall visual impact.

3.18.6.2.3.2.13.2 Applicant Proposed Route Link 4

Wilkinsville. Applicant Proposed Route Link 4 would be visible as it traverses the open field 0.1 mile east of this KOP. The structures would be prominent features on the landscape as the cross the field. The proposed structures would be considerably larger than existing structures in view (as described in Section 3.18.5.7.1), and would result in strong visual contrast. This KOP represents views from a residential area, so visual concern is high and overall visual impacts on the landscape would be high.

3.18.6.2.3.2.13.3 Applicant Proposed Route Link 5

Atoka. Applicant Proposed Route Link 5 would be located 0.7 mile to the south from this location, but views of the transmission line structures would be screened by FG vegetation and terrain, resulting in no visual impact.

Atoka Community Park. Applicant Proposed Route Link 5 would be located 4 miles to the southwest of the Atoka Community Park, but views of the transmission line structures would be screened by FG vegetation resulting in no visual impact.

Edmund Orgill Park. Applicant Proposed Route Link 5 would be located 1 mile to the south. From here, the transmission line structures would likely be screened. If visible, the view would be a small portion of the top of the structures extending above the tree line, resulting in weak contrast and moderate–low visual impact since this is a natural environment.

Harold Park and Millington. Applicant Proposed Route Link 5 would be located 2 miles to the north and would be screened by FG structures and trees, resulting in no visual impact.

Munford. Applicant Proposed Route Link 5 would be located 2 miles to the south. Due to existing structures and dense vegetation in the FG, the proposed transmission line structures would not be visible from this location and there would be no visual impact.

Rhodes Estates. Applicant Proposed Route link 5 would be located 0.6 mile to the southeast. Most of the transmission line structures would be partially screened by vegetation and terrain, leaving the tops visible extending above tree line. This KOP represents views from a residential area, so visual concern is high and the visible structures would result in moderate contrast and moderate–low overall visual impact.

3.18.6.2.3.2.14 Region 7 Conclusion

Region 7 generally contains a low density of sensitive viewers in the western portion of the region (west of the Mississippi) and a higher density of sensitive viewers in the eastern portion (east of the Mississippi River) near Millington. Sensitive viewers are typically associated with rural and suburban communities and scattered residences and recreation areas associated with the communities and the Mississippi River. Visual impacts are anticipated to be mostly moderate–low to low for high sensitivity viewers where the Project is located in the MG distance zone and would either be seen in the context of existing transmission structure or would be partially screened by existing vegetation. Higher impacts are anticipated where the Applicant Proposed Project is located in the FG and would introduce vertical elements into the landscape setting creating strong contrast and where it crosses Distinct landscapes such as the Mississippi River.

3.18.6.2.3.3 Decommissioning Impacts

Project facilities would be removed at the end of the operational life of the transmission line. Conductors, structures, and related facilities would be removed. Foundations would be removed to below the ground surface level. There would be temporary visual impacts during decommissioning of the Project. There would be residual visual impacts for many years after the Project has been decommissioned and structures removed such as vegetative cutbacks, cut and fill scars from construction activities, and access roads, which all add to the visual impact, though these impacts would be at ground level. These areas would be apparent after the removal of structures but are expected to diminish over time as vegetation returns to the area.

3.18.6.3 Impacts Associated with the DOE Alternatives

3.18.6.3.1 Arkansas Converter Station Alternative Siting Area and AC Interconnection Siting Area

3.18.6.3.1.1 Construction Impacts

Construction would result in the short-term visual intrusion of construction vehicles, equipment, materials, and a work force in staging areas, and final converter station location. Vehicles, heavy equipment, structure components, and workers would be visible during converter station construction and modification, access and spur road clearing and grading, structure erection, and cleanup and restoration. Affected viewers would be aware of the existing structures in the area adjacent to the Project and the temporary nature of Project construction impacts, which would decrease both scenic quality and viewer concern to the impact. It should be noted that the converter station would be similar to the proposed converter stations proposed in Oklahoma and Tennessee.

3.18.6.3.1.2 Operations and Maintenance Impacts

3.18.6.3.1.2.1 Arkansas Converter Station Siting Area and AC Interconnection Siting Area

The Arkansas Converter Station Alternative Siting Area and AC Interconnection Siting Area would be located northeast of Atkins. Because a specific location has not yet been selected, a large area was reviewed for the Arkansas Converter Station; therefore, evaluation of visual impacts at specific KOPs is not possible at this time. The surrounding landscape is primarily rural and agricultural and other than rural residences, does not contain a high number of sensitive resources that would be impacted. When visible in the FG, the facilities associated with the converter station would result in high contrast on the rural landscape, but given low numbers of sensitive viewers in the area, it would have an overall low-moderate impact.

3.18.6.3.1.3 Decommissioning Impacts

Project facilities would be removed at the end of the operational life of the converter station. There would be temporary visual impacts during decommissioning of the Project. Structures, and related facilities would be removed and foundations removed to below the ground surface level. There would be residual visual impacts for many years after the Project has been decommissioned and structures removed such as vegetation removal and access roads, which all add to the visual impact, though these impacts would be at ground level. These areas would be apparent after the removal of structures but are expected to diminish over time as vegetation returns to the area.

3.18.6.3.2 HVDC Alternative Routes

3.18.6.3.2.1 Construction Impacts

Construction would result in the short-term visual intrusion of construction vehicles, equipment, materials, and a work force in staging areas, along access roads, and along the new transmission line ROW. Vehicles, heavy equipment, structure components, and workers would be visible during structure erection, conductor stringing, access and spur road clearing and grading, and cleanup and restoration. However, disturbance from construction activities would be transient and of short duration as activities progress along the transmission line route. Affected viewers would be aware of the temporary nature of Project construction impacts, which should decrease their concern to the impact.

3.18.6.3.2.2 Operations and Maintenance Impacts

3.18.6.3.2.2.1 Region 1

A description for Region 1 is provided in Section 3.18.6.2.3.2.1. Additional sensitive resources in proximity to HVDC Alternative Routes in region 1 include the Lake Schultz State Park and Optima NWR. The visual impacts for the Region 1 AR KOPs are listed in Table 3.18-16 and described below.

Table 3.18-16:
Visual Impact Summary of KOPs—HVDC Alternative Routes—Region 1

KOP	AR	Distance (Miles)	Viewer Concern	Landscape Category	Visibility	Contrast	Overall Impact
Laverne	1-A	0.9	High	Developed	Yes	Moderate	Moderate–Low
Hardesty	1-A, 1-C	0.8	High	Common	Yes	Moderate	Moderate
Optima NWR	1-A, 1-C	2.5	High	Common	Yes	Weak	Moderate–Low
Lake Schultz State Park	1-B	0.9	High	Distinct	Yes	Strong	High
Local Historical Marker	1-D	0.8	Moderate	Common	Yes	Moderate	Moderate–Low

3.18.6.3.2.2.1.1 HVDC Alternative Route 1-A

HVDC Alternative Route 1-A corresponds to Applicant Proposed Route Links 2, 3, 4, and 5.

Laverne. DOE Alternative Route 1-A would be located 0.9 mile to the north. The transmission lines structures would be noticeable in open fields and extend above vegetation and low structures, but they would not dominate the view and there would be no change to landform or vegetation. The overall visual impact at this location would be moderate–low.

Hardesty. HVDC Alternative Route 1-A would be located 0.8 mile to the south. The transmission line structures would be a prominent feature on the flat landscape, but because of the distance, would appear at a similar scale to existing vertical elements and would be co-dominant in the view. There would be no change to landform or vegetation and visual impact at this location would be moderate. A visual simulation for this KOP is provided in Appendix K.

Optima NWR. HVDC Alternative Route 1-A would be visible about 2.5 miles to the southeast. Because of distance, transmission line structures would be faintly visible in the distance. Structures may be noticeable as they traverse open lands, but would only result in weak contrast. This KOP represents views from a wildlife refuge, so visual concern is high and the overall visual impact at this location would be moderate–low.

3.18.6.3.2.2.1.2 HVDC Alternative Route 1-B

HVDC Alternative Route 1-B corresponds to Applicant Proposed Route Links 2 and 3.

Lake Schultz State Park. HVDC Alternative Route 1-B would be located 0.9 mile to the north. The view from this KOP is panoramic and the transmission structures would extend above the horizon line, introducing new vertical elements into a very natural landscape free of cultural modifications. This KOP represents views from a public park, so visual concern is high, and the overall visual impact of HVDC Alternative Route 1-B would be high.

3.18.6.3.2.2.1.3 HVDC Alternative Route 1-C

HVDC Alternative Route 1-C corresponds to Applicant Proposed Route Links 2 and 3.

Hardesty. See description of Hardesty KOP for HVDC Alternative Route 1-A. Distance and visibility from HVDC Alternative Route 1-C are similar.

Optima NWR. See description of Optima NWR KOP for HVDC Alternative Route 1-A. Distance and visibility are the same.

3.18.6.3.2.2.1.4 HVDC Alternative Route 1-D

HVDC Alternative Route 1-D corresponds to Applicant Proposed Route Links 3 and 4.

Local Historical Marker. HVDC Alternative Route 1-D would be located 0.8 mile to the north. HVDC Alternative Route 1-D would run adjacent to the existing transmission line, which is located 0.6 mile from this location. The proposed transmission line structures would result in similar impacts as corresponding Applicant Proposed Route Link 4, but would have slightly less contrast due to distance. The overall visual impact of HVDC Alternative Route 1-D would be moderate–low.

3.18.6.3.2.2.1.5 Region 1 Alternative Comparison

Table 3.18-17 provides a comparison of the visual impacts for Region 1.

Table 3.18-17:
Visual Impact Comparison Summary—Region 1

Proposed and Alternative Routes	Miles of Distinct Lands Crossed	Miles of Common Lands Crossed	Miles of Developed Lands Crossed	Residences within 0.5 mile
HVDC Alternative Route 1-A	10.5	105.6	7.1	89
APR Links Corresponding to 1-A	5.2	101.7	8.1	95
HVDC Alternative Route 1-B	2.7	44.1	5.4	37
APR Links Corresponding to 1-B	0.1	49.1	3.9	32
HVDC Alternative Route 1-C	1.9	45.1	5.4	63
APR Links Corresponding to 1-C	0.1	49.1	3.9	32
HVDC Alternative Route 1-D	1	30.3	2.3	45
APR Links Corresponding to 1-D	1.3	32.4	1	51

3.18.6.3.2.2.2 Region 2

A description for Region 2 is provided in Section 3.18.6.2.3.2.2. Towns and residences would be the primary source of sensitive viewers in this region, although there are some additional sensitive resources such as state parks, the Cimarron River and Gloss Mountain State Park. The visual impacts for the Region 2 KOPs are listed in Table 3.18-18 and described below.

Table 3.18-18:
Visual Impact Summary of KOPs—HVDC Alternative Routes—Region 2

KOP	AR	Distance (Miles)	Viewer Concern	Landscape Category	Visibility	Contrast	Overall Impact
Cimarron River Crossing	2-A	0.7	Moderate	Common	Yes	Moderate	Moderate–Low
Cleo Springs	2-A	3	High	Common	Yes	Weak	Low
Gloss Mountain State Park	2-A	0.8	High	Distinct	Yes	Moderate	Moderate–High
Ames	2-A, 2-B	1.3, 2.6	High	Common	Yes	Weak	Moderate-Low
Bison	2-B	1.8	High	Developed	Yes	Weak	Low
Waukomis KOP	2-B	3.5	High	Common	Yes	Weak	Low

3.18.6.3.2.2.2.1 HVDC Alternative Route 2-A

HVDC Alternative Route 2-A corresponds to Applicant Proposed Route Link 2.

Cimarron River Crossing. HVDC Alternative Route 2-A would cross the Cimarron River 0.7 mile to the south. There are existing H-frame and T-frame structures prominent in FG in this view, and the proposed structures would appear as additional vertical elements on the horizon. The form of the proposed structures would be taller and wider than the existing monopole structures, resulting in moderate visual contrast. This is a major river crossing, visual concern is moderate, and has existing cultural modification, resulting in moderate–low overall visual impact.

Cleo Springs. HVDC Alternative Route 2-A would be located 3 miles to the south. There are two existing wood H-frame 115kV lines visible from this location and the new transmission line would be larger in form, but farther away from the view and appear as small vertical elements on the horizon, similar to the existing. Because these proposed structures would be adding to existing vertical elements and not prominent in view, they would only slightly add to visual contrast. The overall visual impacts at this location would be low.

Gloss Mountain State Park. HVDC Alternative Route 2-A would be visible 0.8 mile to the northeast. There are existing structures in view, but this line would introduce new vertical elements to the open landscape and would result in moderate visual contrast. This KOP represents sensitive views from a state park and the overall visual impacts of HVDC Alternative Route 2-A in this location would be moderate-high. A visual simulation for this KOP is provided in Appendix K.

Ames. HVDC Alternative Route 2-A would be located 1.3 miles to the south and would appear as small objects in the distance. Where the structures are not blocked by FG/MG trees and vegetation, they would appear similar in scale to existing structures and would introduce a weak level of contrast. This KOP represents views from a residential area, so visual concern is high and the overall visual impacts at this location would be low.

3.18.6.3.2.2.2.2 HVDC Alternative Route 2-B

HVDC Alternative Route 2-B corresponds to Applicant Proposed Route Link 3.

Ames. Views are similar to Ames KOP description for HVDC Alternative Route 2-A, but slightly less noticeable due to greater distance (2.6 miles).

Bison. Viewers looking to the north from this location would see the transmission line structures of HVDC Alternative Route 2-B appearing as small vertical objects on the horizon 1.8 miles away. Trees in the FG would obstruct the majority of the views and HVDC Alternative Route 2-B in this location would result in weak contrast and overall visual impacts would be low.

Waukomis. HVDC Alternative Route 2-B would be located 3.5 miles to the south. From the Waukomis KOP, the line would be barely visible above the horizon, where it is not screened by FG trees. This KOP represents views from a residential area with high visual concern. The overall visual impact at this location is low.

3.18.6.3.2.2.2.3 Region 2 Alternative Comparison

Table 3.18-19 provides a comparison of the visual impacts for Region 2.

Table 3.18-19:
Visual Impact Comparison Summary of KOPs—Region 2

Proposed and Alternative Routes	Miles of Distinct Lands Crossed	Miles of Common Lands Crossed	Miles of Developed Lands Crossed	Residences within 0.5 mile
HVDC Alternative Route 2-A	9	44.4	4	66
APR Links Corresponding to Alternative 2-A	8.5	43.9	2.2	155
HVDC Alternative Route 2-B	0.2	28.7	1	71
APR Links Corresponding to Alternative 2-B	1.2	26.1	4	29

3.18.6.3.2.2.3 Region 3

A description for Region 3 is provided in Section 3.18.6.2.3.2.3. Towns and residences would continue to be the majority of the sensitive viewers, but there are additional resources in proximity to the HVDC Alternative Routes in this region including lakes and recreation areas that are considered sensitive resources. The visual impacts for the Region 3 KOPs are listed in Table 3.18-20 and described below.

Table 3.18-20:
Visual Impact Summary of KOPs—HVDC Alternative Routes—Region 3

KOP	AR	Distance (Miles)	Viewer Concern	Landscape Category	Visibility	Contrast	Overall Impact
Lake Carl Blackwell	3-A, 3-B	2.7	High	Distinct	No	No Contrast/Not Visible	No Impact
Marshall	3-A, 3-B	1	High	Common	Yes	Weak	Low
Mullhall	3-A, 3-B	3	High	Developed	No	No Contrast/Not Visible	No Impact
Orlando	3-A, 3-B	2.7	High	Common	Yes	Weak	Low
Stillwater	3-A, 3-B	2	High	Developed	No	No Contrast/Not Visible	No Impact
Mehan	3-B	0.7	High	Common	Yes	Moderate	Moderate
Agra	3-C	1.5	High	Developed	Yes	Weak	Low

Table 3.18-20:
Visual Impact Summary of KOPs—HVDC Alternative Routes—Region 3

KOP	AR	Distance (Miles)	Viewer Concern	Landscape Category	Visibility	Contrast	Overall Impact
Beggs	3-C	1.5	High	Distinct	Yes	Weak	Moderate–Low
Bristow and Route 66	3-C	3.4	High	Common	No	No Contrast/Not Visible	No Impact
Depew and Route 66	3-C	1.4	High	Common	Yes	Weak	Low
Okmulgee	3-C	1.5	High	Common	Yes	Weak	Low
Perkins	3-C	0.6	High	Common	Yes	Moderate	Moderate
Preston	3-C	0.6	High	Common	Yes	Strong	High
Shamrock	3-C	3	High	Common	No	No Contrast/Not Visible	No Impact
Boynton	3-C, 3-D	1.5	High	Common	Yes	Weak	Low
Council Hill	3-C, 3-D	2.1	High	Common	Yes	Moderate	Moderate
Honey Springs Battlefield Historic Site and Rentiesville South	3-C, 3-D	2.9	High	Common	Yes	Weak	Low
Honey Springs Battlefield Historic Site North	3-C, 3-D	0.5	High	Common	Yes	Moderate	Moderate–High
McLain	3-C, 3-D, 3-E	0.7	High	Common	Yes	Moderate	Moderate
Oktaha School	3-C, 3-D	0.4	High	Common	Yes	Weak	Low
Webbers Falls	3-C, 3-D, 3-E	1.5 (APR), 2.5 (AR)	High	Distinct	No	No Contrast/Not Visible	No Impact

3.18.6.3.2.2.3.1 HVDC Alternative Route 3-A

HVDC Alternative Route 3-A corresponds to Applicant Proposed Route Link 1.

Lake Carl Blackwell. HVDC Alternative Route 3-A would be located 2.7 miles to the south. Due to distance, terrain, and dense vegetation the transmission line structures are not likely to be visible from this location, resulting in no visual impact.

Marshall. HVDC Alternative Route 3-A would be located 1 mile to the north and would be visible above the FG trees and existing structures. The proposed structures would add to the existing vertical elements in the FG, resulting in weak contrast and low overall visual impact.

Mulhall. HVDC Alternative Route 3-A would be located 3 miles to the north, but would not be noticeable given the distance from the KOP and the surrounding dense vegetation. There would be no overall visual impact from this location.

Orlando. HVDC Alternative Route 3-A would be located 2.7 miles to the south. Views of the structures would be obscured by vegetation and terrain in many places, but where visible, the structures would have similar form to the existing lattice structures in view and would introduce a weak level of contrast. The overall visual impact would be low.

Stillwater. HVDC Alternative Route 3-A would be located 2 miles to the south, but views of the transmission line structures would be blocked by terrain and vegetation, resulting in no visual impact. A visual simulation for this KOP is provided in Appendix K.

3.18.6.3.2.2.3.2 HVDC Alternative Route 3-B

HVDC Alternative Route 3-B corresponds to Applicant Proposed Route Links 1, 2 and 3.

Lake Carl Blackwell. See description of Lake Carl Blackwell KOP for HVDC Alternative Route 3-A. Distance and visibility are the same.

Marshall. See description of Marshall KOP for HVDC Alternative Route3-A. Distance and visibility are the same.

Mulllhall. See description of Mullhall KOP for HVDC Alternative Route 3-A. Distance and visibility are the same.

Orlando. See description of Orlando KOP for HVDC Alternative Route 3-A. Distance and visibility are the same.

Stillwater. See description of Stillwater KOP for HVDC Alternative Route 3-A. Distance and visibility are the same.

Mehan. HVDC Alternative Route 3-B would be located 0.7 mile to the northeast. Much of the transmission line would be obscured by FG vegetation, but portions would likely be visible extending above tree line and through clearings in vegetation. The form and line of the lattice structures would differ from existing elements in the rural landscape and result in moderate contrast. This KOP represents views from a rural residential area, so visual concern is high and the overall visual impacts would be moderate.

3.18.6.3.2.2.3.3 HVDC Alternative Route 3-C

HVDC Alternative Route 3-C corresponds to Applicant Proposed Route Links 3, 4, 5 and 6.

Agra. HVDC Alternative Route 3-C would be located 1.5 miles to the north. The transmission line structures would be visible through openings in the vegetation and FG structures and would appear as dark vertical objects on the horizon. There are multiple existing vertical elements on the existing landscape and these proposed structures would only add a weak amount of visual contrast. This KOP represents views from a residential area, so visual concern is high and the overall visual impact would be low.

Beggs. HVDC Alternative Route 3-C would be located 1.5 miles to the south of this KOP at the closest point. The transmission line may be visible in the distance, but would be mostly screened by FG vegetation and terrain. This KOP represents views from a residential area, so visual concern is high and the Project would result in weak contrast and low-moderate overall visual impacts.

Boynton. HVDC Alternative Route 3-C would be located 1.5 miles to the west. Viewers at this location would be able to see the transmission line structures through breaks in the FG vegetation and they would appear as additional vertical elements. Much of HVDC Alternative Route 3-C in this location would be screened from this viewpoint, resulting in weak visual contrast. This KOP represents views from a residential area, so visual concern is high and the overall visual impacts would be low.

Bristow and Route 66. HVDC Alternative Route 3-C would be located 3.4 miles to the south of this KOP. The terrain and dense vegetation would obscure views of the structures resulting in no visual impact.

Council Hill. HVDC Alternative Route 3-C would be located 2.1 miles to the north. An existing 345kV line is located 1 mile closer that is not visible from the KOP. The proposed transmission line structures would be considerably taller, and portions may be visible above tree line, but much of the structures would be screened by FG elements. Due to distance and screening, the visual contrast from this KOP would be low. This KOP represents views from a residential area, so visual concern is high and the overall impacts would be moderate.

Depew and Route 66. HVDC Alternative Route 3-C would be located 1.4 miles away and appear as vertical elements on the horizon. Views would be blocked by vegetation in many areas, but where visible the large scale of the structures would be noticeable. Due to distance and FG obstructions, HVDC Alternative Route 3-C in this location would result in weak contrast. This KOP represents views from a residential area, so visual concern is high and the overall visual impact at this location would be low.

Honey Springs Battlefield Historic Site and Rentiesville South. HVDC Alternative Route 3-C would be located 2.9 miles to the north. It is unlikely that the transmission line structures would be visible from this location because of terrain and vegetation screening. If visible, they would appear as small objects on the horizon and would introduce weak contrast. This KOP represents a historic site, so visual concern is high and the overall visual impact would be low.

Honey Springs Battlefield Historic Site North. HVDC Alternative Route 3-C would be located 0.5 mile to the north and would run parallel to an existing transmission line. HVDC Alternative Route 3-C in this location would be visible where not screened by FG vegetation and would repeat form similar to the existing structures. The proposed structures would be located on the near side of the existing line and introduce moderate contrast. This KOP represents a historic site, so visual concern is high and the overall visual impact is moderate-high.

McLain. HVDC Alternative Route 3-C would be visible appearing as vertical objects above tree line, where not screened by FG elements. The proposed structures would be parallel to an existing line and would be larger in form and scale, but be farther from the viewer resulting in co-dominance with existing structure in view. The proposed transmission line structures would be noticeable to viewers and result in moderate contrast. This KOP represents views from a residential area, so visual concern is high and the overall visual impact would be moderate.

Okmulgee. HVDC Alternative Route 3-C would be located 1.5 miles to the north. At this distance, the transmission line would be partially visible on the horizon line and on top of the ridgeline and appear as dark vertical shapes silhouetted against the sky. The structures however, would not distract from the view and would result in weak contrast. The overall visual impact on the landscape would be low.

Oktaha School. HVDC Alternative Route 3-C would be 0.4 mile to the southeast and would be visible above tree line. This is a recreational facility in a residential area, so visual concern is high. There are multiple vertical elements on the existing landscape including an existing transmission line, and these structures would introduce additional contrast. Since HVDC Alternative Route 3-C would be located behind an existing transmission line in this location, the contrast would be weak and overall visual impacts would be low. A visual simulation for this KOP is provided in Appendix K.

Perkins. HVDC Alternative Route 3-C would be 0.6 mile to the east of this location. The transmission line structures would be visible above the trees in the MG and in the open fields to the southeast. The introduction of additional vertical elements and difference in form of the proposed structures would result in moderate contrast. The overall visual impacts on this landscape would be moderate.

Preston. HVDC Alternative Route 3-C would be visible 0.6 mile to the south. The transmission line structures would be clearly visible on the horizon, above the tree line adding vertical elements to the landscape resulting in strong contrast. This KOP represents views from a park in a residential area, so visual concern is high. The overall visual impacts would be high.

Shamrock. HVDC Alternative Route 3-C would be located 3 miles to the southwest of this location. Due to vegetation and terrain, the transmission line structures would not be visible from this location and there would be no visual impact.

Webbers Falls. See the Applicant Proposed Route Link 6 description.

3.18.6.3.2.2.3.4 HVDC Alternative Route 3-D

HVDC Alternative Route 3-D corresponds to Applicant Proposed Route Links 5 and 6.

Boynton. See description of Boynton KOP for HVDC Alternative Route 3-C. Distance and visibility are the same.

Council Hill. See description of Council Hill KOP for HVDC Alternative Route 3-C. Distance and visibility are the same.

Honey Springs Battlefield Historic Site and Rentiesville South. See description of Honey Springs Battlefield Historic Site and Rentiesville South KOP for HVDC Alternative Route 3-C. Distance and visibility are the same.

Honey Springs Battlefield Historic Site North. See description of Honey Springs Battlefield Historic Site North KOP for HVDC Alternative Route 3-C. Distance and visibility are the same.

McLain. See description of McLain KOP for HVDC Alternative Route 3-C. Distance and visibility are the same

Oktaha School. See description of Oktaha School KOP for HVDC Alternative Route 3-C. Distance and visibility are the same.

Webbers Falls. HVDC Alternative Route 3-D would be located 2.5 miles to the southwest. Given the distance and existing vegetation, the transmission line structures would not be visible from this location and there would be no visual impact.

3.18.6.3.2.2.3.5 HVDC Alternative Route 3-E

McLain. See description of McLain KOP for HVDC Alternative Route 3-C. Distance and visibility are the same.

Webbers Falls. See description of Webbers Falls KOP for HVDC Alternative Route 3-D. Distance and visibility are the same.

3.18.6.3.2.2.3.6 Region 3 Alternative Comparison

Table 3.18-21 provides a comparison of the visual impacts for Region 3.

Table 3.18-21:
Visual Impact Comparison Summary—Region 3

Proposed and Alternative Routes	Miles of Distinct Lands Crossed	Miles of Common Lands Crossed	Miles of Developed Lands Crossed	Residences within 0.5 Mile
HVDC Alternative Route 3-A	4.4	30.5	2.8	186
APR Links Corresponding to Alternative 3-A	5.5	32.5	2.1	168
HVDC Alternative Route 3-B	4.9	39.7	3.3	476
APR Links Corresponding to Alternative 3-B	18.9	41.2	2.5	520
HVDC Alternative Route 3-C	15.9	102.3	3.7	1450
APR Links Corresponding to Alternative 3-C	28.4	98.2	4.9	1545
HVDC Alternative Route 3-D	1.8	36.0	1.6	600
APR Links Corresponding to HVDC Alternative Route 3-D	1.5	32.2	1.5	552
HVDC Alternative Route 3-E	1.2	6.9	0.4	162
APR Links Corresponding to Alternative 3-E	1.2	6.1	0.5	137

3.18.6.3.2.2.4 Region 4

A description for Region 4 is provided in Section 3.18.6.2.3.5. Region 4 has multiple sensitive resources including the Arkansas River, lakes and reservoirs, state parks, and Ozark-St. Francis National Forest land that would have sensitive viewers using the resources for recreation. HVDC Alternative Route 4-B would cross the Ozark-St. Francis National Forest and visual analysis related to USFS lands would be discussed after the HVDC Alternative Route 4-B KOP analysis. The visual impacts for the Region 4 KOPs are listed in Table 3.18-22 and described below.

Table 3.18-22:
Visual Impact Summary of KOPs—HVDC Alternative Routes—Region 4

KOP[1]	AR	Distance (Miles)	Viewer Concern	Landscape Category	Visibility	Contrast	Overall Impact
Arkansas River	3-C, 3-D	0.5	Moderate	Common	Yes	Weak	Moderate–Low
Arkansas River and Gore PR	3-D, 3-C, 3-E, 4-B	3	High	Distinct	Yes	Weak	Moderate–Low
Brushy Creek Reservoir and Sallisaw State Park	4-A	2.2	High	Distinct	No	No Contrast/ Not Visible	No Impact
Highway 82	4-A	0.1	Moderate	Common	Yes	Strong	High
Little Lee Creek (Scenic River)	4-A	0.4	High	Distinct	Yes	Strong	High
Route 71 (Scenic Byway)	4-A	0.1	High	Common	Yes	Strong	High
Uniontown Highway (Scenic Highway)	4-A	0.1	High	Common	Yes	Strong	High
Marble City	4-A, 4-B	0.3	High	Common	Yes	Strong	High
Tenkiller State Park PR and AR	4-A, 4-B	4	High	Distinct	No	No Contrast/ Not Visible	No Impact
Vian	4-A, 4-B	1.8	High	Common	Yes	Weak	Low

Table 3.18-22:
Visual Impact Summary of KOPs—HVDC Alternative Routes—Region 4

KOP[1]	AR	Distance (Miles)	Viewer Concern	Landscape Category	Visibility	Contrast	Overall Impact
Bluff Hole Park	4-A, 4-D	2.7	High	Common	Yes	Weak	Low
Boys and Girls Camp	4-A, 4-D	0.3	High	Common	Yes	Strong	High
City Park/Ball Fields and Rudy	4-A, 4-D	3.2	High	Developed	No	No Contrast/ Not Visible	No Impact
Frog Bayou Creek	4-A, 4-D	0.1	High	Distinct	Yes	Strong	High
Mulberry River and Trail of Tears	4-A, 4-D	0.7	High	Distinct	Yes	Strong	High
Fire Tower Lookout	4-B	0.9	High	Distinct	No	No Contrast/ Not Visible	No Impact
Highway 82	4-B	0.2	High	Common	Yes	Strong	High
Little Lee Creek (Scenic River)	4-B	0.4	High	Distinct	Yes	Strong	High
Mulberry River	4-B	0.1	High	Distinct	Yes	Strong	High
Route 220 (Scenic Byway)	4-B	0.1	High	Distinct	Yes	Strong	High
Trail of Tears (Highway 352)	4-B	0.1	High	Common	Yes	Moderate	Moderate–High
Trail of Tears (Route 59)	4-B	0.1	High	Distinct	Yes	Strong	High
White Oak	4-B	0.9	High	Common	No	No Contrast/ Not Visible	No Impact
Wiederkehr Village and Highway 186	4-B	3.4	High	Common	Yes	Weak	Low
Ozark	4-B, 4-E	3.7	High	Common	No	No Contrast/ Not Visible	No Impact
Field of Dreams	4-C	2.3	High	Developed	No	No Contrast/ Not Visible	No Impact
Scott Farm	4-C	0.7	High	Common	Yes	Moderate	Moderate
Cedarville	4-D	0.8	High	Common	Yes	Strong	High
Trail of Tears and Scenic Highway 220	4-D	0.1	High	Common	Yes	Strong	High
Van Buren	4-D, 4-C	1.1	High	Common	No	No Contrast/ Not Visible	No Impact
Clarksville	4-E	0.4	High	Common	Yes	Strong	High
Coal Hill	4-E	3.2	High	Common	No	No Contrast/ Not Visible	No Impact
Hagarville	4-E	2.3	High	Common	No	No Contrast/ Not Visible	No Impact
Highway 21 Scenic Byway	4-E	0.4	High	Common	Yes	Strong	High
Lamar	4-E	3.25	High	Common	No	No Contrast/ Not Visible	No Impact
Wiederkehr Village and Highway 186	4-E	0.6	High	Common	Yes	Weak	Low

1 The Arkansas River and Arkansas River and Gore KOPs are located in Region 4, but HVDC Alternative Routes in Region 3 will potentially be visible from these KOPs. As a result, these KOPs are discussed in the Region 4 section, and the Region 3 HVDC alternative routes potentially visible from these KOPs are included in the impact analysis for Region 4.

3.18.6.3.2.2.4.1 HVDC Alternative Route 3-C

HVDC Alternative Route 3-C corresponds to Applicant Proposed Route Links 3, 4, 5 and 6.

Arkansas River. From this KOP, HVDC Alternative Route 3-C would be visible, extending above the tree line 0.5 mile away on the far side of the river. The transmission line structures would be similar in form to the existing structures and would appear co-dominant on the horizon. Views represented are only of the HVDC Alternative Route section not including the river crossing, and would result in weak contrast. This KOP represents a major river crossing at a heavily impacted site with moderate visual concern and the overall impact would be moderate–low.

Arkansas River and Gore. See description of Arkansas River and Gore KOP for Applicant Proposed Route Link 1. Distance and visibility are the same. A visual simulation for this KOP is provided in Appendix K.

3.18.6.3.2.2.4.2 HVDC Alternative Route 3-D

HVDC Alternative Route 3-D corresponds to Applicant Proposed Route Links 5 and 6.

Arkansas River. See description of Arkansas River KOP for HVDC Alternative Route 3-C. Distance and visibility are the same.

Arkansas River and Gore. See description of Arkansas River and Gore KOP for Applicant Proposed Route Link 1. Distance and visibility are the same.

3.18.6.3.2.2.4.3 HVDC Alternative Route 3-E

HVDC Alternative Route 3-E corresponds to Applicant Proposed Route Link 6.

Arkansas River and Gore. See description of Arkansas River and Gore KOP for Applicant Proposed Route Link 1. Distance and visibility are the same.

3.18.6.3.2.2.4.4 HVDC Alternative Route 4-A

HVDC Alternative Route 4-A corresponds to Applicant Proposed Route Links 3, 4, 5, and 6.

Bluff Hole Park. Looking north from Bluff Hole Park, the HVDC Alternative Route 4-A would be located 2.7 miles away. At this distance, the transmission line structures would be mostly screened by vegetation and terrain. If any of the structures are visible, they would appear as small dark vertical elements on the irregular horizon line and result in weak contrast. This KOP represents views from a park, so visual concern is high and the overall visual impact at this location would be low.

Boys and Girls Camp. This KOP represents views from a youth camp in a rural landscape. HVDC Alternative Route 4-A would be located 0.3 mile to the north, just beyond the line of trees in the FG. The transmission line structures would be clearly visible to anyone traveling to or from the camp, extending above tree line and creating a pattern of vertical elements different from the existing landscape. This KOP represents views from a recreation area, so visual concern is high. The resulting contrast would be strong and overall visual impacts would be high.

Brushy Creek Reservoir and Sallisaw State Park. HVDC Alternative Route 4-A would be located 2.2 miles north of this recreation area at Brushy Creek Reservoir. People visiting the park would not be able to see the transmission line structures in this location because hills and dense trees around the lake screening views. There would be no visual impact at this location.

City Park/Ball Fields and Rudy. Looking out from the community ball field in Rudy, views of HVDC Alternative Route 4-A, 3.2 miles away, would be blocked by FG structures and vegetation resulting in no visual impact.

Frog Bayou Creek. HVDC Alternative Route 4-A would be highly visible crossing the valley and continuing up over the ridge in the MG. Structures would appear as tall vertical elements breaking up an otherwise mostly natural environment creating strong contrast. Additional contrast would be added to the landscape with the ROW clearing going up the ridge creating straight lines on the rolling hills. This KOP represents the crossing of a waterbody being viewed from a scenic highway, so visual concern is high. The overall visual impact in this area would be high. A visual simulation for this KOP is provided in Appendix K.

Highway 82. HVDC Alternative Route 4-A would be located 0.1 mile to the southwest of this viewpoint along Highway 82. The structures would be highly visible, extending above tree line and dominating the view of motorists as it crosses the highway. ROW clearing would be visible as straight lines of cleared vegetation along the sides of the road, adding additional contrast to the landscape. This KOP represents views from a well-travelled highway with moderate visual concern and the transmission line would result in strong contrast and high overall visual impact at this location.

Little Lee Creek (Scenic River). HVDC Alternative Route 4-A would cross this scenic river 0.4 mile to the northeast. Where not screened by FG vegetation, transmission line structures in this location would introduce tall vertical structures, and color, line and texture different from what exists currently (as described in Section 3.18.5.4.1 in this primarily natural landscape. On the sides of the river, ROW clearing of dense vegetation would create additional horizontal lines in the landscape visible to people using this river for recreation with high visual concern. These impacts to the landscape would result in strong contrast and high overall visual impact. A visual simulation for this KOP is provided in Appendix K.

Marble City. HVDC Alternative Route 4-A would be located 0.3 mile to the southeast. The structures would be screened by a ridge until crossing the open field in the MG. Through breaks in the FG vegetation and structures, the transmission line structures would be prominent in view and appear as tall vertical objects much larger in scale than the existing wood power poles in view. This KOP represents views from a residential area with high visual concern and the transmission line would result in strong visual contrast and high visual impact in this area.

Mulberry River and Trail of Tears. HVDC Alternative Route 4-A would cross the river 0.7 mile from this location. Most of the transmission line structures would be screened because of the dense vegetation in the area, but when they were visible through breaks in vegetation, they would be clearly visible across the open field to the east. The proposed transmission line structures would be noticeably different than existing structures in view, introducing new form and line to the landscape. Since this is a sensitive viewpoint representing a historic trail, the proposed structures would result in strong contrast and high overall visual impact. A visual simulation for this KOP is provided in Appendix K.

Route 71 (Scenic Byway). HVDC Alternative Route4-A would cross the scenic byway 0.1 mile to the south. The scale of the transmission structures would be much larger than anything in the current landscape in this area and would dominate the views of motorists traveling down the scenic byway as the transmission line crosses the road and cut across the open fields in the FG. This KOP represents views from a Scenic Byway, so visual concern is high. The overall contrast at this location would be strong and the overall visual impact high.

Tenkiller State Park. See the Applicant Proposed Route Link 1 description.

Uniontown Highway (Scenic Byway). HVDC Alternative Route 4-A would cross the highway 0.1 mile from this point. The tall transmission line structures would dominate views in the area as they contrast the rural landscape free of tall man-made vertical structures. Combined with the ROW clearing of vegetation along the highway, HVDC Alternative Route 4-A would create strong contrast and a high overall visual impact in this location.

Vian. HVDC Alternative Route 4-A would be located 1.8 miles to the north. From this location, the transmission line structures would appear behind the ridge in the BG and most likely not be visible. If any of the structures appeared above the tree line, they would appear as dark objects on the horizon and be difficult to notice, resulting in weak contrast and low overall visual impact.

3.18.6.3.2.2.4.5 HVDC Alternative Route 4-B

HVDC Alternative Route 4-B corresponds to Applicant Proposed Route Links 2, 3, 4, 5, 6, 7 and 8.

Arkansas River and Gore. See the Applicant Proposed Route Link 1 description.

Fire Tower Lookout. This KOP represents views from the Ozark-St. Francis National Forest and was chosen by USFS staff to represent forest views. Surrounding the open field are tall trees that would block all views to HVDC Alternative Route 4-B, 0.9 mile to the south. There would be no visual impact at this location.

Highway 82. HVDC Alternative Route4-B would be located 0.2 mile to the south. The transmission line structures would be highly visible in the FG and extend above tree line. The form and scale would be much different than the existing landscape and create strong contrast combined with additional contrast created by the clearing of vegetation in the ROW. This KOP represents views from a residential area, so visual concern is high and the overall visual impact would be high.

Little Lee Creek (Scenic River). Impacts would be similar to HVDC Alternative Route 4-A. See HVDC Alternative Route 4-A description.

Marble City. See description of Marble City KOP for HVDC Alternative Route 4-A. Distance and visibility are the same.

Mulberry River. HVDC Alternative Route 4-B, would be located 0.1 mile to the north. The transmission line structures would be highly visible on the banks of the river and as they cross over to the other side. This KOP represents views from a recreation area along a river, so visual concern is high and the Project would appear in the near FG. The large vertical structures would be dominant in view, and combined with the vegetation being cleared for the ROW, there would be strong contrast and high overall visual impact.

Ozark. HVDC Alternative Route 4-B would be located 3.7 miles to the north and be screened by MG trees and rolling hills resulting in no visual impact.

Route 220 (Scenic Byway). HVDC Alternative Route 4-B would cross the Route 220 scenic highway less than 0.1 mile to the north. Large amounts of vegetation would need to be cleared for the ROW, resulting in straight lines cutting through the curves of the rolling hills and trees in the otherwise natural landscape. The transmission line structures would be larger in scale and form than anything in the vicinity (as described in Section 3.18.5.4.1) and dominate the views of motorists traveling the highway in this area. This KOP represents views from a Scenic Byway, so visual concern is high and the Project would have strong visual contrast and high overall visual impact.

Tenkiller State Park. See description of Tenkiller State Park KOP for Applicant Proposed Route Link 1. Distance and visibility are the same.

Trail of Tears (Highway 352). HVDC Alternative Route 4-B would cross Highway 352 and the Trail of Tears 0.1 mile to the northwest of this KOP. HVDC Alternative Route 4-B would cross the open field on the other side of the existing H-frame structures. The proposed transmission line structures would be larger in scale and considerably different in form than the existing and result in moderate contrast. This KOP represents views from a historic trail, so visual concern is high and the overall visual impacts would be moderate-high.

Trail of Tears (Route 59). HVDC Alternative Route 4-B would be located 0.1 mile to the north and be highly visible to motorists traveling the route. The transmission line structures would introduce a vertical element different in form and scale to the existing structures in the area, and the clearing for the ROW would create strong lines in the dense vegetation, resulting in strong overall contrast and high overall visual impact.

Vian. See HVDC Alternative Route 4-A description. Views are similar, but with a slightly longer distance (2.8 miles) to the transmission line structures.

White Oak. HVDC Alternative Route 4-B would be located 0.9 mile to the north of this KOP. The FG vegetation and terrain would screen any views of HVDC Alternative Route 4-B from this location, resulting in no visual impacts.

Wiederkehr Village and Highway 186. HVDC Alternative Route 4-B would be located 3.4 miles to the northwest of Wiederkehr Village and this KOP represents views from a residential area, so visual concern is high. The transmission line structures would likely be screened by the dense vegetation and low ridge in view. If visible, the tops of the structures would appear as small dark objects on the horizon resulting in weak contrast on low overall visual impacts.

3.18.6.3.2.2.4.6 HVDC Alternative Route 4-B USFS SMS Compliance

HVDC Alternative Route 4-B was developed in response to comments received during scoping for the EIS for the Project. HVDC Alternative Route 4-B is 78.89 miles in length and located in Sequoyah County, Oklahoma, and Crawford and Franklin counties, Arkansas. Of this, 10.51 miles is within the Forest Service Administrative Boundary of the Ozark-St. Francis National Forest, in Crawford County, Arkansas; however, less than one-half of this length (4.19 miles) is on Ozark-St. Francis National Forest land within the Boston Mountains Ranger District. The remaining 6.32 miles is on private land inholdings.

The USFS provided DOE with SIOs and the land management plan for the Ozark-St. Francis National Forest. No KOPs were chosen on USFS lands because no viewpoints were identified through consultation with the USFS or identified during the data collection field effort. For USFS lands, consistency with SIOs involves the comparison of existing landscape integrity with integrity that would occur with implementation of HVDC Alternative Route 4-B. Impacts to landscape scenery were determined by measuring the extent of effects of HVDC Alternative Route 4-B on the scenic landscape through USFS scenic attractiveness ratings, and scenic quality on private, state, and other federal lands. Impacts to viewers were determined by measuring the extent of effects of HVDC Alternative Route 4-B through USFS viewer concern levels and distances and viewer sensitivity levels. The intent of a Land and Resource Management Plan (LRMP) is to provide a framework for integrated resource management and for guiding all project and activity decision making on USFS lands.

The Ozark-St. Francis National Forests' LRMP divides the Ozark-St. Francis National Forest into management areas (MAs) (USFS 2005a). The purpose of these MAs is to identify allowable uses and opportunities within certain areas on the Ozark-St. Francis National Forest. HVDC Alternative Route4-B would cross the Pine Woodland and Oak Woodland MAs (see Figure 2, "Ozark National Forest Management Areas," from the Visual Resources Technical Report (Clean Line 2014; Appendix F).

Lands within these two MAs are primarily managed for timber production. The primary emphasis for both of these MAs is to restore and maintain a landscape mosaic of open woodland that approximates historical conditions. The common purpose for each MA is to provide habitat for associated plants and animals, and to create a setting for recreation that is different, uncommon, visually appealing, and rich in wildlife.

MA Standards are mandatory requirements that apply to site-specific activities such as the Project. There are no MA Standards for the Pine Woodland or Oak Woodland MAs that are relevant to the Project or potential effects on scenery resources.

Scenic Class 1 (Extremely High) Areas. HVDC Alternative Route 4-B crosses a total of 0.24 miles consisting of two small areas the Ozark-St. Francis National Forest inventoried and classified as having Extremely High public value associated with them. The first area occurs along HVDC Alternative Route 4-B approximately 0.35 mile southeast of where it crosses Route 220 (scenic highway). This is an area of uninterrupted forest and rolling terrain located within the Oak Woodland MA. No roads, trails, water, rock outcrops, or other distinctive landscape features are evident. Their scenic attractiveness is typical. The area is classified as Scenic Class 1 because it is within the FG view of the scenic highway and, consequently, also a high public concern area.

The second area occurs along HVDC Alternative Route 4-B approximately 0.38 mile west of where HVDC Alternative Route 4-B crosses Route 59. This is a densely forested area located within the Pine Woodland MA. No distinctive landscape features are evident. The area is classified as Scenic Class 1 because it is within the FG view of Route 59 and an area of high public concern because of its proximity to potential viewers.

With the introduction of Project elements, the landform, vegetation patterns, and cultural features would still combine to provide ordinary or common scenic quality in these areas. Because of the landscape's ability to absorb visual change (i.e., topography, tall trees, constrained views), the overall scenic attractiveness class would not change, so the total acreage of land classified as Scenic Class 1 would not be affected.

Scenic Class 2 (Very High) Areas. HVDC Alternative Route 4-B crosses a total of 2.01 miles consisting of several areas the Ozark-St. Francis National Forest inventoried and classified as having Very High public value. These areas are characterized by rolling terrain and forested areas within both the Oak and Pine Woodland MAs. A few unimproved roads or trails are evident. There are no distinctive landscape features. These areas are fairly homogenous, and their scenic attractiveness would be considered typical of this part of the Ozark-St. Francis National Forest. These areas are all classified as scenic Class 2 because they are within the FG view of secondary roads or rural residences adjacent to the Ozark-St. Francis National Forest.

With the introduction of Project elements, the landform, vegetation patterns, and cultural features would still combine to provide ordinary or common scenic quality in these areas. Because of the landscape's ability to absorb visual change, the overall scenic attractiveness class would not change and, therefore, the total acreage of land classified as Scenic Class 2 would not be affected.

Scenic Class 3 (High) Areas. HVDC Alternative Route 4-B crosses a total of 0.28 mile consisting of two small areas the Ozark-St. Francis National Forest inventoried and classified as having High public value. The areas occur along HVDC Alternative Route 4-B approximately 0.6 mile and 1 mile southeast of where it crosses Route 220 (scenic highway). These are typical forested areas located within the Oak Woodland MA. No roads, trails, water, rock outcrops, or other distinctive landscape features are evident. Their scenic attractiveness is typical. These areas are classified as Scenic Class 3 because they are within the MG view of the scenic highway as well as other secondary roads and are also of moderate public concern.

With the introduction of Project elements, the landform, vegetation patterns, and cultural features would still combine to provide ordinary or common scenic quality in these areas. Because of the landscape's ability to absorb visual change, the overall scenic attractiveness class would not change and, therefore, the total acreage of land classified as Scenic Class 3 would not be affected.

SIO Compliance. Transmission line structures and cleared ROWs would contrast with the landscape character in High, Moderate, and Low SIO areas. Gray-colored structures would extend above the tree line, disrupting the line of the landscape and introducing angular and coarse cultural (human) elements into an otherwise intact and natural-appearing setting. Cleared ROWs would create additional lines on the landscape that vary in terms of line, color, and texture from the surrounding visual landscape. These visual deviations would be most evident to viewers from a superior vantage point or areas where no vegetation was in the immediate FG. Due to their height, transmission line structures may be visible in these areas from Route 220 (scenic highway). Forest projects and activities should contribute to the achievement or attainment of desired conditions. The USFS desires for a certain percentage of projects occurring on NFS lands to meet the intended SIO as identified in the LRMP over the long term. Transmission lines cause visible disruption to the surrounding landscape from two primary actions:

- ROW clearing (visually disruptive through the removal of trees, shrubs, and ground cover, creation of unnatural openings, and abnormal vegetative edges)
- Installation of structures (utility structures typically oppose landscape forms because they are geometric, forceful, and large)

The landscape character for High SIO areas should appear unaltered and intact, and any deviations must "repeat the form, line, color, texture, and pattern common to the landscape character so completely and at such a scale that they are not evident" (USFS 2005b). Even with avoidance and minimization measures, the implementation of HVDC Alternative Route 4-B would not meet this standard and would degrade the Desired Condition for scenic resources described in the LRMP. Due to DOE Action Alternative resulting in high visual impacts HVDC Alternative Route 4-B would not comply with High SIOs. The HVDC Alternative Route 4-B would not be allowed to cross lands managed with non-complying objectives without changing the LRMP.

The landscape character for Moderate SIO areas may appear slightly altered, and deviations "must remain visually subordinate to the landscape character being viewed" (USFS 2005b). It may be possible, but is not likely, for Project elements to meet this standard in 100 percent of locations depending on the avoidance and minimization measures employed and local landscape conditions. With these measures, the implementation of HVDC Alternative Route 4-B would neither enhance nor degrade the Desired Condition for scenic resources described in the LRMP. Due to the DOE Alternative resulting in moderate–high and high visual impacts HVDC Alternative Route 4-B would not comply with Moderate SIOs.

The landscape character for Low SIO areas may appear moderately altered, and deviations may "begin to dominate the valued landscape character being viewed" provided they "borrow valued attributes such as size, shape, edge effect and pattern of natural openings, vegetative type changes, or architectural styles outside the landscape being viewed" (USFS 2005b). Project elements would meet this standard in 100 percent of locations depending on avoidance and minimization measures and local landscape conditions. With these measures, the implementation of HVDC Alternative Route 4-B would enhance the Desired Condition for scenic resources described in the LRMP. Due to the DOE Action Alternative resulting in moderate–high and high visual impacts, HVDC Alternative Route 4-B would comply with Low SIOs.

3.18.6.3.2.2.4.7 HVDC Alternative Route 4-C

HVDC Alternative Route 4-C corresponds to Applicant Proposed Route Link 5.

Field of Dreams. HVDC Alternative Route 4-C would be located 2.3 miles to the north of the Field of Dreams ball field. Dense trees in the FG would obscure views of the Project from this location, resulting in no visual impact.

Scott Farm. HVDC Alternative Route 4-C would be located 0.7 mile away in the FG. The large transmission line structures would be noticeable in view of the residences nearby and introduce a strong vertical element not present in the existing landscape (as described in Section 3.18.4.1). Portions of the structures would be screened by the rolling hills and tall vegetation, resulting in moderate contrast and moderate overall visual impact. A visual simulation for this KOP is provided in Appendix K.

Van Buren. HVDC Alternative Route 4-C would be located 1.1 miles to the northeast of this KOP. Large trees and rolling terrain would obscure views of the transmission line structures from this location, resulting in no visual impact.

3.18.6.3.2.2.4.8 HVDC Alternative Route 4-D

HVDC Alternative Route 4-D corresponds to Applicant Proposed Route Links 4, 5 and 6.

Bluff Hole Park. See description of Bluff Hole Park KOP for HVDC Alternative Route 4-A. Distance and visibility are the same.

Boys and Girls Camp. See description of Boys and Girls Camp KOP for HVDC Alternative Route 4-A. Distance and visibility are the same.

Cedarville. HVDC Alternative Route 4-D would be located 0.8 mile to the southeast. Structures would be partially screened by FG vegetation and terrain, but the top portion would be clearly visible, extending above tree line. The addition of the proposed transmission line structures would introduce new vertical elements to the landscape and result in strong contrast and high overall visual impact in this location.

City Park/Ball Fields and Rudy. See description of Bluff Hole Park KOP for HVDC Alternative Route 4-A. Distance and visibility are the same.

Frog Bayou Creek. See description of Frog Bayou Creek KOP for HVDC Alternative Route 4-A. Distance and visibility are the same.

Mulberry River and Trail of Tears. See description of Mulberry River and Trail of Tears KOP for HVDC Alternative Route 4-A. Distance and visibility are the same.

Trail of Tears and Scenic Highway 220. HVDC Alternative Route 4-D would cross the highway about 0.1 mile to the southeast. The proposed transmission line structures would be much larger and different in form than existing elements on the landscape and be dominant in the view of people traveling the scenic highway. In addition to the structures, the ROW clearing would create strong lines in the landscape that would be highly visible from the roadway. This KOP represents views from the Trail of Tears and scenic highway, so visual concern is high and would result in strong visual contrast and high overall visual impact in this location.

Van Buren. See description of Van Buren KOP for Applicant Proposed Route Link 4. Distance and visibility are the same.

3.18.6.3.2.2.4.9 HVDC Alternative Route 4-E

HVDC Alternative Route 4-E corresponds to Applicant Proposed Route Links 8 and 6.

Clarksville. HVDC Alternative Route 4-E would be located 0.4 mile to the southeast of the Clarksville KOP, representing views from a residential area, so visual concern is high. The transmission line structures would be highly noticeable and visible as they cross the open agricultural fields and would introduce a large vertical element that is not currently present in the landscape. Overall visual contrast would be strong and HVDC Alternative Route 4-E would result in high overall visual impacts in this location.

Coal Hill. HVDC Alternative Route 4-E would be located 3.2 miles to the north and would not be visible due to rolling hills and dense vegetation. There would be no overall visual impact.

Hagarville. HVDC Alternative Route 4-E would be located 2.3 miles south. The transmission line structures of HVDC Alternative Route 4-E would not be visible from this location due to FG vegetation and terrain screening, resulting in no visual impact in this location.

Highway 21 Scenic Byway. HVDC Alternative Route 4-E would cross the highway approximately 0.4 mile to the south-southeast in the MG. The transmission line structures would be much greater in scale than the existing wood structures in view and introduce additional vertical elements into the landscape. The structures would be clearly visible above tree line and crossing the highway, resulting in strong visual contrast. This KOP represents views from a Scenic Byway, so visual concern is high. The overall visual impact would be high.

Lamar. HVDC Alternative Route 4-E would be located 3.25 miles to the north of this KOP, but would not be visible due to FG vegetation and terrain, resulting in no visual impact.

Ozark. See description of Ozark KOP for HVDC Alternative Route 4-B. Distance and visibility are the same.

Wiederkehr Village and Highway 186. HVDC Alternative Route 4-E would be located 0.6 mile to the northwest. The transmission line structures may be partially visible from this location and, if so, would appear as small dark vertical elements appearing above tree line on the horizon, resulting in weak visual contrast and low overall visual impact.

3.18.6.3.2.2.4.10 Region 4 Alternative Comparison

Table 3.18-23 provides a comparison of the visual impacts for Region 4.

Table 3.18-23:
Visual Impact Comparison Summary—Region 4

Proposed and Alternative Routes	Miles of Distinct Lands Crossed	Miles of Common Lands Crossed	Miles of Developed Lands Crossed	Residences within 0.5 mile
HVDC Alternative Route 4-A	10.2	17.7	30.6	1030
APR Links Corresponding to Alternative 4-A	11.6	47.3	1.7	1039
HVDC Alternative Route4-B	19.6	15.1	44.2	1094
APR Links Corresponding to Alternative 4-B	15.8	58.3	7.4	1735
HVDC Alternative Route4-C	1.4	1.9	0.1	278
APR Links Corresponding to Alternative 4-C	0.9	1.2	0.1	123
HVDC Alternative Route 4-D	4.9	10.6	9.9	882
APR Links Corresponding to Alternative 4-D	3.8	20.4	1.2	719
HVDC Alternative Route 4-E	11.0	24.6	1.2	901
APR Links Corresponding to Alternative 4-E	7.6	11.0	20.3	527

3.18.6.3.2.2.5 Region 5

A description for Region 5 is provided in Section 3.18.6.2.3.2.7. This region would have residential viewers as well as several parks and recreational areas where viewers would be more sensitive due to extended viewing periods at these resources. The visual impacts for the Region 5 KOPs are listed in Table 3.18-24 and described below.

Table 3.18-24:
Visual Impact Summary of KOPs—HVDC Alternative Routes—Region 5

KOP	AR	Distance (Miles)	Viewer Concern	Landscape Category	Visibility	Contrast	Overall Impact
Dover and JP Lovelady Ball Park	5-A	3.2	High	Common	No	No Contrast/ Not Visible	No Impact
Hector	5-A	3	High	Common	No	No Contrast/ Not Visible	No Impact
Highway 7 (Scenic Byway)	5-A	0.1	High	Common	Yes	Strong	High
Pope Co. Residential Cluster	5-A	0.8	High	Distinct	Yes	Weak	Moderate-Low
Boy Scout Campground	5-B	2.1	High	Common	No	No Contrast/ Not Visible	No Impact

Table 3.18-24:
Visual Impact Summary of KOPs—HVDC Alternative Routes—Region 5

KOP	AR	Distance (Miles)	Viewer Concern	Landscape Category	Visibility	Contrast	Overall Impact
Damascus	5-B	1.5	High	Common	No	No Contrast/ Not Visible	No Impact
Highway 9 Scenic Highway	5-B	0.5	High	Common	Yes	Strong	High
Twin Groves	5-B	0.1	High	Common	Yes	Strong	High
Wonderview School	5-B	0.7	High	Common	Yes	Moderate	Moderate
Guy	5-B, 5-E	3	High	Common	No	No Contrast/ Not Visible	No Impact
Highway 25 Scenic Highway	5-B, 5-E	0.1	High	Common	Yes	Strong	High
Quitman	5-B, 5-E	1.4	High	Common	Yes	Weak	Low
Highway 16 (Scenic Highway)	5-B, 5-E, 5-F	0.2	High	Common	Yes	Strong	High
Rose Bud City Park	5-B, 5-E, 5-F	2.1	High	Developed	No	No Contrast/ Not Visible	No Impact
Highway 16 (Scenic Highway)	5-C	0.3	High	Common	Yes	Strong	High
Steprock	5-C	0.4	High	Developed	Yes	Weak	Moderate–Low
White River	5-D	1	Moderate	Distinct	Yes	Strong	High

3.18.6.3.2.2.5.1 HVDC Alternative Route 5-A

HVDC Alternative Route 5-A corresponds to Applicant Proposed Route Link 1.

Dover and JP Lovelady Ball Park. See the Applicant Proposed Route Link 1 description. HVDC Alternative Route 5-A would be located 3.2 miles to the north-northwest.

Hector. HVDC Alternative Route 5-A would be located 3 miles to the south. Dense vegetation in the FG/MG would screen all views of the alternative route at this location, resulting in no visual impact.

Highway 7 (Scenic Byway). HVDC Alternative Route 5-A would be located 0.1 mile north in the FG of this view. Motorists would clearly see the structures as they travel the Scenic Byway, and at this distance, the structures would be a dominant element on the landscape. HVDC Alternative Route 5-A would also require vegetation clearing for the ROW in this area and would be visible from the Scenic Byway, appearing as strong lines in the vegetation. The visual concern is high because it represents views from a Scenic Byway and the overall visual contrast at this location would be strong and there would be high overall visual impact.

Pope County Residential Cluster. See description of Pope County Residential Cluster for Applicant Proposed Route Link 1. Distance and visibility are the same.

3.18.6.3.2.2.5.2 HVDC Alternative Route5-B

HVDC Alternative Route 5-B corresponds to Applicant Proposed Route Links 3, 4, 5 and 6.

Boy Scout Campground. HVDC Alternative Route 5-B would be located 2.1 miles to the south of the Boy Scout Campground. Dense vegetation in the FG would screen all views of HVDC Alternative Route 5-B in this location, resulting in no visual impact.

Damascus. HVDC Alternative Route 5-B would be located 1.5 miles to the south, but views would be screened by FG vegetation and terrain, resulting in no visual impact.

Guy. HVDC Alternative Route 5-B would be located 3.0 miles to the north. The rising terrain and dense vegetation in the FG would screen all views of HVDC Alternative Route 5-B in this location, resulting in no visual impact. A visual simulation for this KOP is provided in Appendix K.

Highway 9 Scenic Highway. HVDC Alternative Route 5-B would cross Highway 9, 0.5 mile to the south. The structures would be highly visible as motorists approach the highway crossing and they would differ noticeably in scale, form, and line, than existing elements on the landscape (as described in Section 3.18.5.4.1). ROW vegetation would be noticeable along the sides of the highway, creating additional contrast. The visual concern is high because it represents views from a scenic highway and the overall visual impact would be high.

Highway 16 Scenic Highway. HVDC Alternative Route 5-B would be located 0.2 mile away and be highly visible on the landscape. Transmission line structures would be seen crossing the open field in front of a line of trees in the FG. Because of their scale, the structures would be highly visible to motorists, extending above the trees and creating a dominant feature on the landscape. The visual concern is high because it represents views from a scenic highway and HVDC Alternative Route 5-B would introduce form and line to the landscape that is not currently present at this location, resulting in strong contrast and high overall visual impact.

Highway 25 Scenic Highway. HVDC Alternative Route 5-B would be visible on the landscape 0.1 mile to the south of this KOP. The tall vertical structures would create a repeating pattern different in form and scale than existing elements on the landscape. HVDC Alternative Route 5-B would be dominant in view when motorists traveled along Highway 25 in this location, and ROW clearing would become evident as motorists approached the highway crossing. The visual concern is high because it represents views from a scenic highway and the resulting contrast would be strong and overall visual impacts would be high.

Quitman. HVDC Alternative Route 5-B would be located 1.4 miles to the south. Dense vegetation in the FG would screen much of transmission line structures from view, but some structures may be visible extending above the tree line. The visible structures would appear as small dark objects that would add to the already irregular line of trees on the horizon, resulting in weak contrast and low overall visual impact. A visual simulation for this KOP is provided in Appendix K.

Rose Bud City Park. HVDC Alternative Route 5-B would be located 2.1 miles to the north of Rose Bud City Park, but any potential views of the transmission line structures in this location would be screened by FG terrain and vegetation, resulting in no visual impact.

Twin Groves. HVDC Alternative Route 5-B would be located 0.1 mile to the northwest. Dense trees line the road in this area, but the transmission line structures would be visible through the trees and extend above the trees. The form and line of HVDC Alternative Route 5-B would be noticeably different than anything in the area and would result in strong contrast and high overall visual impact.

Wonderview School. HVDC Alternative Route 5-B would be visible as it crosses the highway 0.7 mile to the south and the structures would be visible extending about trees. The vegetation in the FG and MG would absorb some of the impact and the overall contrast would be moderate. The overall visual impact would be moderate at this KOP.

3.18.6.3.2.2.5.3 HVDC Alternative Route 5-C

HVDC Alternative Route 5-C corresponds to Applicant Proposed Route Links 6 and 7.

Highway 16 Scenic Highway. HVDC Alternative Route 5-C would cross Scenic Highway 16, 0.3 mile to the southeast. Transmission line structures would be clearly visible and noticeable across the open field in the FG and extended above tree line introducing new, vertical elements to the landscape. Because of the scale of the structures, at this distance they would be a dominant form on the landscape and result in strong contrast and high overall visual impact.

Steprock. See the Applicant Proposed Route Link 7 description.

3.18.6.3.2.2.5.4 HVDC Alternative Route 5-D

HVDC Alternative Route 5-D corresponds to Applicant Proposed Route Link 9.

White River. HVDC Alternative Route5-D transmission line would be located 1 mile to the northeast. The structures on either side of the river would be visible, extending above tree line, and the conductors would be seen stretching across the river. Some vegetation clearing for the ROW may also be visible on the banks. This KOP represents views from a major waterbody, but potential viewers are low, so visual concern is moderate. HVDC Alternative Route 5-D would introduce large vertical structures to a very natural landscape resulting in strong contrast and high overall visual impact.

3.18.6.3.2.2.5.5 HVDC Alternative Route 5-E

HVDC Alternative Route 5-E corresponds to Applicant Proposed Route Links 4, 5 and 6.

Guy. See description of Guy KOP for Alternative Route 5-B. Distance and visibility are the same.

Highway 16 Scenic Highway. See description of Highway 16 Scenic Highway KOP for HVDC Alternative Route 5-B. Distance and visibility are the same.

Highway 25 Scenic Highway. See description of Highway 25 Scenic Highway KOP for HVDC Alternative Route 5-B. Distance and visibility are the same.

Quitman. See description of Quitman KOP for HVDC Alternative Route 5-B. Distance and visibility are the same.

Rose Bud City Park. See description of Rose Bud City Park KOP for HVDC Alternative Route 5-B. Distance and visibility are the same.

3.18.6.3.2.2.5.6 HVDC Alternative Route 5-F

HVDC Alternative Route 5-F corresponds to Applicant Proposed Route Links 5 and 6.

Highway 16 Scenic Highway. See description of Highway 16 Scenic Highway KOP for HVDC Alternative Route 5-B. Distance and visibility are the same.

Rose Bud City Park. See description of Rose Bud City Park KOP for HVDC Alternative Route 5-B. Distance and visibility are the same.

3.18.6.3.2.2.5.7 Region 5 Alternative Comparison

Table 3.18-25 provides a comparison of the visual impacts for Region 5.

Table 3.18-25:
Visual Impact Comparison Summary—Region 5

Proposed and Alternative Routes	Miles of Distinct Lands Crossed	Miles of Common Lands Crossed	Miles of Developed Lands Crossed	Residences within 0.5 mile
HVDC Alternative Route 5-A	7.6	4.9	0.2	165
APR Links Corresponding to Alternative 5-A	7.9	4.3	0.2	136
HVDC Alternative Route5-B	12.2	57.2	1.8	975
APR Links Corresponding to Alternative 5-B	16.7	48.5	2.3	868
HVDC Alternative Route5-C	1.1	7.8	0.3	221
APR Links Corresponding to Alternative 5-C	1.5	7.6	0.3	175
HVDC Alternative Route5-D	3.8	17	1	382
APR Links Corresponding to Alternative 5-D	1.5	17.4	1.7	305
HVDC Alternative Route5-E	4.9	30.6	0.9	421
APR Links Corresponding to Alternative 5-E	5.2	26.6	1.4	578
HVDC Alternative Route5-F	3.0	18.7	0.6	239
APR Links Corresponding to Alternative 5-F	4.1	13.9	0.9	328

3.18.6.3.2.2.6 Region 6

A description for Region 6 is provided in section 3.18.6.2.3.2.9. Rural residences and small towns would make up majority of the sensitive viewers in this location and the areas of flat, agricultural lands would increase the viewing distance in many of these areas. The visual impacts for the Region 6 KOPs are listed in Table 3.18-26 and described below.

Table 3.18-26:
Visual Impact Summary of KOPs—HVDC Alternative Routes—Region 6

KOP	AR	Distance (Miles)	Viewer Concern	Landscape Category	Visibility	Contrast	Overall Impact
Fisher and Park	6-A	0.5	High	Developed	Yes	Strong	Moderate–High
Weldon	6-A	2.8	High	Common	Yes	Weak	Low
Amagon	6-B	0.2	High	Developed	Yes	Moderate	Moderate
Highway 14 Scenic Highway	6-B	0.3	High	Common	Yes	Strong	High
Crowley's Ridge Byway	6-C	0.2	High	Common	Yes	Strong	High

3.18.6.3.2.2.6.1 HVDC Alternative Route 6-A

HVDC Alternative Route 6-A corresponds to Applicant Proposed Route Links 2, 3 and 4.

Fisher and Park. HVDC Alternative Route 6-A would be visible in the open field 0.5 mile to the south. The structures would be a dominate feature on the landscape and would add a pattern of vertical structures with larger form than existing vertical elements. The visual contrast would be strong and overall visual impact moderate-high at this location.

Weldon. HVDC Alternative Route 6-A would be located 2.8 miles to the northeast. The flat open landscape would allow for multiple visible transmission-line structures, but at a distance of 2.6 miles, they would appear as a row of dark vertical elements and would be co-dominant with the existing structures on the landscape. This KOP represents views from residential area, so visual concern is high. The overall visual contrast would be weak and result in low overall visual impact.

3.18.6.3.2.2.6.2 HVDC Alternative Route 6-B

HVDC Alternative Route 6-B corresponds to Applicant Proposed Route Link 3.

Amagon. HVDC Alternative Route 6-B would be located 0.2 mile to the south/southwest, running parallel to the existing H-frame structures. This KOP represents views from a residential area and the visual concern is high. The proposed transmission line structures would be considerably larger and different in form than the existing structures, making them visible above tree line and resulting moderate contrast and moderate overall visual impacts.

Highway 14 Scenic Highway. HVDC Alternative Route 6-B would cross Highway 14 0.3 mile from this location and then run parallel to the roadway. This is a flat and open landscape and the transmission line structures would be dominant features in the FG where they cross the highway and then continue as a dominant element as it follows the road into the distance. This KOP represents views from a scenic highway, so visual concern is high. HVDC Alternative Route 6-B would result in strong visual contrast and high overall visual impact in this location. A visual simulation for this KOP is provided in Appendix K.

3.18.6.3.2.2.6.3 HVDC Alternative Route 6-C

HVDC Alternative Route 6-C corresponds to Applicant Proposed Route Links 3, 4 and 5.

Crowley's Ridge Scenic Byway. HVDC Alternative Route 6-C would be located 0.2 mile to the southeast, crossing the open field and Scenic Byway. Structures would be dominant features on the landscape and motorists traveling the Scenic Byway would have unobstructed views. The transmission line structures would attract attention as large vertical elements on an open landscape and result in strong visual contrast. Since this KOP represents views from a Scenic Byway, visual concern is high and the overall visual impact would be high at this location.

3.18.6.3.2.2.6.4 Region 6 Alternative Comparison

Table 3.18-27 provides a comparison of the visual impacts for Region 6.

Table 3.18-27:
Visual Impact Comparison Summary—Region 6

Proposed and Alternative Routes	Miles of Distinct Lands Crossed	Miles of Common Lands Crossed	Miles of Developed Lands Crossed	Residences within 0.5 mile
HVDC Alternative Route 6-A	0.1	15.3	0.9	45
APR Links Corresponding to Alternative 6-A	0.1	16.9	0.8	64
HVDC Alternative Route 6-B	0	13.3	0.8	141
APR Links Corresponding to Alternative 6-B	0.1	9.3	0.3	24
HVDC Alternative Route 6-C	2.7	19.9	0.6	66
APR Links Corresponding to Alternative 6-C	3.9	20.5	0.53	66
HVDC Alternative Route 6-D	0.3	8.8	0.1	5
APR Links Corresponding to Alternative 6-D	0.2	8.1	0.2	0

3.18.6.3.2.2.7 Region 7

A description for Region 7 is provided in Section 3.18.6.2.3.2.11. As the Project moves east, there would be areas of higher population and correspondingly higher amounts of sensitive residential viewers, although the more developed areas have more structures and vertical elements that would offer a higher level of screening and reduce the viewing distance for many of the sensitive viewing areas. The visual impacts for the Region 7 KOPs are listed in Table 3.18-28 and described below.

Table 3.18-28:
Visual Impact Summary of KOPs—HVDC Alternative Routes—Region 7

KOP	AR	Distance (Miles)	Viewer Concern	Landscape Category	Visibility	Contrast	Overall Impact
Dyess	7-A	2.6	High	Common	Yes	Weak	Low
Johnny Cash Home	7-A	3.5	High	Common	Yes	Weak	Low
Lower Hatchie NWR	7-A	4.7	High	Distinct	No	No Contrast/Not visible	No Impact
Marked Tree AR	7-A	1	High	Developed	Yes	Weak	Low
McGavock-Grider Park	7-A	1.8	High	Common	Yes	Weak	Low
Mississippi River and Trail of Tears	7-A	0.3	High	Distinct	Yes	Strong	High
Tyronza	7-A	2.4	High	Common	Yes	Weak	Low
Wilson Park	7-A	1.8	High	Common	Yes	Weak	Low
Harold Park and Millington	7-B	2	High	Developed	No	No Contrast/Not visible	No Impact
Wilkinsville	7-B	0.7	High	Common	Yes	Strong	Moderate–High
Atoka	7-C	0.7	High	Common	No	No Contrast/Not visible	No Impact
Aycock Park and Millington	7-C	0.2	High	Developed	Yes	Moderate	Moderate
Harold Park and Millington	7-C	0.6	High	Developed	Yes	Moderate	Moderate-Low
Millington East	7-C	0.3	High	Common	Yes	Moderate	Moderate–High
Millington USA Baseball Stadium	7-C	0.5	High	Developed	Yes	Moderately Low	Moderate-Low
Rockyford Park	7-C	2.9	High	Developed	No	No Contrast/Not visible	No Impact
Edmund Orgill Park	7-C, 7-B, 7-D	1.7	High	Distinct	No	No Contrast/Not visible	No Impact

Table 3.18-28:
Visual Impact Summary of KOPs—HVDC Alternative Routes—Region 7

KOP	AR	Distance (Miles)	Viewer Concern	Landscape Category	Visibility	Contrast	Overall Impact
Atoka	7-D	0.2	High	Common	Yes	Strong	Moderate–High
Atoka Community Park	7-D	3.2	High	Developed	No	No Contrast/Not visible	No Impact
Munford	7-D	0.4	High	Developed	Yes	Weak	Moderate-Low
Rhodes Estates	7-D	0.6	High	Developed	Yes	Weak	Low

3.18.6.3.2.2.7.1 HVDC Alternative Route 7-A

HVDC Alternative Route 7-A corresponds to Applicant Proposed Route Links 2, 3 and 4.

Dyess. HVDC Alternative Route 7-A would be located 2.6 miles to the south. Since this is a very flat landscape with panoramic views, the transmission line structures may be visible in the distance and appear as a series of dark vertical objects on the horizon and would result in weak contrast. The overall visual impacts of the structures would be low from this location.

Johnny Cash Home. HVDC Alternative Route 7-A would be located 3.5 miles south of the Johnny Cash Boyhood Home Historic site, so the visual concern is high. The flat landscape in this area provides panoramic views and the transmission line structures would be faintly visible on the horizon. At this distance, the structures would appear as dark vertical objects creating a pattern on the horizon resulting in weak visual contrast and low overall visual impact.

Lower Hatchie NWR. HVDC Alternative Route 7-A would be located 4.7 miles to the west. Terrain and dense vegetation would screen all potential views of the transmission line structures at this location, resulting in no visual impact.

Marked Tree. HVDC Alternative Route 7-A would be located 1 mile to the southeast of this location. Existing structures and vegetation in view would screen most of the structures, leaving just the top portion of the HVDC Alternative Route 7-A structures visible. This KOP represents views from a park and recreation area and visual concern is high. There are several existing structures in view, so the proposed structures would result in weak contrast and low overall visual impact. A visual simulation for this KOP is provided in Appendix K.

McGavock-Girder Park. HVDC Alternative Route 7-A would be located 1.8 miles to the south-southwest. The open landscape would offer views of the transmission structures, appearing as a pattern of vertical structures in the distance. The transmission line structures would not be a dominant feature on the landscape and would result in weak visual contrast at this location. This KOP represents views from a public park and the visual concern is high. The overall visual impacts would be low.

Mississippi River and Trail of Tears. HVDC Alternative Route would cross the Mississippi River 0.3 mile from this location. The transmission line structures required to cross the river would be very tall and prominent in view and would appear much taller than existing structures. The structures would be substantially taller than the trees on the banks of the river and would be a dominant feature in view of anyone using the river for recreation. In addition, FAA lighting would be required due to height requirements for additional light sources for nighttime views. Vegetation would also need to be removed along the banks of the river for the ROW creating additional impact. This KOP represents views from a major waterbody and historic trail, so visual concern is high. HVDC Alternative Route 7-A would result in strong visual contrast and high overall visual impacts at this location. A visual simulation for this KOP is provided in Appendix K.

Tyronza. HVDC Alternative Route 7-A would be located 2.4 miles to the north. Because the landscape in this area is flat and offers panoramic views, the transmission line structures would be visible above the trees in the distance. At this distance, they would appear on the horizon as dark vertical elements and would not appear substantially different than the FG structures, resulting in weak contrast and low overall visual impact.

Wilson Park. HVDC Alternative Route 7-A would be located 1.8 miles to the northwest. This KOP represents views from a public park, so visual concern is high. The transmission line structures would be visible as a pattern of vertical objects with different form and line than the existing vertical elements. The proposed structures would be larger in scale than the existing structures, but because of distance, they would not be a dominant element on the landscape. HVDC Alternative Route 7-A would result in weak visual contrast, and low overall visual impact at this location.

3.18.6.3.2.2.7.2 HVDC Alternative Route 7-B

HVDC Alternative Route 7-B corresponds to Applicant Proposed Route Links 3 and 4.

Edmund Orgill Park. HVDC Alternative Route 7-B would be located 1.7 miles from Edmund Orgill Park. The dense trees and rolling terrain in the FG would screen all views of the transmission line structures, resulting in no visual impact at this location.

Harold Park and Millington. See the Applicant Proposed Route Link 5 description.

Wikinsville. HVDC Alternative Route 7-B would be located 0.7 mile to the south. The structures would appear as a row of objects extending above the trees in the MG adding a strong vertical element to a landscape with primarily horizontal line. This KOP represents views from a residential area and visual concern is high. HVDC Alternative Route 7-B would result in strong visual contrast and high overall visual impact at this location.

3.18.6.3.2.2.7.3 HVDC Alternative Route 7-C

HVDC Alternative Route 7-B corresponds to Applicant Proposed Route Links 3, 4 and 5.

Atoka. See description of Atoka KOP for Applicant Proposed Route Link 5. Distance and visibility are the same.

Aycock Park and Millington. HVDC Alternative Route 7-C would be located less than 0.2 mile to the north and would parallel the existing 161kV line. Although the proposed transmission line structures would be parallel to the existing transmission line, the proposed structures would be larger in scale and extend above the trees in the FG, adding moderate contrast to the landscape. This KOP represents views from a neighborhood park and residential area and has high visual concern. The overall visual impact would be moderate at this location since there is an existing transmission line in view.

Edmund Orgill Park. See description of Edmund Orgill Park KOP for HVDC Alternative Route 7-B. Distance and visibility are the same.

Harold Park and Millington. HVDC Alternative Route 7-C would be located 0.6 mile west. Looking west, the transmission line structures would be visible through breaks in the FG trees, extending above the trees in the distance. The structures would differ in form than the existing low, primarily horizontal houses in the area, resulting in moderate contrast and moderate–low overall visual impact. A visual simulation for this KOP is provided in Appendix K.

Millington East. HVDC Alternative Route 7-C would be located 0.3 mile to the southeast, running parallel to an existing 161kV transmission line. The proposed transmission line structures would be larger in scale than the existing transmission line structures and extend above tree line, with the bottom portion screened by vegetation in the FG. This KOP represents views from a residential area and visual concern is high. The structures would be prominent on the landscape and result in moderate contrast and moderate-high overall visual impact.

Millington USA Baseball Stadium. HVDC Alternative Route 7-C would be located 0.5 mile to the south, running parallel to an existing 161kV transmission line. The tops of the transmission line structures would be visible above the trees and would introduce additional vertical elements to the landscape. There are several tall vertical elements in the existing environment, so the additional structures would result in weak contrast and moderate–low overall visual impact.

Rockyford Park. HVDC Alternative Route 7-C would be located 2.9 miles to the northwest. The dense trees and terrain would block all views of HVDC Alternative Route 7-C, resulting in no overall visual contrast at this location.

3.18.6.3.2.2.7.4 HVDC Alternative Route 7-D

HVDC Alternative Route 7-D corresponds to Applicant Proposed Route Links 4 and 5.

Atoka. HVDC Alternative Route 7-D would be located less than 0.2 mile to the southwest in the FG. This KOP represents views from a residential area and visual concern is high. The transmission line structures would be a dominant feature crossing the open fields in front of the FG trees and vegetation clearing may be visible. Because HVDC Alternative Route 7-D would be introducing new dominant features into an undeveloped landscape, it would result in strong visual contrast and high overall visual impact.

Atoka Community Park. See description of Atoka Community Park KOP for Applicant Proposed Route Link 5. Distance and visibility are the same.

Edmund Orgill Park. See description of Edmund Orgill Park KOP for HVDC Alternative Route 7-C. Distance and visibility are the same.

Munford. HVDC Alternative Route 7-D would be located 0.4 mile to the southwest. This KOP represents views from a residential area and visual concern is high. HVDC Alternative Route 7-D would run parallel to an existing 500kV transmission line and would be visible extending above the FG trees. The proposed structures would not introduce any new form, line, color, or texture but would add to existing elements, resulting in weak visual contrast and moderate–low overall visual impact.

Rhodes Estates. HVDC Alternative Route 7-D would be located 0.6 mile to the northeast and would run parallel to an existing 500kV transmission line, but at a farther distance. With the increased distance to the structures, they would appear smaller in size and less dominant, resulting in weak visual contrast. This KOP represents views from a residential area and visual concern is high and the overall visual impact is low.

3.18.6.3.2.2.7.5 Region 7 Alternative Comparison

Table 3.18-29 provides a comparison of the visual impacts for Region 7.

Table 3.18-29:
Visual Impact Comparison Summary—Region 7

Proposed and Alternative Routes	Miles of Distinct Lands Crossed	Miles of Common Lands Crossed	Miles of Developed Lands Crossed	Residences within 0.5 mile
HVDC Alternative Route 7-A	1.9	40.5	0.8	127
APR Links Corresponding to Alternative 7-A	1.5	25.5	1.6	61
HVDC Alternative Route 7-B	1.8	6.2	0.6	503
APR Links Corresponding to Alternative 7-B	3.0	5.2	0.2	537
HVDC Alternative Route 7-C	2.1	20.5	1.2	1536
APR Links Corresponding to Alternative 7-C	3.7	9.0	0.5	717
HVDC Alternative Route 7-D	0.3	6.0	0.2	1400
APR Links Corresponding to Alternative 7-D	0.8	5.3	0.3	334

3.18.6.3.2.3 Decommissioning Impacts

Project facilities would be removed at the end of the operational life of the transmission line. There would be temporary visual impacts during decommissioning activities. Conductors, structures, and related facilities would be removed. Foundations would be removed to below the ground surface level. There would be residual visual impacts for many years after the Project has been decommissioned and structures removed such as vegetative cutbacks, cut and fill scars from construction activities, and access roads, which all add to the visual impact, though these impacts would be at ground level. These areas would be apparent after the removal of structures but are expected to diminish over time as the removed vegetation grows back.

3.18.6.4 Best Management Practices

The Applicant has developed a comprehensive list of EPMs that would minimize or avoid potential adverse impacts to visual resources. A complete list of EPMs for the Project is provided in Appendix F.

3.18.6.5 Unavoidable Adverse Impacts

Unavoidable impacts include the potential loss or alteration of sensitive views from public or private lands that are located within or adjacent to (within the FG/MG) the transmission line ROW or adjacent to converter station siting areas.

3.18.6.6 Irreversible and Irretrievable Commitment of Resources

Irretrievable impacts to visual resources are anticipated where large trees are removed in the ROW, since trees would not be replanted or would be replanted and would result in age disparities, the effects of which would be noticeable to the casual observer. Removed trees would not be available for use by future generations even if new trees are replanted.

Views of the ROW and structures for the life of the Project would be irreversible due to the introduction of structures and vegetative clearing. Once the Project has been decommissioned, all structures could be removed, access roads reclaimed, and vegetation restored.

3.18.6.7 Relationship between Local Short-term Uses and Long-term Productivity

Short-term vegetation management may impair long-term visual resources where trees or areas of thick vegetation are removed and take years to grow back.

3.18.6.8 Impacts from Connected Actions

3.18.6.8.1 Wind Energy Generation

The WDZs fall within a 40-mile radius from the Oklahoma Converter Station in Region 1, as described in Section 3.18.5.8. The region is primarily flat agricultural lands with open and expansive views and the tall vertical wind turbines would be potentially visible from large distances. Sensitive viewers in this area would be primarily rural residences and small towns, but there are several local parks, state parks, wildlife areas and the Rita Blanca National Grassland that would have possible views because of the panoramic views in the region. This region is free of heavy development and for the most part, cultural modifications are limited to grain silos, center pivots, and scattered transmission structures. The primarily horizontal lines of the landscape would have strong contrast with the tall vertical wind turbines when in the FG and near MG. Additionally, required FAA lighting would be visible for long distances and would likely attract attention when flashing. Most of the highly sensitive resources, such as the national grassland and recreation areas, however, would be located in the BG distance zone, so impacts would not be as strong as turbines would not be a dominant feature at that distance.

3.18.6.8.2 Optima Substation

Construction and operations and maintenance of the future Optima Substation would result in low visual impacts because of the low visual sensitivity of viewers associated with local roads and existing cultural modifications in the area that have already introduced vertical elements in the a relatively flat landscape setting. Highly sensitive resources, such as viewers associated with the Optima National Wildlife Refuge, would be located in the BG distance zone, and views of the substation would be obstructed by the rolling terrain; therefore no visual impacts are anticipated to high sensitivity viewers in the BG.

3.18.6.8.3 TVA Upgrades

A precise ROI has not been identified for the TVA upgrades. Where possible, general impacts associated with the required TVA upgrades are discussed below.

Upgrades to existing facilities related to terminal modifications and conductor replacement are not expected to result in high visual impacts because contrast would be weak as the existing facilities have already introduced vertical elements into the landscape that are similar in form, line color and texture. Increasing the heights of existing towers and constructing a new electric transmission line could have higher contrast and higher overall impacts depending on the specific locations of the towers that would be increased in height and location of the new transmission line. The level of potential visual impacts would depend on whether these upgrades were constructed in visually important or unique landscapes, or near highly sensitive viewer locations such as community enhancement areas (e.g., roadside parks, viewpoints and historic markers) or locations with special scenic, historic, recreation, cultural, and/or natural qualities that have been recognized as such through legislation or some other official declaration.

3.18.6.9 Impacts Associated with the No Action Alternative

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not be constructed. Current management across the Regions 1 through 7 of the Project would be maintained under the No Action Alternative. Under this alternative, there would be no Project construction or operation to impact visual resources.

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Contents

Tables

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3.19 Wetlands, Floodplains, and Riparian Areas

3.19.1 Regulatory Background

This section includes a summary of the federal and state surface water resource regulations and standards relevant to wetlands, floodplains, and riparian areas.

3.19.1.1 Federal

3.19.1.1.1 Clean Water Act

The EPA regulates discharges of pollutants into waters of the United States as well as quality standards for surface waters under the CWA (33 USC § 1251 *et seq*.).

Under Section 404 of the CWA, the USACE is responsible for regulating the discharge of dredge or fill material to waters of the United States, including jurisdictional wetlands. The USACE and the EPA jointly define wetlands as "Those areas saturated or inundated with ground or surface water, at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (Environmental Laboratory 1987)."

Title 33 CFR 328.3(a) currently defines "waters of the United States" as follows:

1. *All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;*
2. *All interstate waters including interstate wetlands;*
3. *All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters:*
   - i. *Which are or could be used by interstate or foreign travelers for recreational or other purposes; or*
   - ii. *From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or*
   - iii. *Which are used or could be used for industrial purpose by industries in interstate commerce;*
4. *All impoundments of waters otherwise defined as waters of the United States under the definition;*
5. *Tributaries of waters identified in paragraphs (a)(1) through (4) of this section;*
6. *The territorial seas;*
7. *Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (a)(1)through (6) of this section.*
8. *Waters of the United States do not include prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other Federal agency, for the purposes of the Clean Water Act, the final authority regarding Clean Water Act jurisdiction remains with the EPA. Waste treatment systems, including treatment ponds or lagoons*

designed to meet the requirements of CWA (other than cooling ponds as defined in 40 CFR 123.11(m) which also meet the criteria of this definition) are not waters of the United States.

The EPA and USACE recently published (79 FR 22188, April 21, 2014) for public comment a proposed rule redefining the scope of waters protected under the CWA, in light of the U.S. Supreme Court cases in the *U.S. v. Riverside Bayview*, *Rapanos v. United States*, and *Solid Waste Agency of Northern Cook County (SWANCC) v. U.S. Army Corps of Engineers*, and *Rapanos v. United States (Rapanos).* This proposal would enhance protection for the nation's public health and aquatic resources and increase CWA program predictability and consistency by increasing clarity as to the scope of ''waters of the United States'' protected under the Act.

Dredge and fill activities in waters of the United States, including wetlands, must be authorized through either a nationwide permit, a regional permit (covering various classes of routine activities), or through an individual permit. The Project's seven regions traverse the jurisdiction of the USACE Tulsa, Little Rock, and Memphis District offices. Impacts to wetlands and other waters of United States will be avoided, minimized, and mitigated for the Project through permit-based efforts in consultation with the aforementioned offices of the USACE. Additionally, EPMs (Section 3.19.6.1.1) and BMPs (Section 3.19.6.4) will be adhered to for construction, operations and maintenance, and decommissioning phases of the Project.

Under Section 401 of the CWA, a federal agency cannot issue a permit or license for an activity that may result in a discharge to waters of the United States until the state or tribe where the discharge would originate has granted or waived Section 401 water quality certification, indicating that the proposed discharge would comply with the state's water quality standards. Any USACE Section 404 Individual Permits applied for would require individual review and water quality certification by the appropriate state agency (i.e., the TCEQ, the ODEQ, the ADEQ, or the TDEC).

3.19.1.1.2 Rivers and Harbors Appropriation Act of 1899

Section 10 of the Rivers and Harbors Appropriation Act of 1899 (33 USC § 403) prohibits the unauthorized obstruction or alteration of any navigable water of the U.S. Pursuant to the implementing regulations, Section 10 permits must be obtained from the USACE for power transmission line crossings of navigable waters of the United States, with limited exceptions (33 CFR Part 322).

3.19.1.1.3 DOE Floodplain and Wetland Environmental Review Requirements

Executive Orders 11988 "Floodplain Management" (May 24, 1977) and 11990 "Protection of Wetlands" (May 24, 1977) direct federal agencies to undertake various actions to protect floodplains and wetlands, including preparing a floodplain or wetland assessment for any action proposed in a floodplain and new construction proposed in a wetland. DOE's regulations implementing these Executive Orders, Compliance with Floodplain and Wetland Environmental Review Requirements (10 CFR Part 1022) require that any floodplain or wetland assessment normally be included in an Environmental Assessment or EIS, if one is being prepared (10 CFR 1022.13(b)). A floodplain or wetland assessment includes a description of the proposed action, a discussion of its potential effects on the floodplain or wetland (including a discussion of floodplain or wetland values), and consideration of alternatives (10 CFR 1022.4). The outcome of a floodplain assessment is documented in a floodplain statement of findings, which may be incorporated into a final EIS or record of decision (10 CFR 1022.14(c)). A wetland statement of findings may be similarly prepared for a wetland assessment but is not required.

3.19.1.2 State of Oklahoma

Oklahoma protects wetlands through the efforts of four agencies: Oklahoma Conservation Commission ODEQ, ODWC, and Oklahoma Water Resources Board. The Oklahoma Conservation Commission is the lead agency for wetland planning and coordinates the Oklahoma Wetlands Working Group. The Oklahoma Wetlands Working Group is guided by the Oklahoma Comprehensive Wetlands Conservation Plan. The ODEQ regulates wetlands by providing CWA Section 401 water quality certification for federal permits or licenses that result in impacts to waters of the state, including CWA Section 404 dredge and fill permits. The ODWC reviews federal actions that may cause impacts to wetlands in the state, assists in coordinating wetlands mitigation, and acquires wetlands for protection through fee title acquisition. The Oklahoma Water Resources Board develops state water quality standards, which are applicable to jurisdictional wetlands and stream resources.

3.19.1.3 State of Arkansas

The state of Arkansas' wetland regulatory program efforts are tied to CWA Section 401 water quality certification. Arkansas has a Multi-Agency Wetland Planning Team that is a consortium of state agencies that work together on restoration and planning for wetlands conservation. The team is guided by the Arkansas Wetlands Strategy, which is a comprehensive planning document that outlines objectives and strategies for state wetland initiatives.

3.19.1.4 State of Tennessee

Wetlands in the state of Tennessee are regulated by the TDEC Division of Water Pollution Control. TDEC requires either a CWA Section 401 certification or a state permit for any impacts to wetlands within Tennessee. The Tennessee Wildlife Resources Agency collaborates with TDEC on mitigation banking for wetland impacts. Tennessee Wildlife Resources Agency also administers a program to acquire and restore wetland properties within the state. Various federal agencies, such as the USACE, EPA, USFWS, and the USDA/NRCS may take part on Mitigation Banking Interagency Teams (IRT) when impacts to wetlands or streams in Tennessee require mitigation.

The Tennessee Water Quality Control Act of 1977 and the Aquatic Resources Alteration Rule establish the state's Aquatic Resources Alteration Permit program. This program regulates wetlands and wetland activities apart from those covered by individual CWA Section 404 permits.

3.19.1.5 State of Texas

As with the other states discussed in Section 3.19.1, the primary form of wetland regulation at the state level in Texas is the CWA Section 401 water quality certification program. There are several state agencies involved in the regulation of wetland-related activities, including the TCEQ, which conducts CWA Section 401 water quality certification for most activities. The Texas General land Office manages coastal wetlands under the Coastal Zone Management Plan; however, no coastal wetlands are involved in the proposed Project.

3.19.2 Data Sources

The primary data sources for this section on wetlands, floodplains, and riparian areas include the national wetland inventory (NWI) (GIS Data Source: USFWS 2014g), the national hydrography dataset, the NLCD, the Farm Service Agency's National Agriculture Imagery Program, and the national flood hazard layer data (GIS Data Sources: USGS 2014a; Jin et al. 2013; NAIP 2013a, 2013b, 2012a, 2012b; FEMA 2014).

3.19.3 Region of Influence

The ROI for evaluation of impacts on wetlands, floodplains, and riparian areas from the Project and connected actions is the same as that identified in Section 3.1.1.

3.19.4 Affected Environment

This affected environment section details overall numbers and types of wetlands, the 100-year floodplains, and the associated riparian areas. Each of these three resource types is discussed within the context of the ROI. The ROI traverses four states: Texas, Oklahoma, Arkansas, and Tennessee.

3.19.4.1 Wetlands

Wetlands within the ROI were identified utilizing USFWS NWI program data (GIS Data Source: USFWS 2014g). These data have provided the number of wetlands per region, as well as the Cowardin classification (Cowardin et al. 1979) for each of the identified wetlands. Deepwater habitats, defined as aquatic systems deeper than 2 meters (6.6 feet), are also included in the classification system, and several of these lake systems have been identified in the ROI. The Cowardin classification system is an alpha-numeric coding system that corresponds to the classification nomenclature that best describes various wetland habitats. Cowardin classes represented within the ROI are summarized in Table 3.19-1. This table represents a subset of the overall Cowardin classification system, limited here to the systems, subsystems, and classes applicable to NWI wetlands mapped in the ROI. NWI wetlands are depicted on Figures 3.15-2a through 3.15-2f in Appendix A.

Table 3.19-1:
Cowardin Classifications Identified for Wetlands and Deepwater Habitats in the ROI

System	Subsystem	Class	Code	Description
Palustrine		Emergent	PEM	Non-tidal wetlands less than 6.6 feet in depth dominated by erect, rooted, herbaceous vegetation.
		Scrub/Shrub	PSS	Non-tidal wetlands less than 6.6 feet in depth dominated by woody plants less than 20 feet in height.
		Forested	PFO	Non-tidal wetlands less than 6.6 feet in depth dominated by woody plants 20 feet in height or taller.
		Aquatic Bed	PAB	Non-tidal wetlands less than 6.6 feet in depth dominated by plants that grow principally on or below the surface of the water for most of the growing season in most years.
		Unconsolidated Bottom	PUB	Non-tidal wetlands less than 6.6 feet in depth. The substrate has at least 25 percent cover of particles smaller than stones and a vegetative cover less than 30 percent.
		Unconsolidated Shore	PUS	Non-tidal wetlands less than 6.6 feet in depth with substrates lacking vegetation except for pioneering plants that become established during brief periods when growing conditions are favorable.
Riverine	Lower Perennial	Unconsolidated Bottom	R2UB	All wetlands and deepwater habitats contained in well-formed channels and not dominated by trees, shrubs, and persistent emergent, emergent mosses or lichens. Lower perennial channels (R2) have low gradient, slow flows, and well-developed floodplains. The substrate has at least 25 percent cover of particles smaller than stones and a vegetative cover less than 30 percent.
		Unconsolidated Shore	R2US	All wetlands and deepwater habitats contained in well-formed channels and not dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens.

Table 3.19-1:
Cowardin Classifications Identified for Wetlands and Deepwater Habitats in the ROI

System	Subsystem	Class	Code	Description
	Intermittent	Streambed	R4SB	Intermittent stream wetlands where flow is restricted to limited portions of the year. All wetlands are contained in well-formed channels and not dominated by trees, shrubs, persistent emergents, emergent mosses or lichens.
	Unknown Perennial	Unconsolidated Bottom	R5UB	This Subsystem designation was created specifically for use when the distinction between lower perennial, upper perennial and tidal cannot be made from aerial photography and no data is available. The substrate has at least 25 percent cover of particles smaller than stones and a vegetative cover less than 30 percent.
Lacustrine	Limnetic	Unconsolidated Bottom	L1UB	Deepwater (>6.6 feet) lake habitats lacking trees, shrubs, and emergent vegetation and exceeding 20 acres in size. The substrate has at least 25 percent cover of particles smaller than stones and a vegetative cover less than 30 percent.
	Littoral	Unconsolidated Bottom	L2UB	Lake shoreline (<6.6 feet) wetlands lacking trees, shrubs, and emergent vegetation and exceeding 20 acres in size. The substrate has at least 25 percent cover of particles smaller than stones and a vegetative cover less than 30 percent.
		Unconsolidated Shore	L2US	Lake shoreline (<6.6 feet) wetlands characterized by substrates lacking vegetation except for pioneering plants that become established during brief periods when growing conditions are favorable.
		Emergent	L2EM	Lake shoreline (<6.6 feet) wetlands dominated by erect, rooted, herbaceous vegetation

3.19.4.2 Floodplains

Floodplain data for the ROI were collected from the National Flood Hazard Layer (GIS Data Source: FEMA 2014). This section describes the mapped base floodplains and critical action floodplains in the ROI. Under 44 CFR 9.4, base floodplains are defined as the 100-year floodplain (1-percent annual-chance floodplain), and critical action floodplains are defined as the 500-year floodplain (0.2-percent annual-chance floodplain). No 500-year floodplain data were available in this most recent FEMA national flood hazard layer for this Project's ROI. FEMA has not delineated 500-yeard floodplains in the most current data set and these areas are thus considered non-special flood hazard areas. Floodplains have been identified using FEMA's national flood hazard layer where available, and "Q3" data where there are gaps in national flood hazard layer coverage. "Q3" data are digital data that FEMA developed by scanning existing Flood Insurance Rate Map hardcopies and vectorizing select data features (including 100-year and 500-year flood zones) into a countywide format (FEMA 2013b). Q3 data were used where national flood hazard layer data were not available in Van Buren, Jackson, and Cross counties in Arkansas. FEMA floodplain mapping for Beaver, Harper, and Major counties in Oklahoma, and for Sherman, Hansford, and Ochiltree counties in Texas is not available (FEMA 2013a). Floodplains for these counties are not shown on mapping or in the floodplain tables. 100-year floodplains are depicted on Figure 3.15-2 in Appendix A and they are described for the ROI below.

3.19.4.3 Riparian Areas

This section describes the mapped streams that may have associated riparian areas located within the ROI. Section 3.15 also provides a listing of streams by watershed for each region of the Project. Riparian areas, which are those lands considered to be transitional between uplands and riverine ecosystems, were evaluated using information available from the National Hydrography Dataset (GIS Data Source: USGS 2014a). These areas are typically linear in shape and act as important buffer strips between flowing surface waters and the surrounding upland landscapes. Riparian areas may be dominated by a variety of vegetation types, from herbaceous plants to shrubs, and also by gallery or streamside forests. Riparian areas have several beneficial functions including the control of upland runoff, dissipation of flood flows, stabilization of streambanks, provision of valuable wildlife habitat and habitat connectivity corridors, and they can act as noise and visual buffering for streams. Some common riparian tree species to be found in the ROI may include bald cypress (*Taxodium distichum*), cottonwood (*Populus* spp.), willow (*Salix* spp.), box elder (*Acer negundo*), red maple (*Acer rubrum*), willow oak (*Quercus phellos*), sycamore (*Plantanus occidentalis*), American beech (*Fagus grandifolia*), sweetgum (*Liquidamber styraciflua*), green ash (*Fraxinus pennsylvanica*), and water oak (*Quercus nigra*) (USDA 2013; Williams 2005).

Table 3.19-2 provides the total number of streams (named and unnamed) that would be crossed by the Project within the ROI of the respective Applicant Proposed Route and the HVDC alternative routes.

Table 3.19-2:
Total Stream Crossings by Region

Project Region	Total Stream Crossings
Region 1—APR (Links 1–5)	115
Region 1—Alternative Routes (1-A, 1-B, 1-C, and 1-D)	326
Region 2—APR (Links 1–3)	96
Region 2—Alternative Routes (2-A, and 2-B)	101
Region 3—APR (Links 1–6)	327
Region 3—Alternative Routes 3-A, 3-B, 3-C, 3-D and 3-E	578
Region 4—APR (Links 1–9)	212
Region 4—Alternative Routes 4-A, 4-B, 4-C, 4-D, and 4-E	322
Region 5 —APR (Links 1–9)	205
Region 5—Alternative Routes 5A, 5-B, 5-C, 5-D, 5-E, and 5-F	353
Region 6—APR (Links 1–8)	87
Region 6—Alternative Routes 6-A, 6-B, 6-C, and 6-D	118
Region 7—APR (Links 1–5)	81
Region 7—Alternative Routes 7-A, 7-B, 7-C, and 7-D	135

GIS Data Source: USGS (2014a)

3.19.5 Regional Description

The following sections provide detailed descriptions of wetlands, floodplains, and riparian areas in the ROI for Regions 1 through 7. The regional descriptions in this section identify these resource types as they are found within the 1,000-foot-wide ROI of the HVDC transmission line routes. Information for the AC collection system (included in the Region 1 description) is similarly presented in terms of a 2-mile-wide ROI. This information is used in evaluating potential impacts of the Project in Section 3.19.6, which is based on a 200-foot-wide representative ROW within the ROI.

3.19.5.1 Region 1

Region 1 is referred to as the Oklahoma Panhandle Region and includes the proposed Oklahoma Converter Station Siting Area and AC Interconnection, Applicant Proposed Route, and the HVDC Alternative Routes 1-A through 1-D.

3.19.5.1.1 Wetlands

Desktop analysis for NWI-mapped wetland resources determined no NWI wetland resources present in the ROI for either the Oklahoma Converter Station Siting Area or the AC interconnection.

Table 3.19-3 provides a summary of wetlands identified for the Applicant Proposed Route (Links 1–5 in Region 1). The definition of Cowardin classifications is provided in Table 3.19-1. All of the streams have the potential to have riparian areas associated with them. The stream crossing totals in Table 3.19-3 are derived from the NHD data set.

Table 3.19-3:
Wetlands in the 1,000-Foot Corridor—Region 1, Applicant Proposed Route

Wetland Type	No. of Wetlands	Acreage of Wetlands
PEM	7	9
Palustrine - farmed	5	40
PFO/PSS	1	1
PFO	10	7
PSS	9	38
PUB	1	1
PUS	27	13
R2UB	1	3
R2US	1	4
Total	62	116

GIS Data Source: USFWS (2014g)

Table 3.19-4 provides a summary of wetlands identified for HVDC Alternative Route 1-A (corresponding to Applicant Proposed Route Links 2, 3, 4, and 5 in Region 1) within the 1,000-foot-wide ROI.

Table 3.19-4:
Wetlands in the 1,000-Foot Corridor—Region 1, HVDC Alternative Route 1-A

Wetland Type	No. of Wetlands	Acreage of Wetlands
PEM	21	46
PFO	5	7
PSS	4	11
PUB	3	1
PUS	20	7
R2UB	2	2
R2US	1	1
Total	56	75

GIS Data Source: USFWS (2014g)

Table 3.19-5 provides a summary of wetlands identified for HVDC Alternative Route 1-B (corresponding to Applicant Proposed Route Links 2 and 3 in Region 1).

Table 3.19-5:
Wetlands in the 1,000-Foot Corridor—Region 1, HVDC Alternative Route 1-B

Wetland Type	No. of Wetlands	Acreage of Wetlands
PEM/PSS	1	1
PSS	2	5
PUB	3	2
PUS	1	<1
R2UB	1	2
R2US	1	6
Total	9	16

GIS Data Source: USFWS (2014g)

Table 3.19-6 provides a summary of wetlands identified for HVDC Alternative Route 1-C (corresponding to Applicant Proposed Route Links 2 and 3 in Region 1).

Table 3.19-6:
Wetlands in the 1,000-Foot Corridor—Region 1, HVDC Alternative Route 1-C

Wetland Type	No. of Wetlands	Acreage of Wetlands
PEM	8	6
PFO	1	3
PSS	6	11
PUS	1	<1
R2UB	2	2
Total	18	22

GIS Data Source: USFWS (2014g)

Table 3.19-7 provides a summary of wetlands identified for HVDC Alternative Route 1-D (corresponding to Applicant Proposed Route Links 3 and 4 in Region 1).

Table 3.19-7:
Wetlands in the 1,000-Foot Corridor—Region 1, HVDC Alternative Route 1-D

Wetland Type	No. of Wetlands	Acreage of Wetlands
PEM	4	2
PFO	1	<1
PSS	2	5
PUS	7	2
R4SB	1	2
Total	15	11

GIS Data Source: USFWS (2014g)

Table 3.19–8 lists wetlands within the thirteen 2-mile-wide AC collection system routes.

Table 3.19-8:
Wetlands in the AC Collection System—Region 1

Route	Wetland Type	No. of Wetlands	Acreage of Wetlands
E-1	PEM/PFO	1	2
E-1	PEM/PSS	1	4
E-1	PEM1	21	125
E-1	Palustrine—Farmed	4	18
E-1	PFO	3	18
E-1	PSS	19	260
E-1	PUB	5	4
E-1	PUS	2	1
E-1	R2UB	1	32
E-1	R2US	4	28
	Total	65	492
E-2	L2EM	3	100
E-2	PEM/PSS	40	107
E-2	Palustrine—Farmed	11	82
E-2	PFO/PSS	6	42
E-2	PFO	2	4
E-2	PSS	8	73
E-2	PUB	6	10
E-2	PUS	4	3
E-2	R2UB	3	25
E-2	R2US	5	14
	Total	88	460
E-3	L2EM	2	56
E-3	PEM/PSS	3	6
E-3	PEM	10	11
E-3	PFO/PSS	1	9
E-3	PFO	2	6
E-3	PSS	12	138
E-3	PUB	17	35
E-3	PUS	8	8
E-3	R2UB	2	25
E-3	R2US	6	13
	Total	63	307
NE-1	L2EM	4	141
NE-1	PEM/PSS	2	8
NE-1	PEM	26	112
NE-1	Palustrine—Farmed	11	79
NE-1	PFO/PEM	1	20
NE-1	PFO	4	9
NE-1	PSS	1	<1
NE-1	PUB	27	82

Table 3.19-8:
Wetlands in the AC Collection System—Region 1

Route	Wetland Type	No. of Wetlands	Acreage of Wetlands
NE-1	PUS	7	19
NE-1	R2UB	1	20
NE-1	R2US	2	15
NE-1	R4SB	4	30
	Total	90	535
NE-2	L2EM	1	53
NE-2	PEM/PSS	10	77
NE-2	PEM	41	265
NE-2	Palustrine—Farmed	2	6
NE-2	PFO/PSS	2	10
NE-2	PFO	2	1
NE-2	PSS	7	24
NE-2	PUB	12	39
NE-2	PUS	2	2
NE-2	R2UB	1	19
NE-2	R2US	9	18
NE-2	R4SB	3	37
	Total	92	551
NW-1	L2EM	3	203
NW-1	PEM/PSS	3	6
NW-1	PEM	22	83
NW-1	Palustrine—Farmed	3	45
NW-1	PFO	1	2
NW-1	PSS	4	20
NW-1	PUB	2	16
NW-1	R4SB	7	49
	Total	45	424
NW-2	L2EM	2	94
NW-2	PEM/PSS	2	8
NW-2	PEM	27	121
NW-2	Palustrine—Farmed	9	108
NW-2	PFO/PEM	1	20
NW-2	PFO	4	9
NW-2	PSS	1	<1
NW-2	PUB	35	112
NW-2	PUSC	6	6
NW-2	R2UB	1	20
NW-2	R2US	2	15
NW-2	R4SB	15	288
	Total	105	801

Table 3.19-8:
Wetlands in the AC Collection System—Region 1

Route	Wetland Type	No. of Wetlands	Acreage of Wetlands
SE-1	L2EM	6	550
SE-1	PEM/PSS	13	87
SE-1	PEM	44	186
SE-1	Palustrine—Farmed	13	130
SE-1	PFO/PSS	9	53
SE-1	PSS	35	218
SE-1	PUB	7	10
SE-1	PUS	3	2
SE-1	R2UB	4	29
SE-1	R2US	5	14
	Total	139	1,279
SE-2	L2EM	1	20
SE-2	L2UB	1	53
SE-2	PEM	8	37
SE-2	Palustrine—Farmed	3	12
SE-2	PSS	2	6
SE-2	PUB	2	1
SE-2	PUS	1	1
	Total	18	130
SE-3	L2EM	6	409
SE-3	L2US	1	131
SE-3	PEM/PSS	2	12
SE-3	PEM	52	198
SE-3	Palustrine—Farmed	35	409
SE-3	PFO/PSS	6	42
SE-3	PFO	2	4
SE-3	PSS	8	73
SE-3	PUB	15	35
SE-3	PUS	8	58
SE-3	R2UB	3	25
SE-3	R2US	5	14
	Total	143	1.410
SW-1	PEM	5	14
SW-1	Palustrine—Farmed	1	3
SW-1	PUB	1	1
	Total	7	18
SW-2	L2EM	1	9
SW-2	PEM	8	69
SW-2	Palustrine—Farmed	1	3
SW-2	PFO	1	2

Table 3.19-8:
Wetlands in the AC Collection System—Region 1

Route	Wetland Type	No. of Wetlands	Acreage of Wetlands
SW-2	PUB	12	40
SW-2	R4SB	3	17
	Total	26	140
W-1	PEM	3	6
W-1	Palustrine—Farmed	1	29
W-1	PFO	1	2
W-1	PUB	2	6
W-1	R4SB	3	17
	Total	10	60

GIS Data Source: USFWS (2014g)

3.19.5.1.2 Floodplains

Table 3.19-9 provides the number and acreage of 100-year floodplain crossings estimated for each of the HVDC alternative routes and for the Applicant Proposed Route within the ROI in Region 1. The Applicant Proposed Route is anticipated to cross two of these 100-year floodplains. No 100-year or 500-year floodplains are documented for the Oklahoma Converter Station Siting Area.

Table 3.19-9:
100-Year Floodplains in the 1,000-Foot Corridor for the HVDC Transmission Line—Region 1

Alternative Route	No. of Floodplain Crossings	Estimated Acreage of Crossings
APR	2	254
1-A	2	31
1-B	2	49
1-C	2	31
1-D	0	0

Note: No FEMA floodplain data were available for Beaver and Harper counties, Oklahoma.

The AC collection system routes are estimated to cross 113 floodplains as identified in Table 3.19-10. AC Collection System Routes NW-1, SW-2, and W-1 would cross the greatest number of floodplains (12 each).

Table 3.19-10:
100-Year Floodplains in the ROI for the AC Collection System Routes—Region 1

Route	No. of Floodplain Crossings	Estimated Acreage of Crossings
E-1	6	133
E-2	9	1025
E-3	9	604
NE-1	9	1199
NE-2	5	1172
NW-1	12	2083
NW-2	9	1199
SE-1	9	1025

Table 3.19-10:
100-Year Floodplains in the ROI for the AC Collection System Routes—Region 1

Route	No. of Floodplain Crossings	Estimated Acreage of Crossings
SE-2	6	78
SE-3	9	1025
SW-1	6	78
SW-2	12	1934
W-1	12	1360

Note: No FEMA floodplain data were available for Beaver County, Oklahoma, or for Sherman, Hansford, and Ochiltree counties, Texas.

3.19.5.1.3 Riparian Areas

Table 3.19-2 includes a total number of potential stream crossings for Region 1. These streams may all have associated riparian area resources. The Oklahoma Converter Station and AC Interconnection Siting Areas include 1.6 miles of intermittent streams, no perennial streams, and no other major waterbodies. Table 3.19-11 provides information on surface water resources within the 2-mile-wide corridor of the AC collection system. Riparian areas may be associated with many of these surface water systems.

Table 3.19-11:
Potential Riparian Areas associated with Surface Water Features within the 2-Mile-Wide Corridors of the AC Collection System Routes

Route	Perennial Streams (miles)	Intermittent Streams (miles)	Major Waterbodies (miles)	Reservoirs, Lakes, and Ponds (acres)
E-1	9.2	100.2	0	33.8
E-2	13.5	100.1	0.1	149.0
E-3	10.1	137.6	0.0	36.7
NE-1	24.1	33.0	0.1	141.0
NE-2	7.8	78.3	0.1	70.8
NW-1	13.1	110.9	0.1	167.3
NW-2	31.1	77.7	0.2	119.2
SE-1	21.5	75.7	0.04	677.8
SE-2	0.8	26.7	0.0	98.0
SE-3	14.5	98.5	0.1	768.0
SW-1	1.0	58.1	0.0	14.2
SW-2	8.0	125.1	0.1	57.4
W-1	6.2	45.1	0.1	9.3

GIS Data Source: USGS (2014a)

3.19.5.2 Region 2

Region 2 is referred to as the Oklahoma Central Great Plains Region and includes the Applicant Proposed Route and HVDC Alternative Routes 2-A and 2-B.

3.19.5.2.1 Wetlands

Table 3.19-12 provides a summary of wetlands identified for the Applicant Proposed Route (Links 1-3 in Region 2).

Table 3.19-12:
Wetlands in the 1,000-Foot Corridor—Region 2, Applicant Proposed Route

Wetland Type	No. of Wetlands	Acreage of Wetlands
PEM1/PSS	1	3
PEM	21	12
PFO	5	8
PSS/PEM	2	1
PSS	2	1
PUB	35	21
PUS	27	8
R2UB	1	3
R2US	2	17
Total	96	74

GIS Data Source: USFWS (2014g)

Table 3.19-13 provides a summary of wetlands identified for HVDC Alternative Route 2-A (corresponding to Applicant Proposed Route Link 2 in Region 2) within the 1,000-foot-wide ROI.

Table 3.19-13:
Wetlands in the 1,000-Foot Corridor—Region 2, HVDC Alternative Route 2-A

Wetland Type	No. of Wetlands	Acreage of Wetlands
PEM	13	6
PFO	5	8
PSS	1	11
PUB	17	13
PUS	31	9
R2UB	1	4
R2US	4	15
R4SB	1	<1
Total	73	66

GIS Data Source: USFWS (2014g)

Table 3.19-14 provides a summary of wetlands identified for HVDC Alternative Route 2-B (corresponding to Applicant Proposed Route Link 3 in Region 2) within the 1,000-foot-wide ROI.

Table 3.19-14:
Wetlands in the 1,000-Foot Corridor—Region 2, HVDC Alternative Route 2-B

Wetland Type	No. of Wetlands	Acreage of Wetlands
PEM/PSS	1	3
PEM	19	26
PFO	1	3
PUB	7	4
PUS	20	9
Total	48	45

GIS Data Source: USFWS (2014g)

3.19.5.2.2 Floodplains

Table 3.19-15 provides the number and acreage of 100-year floodplain crossings estimated for the Applicant Proposed Route and HVDC Alternative Routes 2-A and 2-B within the ROI in Region 2.

Table 3.19-15:
100-Year Floodplains in the 1,000-Foot Corridor for the HVDC Transmission Line—Region 2

Alternative Route	No. of Floodplain Crossings	Estimated Acreage of Crossings
APR	6	800
2-A	1	23
2-B	4	457

Note: No FEMA floodplain data were available for Major County, Oklahoma.

3.19.5.2.3 Riparian Areas

Table 3.19-2 includes a total number of potential stream crossings for Region 2. These streams may all have associated riparian area resources.

3.19.5.3 Region 3

Region 3 is referred to as the Oklahoma Cross Timbers Region and includes the Applicant Proposed Route and HVDC Alternative Routes 3-A through 3-E.

3.19.5.3.1 Wetlands

Table 3.19-16 provides a summary of wetlands identified for the Applicant Proposed Route (Links 1–6 in Region 3).

Table 3.19-16:
Wetlands in the 1,000-Foot Corridor—Region 3, Applicant Proposed Route

Wetland Type	No. of Wetlands	Acreage of Wetlands
L1UB	3	8
PAB	2	1
PEM	20	8
PFO/PEM	1	5
PFO	37	143
PFO/PUB	2	1
PSS/PEM	1	5
PSS	4	1
PUB	304	144
PUS	43	11
R2UB	2	20
R2US	1	<1
Total	420	347

GIS Data Source: USFWS (2014g)

Table 3.19-17 provides a summary of wetlands identified for HVDC Alternative Route 3-A (corresponding to Applicant Proposed Route Link 1 in Region 3) within the 1,000-foot-wide ROI.

Table 3.19-17:
Wetlands in the 1,000-Foot Corridor—Region 3, HVDC Alternative Route 3-A

Wetland Type	No. of Wetlands	Acreage of Wetlands
PAB	1	1
PEM	9	4
PFO	7	17
PUB	23	20
PUS	59	19
Total	99	61

GIS Data Source: USFWS (2014g)

Table 3.19-18 provides a summary of wetlands identified for HVDC Alternative Route 3-B (corresponding to Applicant Proposed Route Links 1, 2, and 3 within Region 3) within the 1,000-foot-wide ROI.

Table 3.19-18:
Wetlands in the 1,000-Foot Corridor—Region 3, HVDC Alternative Route 3-B

Wetland Type	No. of Wetlands	Acreage of Wetlands
PAB	1	1
PEM	10	4
PFO	12	25
PUB	46	38
PUS	65	21
R2UB	1	1
Total	135	90

GIS Data Source: USFWS (2014g)

Table 3.19-19 provides a summary of wetlands identified for HVDC Alternative Route 3-C (corresponding to Applicant Proposed Route Links 3, 4, 5 and 6 within Region 3) within the 1,000-foot-wide ROI.

Table 3.19-19:
Wetlands in the 1,000-Foot Corridor—Region 3, HVDC Alternative Route 3-C

Wetland Type	No. of Wetlands	Acreage of Wetlands
L1UB	1	11
PEM	22	38
PFO/PSS	3	32
PFO	42	302
PFO/PUB	1	20
PSS/PEM	2	8
PUB	269	117
PUS	5	1
R2UB	1	11
R2US	2	13
R4US	1	<1
Total	349	553

Table 3.19-20 provides a summary of wetlands identified for HVDC Alternative Route 3-D (corresponding to Applicant Proposed Route Links 5 and 6 in Region 3) within the 1,000-foot-wide ROI.

Table 3.19-20:
Wetlands in the 1,000-Foot Corridor—Region 3, HVDC Alternative Route 3-D

Wetland Type	No. of Wetlands	Acreage of Wetlands
PEM	16	29
PFO/PSS	3	32
PFO	22	111
PSS/PEM	2	8
PUB	114	48
Total	157	228

GIS Data Source: USFWS (2014g)

Table 3.19-21 provides a summary of wetlands identified for HVDC Alternative Route 3-E (corresponding to Applicant Proposed Route Link 6 in Region 3) within the 1,000-foot-wide ROI.

Table 3.19-21:
Wetlands in the 1,000-Foot Corridor—Region 3, HVDC Alternative Route 3-E

Wetland Type	No. of Wetlands	Acreage of Wetlands
PFO/SS	3	33
PFO	6	15
PUB	24	10
Total	33	58

GIS Data Source: USFWS (2014g)

3.19.5.3.2 Floodplains

Table 3.19-22 provides the number and acreage of 100-year floodplain crossings estimated for each of the HVDC alternative routes and for the Applicant Proposed Route within the ROI in Region 3. The Applicant Proposed Route is estimated to cross twenty-four 100-year floodplains totaling an estimated 1,587 acres within the ROI for Region 3.

Table 3.19-22:
100-Year Floodplains in the 1,000-Foot Corridor for the HVDC Transmission Line—Region 3

Alternative Route	No. of Floodplain Crossings	Estimated Acreage of Crossings
APR	24	1587
3-A	11	233
3-B	14	328
3-C	32	1591
3-D	13	466
3-E	6	111

3.19.5.3.3 Riparian Areas

Table 3.19-2 includes a total number of potential stream crossings in Region 3. These streams may all have associated riparian area resources.

3.19.5.4 Region 4

Region 4 is referred to as the Arkansas River Valley Region and includes the Applicant Proposed Route, including the Lee Creek Variation, and HVDC Alternative Routes 4-A through 4-E.

3.19.5.4.1 Wetlands

Table 3.19-23 provides a summary of wetlands identified for the Applicant Proposed Route (Links 1–9 in Region 4).

Table 3.19-23:
Wetlands in the 1,000-Foot Corridor—Region 4, Applicant Proposed Route

Wetland Type	No. of Wetlands	Acreage of Wetlands
L1UB	2	40
L2US	1	<1
PEM	5	15
PFO	22	39
PSS	1	3
PUB	66	21
R2UB	5	11
R2US	3	3
Total	105	132

GIS Data Source: USFWS (2014g)

Table 3.19-24 provides a summary of wetlands identified for HVDC Alternative Route 4-A (corresponding to Applicant Proposed Route Links 3, 4, 5, and 6 in Region 4) within the 1,000-foot-wide ROI.

Table 3.19-24:
Wetlands in the 1,000-Foot Corridor—Region 4, HVDC Alternative Route 4-A

Wetland Type	No. of Wetlands	Acreage of Wetlands
PEM/PSS	1	1
PFO	6	12
PSS/PEM	1	7
PSS	2	3
PUB	64	23
R2UB	3	4
R2US	4	3
Total	81	53

GIS Data Source: USFWS (2014g)

Table 3.19-25 provides a summary of wetlands identified for HVDC Alternative Route 4-B (corresponding to Applicant Proposed Route Links 2, 3, 4, 5, 6, 7, and 8 in Region 4) within the 1,000-foot-wide ROI.

Table 3.19-25:
Wetlands in the 1,000-Foot Corridor—Region 4, HVDC Alternative Route 4-B

Wetland Type	No. of Wetlands	Acreage of Wetlands
PFO/PSS	1	3
PFO	9	16
PSS/PEM	1	7
PSS	3	3
PUB	43	16
R2UB	4	3
R2US	1	1
Total	62	49

GIS Data Source: USFWS (2014g)

No NWI-mapped wetlands were documented in the desktop analysis for HVDC Alternative Route 4-C. NLCD land cover data were also reviewed and were determined to show 0.03 acres of woody wetlands present within the ROI for this alternative.

Table 3.19-26 provides a summary of wetlands identified for HVDC Alternative Route 4-D (corresponding to Applicant Proposed Route Links 4, 5, and 6 in Region 4) within the 1,000-foot-wide ROI.

Table 3.19-26:
Wetlands in the 1,000-Foot Corridor—Region 4, HVDC Alternative Route 4-D

Wetland Type	No. of Wetlands	Acreage of Wetlands
PUB	5	2
Total	5	2

GIS Data Source: USFWS (2014g)

No NWI-mapped wetlands were documented in the desktop analysis for HVDC Alternative Route 4-E. NLCD land cover data were also reviewed and documented a combined 14.3 acres of woody wetlands and emergent herbaceous wetland land cover in the ROI.

3.19.5.4.2 Floodplains

Table 3.19-27 provides the number and acreage of 100-year floodplain crossings estimated for each of the HVDC alternative routes and for the Applicant Proposed Route within the ROI in Region 4. The Applicant Proposed Route is estimated to cross thirty-six 100-year floodplains totaling an estimated 2,690 acres within the ROI for Region 4.

Table 3.19-27:
100-Year Floodplains in the 1,000-Foot Corridor for the HVDC Transmission Line—Region 4

Alternative Route	No. of Floodplain Crossings	Estimated Acreage of Crossings
APR	36	2,690
4-A	18	677
4-B	17	513
4-D	9	251
4-E	12	350

3.19.5.4.3 Riparian Areas

Table 3.19-2 includes a total number of potential stream crossings in Region 4. These streams may all have associated riparian area resources.

3.19.5.5 Region 5

Region 5 is referred to as the Central Arkansas Region and includes the Arkansas Converter Station Alternative Siting Area and AC Interconnection Siting Area, the Applicant Proposed Route, and the HVDC Alternative Routes 5-A through 5-F.

3.19.5.5.1 Wetlands

Table 3.19-28 provides a summary of wetlands identified for the Applicant Proposed Route (Links 1–9 in Region 5).

Table 3.19-28:
Wetlands in the 1,000-Foot Corridor—Region 5, Applicant Proposed Route

Wetland Type	No. of Wetlands	Acreage of Wetlands
L2UB	1	8
PAB	1	2
PEM	7	8
PFO	7	39
PSS	3	3
PUB	21	14
R2UB	2	19
Total	42	93

GIS Data Source: USFWS (2014g)

Table 3.19-29 provides the potential wetland resources within the ROI of the Arkansas Converter Station Alternative Siting Area and the AC Interconnection Siting Area.

Table 3.19-29:
Wetlands in the Siting Area for the Arkansas Converter Station Alternative Siting Area and AC Interconnection Siting Area—Region 5

Wetland Type	No. of Wetlands	Acreage of Wetlands
L	2	76
PUB	170	96
R4SB	53	125
R5UB	8	66
Total	233	363

GIS Data Source: USFWS (2014g)

The Region 5 Applicant Proposed Route and HVDC Alternative Route 5-D have been evaluated using NWI wetland data. No NWI-mapped wetlands were documented in the desktop analysis for HVDC Alternative Routes 5-A, 5-B, 5-C, 5-E and 5-F, so NLCD land cover data were reviewed to estimate acreage within the respective ROIs to make an evaluation of wetland resources for the HVDC alternative routes.

Table 3.19-30 provides a summary of wetlands identified for HVDC Alternative Routes 5-A, 5-B, 5-C, 5-E, and 5-F within the 1,000-foot-wide ROI.

Table 3.19-30:
Wetland Land Cover in the 1,000-Foot Corridor—Region 5, HVDC Alternative Routes* 5-A, 5-B, 5-C, 5-E and 5-F

Alternative Route	Wetland Land Cover Type	Acreage of Wetlands
5-A	Woody wetlands	2.3
5-B	Woody wetlands	29.9
5-C	Woody wetlands	2.6
5-E	Woody wetlands	13.0
5-F	Woody wetlands	8.9

*NLCD data used due to lack of NWI data

Table 3.19-31 provides a summary of wetlands identified for HVDC Alternative Route 5-D (corresponding to Applicant Proposed Route Link 9 in Region 5) within the 1,000-foot-wide ROI.

Table 3.19-31:
NWI Wetlands in the 1,000-Foot Corridor—Region 5, HVDC Alternative Route 5-D

Wetland Type	No. of Wetlands	Acreage of Wetlands
PEM	3	6
PFO	3	20
PUB	26	18
R2UB	2	26
Total	34	70*

*Note: For comparative purposes, the NLCD land cover data records 72.4 acres of woody wetlands in Alt. Rt. 5-D.

3.19.5.5.2 Floodplains

Table 3.19-32 provides the number and acreage of 100-year floodplain crossings estimated for each of the HVDC alternative routes and for the Applicant Proposed Route within the ROI in Region 5. The Applicant Proposed Route is estimated to cross twenty-six 100-year floodplains totaling an estimated 1,564 acres.

Table 3.19-32:
100-Year Floodplains in the 1,000-Foot Corridor for the HVDC Transmission Line—Region 5

Alternative Route	No. of Floodplain Crossings	Estimated Acreage of Crossings
APR	26	1,564
5-A	3	81
5-B	10	793
5-C	2	109
5-D	14	677
5-E	6	486
5-F	3	378
Total	64	4,088

3.19.5.5.3 Riparian Areas

Table 3.19-2 includes a total number of potential stream crossings in Region 5. These streams may all have associated riparian area resources.

3.19.5.6 Region 6

Region 6 is referred to as the Cache River and Crowley's Ridge Region and includes the Applicant Proposed Route and HVDC Alternative Routes 6-A through 6-D. Straight Slough, a designated Ecologically Sensitive Waterbody (ESW), occurs at the lower limit of the St. Francis River in Region 6 in Arkansas. ESWs are designated based on their provision of habitat within the existing range of threatened, endangered, or endemic species of aquatic or semi-aquatic life forms. Straight Slough is discussed in more detail in Sections 3.14.2 and 3.20.2.5.6.

3.19.5.6.1 Wetlands

The Region 6 Applicant Proposed Route and HVDC Alternative Routes 6-A and 6-B have been evaluated using NWI wetland data. No NWI-mapped wetlands were documented in the desktop analysis for HVDC Alternative Routes 6-C and 6-D, so NLCD land cover data were reviewed to estimate acreage within the respective ROIs to make an evaluation of wetland resources for the HVDC alternative routes.

Table 3.19-33 provides a summary of wetlands identified for the Applicant Proposed Route (Links 1-7 in Region 6).

Table 3.19-33:
Wetlands in the 1,000-Foot Corridor—Region 6, Applicant Proposed Route

Wetland Type	No. of Wetlands	Acreage of Wetlands
PEM	4	11
PFO	7	17
PSS	2	1
PUB	5	19
R2UB	2	12
Total	20	60

GIS Data Source: USFWS (2014g)

Table 3.19-34 provides a summary of wetlands identified for HVDC Alternative Route 6-A (corresponding to Applicant Proposed Route Links 2, 3, and 4 in Region 6) within the 1,000-foot-wide ROI.

Table 3.19-34:
Wetlands in the 1,000-Foot Corridor—Region 6, HVDC Alternative Route 6-A

Wetland Type	No. of Wetlands	Acreage of Wetlands
PEM	2	9
PFO	19	130
PSS	2	5
PUB	2	8
R2U	2	5
Total	27	157

GIS Data Source: USFWS (2014g)

Table 3.19-35 provides a summary of wetlands identified for HVDC Alternative Route 6-B (corresponding to Applicant Proposed Route Link 3 in Region 6) within the 1,000-foot-wide ROI.

Table 3.19-35:
Wetlands in the 1,000-Foot Corridor—Region 6, HVDC Alternative Route 6-B

Wetland Type	No. of Wetlands	Acreage of Wetlands
L2US	1	1
PFO	7	91
PSS	4	6
PUB	6	12
Total	18	110

GIS Data Source: USFWS (2014g)

Table 3.19-36 provides a summary of wetlands identified for HVDC Alternative Route 6-C and 6-D (corresponding to Region 6 Applicant Proposed Route Links 6, and 6 and 7, respectively) within the 1,000-foot-wide ROI.

Table 3.19-36:
Wetland Land Cover in the 1,000-Foot Corridor—Region 6, HVDC Alternative Route 6-C* and 6-D*

Alternative Route	Wetland Land Cover Types	Acreage of Wetlands
6-C	Woody wetlands	114.9
6-D	Woody wetlands and Emergent herbaceous wetlands	87.1

*NLCD data used due to lack of NWI data

3.19.5.6.2 Floodplains

Table 3.19-37 provides the number and acreage of 100-year floodplain crossings estimated for each of the HVDC alternative routes and for the Applicant Proposed Route within the ROI in Region 6. The Applicant Proposed Route is anticipated to cross 24 of these 100-year floodplains.

Table 3.19-37:
100-Year Floodplains in the 1,000-Foot Corridor for the HVDC Transmission Line—Region 6

Alternative Route	No. of Floodplain Crossings	Estimated Acreage of Crossings
APR	24	3319
6-A	7	1132
6-B	4	762
6-C	7	507
6-D	6	560

3.19.5.6.3 Riparian Areas

Table 3.19-2 includes a total number of potential stream crossings for Region 6. These streams may all have associated riparian area resources.

3.19.5.7 Region 7

Region 7 is referred to as the Arkansas Mississippi River Delta and Tennessee Region and includes the Tennessee Converter Station Siting Area and AC Interconnection, the Applicant Proposed Route, and the HVDC Alternative Routes 7-A through 7-D.

3.19.5.7.1 Wetlands

Table 3.19-38 provides a summary of wetlands identified for the Applicant Proposed Route (Links 1–5 in Region 7).

Table 3.19-38:
Wetlands in the 1,000-Foot Corridor—Region 7, Applicant Proposed Route

Wetland Type	No. of Wetlands	Acreage of Wetlands
PEM	7	9
PFO	24	138
PSS	2	11
PUB	11	15
R2UB	2	87
R2US	2	<1
Total	48	260

GIS Data Source: USFWS (2014g)

Table 3.19-39 provides a summary of wetlands identified for HVDC Alternative Route 7-A (corresponding to Applicant Proposed Route Link 1 in Region 7) within the 1,000-foot-wide ROI.

Table 3.19-39:
Wetlands in the 1,000-Foot Corridor—Region 7, HVDC Alternative Route 7-A

Wetland Type	No. of Wetlands	Acreage of Wetlands
PEM	3	10
PFO	8	81
R2UB	2	74
Total	13	165

GIS Data Source: USFWS (2014g)

Table 3.19-40 provides a summary of wetlands identified for HVDC Alternative Route 7-B (corresponding to Applicant Proposed Route Links 3 and 4 in Region 7) within the 1,000-foot-wide ROI.

Table 3.19-40:
Wetlands in the 1,000-Foot Corridor—Region 7, HVDC Alternative Route 7-B

Wetland Type	No. of Wetlands	Acreage of Wetlands
PEM	1	1
PFO	5	23
PSS	1	3
PUB	4	2
Total	11	29

GIS Data Source: USFWS (2014g)

Table 3.19-41 provides a summary of wetlands identified for HVDC Alternative Route 7-C (corresponding to Applicant Proposed Route Links 3, 4 and 5 in Region 7) within the 1,000-foot-wide ROI.

Table 3.19-41:
Wetlands in the 1,000-Foot Corridor—Region 7, HVDC Alternative Route 7-C

Wetland Type	No. of Wetlands	Acreage of Wetlands
PEM	5	5
PFO	22	96
PSS	5	3
PUB	12	9
Total	44	113

GIS Data Source: USFWS (2014g)

Table 3.19-42 provides a summary of wetlands identified for HVDC Alternative Route 7-D (corresponding to Applicant Proposed Route Links 4 and 5 in Region 7) within the 1,000-foot-wide ROI.

Table 3.19-42:
Wetlands in the 1,000-Foot Corridor—Region 7, HVDC Alternative Route 7-D

Wetland Type	No. of Wetlands	Acreage of Wetlands
PFO	6	18
PSS	2	0
PUB	4	3
Total	12	21

GIS Data Source: USFWS (2014g)

Table 3.19-43 provides a list of NWI wetland resources identified in the ROI for the Tennessee Converter Station Siting Area.

Table 3.19-43:
Wetlands in the 1,000-Foot Corridor—Region 7, Tennessee Converter Station Siting Area and AC Interconnection System

Wetland Type	No. of Wetlands	Acreage of Wetlands
PFO	3	4
PSS	2	2
Total	5	6

GIS Data Source: USFWS (2014g)

3.19.5.7.2 Floodplains

Table 3.19-44 provides the number and acreage of 100-year floodplain crossings estimated for each of the HVDC alternative routes and for the Applicant Proposed Route within the ROI in Region 7. The Applicant Proposed Route is estimated to cross forty-one 100-year floodplains totaling an estimated 1,712 acres. The ROI for the Tennessee Converter Station Siting Area is estimated to cross 16 separate 100-year floodplains.

Table 3.19-44:
100-Year Floodplains in the 1,000-Foot Corridor for the HVDC Transmission Line—Region 7

Alternative Route	No. of Floodplain Crossings	Estimated Acreage of Crossings
APR	41	1,712
7-A	10	1382
7-B	8	286
7-C	33	725
7-D	19	223
Tennessee Converter Station Siting Area	16	137

3.19.5.7.3 Riparian Areas

Table 3.19-2 includes a total number of potential stream crossings in Region 7. These streams may all have associated riparian area resources.

3.19.5.8 Connected Actions

3.19.5.8.1 Wind Energy Generation

The NWI database has provided data to document palustrine (depressional), lacustrine (lakes), and riverine wetlands within the various WDZs. These wetland types include emergent, scrub-shrub, forested, farmed, unconsolidated bottom, unconsolidated shore, intermittent stream, and lower perennial stream types. The overall wetland acreages within each zone are discussed in the following subsections.

FEMA's 100-year national flood hazard layer (GIS Data Source: FEMA 2014) was used to identify potential floodplain impact areas within each wind development zone.

Riparian areas may potentially occur in areas with perennial or intermittent streams, as well as ponds, lakes, or reservoirs.

3.19.5.8.1.1 WDZ-A

The NWI database documents approximately 2,896 acres of wetlands within this development zone. This total of 2,896 acres of wetlands includes about 1,119 acres of lake shoreline wetlands and another 1,298 acres of farmed wetlands. As shown in Table 3.15-32, WDZ-A encompasses approximately 4.9 miles of perennial streams, 103.4 miles of intermittent streams, and 1,368 acres of reservoirs, lakes, and ponds, of which 97 percent are identified as only intermittent waterbodies. The acreage of reservoirs, lakes, and ponds, although mostly intermittent, is the second highest of any of the WDZs. There are no 100-year or 500-year floodplains mapped in this WDZ.

3.19.5.8.1.2 WDZ-B

The NWI database documents approximately 1,520 acres of wetlands within this development zone. This total includes 770 acres of lake shoreline wetlands and 202 acres of farmed wetlands. WDZ-B is located in the Palo Duro watershed (Table 3.15-31), but Palo Duro Creek, the watershed's primary drainage feature, runs adjacent to the zone's southeast extent, not through it. As shown in Table 3.15-32, WDZ-B encompasses about 8.0 miles of perennial streams, 124.1 miles of intermittent streams, and 976 acres of reservoirs, lakes, and ponds, of which 83 percent are identified as only intermittent waterbodies. There are no 100-year or 500-year floodplains mapped in this WDZ.

3.19.5.8.1.3 WDZ-C

The NWI database documents approximately 812 acres of wetlands within this development zone. Farmed wetlands account for approximately 131 acres of the total 812 acres of wetlands. There are approximately 226 acres of palustrine emergent wetlands in this zone. WDZ-C is located in the Coldwater watershed (Table 3.15-31), and both Frisco Creek and Coldwater Creek, the watershed's primary drainage features, run through portions of the zone. The north-central portion of WDZ-C includes a small segment of Frisco Creek and Coldwater Creek extends the entire length of the zone, running just inside or outside the southern and southeastern periphery. As shown in Table 3.15-32, WDZ-C encompasses about 6.4 miles of perennial streams, 204.4 miles of intermittent streams, and 323 acres of reservoirs, lakes, and ponds, of which 61 percent are identified as only intermittent waterbodies. There are no 100-year or 500-year floodplains mapped in this WDZ.

3.19.5.8.1.4 WDZ-D

The NWI database documents approximately 382 acres of wetlands within this development zone. There are approximately 121 acres of lake shoreline wetlands within the total of 382 total wetland acres. FEMA has mapped two 100-year floodplains totaling approximately 1,991 acres within this development zone. WDZ-D straddles the Middle Beaver, Coldwater, and Palo Duro watersheds (Table 3.15-31), but the watersheds' primary drainage features (i.e., Beaver River and Coldwater, Frisco, and Palo Duro creeks) do not run through the zone. As shown in Table 3.15-32, WDZ-D encompasses about 12.7 miles of perennial streams, 134.9 miles of intermittent streams, and 166 acres of reservoirs, lakes, and ponds, of which 66 percent are identified as only intermittent waterbodies. There are an estimated 1,991 acres of 100-year floodplains and no acreage of 500-year floodplains mapped in WDZ-D.

3.19.5.8.1.5 WDZ-E

The NWI database documents approximately 430 acres of wetlands within this development zone. There are approximately 121 acres of farmed wetlands and 185 acres if palustrine unconsolidated bottom wetlands in the total of 430 acres. WDZ-E is located primarily within the Middle Beaver watershed (Table 3.15-31), but the Beaver River, the watershed's primary drainage feature, is north of the zone and does not run through it. WDZ-E also extends into the Coldwater watershed, but this watershed's primary drainage features also do not run through the zone. As shown in Table 3.15-32, WDZ-E encompasses about 2.6 miles of perennial streams, 43.6 miles of intermittent streams, and 33 acres of reservoirs, lakes, and ponds, of which 24 percent are identified as only intermittent waterbodies. The miles of perennial and intermittent streams are the second lowest of any of the WDZs and the total acreage of reservoirs, lakes, and ponds is the lowest. There are no 100-year or 500-year floodplains mapped in this WDZ.

3.19.5.8.1.6 WDZ-F

The NWI database documents approximately 507 acres of wetlands within this development zone. These resources are somewhat evenly spread between lake shoreline, palustrine emergent, palustrine forested, and palustrine scrub-shrub wetland types. FEMA has mapped three 100-year floodplains totaling approximately 2,800 acres within this development zone. WDZ-F straddles the Middle Beaver and Coldwater watersheds (Table 3.15-31). The northern and western peripheries of WDZ-F extend over short segments of the Beaver River, a primary drainage feature, but the zone does not extend over either of the Coldwater watershed's primary drainage features. As shown in Table 3.15-32, WDZ-F encompasses about 13.0 miles of perennial streams, 207.1 miles of intermittent streams, and 52 acres of reservoirs, lakes, and ponds, of which 54 percent are identified as only intermittent waterbodies. The total acreage of reservoirs, lakes, and ponds is the second lowest of any of the WDZs. There are an estimated 2,800 acres of 100-year floodplains and no acreage of 500-year floodplains in WDZ-F.

3.19.5.8.1.7 WDZ-G

The NWI database documents approximately 776 acres of wetlands within this development zone. There are approximately 287 acres of farmed wetlands and 261 acres of palustrine emergent wetlands in the total of 776 total acres. WDZ-G is located primarily within the Upper Beaver watershed (Table 3.15-31), but the Beaver River, the watershed's primary drainage feature, does not run through the zone. As shown in Table 3.15-32, WDZ-G encompasses about 6.8 miles of perennial streams, 191.7 miles of intermittent streams, and 281 acres of reservoirs, lakes, and ponds, of which 96 percent are identified as only intermittent waterbodies. The 12 acres of perennial reservoirs, lakes, and ponds is the second lowest of any of the WDZs. There are no 100-year or 500-year floodplains mapped in this WDZ.

3.19.5.8.1.8 WDZ-H

The NWI database documents approximately 819 acres of wetlands within this development zone. This total primarily consists of intermittent riverine wetlands (416 acres), palustrine emergent wetlands (121 acres), and lakeshore emergent wetlands (224 acres). WDZ-H is located within the Upper Beaver watershed (Table 3.15-31) and the Beaver River, the watershed's primary drainage feature, runs adjacent to the zone's southeastern periphery, but does not run through it. As shown in Table 3.15-32, WDZ-H encompasses about 19.9 miles of perennial streams, 205.4 miles of intermittent streams, and 211 acres of reservoirs, lakes, and ponds, of which 96 percent are identified as only intermittent waterbodies. The 8 acres of perennial reservoirs, lakes, and ponds is the lowest acreage of this type of perennial waters from any of the WDZs. There are no 100-year or 500-year floodplains mapped in this WDZ.

3.19.5.8.1.9 WDZ-I

The NWI database documents approximately 1,620 acres of wetlands within this development zone. This total is composed primarily of farmed wetlands (318 acres), palustrine emergent wetlands (688 acres), and lakeshore emergent wetlands (400 acres). WDZ-I is located within the Middle Beaver watershed (Table 3.15-31), but the Beaver River, the watershed's primary drainage feature, does not run through the zone. As shown in Table 3.15-32, WDZ-I encompasses about 1.7 miles of perennial streams, 17.5 miles of intermittent streams, and 705 acres of reservoirs, lakes, and ponds, of which 98 percent are identified as only intermittent waterbodies. The miles of perennial and intermittent streams are the lowest of any of the WDZs. There are no 100-year or 500-year floodplains mapped in this WDZ.

3.19.5.8.1.10 WDZ-J

The NWI database documents approximately 759 acres of wetlands within this development zone. There are approximately 454 acres of palustrine emergent wetlands and 169 acres of palustrine scrub-shrub wetlands within the total of 759 acres. WDZ-J is located primarily within the Middle Beaver watershed, with a portion in the Palo Duro watershed, and an edge crossing into the Lower Beaver watershed (Table 3.15-31). The northernmost point of the zone extends over the Beaver River and the southwest extent of the zone reaches Palo Duro Creek, but these are the only points where the two primary drainage features of the watersheds are at or in the zone. As shown in Table 3.15-32, WDZ-J encompasses about 26.2 miles of perennial streams, 285.0 miles of intermittent streams, and 164 acres of reservoirs, lakes, and ponds, of which 25 percent are identified as only intermittent waterbodies. The miles of perennial streams are the second highest of any of the WDZs and the miles of intermittent streams are the highest. There are no 100-year or 500-year floodplains mapped in this WDZ.

3.19.5.8.1.11 WDZ-K

The NWI database documents approximately 736 acres of wetlands within this development zone. The wetlands within this development zone include 326 acres of farmed wetlands and 251 acres of lake shoreline wetlands. WDZ-K is located primarily within the Lower Beaver watershed, with a small amount of the southwestern periphery extending into the Middle Beaver watershed (Table 3.15-31). The Beaver River, the primary drainage feature for both watersheds, does not run through the zone. As shown in Table 3.15-32, WDZ-K encompasses about 6.3 miles of perennial streams, 220.2 miles of intermittent streams, and 487 acres of reservoirs, lakes, and ponds, of which 88 percent are identified as only intermittent waterbodies. The miles of intermittent streams are the second highest of any of the WDZs. There are no 100-year or 500-year floodplains mapped in this WDZ.

3.19.5.8.1.12 WDZ-L

The NWI database documents approximately 5,214 acres of wetlands within this development zone. This total of approximately 5,200 acres of wetlands includes about 3,135 acres of lake shoreline wetlands, and another 711 acres of farmed wetlands. WDZ-L is located primarily within the Upper Wolf watershed, with a small amount of the western periphery extending into the Palo Duro watershed (Table 3.15-31). Wolf Creek, the primary drainage feature of the Upper Wolf watershed, runs through the northeastern portion of the zone; Palo Duro Creek, the primary drainage feature of the other watershed does not run through the zone. As shown in Table 3.15-32, WDZ-L encompasses about 31.6 miles of perennial streams, 190.6 miles of intermittent streams, and 3,868 acres of reservoirs, lakes, and ponds, of which 83 percent are identified as only intermittent waterbodies. The miles of perennial streams are the highest of any of the WDZs. The acreage of both perennial and intermittent reservoirs, lakes, and ponds are also the highest of any of the WDZs; however, WDZ-L has the largest land area of any of the zones. There are no 100-year or 500-year floodplains mapped in this WDZ.

3.19.5.8.2 Optima Substation

The land cover in the future Optima Substation location is primarily grassland herbaceous, with some shrub/scrub and developed, open space. There are no structures or existing infrastructure on the 160-acre site, although there are roads and an operating wind farm nearby. Irrigated cropland is also in the vicinity. No wetlands, floodplains, or riparian areas are documented for this site.

3.19.5.8.3 TVA Upgrades

A precise ROI has not been identified for the TVA upgrades. Where possible, general impacts associated with the required TVA upgrades are discussed in the impact sections that follow.

3.19.6 Impacts to Wetlands, Floodplains, and Riparian Areas

3.19.6.1 Methodology

3.19.6.1.1 Environmental Protection Measures

The Applicant has developed a comprehensive list of EPMs that would avoid and minimize impacts to wetlands, floodplains, and riparian areas. Implementation of these EPMs is assumed throughout the impact analysis that follows for Project. A complete list of EPMs for the Project is provided in Appendix F; those EPMs that would specifically allow for the avoidance and/or minimization of potential adverse impacts in wetlands, floodplains, and riparian areas are listed below:

General EPMs:

- GE-1: Clean Line will train personnel on health, safety, and environmental matters. Training will include practices, techniques, and protocols required by federal and state regulations and applicable permits.
- GE-3: Clean Line will minimize clearing vegetation within the ROW, consistent with a Transmission Vegetation Management Plan filed with NERC, and applicable federal, state, and local regulations.
- GE-5: Any herbicides used during construction and operations and maintenance will be applied according to label instructions and any federal, state, and local regulations.
- GE-6: Clean Line will restrict vehicular travel to the ROW and other established areas within the construction, access, or maintenance easement(s).
- GE-7: Roads not otherwise needed for maintenance and operations will be restored to preconstruction conditions. Restoration practices may include decompacting, recontouring, and re-seeding. Roads needed for maintenance and operations will be retained.
- GE-9: Clean Line will avoid and/or minimize damage to drainage features and other improvements such as ditches, culverts, levees, tiles, and terraces; however, if these features or improvements are inadvertently damaged, they will be repaired and or restored.
- GE-13: Emergency and spill response equipment will be kept on hand during construction.
- GE-14: Clean Line will restrict the refueling and maintenance of vehicles and the storage of fuels and hazardous chemicals within at least 100 feet from wetlands, surface waterbodies, and groundwater wells, or as otherwise required by federal, state, or local regulations.
- GE-15: Waste generated during construction or maintenance, including solid waste, petroleum waste, and any potentially hazardous materials will be removed and taken to an authorized disposal facility.
- GE-21: Clean Line will maintain construction equipment in good working order. Equipment and vehicles that show excessive emissions of exhaust gasses and particulates due to poor engine adjustments or other inefficient operating conditions will be repaired or adjusted.
- GE-27: Clean Line will minimize compaction of soils and rutting through appropriate use of construction equipment (e.g., low ground pressure equipment and temporary equipment mats).

Soils and Agriculture EPMs:

- AG-1: Clean Line will avoid or minimize adverse effects to surface and subsurface irrigation and drainage systems (e.g., tiles). Clean Line will work with landowners to minimize the placement of structures in locations that would interfere with the operation of irrigation systems.
- GEO-1: Clean Line will stabilize slopes exposed by its activities to minimize erosion.

Vegetation EPMs:

- FVW-1: Clean Line will identify environmentally sensitive vegetation (e.g., wetlands, protected plant species, riparian areas, large contiguous tracts of native prairie) and avoid and/or minimize impacts to these areas.
- FVW-2: Clean Line will identify and implement measures to control and minimize the spread of non-native invasive species and noxious weeds.
- FVW-3: Clean Line will clearly demarcate boundaries of environmentally sensitive areas during construction to increase visibility to construction crews.

Water EPMs:

- W-1: Clean Line will avoid and/or minimize construction of access roads in special interest waters.
- W-2: Clean Line will identify, avoid, and/or minimize adverse effects to wetlands and waterbodies. Clean Line will not place structure foundations within the Ordinary High Water Mark of Waters of the United States.
- W-3: Clean Line will establish streamside management zones within 50 feet of both sides of intermittent and perennial streams and along margins of bodies of open water where removal of low-lying vegetation is minimized.
- W-4: If used, Clean Line will selectively apply herbicides within streamside management zones.
- W-5: Clean Line will construct access roads to minimize disruption of natural drainage patterns including perennial, intermittent, and ephemeral streams.
- W-6: Clean Line will not construct counterpoise or fiber optic cable trenches across waterbodies.
- W-7: Clean Line will locate spoil piles from foundation excavations and fiber optic cable trenches outside of streamside management zones.
- W-8: Dewatering will be conducted in a manner designed to prevent soil erosion (e.g., through discharge of water to vegetated areas and/or the use of flow control devices).
- W-9: Clean Line will design converter station sites to avoid adverse changes to the base flood elevation within the 100-year floodplain.
- W-10: Clean Line will minimize fill for access roads and structure foundations within 100-year floodplains to avoid adverse changes to the base flood elevation.
- W-11: Clean Line will locate and minimize impacts to groundwater wells and springs within the construction ROW.
- W-14: Clean Line will ensure that there is no off-site discharge of wastewater from batch plant sites.

In addition, Clean Line will prepare the following plans to provide guidance for work activities during the construction and operations and maintenance phases of the proposed Project:

- Transportation and Traffic Management Plan: This plan will describe measures designed to avoid and/or minimize adverse effects associated with the existing transportation system.
- Restoration Plan: This plan will describe post-construction activities to reclaim disturbed areas.
- Spill Prevention, Control and Countermeasures (SPCC) Plan: This plan will describe the measures designed to prevent, control, and clean up spills of hazardous materials.
- Storm Water Pollution Prevention Plan (SWPPP): This plan, consistent with federal and state regulations, will describe the practices, measures, and monitoring programs to control sedimentation, erosion, and runoff from disturbed areas.
- Transmission Vegetation Management Plan (TVMP): This plan, to be filed with the NERC, will describe how Clean Line will conduct work on its right-of-way to prevent outages due to vegetation.

Finally, DOE will prepare a Statement of Findings as required by 10 CFR 1022.14 and Executive Orders 11988 and 11990. The Project, through appropriate use of EPMs and BMPs would avoid and/or minimize impacts to wetlands, floodplains, and riparian areas.

3.19.6.1.2 Construction Impacts Common to All Alternatives

3.19.6.1.2.1 Wetlands

The potential impacts to wetland resources were calculated using the NWI database (GIS Data Source: USFWS 2014g). The 200-foot representative ROWs for Project elements (e.g., AC collection system, the Applicant Proposed Route, and the HVDC alternative routes) were evaluated according to their respective widths and lengths as they intersected specific NWI-mapped wetland features. These intersections of ROW with wetland resources yielded an acreage estimate for potential impacts. It should be noted that these impact estimates do not account for implementation of the EPM's listed in Section 3.19.6.1.1. In many cases, the use of EPMs would greatly diminish or, in some cases, eliminate the potential for impact altogether. In the case of the converter stations and AC interconnection siting areas, GIS was used to determine the acreage of intersection between siting area footprints and NWI-mapped wetland resources to yield acreage of potential impact to wetland resources. All estimated impact numbers have been rounded to the nearest acre. Impact estimates for acreage and mileage have been rounded to the tenths place (e.g., 0.1 mile, 2.5 acres, etc.).

The potential short-term impacts to wetlands from construction activities could include:

- Mechanical damage/crushing of wetland vegetation from use of heavy machinery
- Compaction of wetland soils, which could reduce the soil's water-holding capacity
- Sedimentation and turbidity from construction activities adjacent to wetlands
- Alteration of hydrology from access road construction, excavations for structure foundations, dewatering activities, or blasting
- Contamination from herbicide runoff and from accidental spills of hazardous substances, such as fuels, lubricants, and that may be accidentally released into wetlands or which could reach wetlands through overland runoff paths

The potential long-term impacts to wetlands from Project construction may include:

- Placement of fill into wetlands at foundation footprint locations or for permanent access roads
- Long-term conversion of forested wetlands to shrubby or herbaceous cover type within the ROW
- Changes to wetland hydrology from any permanent access roads constructed through wetlands
- Introduction of invasive species from construction equipment (Clean Line 2013)

The potential impacts to wetlands from specific construction activities and proposed avoidance and minimization measures are discussed in the following sections.

Clearing and Grading

Construction of the Project would require the removal of some wetland vegetation for the purposes of equipment access, safe construction processes, and for long-term electrical safety clearances. The removal of wetland vegetation may reduce water retention capacity of affected wetland ecosystems. Vegetation removal may also impair individual wetlands' ability to filter sediments. Soil and water temperatures in wetland ecosystems could increase where shading is diminished by vegetation removal. Wetland habitat suitability would be altered where forested wetland vegetation or scrub-shrub wetland vegetation types are removed during construction and are replaced with palustrine emergent wetland vegetation (wetlands typically dominated by grasses, sedges, and rushes).

The grading of soils in wetlands has the potential to change existing topographic contours. This alteration may change flow regimes through these ecosystems, resulting in increased erosion, additional loss of vegetation, and potential for sedimentation downstream/downgradient of the affected wetlands.

To address the short-term and potentially long-term direct and indirect impacts of the clearing of wetland vegetation, clearing of vegetation would be minimized during construction within the representative 200-foot-wide ROW, consistent with a TVMP (EPM GE-3). Vegetation removed during clearing would be disposed of according to federal, state, and local regulations (EPM GE-4).

Herbicide Use

Herbicides would be used selectively to minimize regrowth of certain trees and woody species in the ROW as needed during construction activities. Herbicides may have adverse impacts on wetland vegetation, potentially causing both short-term and long-term loss of living tissue as well as changes in growth and reproduction. Use of herbicides also carries the threat of harm to non-target organisms if the active ingredient is mobilized in semi-aquatic or aquatic ecosystem such as wetlands. All herbicides used during construction would be applied according to labeled instructions and any federal, state, and local regulations (EPM GE-5).

Structure Placement within Wetlands

Structural foundations placed in wetlands would constitute fill under the CWA, and as such, would require permitting through the appropriate regulatory office of the USACE. This type of impact would constitute a long-term loss of wetland acreage because the structures would remain for the life of the Project. The Applicant would avoid or minimize foundations and foundation spoil piles in wetlands (EPM W-2 and EPM W-7). If final siting of structures is determined to be planned for areas identified as potential wetlands or other waters of the United States, then these resources should be formally delineated prior to construction to establish true wetland/upland boundaries and to determine acreage of potential impact.

Construction Equipment Usage in Wetland Areas

The Applicant would use low ground-pressure equipment and temporary equipment mats and mat boards when activity is required within the boundaries of wetland ecosystems (EPM GE-27). If construction equipment is driven through wetlands, it can result in mechanical damage to or loss of vegetation and it may lead to compacted wetland soils. Soil compaction reduces the ability of a wetland to retain water. When temporary crossings (e.g., matting) of wetlands is necessary and unavoidable, these crossing materials would be removed following construction activities. The Applicant would restrict vehicular travel to the ROW and other established areas within the construction, access, or maintenance easements (EPM GE-6). Roads traversing wetland areas not otherwise needed for maintenance and operations would be restored to preconstruction contours and reseeded (EPM GE-7). The Applicant would prepare and implement a Restoration Plan that would describe post-construction activities to reclaim disturbed areas, including wetlands.

Excavation and Dewatering

Construction of AC and HVDC transmission structure foundations, trenches for buried counterpoise wire and fiber optic cables, and any excavation needed at converter station locations (i.e., for structural foundation installation and for installation of electrical raceways and grounds) may temporarily accumulate water either from groundwater intrusion or from precipitation. The excavations and trenches may need to be dewatered periodically to allow for proper and safe construction. In areas where the Applicant encounters groundwater during excavation, impacts to the water table may occur if excavations require dewatering, which could affect hydrology of adjacent wetlands. These indirect impacts would be temporary and localized. The Applicant would minimize the amount of time that any excavations remain open (EPM GE-30) to minimize the amount of dewatering required. Dewatering would be conducted in a manner designed to prevent soil erosion (e.g., through discharge of water to vegetated areas and/or the use of flow control devices) (EPM W-8). The implementation of the SWPPP would control erosion, sedimentation, and runoff in areas affected by dewatering. The Applicant would not construct counterpoise or fiber optic cable trenches across waterbodies (EPM W-6). It is anticipated that excavation and dewatering impacts would be minor in intensity and short-term in duration.

Blasting

The use of blasting techniques may be required in some locations, such as transmission line structure foundations. The Applicant would not place structure foundations within the Ordinary High Water Mark of waters of the United States (EPM W-2). Blasting in or adjacent to Waters of the United States, including wetlands, is not anticipated. The Applicant would avoid such blasting; however, if blasting is required within 150 feet of a spring or groundwater well, the Applicant would conduct preconstruction monitoring of yield and water quality in cooperation with the landowner (EPM W-12). The Applicant would develop and implement a Blasting Plan in the unlikely event blasting is required. This plan would describe measures designed to minimize adverse effects due to blasting. No impact to wetlands from blasting is anticipated.

Hazardous Materials Handling

Accidental spills of fluids used during construction, such as fuel, insulating oil, lubricants, antifreeze, detergents, paints, solvents, and herbicides, could contaminate wetland vegetation, waters, and soils. To minimize the potential for these short-term and long-term direct and indirect impacts, the Applicant would restrict the refueling and maintenance of vehicles and the storage of fuels and hazardous chemicals to areas outside of a 100-foot buffer from wetlands, or as otherwise required by federal, state, or local regulations (EPM GE-14). The Applicant would maintain construction equipment in good working order (EPM GE-21). Emergency and spill response equipment would be kept on hand during construction (EPM GE-13). It is anticipated that these impacts would be generally minor and temporary, or short term.

Wastewater Discharge from Concrete Batch Plants

Temporary concrete batch plants may be required at multi-use construction yards. If left uncontrolled, process wastewater and contaminated stormwater runoff from the temporary concrete batch plants could potentially wash into wetlands, resulting in short-term direct and indirect impacts. To minimize the potential for these impacts, the Applicant would ensure that there is no off-site discharge of wastewater from temporary batch plant sites (EPM W-14). Waste generated during construction, including solid waste, petroleum waste, and any potentially hazardous materials, would be removed and taken to an authorized disposal facility (EPM GE-15).

3.19.6.1.2.2 Floodplains

The potential impacts to floodplain resources were calculated using FEMA floodplain data for 100-year floodplains (GIS Data Source: FEMA 2014). No 500-year floodplain data were available in this most recent FEMA national flood hazard layer for any portion of the planned Project ROWs. FEMA has not delineated 500-yeard floodplains in the most current data set and these areas are thus considered non-special flood hazard areas. The planned ROWs for Project elements (e.g., AC collection system, the Applicant Proposed Route, and the HVDC alternative routes) were evaluated according to their respective widths and lengths as they intersected specific FEMA-mapped floodplain features. These intersections of ROW with floodplain resources yielded an acreage estimate for potential impacts. In the case of the converter station and AC interconnection siting areas, GIS was used to determine the acreage of intersection between siting area footprints and FEMA-mapped floodplain resources to yield acreage of potential impact to floodplain resources. All impact values have been rounded to the nearest acre. For those floodplain impact estimates where the value derived from GIS data was less than 0.5 acre, values in the impact tables have been reported as <1 acre. Values between 0.5 and 0.9 acre are reported as 1 acre in the impact tables.

The construction activities that could affect floodplains include placing long-term structures such as AC and HVDC transmission structures, converter station foundations, and permanent above-grade access roads within a floodplain and driving heavy equipment within a floodplain resulting in soil compaction. The quantity of impact from construction related activities on floodplains was calculated using GIS and has been rounded to the nearest tenth of an acre.

Structure Placement within Floodplains

The placement of structure foundations within 100-year floodplains would be avoided; however, placement of some structures in 100-year floodplains would be necessary in some areas (e.g., the Mississippi River floodplain) (EPM W-10). Transmission line structures would not prohibit the flow of water within floodplains, because water can flow around structure foundations.

Placing converter stations within a floodplain would increase impermeable surfaces within the floodplain and reduce water absorption, and could change the grade of the floodplain, limiting the ability of water to spread during high-flow events. The Applicant would not construct a converter station within 100-year floodplains, if practicable. If impacts to a floodplain are unavoidable, the design of the converter station sites would seek to avoid adverse changes to the base flood elevation (EPM W-9). Impacts are anticipated to be minor in intensity, and temporary in duration.

Driving Heavy Equipment within a Floodplain

The addition of new access roads within a floodplain can result in soil compaction, an increase in impervious surfaces, and reduction in water absorption. Access roads can also change the gradient of the floodplain, limiting the ability of water to spread during high-flow events. To address these potential long-term impacts, the Applicant would limit building new access roads within 100-year floodplains to the extent practicable (EPM W-10). The Applicant would utilize low ground-pressure equipment and temporary equipment mats (EPM GE-27)as practicable. A Restoration Plan would detail measures the Applicant would implement to minimize long-term impact from compaction.

3.19.6.1.2.3 Riparian Areas

Riparian systems may be broadly defined as transitional areas between surface water systems and purely upland areas. Riparian areas share some of the same characteristics of hydrology, hydric soils, and hydrophytic vegetation with wetlands and surface water resources, but they also may feature more mesic soils and vegetation. Given this diversity, riparian areas are ecologically significant in any landscape where they occur and they tend to provide important ecosystem services, such as wildlife habitat, flood flow attenuation, and sediment retention. The impacts that take place in wetlands and floodplains may impact riparian areas, especially those wetlands and floodplains associated with perennial creeks and rivers that are intersected by the ROW.

Riparian areas have not been specifically mapped, nor field verified for environmental impacts. No specific database concerning riparian resources was identified during desktop analysis. In order to provide an assessment of potential impacts for riparian areas, data developed for perennial, intermittent streams, and for other waterbodies (ponds, lakes, reservoirs, etc.) have been reproduced from Section 3.15. These data come from the National Hydrography dataset. These data, while not definitive in identifying riparian areas specifically, do provide a measure of understanding concerning their potential to exist and to be impacted within a given Project component ROW or siting area footprint. The data were obtained using GIS and include estimates of the mileage that national hydrography dataset-mapped perennial and intermittent streams cross ROWs or siting areas, as well as estimates of the acreage for ponds, lakes, and reservoirs that are intersected by ROWs or siting areas.

The construction activities that could affect riparian areas includes short–term loss of vegetation due construction vehicle access through riparian corridors, plus long-term loss of vegetation due to placement of structures such as AC and HVDC support structures, converter station foundations, and permanent above-grade access roads. Riparian areas may also incur soil compaction from the use of heavy construction equipment in more hydric areas.

3.19.6.1.3 Operations and Maintenance Impacts Common to All Alternatives

This section details potential impacts to wetlands, floodplains and riparian areas from the operation and maintenance of the converter stations and interconnections, the HVDC and AC transmission lines, access roads, and fiber optic regeneration stations.

3.19.6.1.3.1 Wetlands

Wetland ecosystems may be impacted by the operations and maintenance activities associated with vegetation maintenance, herbicide use, driving vehicles within wetlands, and hazardous materials handling during inspections and maintenance work. Impacts are expected to be minor and short-term.

Vegetation Maintenance

The Applicant would maintain a 150- to 200-foot-wide ROW (typical) during operation in accordance with a TVMP. Maintenance may include the long-term direct impact of vegetation removal as well as the short-term impact of trimming or pruning of vegetation in wetland areas. Vegetation maintenance (i.e., trimming of woody vegetation) within wetlands could potentially decrease evapotranspiration rates and increase soil and water temperatures due to lack of shading. To minimize these potential impacts, the Applicant would minimize clearing of vegetation within the ROW, consistent with the TVMP and applicable federal, state, and local regulations (EPM GE-3). Vegetation impacts are projected to be long-term in some portions of the Project, especially the areas of forested and scrub-shrub wetlands cover types. Vegetation impacts in palustrine emergent wetlands would likely be minor and short-term. The Applicant would restrict vehicular travel to the ROW and other established areas within the access or maintenance easement(s) to avoid or minimize impacts to wetland resources (EPM GE-6).

Herbicide Use

The Applicant may selectively apply herbicides to minimize regrowth of certain trees and woody species in forested and scrub-shrub wetlands. Herbicides may be toxic to aquatic organisms depending on the type used and the concentration. Any herbicides used during operations and maintenance would be applied according to labeled instructions and any federal, state, and local regulations (EPM GE-5). To minimize potential short-term and direct impacts, the Applicant would selectively apply herbicides to protect wetland and other water resources.

Equipment Usage in Wetland Areas

It may be necessary to drive operations and maintenance equipment across wetlands when dry, or to establish temporary crossings using mat boards when soils are saturated. Driving equipment across wetlands could compact or rut wetland soils as well as cause sedimentation in wetlands and increased turbidity in surface waters. The Applicant would minimize compaction of soils and rutting through appropriate use of equipment (e.g., low ground-pressure equipment and temporary equipment mats) (EPM GE-27). Following removal of the temporary crossings, wetlands would be restored to pre-disturbance conditions. Any impacts associated with driving construction vehicles in wetlands would be minor and temporary. Dredge or fill of wetlands may occur during the operations and maintenance phase of the Project; however, any impacts would be subject to permit requirements at the time.

During operations and maintenance, the Applicant would restrict vehicular travel to the ROW and other established areas within the access or maintenance easement(s) (EPM GE-6).

Hazardous Materials Handling

Inadvertent spills of fluids, such as fuel, insulating oil, lubricants, antifreeze, detergents, paints, solvents, and herbicides used during operations and maintenance along the HVDC or AC transmission line ROWs, or at the converter stations, could contaminate wetland soils and vegetation. While spills of insulating fluid at converter stations could potentially contaminate wetlands, standard design of the facilities would include secondary containment to minimize potential impact. Industry-standard equipment and vehicles used by employees and used for operations and maintenance activities also could be a source of inadvertent minor spills. The Applicant would implement EPMs GE-13, GE-14, GE-15, and GE-21 to minimize potential impacts and would implement an SPCCP. Impacts to wetlands from hazardous materials handling should be minor in intensity and temporary in duration.

3.19.6.1.3.2 Floodplains

It is anticipated that unpaved roads or two-track access would be used for maintenance. This usage would result in long-term but low intensity impact in the form of soil compaction in floodplains. Vehicular travel would be restricted to the ROW and other established areas within the access and maintenance easement where operations and maintenance are necessary (EPM GE-6). No additions of impervious surfaces or changes to grade within the ROW would be made during operations and maintenance. The Applicant would not conduct operations and maintenance activity during flooding conditions in any floodplain unless emergency conditions warrant.

3.19.6.1.3.3 Riparian Areas

Riparian areas are predicted to experience only minor, short-term impacts during the operations and maintenance phase of the Project. The impact types are likely to include minor clearing of wetland and floodplain vegetation to satisfy line safety considerations or to keep access roads passable. The occasional use of access roads may result in minor soil compaction where they cross riparian zones. There is a potential for drift or runoff of selective herbicide applications in riparian areas that could cause damage or loss of riparian vegetation and for accidental spills of small quantities of hazardous materials, such as fuels and lubricants. Such spills could cause damage to or loss of riparian area vegetation.

3.19.6.1.4 Decommissioning Impacts Common to All Alternatives

Transmission line and converter station decommissioning could occur at the end of the useful life of the facilities. Decommissioning for the Project would include the dismantling and removal of conductors, insulators, and support structures as well as removal of the converter and regeneration stations. The Applicant would decommission access roads that were solely designed and built to provide maintenance crews with access to the Project infrastructure. The Applicant may decommission access roads before the end of the transmission line's useful life if it determined the roads were no longer necessary. The Applicant would consult with landowners to assess whether landowners wish to keep the access roads.

Decommissioning of the Project could result in impacts to wetlands, floodplains, and riparian vegetation very similar to those incurred during construction (e.g., mechanical damage or loss of wetland and riparian vegetation, increased sedimentation and turbidity, erosion, soil compaction, damage or loss of wetland and riparian vegetation from drift or runoff of herbicides, and damage or loss of wetland and riparian vegetation from spills of hazardous materials.

Assuming that the ROW is allowed to revert to preconstruction conditions and unnecessary access roads are removed, many of the long-term impacts resulting from construction (e.g. loss of forested and scrub-shrub wetlands, establishment of permanent access roads in through floodplains and wetlands) could be reversed, resulting in beneficial impacts.

A Decommissioning Plan would be developed prior to decommissioning, but given the uncertainty of future technology and unknown future environmental requirements, the contents and requirements of such a plan cannot be known at this time. Any plan document would follow appropriate governing requirements in place at the time the plan is drafted.

3.19.6.2 Impacts Associated with the Applicant Proposed Project

3.19.6.2.1.1 Construction Impacts

Impacts to wetlands, floodplains, and riparian areas during construction of the converter stations may vary from minor and short term to long term and potentially permanent loss of wetland, floodplain, and riparian acreage. Impacts to wetlands and other waters of the United States would need to be permitted under Section 404 of the CWA. Typically those impacts totaling more than one-tenth of an acre would require a preconstruction notification to the appropriate regulatory office of the USACE. In Arkansas, the counties crossed by the Project are all within the so-called Fayetteville Shale Play area. Any level of impacts to wetlands and other waters of the United States in the Fayetteville Shale Play are required to be reported to the USACE under regional conditions for nationwide permitting. Additional permitting may be required from local jurisdictions for changes or adverse impacts to floodplains.

3.19.6.2.1.1.1 Oklahoma Converter Station Siting Area and AC Interconnection Siting Area

The Oklahoma Converter Station and AC Interconnection Siting Areas are dominated by grassland/herbaceous vegetation (605 acres). Desktop analysis, including a review of NWI data and NLCD data, has not identified wetland resources within the estimated siting areas. Based on the desktop analysis, it is not anticipated that there would be adverse impacts to wetland ecosystems from construction of the converter station or the AC interconnection.

No 100-year floodplains are mapped for the Oklahoma Converter Station and AC Interconnection Siting Areas, and thus no impacts to mapped floodplain resources are estimated.

Potential impacts to riparian areas associated with construction of the converter station and AC interconnections are unlikely. Limited surface water features consisting of less than 2 miles of intermittent stream beds, no perennial streams, and no major waterbodies are present within the Oklahoma Converter Station Siting Area. Similarly, surface water features are limited in the AC Interconnection Siting Area. The Applicant would adhere to EPM FVW-1 to avoid and/or minimize impacts to areas with sensitive vegetation resources such as wetlands and riparian areas. The Applicant would also avoid open water ecosystems such as intermittent and perennial streams, and other open water bodies such as ponds, lakes, and reservoirs (EPM W-3).

3.19.6.2.1.1.2 Tennessee Converter Station Siting Area and AC Interconnection Siting Area

The Tennessee Converter Station and Interconnection Siting Area includes approximately 6 acres of wetlands (Table 3.19-45) according to the NWI database.

Table 3.19-45:
Potential Impacts to Wetlands in the Tennessee Converter Station and AC Interconnection Siting Area

Wetland Type	Number of Wetlands	Acreage of Potential Impact
PFO	3	4
PSS	2	2
Totals	5	6

GIS Data Source: USFWS (2014g)

Construction that causes dredge or fill impacts in wetlands and other waters of the United States would require permitting under the CWA Section 404 program. The construction effort would avoid wetlands and waters of the United States to the extent practicable. Where impacts appear unavoidable, those wetland sites would receive a formal wetland delineation and appropriate consultation with the USACE.

No 100-year floodplains are mapped for the Tennessee Converter Station and AC Interconnection Siting Areas.

Limited surface water features occur in the siting area. Only 0.25 mile of perennial streams, 4.4 miles of intermittent streams, and no major waterbodies are present within the Tennessee Converter Station Siting Area. Similarly, surface water features are limited in the AC interconnection siting area. Potential impacts to riparian areas associated with construction of the station and AC interconnection are unlikely.

3.19.6.2.1.2 Operations and Maintenance Impacts

3.19.6.2.1.2.1 Oklahoma Converter Station Siting Area and AC Interconnection Siting Area

The Oklahoma Converter Station and AC Interconnection Siting Areas have been determined not to contain wetlands based on desktop analysis, including a review of NWI data. For this reason, it is not anticipated that there would be adverse impacts to wetland ecosystems from operation and maintenance of the Oklahoma Converter Station. In addition, no data exist to identify 100-year floodplains in the siting areas. Riparian areas are likely very limited in the siting area and unlikely to be impacted by operations and maintenance.

3.19.6.2.1.2.2 Tennessee Converter Station Siting Area and AC Interconnection Siting Area

As stated in the construction impacts section for the Tennessee converter station, the siting area may contain five or more acres of wetlands and/or waters of the United States. If these areas can be avoided during construction activity, then they should also be avoided during all operation and maintenance activities. Field reconnaissance and potentially wetland delineation should be conducted prior to construction to identify exact locations and sizes of wetlands in the siting area. Potential impacts that result in fill of a wetland would be permitted under Section 404 of the CWA prior to construction. Operations and maintenance activities would adhere to all restrictions and conditions that are established as part of the permitting process.

3.19.6.2.1.3 Decommissioning Impacts

The decommissioning impacts related to the Project would be similar in nature to the set of temporary impacts resulting from initial construction. These temporary impacts would involve use of construction machinery at each of the two converter stations (i.e., Oklahoma and Tennessee), as well as the ROW areas that would have been used for AC interconnection. The specific acreages for the footprints of the two converter stations total a projected maximum of 120 acres that would be reclaimed and revegetated according to the details that would be written into the Decommissioning Plan.

3.19.6.2.2 AC Collection System

3.19.6.2.2.1 Construction Impacts

Impacts to wetlands, floodplains, and riparian areas during construction of the AC collection system routes may vary from minor and short term to long term and potentially permanent loss of wetland acreage. The following discussion of potential impacts is specific to the 200-foot representative ROW within the overall 2-mile-wide ROI.

3.19.6.2.2.1.1 Route E-1

The construction of AC Collection System Route E-1 has been estimated to potentially result in as much as 8.4 acres of impacts to wetlands. Wetland impacts are predicted for a total of seven wetlands from five different wetland types (Table 3.19-46).

Table 3.19-46:
Potential Construction Impacts to Wetlands in AC Collection System Route E-1

Wetland Type	Number of Wetlands	Acreage of Potential Impact
PEM	2	2.8
PFO	1	2.9
PSS	2	2.1
R2UB	1	0.5
R2US	1	0.1
Totals	7	8.4

GIS Data Source: USFWS (2014g)

One 100-year floodplain totaling 1.0 acre exists within the ROW for AC Collection System Route E-1 and could be impacted.

As shown in Table 3.15-5, AC Collection System Route E-1 encompasses about 0.2 mile of perennial streams, 1.6 miles of intermittent streams, no major waterbodies, and 0.5 acre of reservoirs, lakes, and ponds. Riparian areas may be associated with many, if not all, of these surface water features.

3.19.6.2.2.1.2 Route E-2

Construction of AC Collection System Route E-2 could result in a total of up to 7.8 acres of impacts to wetlands. The representative ROW for AC Collection System Route E-2 features nine wetlands in five different types (Table 3.19-47).

Table 3.19-47:
Potential Construction Impacts to Wetlands in AC Collection System Route E-2

Wetland Type	Number of Wetlands	Acreage of Potential Impact
PEM	4	1.6
PFO/PSS	1	0.8
PSS	2	4.2
R2UB	1	0.3
R2US	1	0.9
Totals	9	7.8

GIS Data Source: USFWS (2014g)

Two 100-year floodplains totaling 54.6 acres are present in the ROW that could be impacted by construction along AC Collection System Route E-2.

As shown in Table 3.15-5, the AC Collection System Route E-2 includes approximately 0.4 mile of perennial streams, 2.2 miles of intermittent streams, 0.1 mile of major waterbodies, and 1.0 acres of reservoirs, lakes, and ponds. Riparian areas may be associated with many, if not all, of these surface water features.

3.19.6.2.2.1.3 Route E-3

Construction of AC Collection System Route E-3 could result in a total of up to 2.8 acres of impacts to wetlands in the ROW. Route E-3 features a total of three wetlands representing three different wetland types (Table 3.19-48).

Table 3.19-48:
Potential Construction Impacts to Wetlands in AC Collection System Route E-3

Wetland Type	Number of Wetlands	Acreage of Potential Impact
PSS	1	0.8
R2UB	1	0.3
R2US	1	1.7
Totals	3	2.8

GIS Data Source: USFWS (2014g)

Two 100-year floodplains totaling 6.8 acres may be impacted by construction along AC Collection System Route E-3.

The AC Collection System Route E-3 includes approximately 0.1 mile of perennial streams, 2.4 miles of intermittent streams, less than 0.1 mile of major waterbodies, and 0.3 acre of reservoirs, lakes, and ponds (Table 3.15-5). The length of intermittent streams is the highest of any of the AC collection system routes. Riparian areas may be associated with many, if not all, of these surface water features.

3.19.6.2.2.1.4 Route NE-1

Construction of AC Collection System Route NE-1 could potentially result in a total of 3.4 acres of impacts to wetlands within the ROW. Wetland impacts could occur in five wetlands representing four types (Table 3.19-49).

Table 3.19-49:
Potential Construction Impacts to Wetlands in AC Collection System Route NE-1

Wetland Type	Number of Wetlands	Acreage of Potential Impact
PEM/PSS	1	0.6
Pf	1	1.3
R2UB	1	0.7
R4SB	2	0.8
Totals	5	3.4

GIS Data Source: USFWS (2014g)

Two 100-year floodplains totaling 19.1 acres could potentially be impacted by construction along AC Collection System Route NE-1.

The AC Collection System Route NE-1 includes approximately 0.4 mile of perennial streams, 0.3 mile of intermittent streams, 0.1 mile of major waterbodies, and no acreage of reservoirs, lakes, and ponds (Table 3.15-5). The length of perennial streams is the second highest of any of the AC collection system routes. Riparian areas may be associated with many, if not all, of these surface water features.

3.19.6.2.2.1.5 Route NE-2

Construction of AC Collection System Route NE-2 could potentially result in a total of approximately 20.1 acres of impacts to wetlands in the representative ROW. AC Collection System Route NE-2 ROW contains 14 wetlands representing seven wetland types (Table 3.19-50).

Table 3.19-50:
Potential Construction Impacts to Wetlands in AC Collection System Route NE-2

Wetland Type	Number of Wetlands	Acreage of Potential Impact
L2EM	1	9.3
PEM/PSS	2	1.1
PEM	6	8.1
PSS	1	0.8
R2UB	1	0.4
R2US	2	0.1
R4SB	1	0.3
Totals	14	20.1

GIS Data Source: USFWS (2014g)

One 100-year floodplain totaling approximately 24.3 acres within the ROW may be impacted by construction of AC Collection System Route NE-2.

The AC Collection System Route NE-2 includes approximately 0.2 mile of perennial streams, 1.3 miles of intermittent streams, 0.1 mile of major waterbodies, and 2.0 acres of reservoirs, lakes, and ponds (Table 3.15-5).Riparian areas may be associated with many, if not all, of these surface water features.

3.19.6.2.2.1.6 Route NW-1

Construction of AC Collection System Route NW-1 could potentially result in a total of 1.0 acre of total impact to a set of two wetlands in the ROW (Table 3.19-51).

Table 3.19-51:
Potential Construction Impacts to Wetlands in AC Collection System Route NW-1

Wetland Type	Number of Wetlands	Acreage of Potential Impact
PEM	1	0.7
R4SB	1	0.3
Totals	2	1.0

GIS Data Source: USFWS (2014g)

Two 100-year floodplains totaling 32.8 acres within the ROW could be impacted by construction for AC Collection System Route NW-1.

The AC Collection System Route NW-1 includes approximately 0.2 mile of perennial streams, 2.0 miles of intermittent streams 0.1 mile of major waterbodies, and no acreage of reservoirs, lakes, and ponds (Table 3.15-5). Riparian areas may be associated with many, if not all, of these surface water features.

3.19.6.2.2.1.7 Route NW-2

The construction of AC Collection System Route NW-2 could result in a total of approximately 4.1 acres of impacts to wetlands in the ROW. A total of nine wetlands distributed through four types are represented in the ROW (Table 3.19-52).

Table 3.19-52:
Potential Construction Impacts to Wetlands in AC Collection System Route NW-2

Wetland Type	Number of Wetlands	Acreage of Potential Impact
PEM/PSS	1	0.6
PEM	1	0.2
R2UB	1	0.7
R4SB	6	2.6
Totals	9	4.1

GIS Data Source: USFWS (2014g)

One floodplain totaling 19.1 acres could be impacted by construction along AC Collection System Route NW-2.

The AC Collection System Route NW-2 includes approximately 0.5 mile of perennial streams, 1.0 mile of intermittent streams, 0.2 mile of major waterbodies, and less than 0.1 mile of reservoirs, lakes, and ponds (Table 3.15-5). Riparian areas may be associated with many, if not all, of these surface water features.

3.19.6.2.2.1.8 Route SE-1

The ROW for AC Collection System Route SE-1 contains eight wetlands from four wetland types (Table 3.19-53). The construction of AC Collection System Route SE-1 could potentially result in a total of approximately 4.9 acres of impacts to these wetlands.

Table 3.19-53:
Potential Construction Impacts to Wetlands in AC Collection System Route SE-1

Wetland Type	Number of Wetlands	Acreage of Potential Impact
L2EM	1	0.2
PEM	3	2.8
Pf	1	0.1
PSS	3	1.8
Totals	8	4.9

GIS Data Source: USFWS (2014g)

Two floodplains totaling 54.6 acres could be impacted by construction along AC Collection System Route SE-1.

The AC Collection System Route SE-1 includes approximately 0.4 mile of perennial streams, 2.1 miles of intermittent streams, less than 0.1 mile of major waterbodies, and 2.6 acres of reservoirs, lakes, and ponds (Table 3.15-5). The area of reservoirs, lakes, and ponds is the second highest of any of the AC collection system routes. Riparian areas may be associated with many, if not all, of these surface water features.

3.19.6.2.2.1.9 Route SE-2

No wetlands are documented by NWI mapping in the representative ROW for AC Collection System Route SE-2. Based on the NWI data there would be no expected impacts to wetlands within the representative ROW. However, the data should be verified in the field prior to construction to avoid potential impacts if wetlands are present that were not included in the NWI mapping.

No mapped 100-year floodplains are present within this ROW.

The AC Collection System Route SE-2 encompasses no perennial streams, 0.3 mile of intermittent streams, no major waterbodies, and 0.4 acre of reservoirs, lakes, and ponds (Table 3.15-5). Riparian areas may be associated with many, if not all, of these surface water features.

3.19.6.2.2.1.10 Route SE-3

Construction of AC Collection System Route SE-3 could affect 13 total wetlands representing six wetland types for a combined potential acreage of impact of approximately 14.3 acres within the ROW (Table 3.19-54).

Table 3.19-54:
Potential Construction Impacts to Wetlands in AC Collection System Route SE-3

Wetland Type	Number of Wetlands	Acreage of Potential Impact
PEM	4	2.6
Pf	4	5.5
PFO/PSS	1	0.8

Table 3.19-54:
Potential Construction Impacts to Wetlands in AC Collection System Route SE-3

Wetland Type	Number of Wetlands	Acreage of Potential Impact
PSS	2	4.2
R2UB	1	0.3
R2US	1	0.9
Totals	13	14.3

GIS Data Source: USFWS (2014g)

Two floodplains are predicted to be impacted within the ROW by construction of AC Collection System Route SE-3 for a total of 54.6 acres.

The AC Collection System Route SE-3 includes approximately 0.4 mile of perennial streams, 2.1 miles of intermittent streams, 0.1 mile of major waterbodies, and 1.0 acre of reservoirs, lakes, and ponds (Table 3.15-5). The area of reservoirs, lakes, and ponds is the highest of any of the AC collection system routes. Riparian areas may be associated with many, if not all, of these surface water features.

3.19.6.2.2.1.11 Route SW-1

Desktop analysis, including a review of NWI data and NLCD data, has not identified wetland resources within the ROW for AC Collection System Route SW-1. Based on this level of analysis, it is not anticipated that there would be adverse impacts to wetland ecosystems from construction of SW-1.

No 100-year floodplains are mapped within this alternative's ROW.

The AC Collection System Route SW-1 includes no perennial streams, 0.9 mile of intermittent streams, no major waterbodies, and no reservoirs, lakes, or ponds (Table 3.15-5). Riparian areas may be associated with many, if not all, of these surface water features.

3.19.6.2.2.1.12 Route SW-2

Construction of AC Collection System Route SW-2 is predicted to impact less than 1 acre of a single palustrine emergent wetland that would be crossed.

Two floodplains are predicted to be impacted within the ROW by construction of AC Collection System Route SW-2 for a total of 16.6 acres.

The AC Collection System Route SW-2 includes approximately 0.1 mile of perennial streams, 2.9 miles of intermittent streams, 0.1 mile of major waterbodies, and 0.2 acre of reservoirs, lakes, and ponds (Table 3.15-5). Riparian areas may be associated with many, if not all, of these surface water features.

3.19.6.2.2.1.13 Route W-1

No wetlands are documented in the representative ROW for AC Collection System Route W-1, so no impacts are anticipated to wetlands from construction.

Two floodplains could be impacted by construction along the representative ROW for AC Collection System Route W-1 for a total of 15.2 acres.

The AC Collection System Route W-1 includes approximately 0.2 mile of perennial streams, 1.1 miles of intermittent streams, 0.1 mile of major waterbodies, and 0.5 acre of reservoirs, lakes, and ponds (Table 3.15-5). The area of reservoirs, lakes, and ponds is the lowest of any of the AC collection system routes. Riparian areas may be associated with many, if not all, of these surface water features.

3.19.6.2.2.2 Operations and Maintenance Impacts

Impacts related to operations and maintenance may result from use of heavy machinery through wetlands, floodplains, and riparian areas. These impacts can cause soil compaction and mechanical damage or removal of vegetation. These operations and maintenance impacts are anticipated to cover a range from temporary and minor to potentially more severe and long-term/permanent. The estimated acreage of each resource type (wetlands, floodplains, and riparian areas) by alternative, are provided in the previous subsections of 3.19.6.2.2.1.

The use of vegetation management would be necessary to protect the Project infrastructure and enhance safety. However, the trimming, mowing, or removal of vegetation can cause changes to plant diversity and function in all three ecosystem types (i.e., wetlands, floodplains, and riparian areas). Vegetation maintenance in wetlands and riparian areas should be kept to a minimum. Additionally, the use of herbicides can cause minor to severe impacts to vegetation in areas where they are applied. If used, the Applicant would selectively apply herbicides within streamside management zones.

3.19.6.2.2.3 Decommissioning Impacts

The decommissioning impacts related to the Project would be similar in nature to the set of temporary impacts resulting from initial construction. These temporary impacts would involve use of construction machinery at the various locations where there is AC collection system infrastructure, (e.g., the lattice structures, tubular structures, H-frame structures, fiber optic infrastructure, etc.) which would involve removal of aboveground material, and foundation material where required. Use of construction machinery would have the potential to crush or remove vegetation (primarily in grasslands or croplands), but these areas would be reseeded following removal of infrastructure. No long-term effects are judged to be likely from the decommissioning phase of the Project. Revegetation for wetlands, floodplains, and riparian areas would be guided by the Project's Decommissioning Plan and by the conditions set forth in any CWA permitting that would be required.

3.19.6.2.3 HVDC Applicant Proposed Route

3.19.6.2.3.1 Construction Impacts

Impacts to wetlands, floodplains, and riparian areas during construction of the Applicant Proposed Route may vary from minor and short term to long term and potentially permanent loss of acreage. In Arkansas, the counties crossed by the Project are all within the Fayetteville Shale Play area. Any level of impacts to wetlands and other waters of the United States in the Fayetteville Shale Play are required to be reported to the USACE under regional conditions for nationwide permitting. Additional permitting may be required from local jurisdictions for changes or adverse impacts to floodplains.

Impacts presented for the Applicant Proposed Route represent impacts to the amount of wetlands, floodplains, and riparian areas estimated to exist within the 200-foot-wide representative ROW.

3.19.6.2.3.1.1 Region 1

Construction of the Applicant Proposed Route in Region 1 could cause impacts to six wetland types totaling approximately 22.1 acres within the ROW. Table 3.19-55 provides the number of wetlands by type with the associated prediction of impact acreage.

Table 3.19-55:
Potential Construction Impacts to Wetlands within the ROW of the Applicant Proposed Route—Region 1

Wetland Type	Number of Wetlands	Acreage of Potential Impact
PEM	11	3.1
Pf	3	9.4
PFO	2	0.6
PSS	5	5.4
PUS	5	2.3
R2UB	1	1.3
Totals	27	22.1

GIS Data Source: USFWS (2014g)

Two 100-year floodplains within Region 1 would be crossed by the construction of the Applicant Proposed Route in its representative ROW. These crossings may result in the potential for 52.4 acres of impact. No floodplains are anticipated to be crossed by the Applicant Proposed Route in this region.

As shown in Table 3.15-4, the 200-foot-wide corridor of the Applicant Proposed Route in Region 1 includes approximately 0.9 miles of perennial streams, 5.9 miles of intermittent streams, less than 0.1 mile of major waterbodies and 9.9 acres of reservoirs, lakes, and ponds. Riparian areas may be associated with many, if not all, of these surface water features.

3.19.6.2.3.1.2 Region 2

The Applicant Proposed Route in Region 2 could result in construction impacts to eight wetland types and approximately 14 total acres within the ROW. Table 3.19-56 provides the number of wetlands by type, and the associated estimate for potential impact acreage.

Table 3.19-56:
Potential Construction Impacts to Wetlands within the ROW for the Applicant Proposed Route—Region 2

Wetland Type	Number of Wetlands	Acreage of Potential Impact
PEM/PSS	2	0.8
PEM	8	2.5
PFO	4	2.6
PSS	1	0.2
PUB	6	2.3
PUS	8	1.0
R2UB	1	0.6

Table 3.19-56:
Potential Construction Impacts to Wetlands within the ROW for the Applicant Proposed Route—Region 2

Wetland Type	Number of Wetlands	Acreage of Potential Impact
R2US	2	3.6
Totals	32	13.6

GIS Data Source: USFWS (2014g)

Five 100-year floodplains within Region 2 would be crossed by the construction of the Applicant Proposed Route. These crossings could account for a potential of 157.0 acres of impact.

The 200-foot-wide corridor of the Applicant Proposed Route in Region 2 includes approximately 1.4 miles of perennial streams, 3.8 miles of intermittent streams, less than 0.1 mile of major waterbodies, and 1.9 acres of reservoirs, lakes, and ponds (Table 3.15-8). Riparian areas may be associated with many, if not all, of these surface water features.

3.19.6.2.3.1.3 Region 3

Construction of the Applicant Proposed Route in Region 3 could result in as much as 61 acres of impacts to wetlands within the representative ROW. Table 3.19-57 provides the number of wetlands by type and the associated estimate of potential impact acreage within the ROW.

Table 3.19-57:
Potential Construction Impacts to Wetlands within the ROW of the Applicant Proposed Route—Region 3

Wetland Type	Number of Wetlands	Acreage of Potential Impact
L1UB	1	0.6
PEM	6	0.3
PFO/PEM	1	0.1
PFO	20	24.6
PEM/PSS	1	1.2
PSS	1	0.5
PUB	110	27.9
PUS	8	2.2
R2UB	3	3.4
Totals	151	60.8

GIS Data Source: USFWS (2014g)

Twenty 100-year floodplains within Region 3 would be crossed by the construction of the Applicant Proposed Route. These crossings could account for as much as 293.8 acres of impact to floodplains in the ROW.

The 200-foot-wide corridor of the Applicant Proposed Route in Region 3 includes approximately 10.5 miles of perennial streams, 7.8 miles of intermittent streams, 0.2 mile of major waterbodies, and 39.5 acres of reservoirs, lakes, and ponds (Table 3.15-12). Riparian areas may be associated with many, if not all, of these surface water features.

3.19.6.2.3.1.4 Region 4

Construction of the Applicant Proposed Route in Region 4 could cause impacts to as many as seven wetland types totaling 22.8 acres of wetlands within the representative ROW. Table 3.19-58 provides the number of wetlands by type and the associated potential impact acreage.

Table 3.19-58:
Potential Construction Impacts to Wetlands within the ROW for the Applicant Proposed Route—Region 4

Wetland Type	Number of Wetlands	Acreage of Potential Impact
L1UB	1	5.3
PEM	3	1.8
PFO	8	8.6
PSS	1	0.0
PUB	19	4.6
R2UB	4	2.1
R2US	2	0.4
Totals	38	22.8

GIS Data Source: USFWS (2014g)

Thirty-two 100-year floodplains within Region 4 would be crossed by construction of the Applicant Proposed Route. These crossings could account for a potential of up to 545.7 acres of impact to floodplains in the ROW.

As shown in Table 3.15-16, the 200-foot-wide corridor of the Applicant Proposed Route in Region 4 includes approximately 3.5 miles of perennial streams, 9.0 miles of intermittent streams, 0.2 mile of major waterbodies, and 16.1 acres of reservoirs, lakes, and ponds. Riparian areas may be associated with many, if not all, of these surface water features.

A 100-foot buffer was applied to each side of the centerline of the Lee Creek Variation in order to calculate potential impacts to wetland and floodplain resources in a 200-wide ROW. Results of potential impacts to NWI wetland resources include 0.44 acres of riverine, unconsolidated bottom (R2UB) wetlands and less than 0.1 acre of riverine, unconsolidated shore (R2US) wetlands. There is a potential for riparian area impacts associated with these riverine wetland types. 100-year floodplains impacts for the Lee Creek Variation were calculated at 7.7 acres within the 200-wide ROW. As noted in Section 3.15.5.4.2, the Lee Creek Variation within the Applicant Proposed Route avoids the 300-foot buffer zone established around Lee Creek Reservoir by the city of Fort Smith, Arkansas.

3.19.6.2.3.1.5 Region 5

Construction of the Applicant Proposed Route in Region 5 could result in impacts to four wetland types and totaling approximately 12 total acres within the ROW. Table 3.19-59 provides the number of wetlands by type and the associated potential impact acreage.

Table 3.19-59:
Potential Construction Impacts to Wetlands within the ROW of the Applicant Proposed Route—Region 5

Wetland Type	Number of Wetlands	Acreage of Potential Impact
PEM	3	1.3
PFO	5	4.8

Table 3.19-59:
Potential Construction Impacts to Wetlands within the ROW of the Applicant Proposed Route—Region 5

Wetland Type	Number of Wetlands	Acreage of Potential Impact
PUB	7	1.7
L2UB	2	3.8
Totals	17	11.6

GIS Data Source: USFWS (2014g)

Fourteen 100-year floodplains within Region 5 could be impacted by construction of the Applicant Proposed Route. The floodplain crossings could account for a potential of up to 111.1 acres of impact.

The 200-foot-wide corridor of the Applicant Proposed Route in Region 5 includes approximately 2.2 miles of perennial streams, 9.3 miles of intermittent streams, 0.2 mile of major waterbodies, and 17.3 acres of reservoirs, lakes, and ponds (Table 3.15-20). Riparian areas may be associated with many, if not all, of these surface water features.

3.19.6.2.3.1.6 Region 6

Construction of the Applicant Proposed Route in Region 6 could cause impacts to five wetland types totaling approximately 13.5 acres within the representative ROW. Table 3.19-60 provides the number of wetlands by type and the associated potential impact acreage.

Table 3.19-60:
Potential Construction Impacts to Wetlands within the ROW of the Applicant Proposed Route—Region 6

Wetland Type	Number of Wetlands	Acreage of Potential Impact
PEM	12	3.2
PFO	4	5.1
PSS	1	0.1
PUB	2	2.8
R2UB	2	2.3
Totals	21	13.5

GIS Data Source: USFWS (2014g)

Five 100-year floodplains within Region 6 could be impacted by construction of the Applicant Proposed Route. The floodplain crossings could account for a potential of up to 335.5 acres of impact in the representative ROW.

The 200-foot-wide corridor of the Applicant Proposed Route in Region 6 includes approximately 0.8 mile of perennial streams, 3.5 miles of intermittent streams, 0.2 mile of major waterbodies, and 5.2 acres of reservoirs, lakes, and ponds (Table 3.15-24). Riparian areas may be associated with many, if not all, of these surface water features.

3.19.6.2.3.1.7 Region 7

Construction of the Applicant Proposed Route in Region 7 could cause impacts to five wetland types and 42 total acres within the ROW. Table 3.19-61 provides the number of wetlands by type with the associated predicted impact acreage.

Table 3.19-61:
Potential Construction Impacts to Wetlands within the ROW of the Applicant Proposed Route–Region 7

Wetland Type	Number of Wetlands	Acreage of Potential Impact
PEM	3	1.8
PFO	14	17.7
PSS	1	2.6
PUB	3	2.8
R2UB	2	16.9
Totals	23	41.8

GIS Data Source: USFWS (2014g)

Twenty-five 100-year floodplains within Region 7 could be impacted by construction of the Applicant Proposed Route. These floodplain crossings account for a potential of 344.6 acres of impact within the ROW.

The 200-foot-wide corridor of the Applicant Proposed Route in Region 7 includes approximately 0.5 mile of perennial streams, 4.3 miles of intermittent streams, 0.6 mile of major waterbodies, and 2.4 acres of reservoirs, lakes, and ponds (Table 3.15-28). Riparian areas may be associated with many, if not all, of these surface water features.

3.19.6.2.3.2 Operations and Maintenance Impacts

The operation and maintenance for the Applicant Proposed Route would involve routine and periodic vegetation management according to the TVMP. Impacts related to operations and maintenance may result from use of heavy machinery through wetlands, floodplains, and riparian areas. These impacts can cause soil compaction and mechanical damage or removal of vegetation. These operations and maintenance impacts are anticipated to cover a range from temporary and minor to potentially more severe and long term/permanent. The estimated acreage of each resource type (wetlands, floodplains, and riparian areas) by region is provided in the previous subsections of Section 3.19.6.2.3.1.

The use of vegetation management would be necessary to protect the Project infrastructure and enhance safety. However, the trimming, mowing, or removal of vegetation can cause changes to plant diversity and function in all three ecosystem types (i.e., wetlands, floodplains, and riparian areas). Vegetation maintenance in wetlands and riparian areas should be kept to a minimum to the extent practicable. Additionally, the use of herbicides can cause minor to severe impacts to vegetation in areas where they are applied. Great care would need to be used when applying herbicides in close proximity to wetlands and riparian areas. Herbicides may drift in windy conditions and cause impacts to non-target plants, so application should be avoided in these conditions. Label directions for herbicides typically advise the applicator as to whether a specific herbicide can be used in or near wetlands and waterways.

3.19.6.2.3.3 Decommissioning Impacts

The decommissioning impacts related to Project would be similar in nature to the set of temporary impacts resulting from initial construction. These temporary impacts would involve use of construction machinery at the various sites of infrastructure (e.g., the lattice structures, lattice crossing structures, monopole structures, guyed structures, fiber optic infrastructure, etc.) to remove aboveground material, and foundation material where required. Use of construction machinery would have the potential to crush or remove vegetation, but no long-term effects are anticipated to be likely from the decommissioning phase of the Project. Revegetation for wetlands, floodplains, and riparian areas would be guided by the Project's Decommissioning Plan and by the conditions set forth in any CWA permitting that would be required.

3.19.6.3 Impacts Associated with the DOE Alternatives

3.19.6.3.1 Arkansas Converter Station Alternative Siting Area and AC Interconnection Siting Area

3.19.6.3.1.1 Construction Impacts

The Arkansas Converter Station Siting Area includes approximately 96 acres of palustrine wetlands, 76 acres of lacustrine wetlands, and 191 acres of riverine wetlands (a total of 363 acres of wetlands). The converter station would ultimately only disturb approximately 60 acres of lands and it is very unlikely that these 60 acres would be focused on the wetland resources documented within the siting area. Construction that causes dredge or fill impacts in wetlands and waters of the United States would require permitting under the CWA Section 404 program. Wetland impacts would typically require a preconstruction notification filed with the applicable regulatory office of the USACE. In Arkansas, the counties crossed by the Project are all within the so-called Fayetteville Shale Play area. Any level of impacts to wetlands and other waters of the United States in the Fayetteville Shale Play are required to be reported to the USACE under regional conditions for nationwide permitting. The construction effort should avoid wetlands and waters of the United States to the extent practicable.

One floodplain could be impacted by construction in the Arkansas Converter Station Alternative Siting Area. An estimated 73 acres of 100-year floodplain are contained with the siting area, and specific placement of the converter station infrastructure would determine the ultimate impact acreage.

The Arkansas Converter Station Alternative Siting Area includes almost 13 miles of perennial streams and about 58 miles of intermittent streams (Section 3.15.6.3.1.1). Riparian areas may be associated with many, if not all, of these surface water features.

3.19.6.3.1.2 Operations and Maintenance Impacts

The operation and maintenance of the Arkansas converter station would involve routine and periodic vegetation management according to the TVMP. Wetlands, floodplains and riparian areas associated with perennial streams have all been documented within the siting area, but ultimately only 60 acres of land would be disturbed. These resources should be avoided during siting so that no impacts would be incurred during operations and routine maintenance.

3.19.6.3.1.3 Decommissioning Impacts

The decommissioning impacts related to the Project would be similar in nature to the set of temporary impacts resulting from initial construction. These temporary impacts would involve use of construction machinery at the Arkansas converter station, as well as the ROW areas that would have been used for the AC interconnection. The specific acreage for the footprint of the converter station would total a projected maximum of 60 acres that would be reclaimed and revegetated according to the details that would be written into the Decommissioning Plan.

3.19.6.3.2 HVDC Alternative Routes

3.19.6.3.2.1 Construction Impacts

Impacts to wetlands during construction of the HVDC alternative routes would vary depending upon alternative chosen. Impacts may vary from no impact, to minor and short term to long term, and, potentially, permanent loss of wetland acreage. Impacts presented below represent the amount of wetlands, floodplains, and riparian areas estimated to exist within the 200-foot-wide representative ROW for the HVDC alternative routes. Riparian areas may be associated with many, if not all, of these surface water features listed for each alternative.

3.19.6.3.2.1.1 Region 1

3.19.6.3.2.1.1.1 Alternative Route 1-A

HVDC Alternative Route 1-A is 123.0 miles in length and corresponds to Applicant Proposed Route Links 2, 3, 4, and 5, which are a combined 113.6 miles in length.

HVDC Alternative Route 1-A could cause up to 15.1 acres of impacts in 30 wetlands within the representative ROW. Table 3.19-62 provides the number of wetlands by type with the associated estimate of potential impact acreage for HVDC Alternative Route 1-A. By comparison, Applicant Proposed Route Links 2, 3, 4, and 5 are predicted to potentially cause as much as 22 acres of impacts to wetlands.

Table 3.19-62:
Potential Construction Impacts to Wetlands within the ROW of HVDC Alternative Route 1-A

Wetland Type	Number of Wetlands	Acreage of Potential Impact
PEM	10	8.6
PFO	2	1.3
PSS	5	2.1
PUS	10	2.6
R2UB	2	0.4
R2US	1	0.1
Totals	30	15.1

GIS Data Source: USFWS (2014g)

One 100-year floodplain could be impacted by construction in the 200-foot-wide ROW of HVDC Alternative Route 1-A. The estimated potential impact for this floodplain crossing is 5.3 acres. Floodplain impacts for Applicant Proposed Route Links 2, 3, 4, and 5 include the crossing of two 100-year floodplains; the potential impact acreage for those crossings equals 52 acres.

As shown in Table 3.15-4, the 200-foot-wide ROW of HVDC Alternative Route 1-A includes approximately 0.8 mile of perennial streams, 8.6 miles of intermittent streams, less than 0.1 mile of major waterbodies, and 6.8 acres of reservoirs, lakes, and ponds. In comparison, the Applicant Proposed Route Links 2, 3, 4, and 5 feature approximately 0.9 mile of perennial streams, 5.9 miles of intermittent streams, less than 0.1 mile of major waterbodies, and 9.9 acres of reservoirs, lakes, and ponds.

3.19.6.3.2.1.1.2 Alternative Route 1-B

HVDC Alternative Route 1-B is 51.8 miles in length and corresponds to Applicant Proposed Route Links 2 and 3 which are a combined 53.8 miles in length.

HVDC Alternative Route 1-B could cause impacts to four wetland types that would equal as much as 2.8 total acres within the ROW. Table 3.19-63 provides the number of wetlands by type with the associated potential impact acreage for HVDC Alternative Route 1-B. The potential acreage of wetland impact for Applicant Proposed Route Links 2 and 3 is 14.9 acres located within 17 NWI-mapped wetlands.

Table 3.19-63:
Potential Construction Impacts to Wetlands within the ROW of HVDC Alternative Route 1-B

Wetland Type	Number of Wetlands	Acreage of Potential Impact
PEM/PSS	1	0.4
PSS	2	1.1
R2UB	1	0.3
R2US	1	1.0
Totals	5	2.8

GIS Data Source: USFWS (2014g)

Two 100-year floodplains could be impacted by construction in the 200-foot-wide ROW of HVDC Alternative Route 1-B. The estimated potential acreage of impact for these floodplain crossings is 6.0 acres. Floodplain impacts for Applicant Proposed Route Links 2 and 3 include the crossing of two 100-year floodplains; the acreage for those crossings equals approximately 52.4 acres.

The 200-foot-wide ROW of HVDC Alternative Route 1-B includes approximately 0.1 mile of perennial streams, 3.0 miles of intermittent streams, less than 0.1 mile of major waterbodies, and 1.1 acres of reservoirs, lakes, and ponds (Table 3.15-4). In comparison, the corresponding Applicant Proposed Route Links 2 and 3 feature approximately 0.3 mile of perennial streams, 2.4 miles of intermittent streams, less than 0.1 mile of major waterbodies, and 1.1 acres of reservoirs, lakes, and ponds.

3.19.6.3.2.1.1.3 Alternative Route 1-C

HVDC Alternative Route 1-C is 52.0 miles in length. It corresponds to Applicant Proposed Route Links 2 and 3, which are a combined 53.8 miles in length.

HVDC Alternative Route 1-C could cause impacts to five wetland types and up to a total of 4.9 acres within the representative ROW. Table 3.19-64 provides the number of wetlands by type with the associated potential impact acreage for HVDC Alternative Route 1-C. The Applicant Proposed Route Links 2 and 3 could impact up to 14.9 acres within 17 NWI-mapped wetlands in the ROW.

Table 3.19-64:
Potential Construction Impacts to Wetlands within the ROW of HVDC Alternative Route 1-C

Wetland Type	Number of Wetlands	Acreage of Potential Impact
PEM	3	1.4
PFO	1	0.9
PSS	6	2.1
PUS	1	0.1
R2UB	2	0.4
Totals	13	4.9

GIS Data Source: USFWS (2014g)

One 100-year floodplain could be impacted by construction in the 200-foot-wide ROW of HVDC Alternative Route 1-C. The estimated acreage of impact for this floodplain crossing is 5.3 acres. Floodplain impacts for Applicant Proposed Route Links 2 and 3 include the crossing of two 100-year floodplains; the acreage for those crossings equals 52.4 acres.

The 200-foot-wide ROW of HVDC Alternative Route 1-C includes approximately 0.2 mile of perennial streams, 2.6 miles of intermittent streams, less than 0.1 mile of major waterbodies, and 1.2 acres of reservoirs, lakes, and ponds (Table 3.15-4). In comparison, the corresponding Applicant Proposed Route Links 2 and 3 feature approximately 0.3 mile of perennial streams, 2.4 miles of intermittent streams, less than 0.1 mile of major waterbodies, and 7.2 acres of reservoirs, lakes, and ponds.

3.19.6.3.2.1.1.4 Alternative Route 1-D

HVDC Alternative Route 1-D is 33.5 miles in length. It corresponds to Applicant Proposed Route Links 3 and 4, which are a combined 33.6 miles in length

HVDC Alternative Route 1-D could impact up to three wetland types and a total of 1.7 acres within the ROW. Table 3.19-65 provides the number of wetlands by type with the associated prediction of impact acreage for HVDC Alternative Route 1-D. In comparison, there is 0.9 acre of potential impact to wetlands in the Applicant Proposed Route Links 3 and 4.

Table 3.19-65:
Potential Construction Impacts to Wetlands within the ROW of HVDC Alternative Route 1-D

Wetland Type	Number of Wetlands	Acreage of Potential Impact
PEM	1	0.1
PSS	1	1.4
PUS	1	0.2
Totals	3	1.7

GIS Data Source: USFWS (2014g)

No FEMA 100-year floodplains are mapped within the ROW for HVDC Alternative Route 1-D. The 200-foot-wide ROW of HVDC Alternative Route 1-D includes approximately 0.1 mile of perennial streams, 2.2 miles of intermittent streams, no major waterbodies, and 0.2 acre of reservoirs, lakes, and ponds (Table 3.15-4). In comparison, the corresponding Applicant Proposed Route Links 3 and 4 feature approximately 0.1 mile of perennial streams, 2.6 miles of intermittent streams, no major waterbodies, and 1.0 acre of reservoirs, lakes, and ponds.

3.19.6.3.2.1.2 Region 2

3.19.6.3.2.1.2.1 Alternative Route 2-A

HVDC Alternative Route 2-A is 57.2 miles in length. It corresponds to Applicant Proposed Route Link 2, which is 54.4 miles in length. HVDC Alternative Route 2-A features 11 land cover types.

HVDC Alternative Route 2-A could cause as many as 10.4 acres of impacts in 26 wetlands that NWI has mapped in the ROW of the alternative. Table 3.19-66 provides the number of wetlands by type with the associated potential impact acreage for HVDC Alternative Route 2-A. By comparison, there are predicted to be as many as 9.1 acres of wetlands that could be impacted within the ROW for Applicant Proposed Route Link 2.

Table 3.19-66:
Potential Construction Impacts to Wetlands within the ROW of HVDC Alternative Route 2-A

Wetland Type	Number of Wetlands	Acreage of Potential Impact
PEM	4	0.6
PFO	1	0.0
PSS	1	2.6
PUB	8	2.2
PUS	8	1.4
R2UB	1	0.8
R2US	3	2.8
Totals	26	10.4

GIS Data Source: USFWS (2014g)

One 100-year floodplain is predicted to be impacted by construction in the 200-foot-wide ROW along HVDC Alternative Route 2-A. The estimated acreage of impact for this floodplain crossing is 4.5 acres. Applicant Proposed Route Link 2 is not projected to cross floodplains within its ROW.

As shown in Table 3.15-8, the 200-foot-wide ROW of HVDC Alternative 2-A includes approximately 3.4 miles of perennial streams, 0.6 mile of intermittent streams, 0.1 mile of major waterbodies, and 6.5 acres of reservoirs, lakes, and ponds. In comparison, the corresponding Applicant Proposed Route Link 2 features approximately 1.3 miles of perennial streams, 1.8 miles of intermittent streams, less than 0.1 mile of major waterbodies, and 0.8 acre of reservoirs, lakes, and ponds.

3.19.6.3.2.1.2.2 Alternative Route 2-B

HVDC Alternative Route 2-B is 29.8 miles in length. It corresponds to Region 2, Applicant Proposed Route Link 3, which is 31.2 miles in length.

Three 100-year floodplains are predicted to be impacted by construction in the 200-foot-wide ROW along HVDC Alternative Route 2-B. The estimated total acreage of impact for these floodplain crossings is 83.0 acres. Applicant Proposed Route Link 3 would cross four 100-year floodplains, with an estimated total of 64.5 acres of impact within the 200-foot-wide ROW.

HVDC Alternative Route 2-B could cause impacts to five wetland types and 9.3 total acres within the ROW. Table 3.19-67 provides the number of wetlands by type with the associated potential impact acreage for HVDC Alternative Route 2-B. Twelve NWI wetlands (4.5 acres within the ROW) are present in Applicant Proposed Route Link 3.

Table 3.19-67:
Potential Construction Impacts to Wetlands within the ROW of HVDC Alternative Route 2-B

Wetland Type	Number of Wetlands	Acreage of Potential Impact
PEM/PSS	1	0.5
PEM	11	6.1
PFO	1	0.5
PUB	3	0.9

Table 3.19-67:
Potential Construction Impacts to Wetlands within the ROW of HVDC Alternative Route 2-B

Wetland Type	Number of Wetlands	Acreage of Potential Impact
PUS	4	1.3
Totals	20	9.3

GIS Data Source: USFWS (2014g)

The 200-foot-wide ROW of HVDC Alternative Route 2-B includes approximately 0.5 mile of perennial streams, 1.3 miles of intermittent streams, no major waterbodies, and 1.6 acres of reservoirs, lakes, and ponds (Table 3.15-8). In comparison, the corresponding Applicant Proposed Route Link 3 features approximately 0.1 mile of perennial streams, 1.9 miles of intermittent streams, no major waterbodies, and 1.1 acres of reservoirs, lakes, and ponds.

3.19.6.3.2.1.3 Region 3

3.19.6.3.2.1.3.1 Alternative Route 3-A

HVDC Alternative Route 3-A is 37.6 miles in length. It corresponds to Applicant Proposed Route Link 1, which is 40.0 miles in length.

HVDC Alternative Route 3-A could cause impacts to four wetland types and up to 11.3 total acres within the ROW. Table 3.19-68 provides the number of wetlands by type with the associated potential impact acreage for HVDC Alternative Route 3-A. Applicant Proposed Route Link 1 features 14 NWI-mapped wetlands in its ROW. Impact for Region 3, Applicant Proposed Route Link 1 could be as many as 6.8 acres.

Table 3.19-68:
Potential Construction Impacts to Wetlands within the ROW of HVDC Alternative Route 3-A

Wetland Type	Number of Wetlands	Acreage of Potential Impact
PEM	1	0.4
PFO	5	2.2
PUB	7	4.4
PUS	22	4.3
Totals	35	11.3

GIS Data Source: USFWS (2014g)

Nine 100-year floodplains are predicted to be impacted by construction along the HVDC Alternative Route 3-A 200-foot-wide ROW. The estimated acreage of impact for these floodplain crossings equal 43.6 acres. Applicant Proposed Route Link 1 is predicted to cross six 100-year floodplains, with a total potential impact of 95 acres.

The 200-foot-wide ROW of HVDC Alternative Route 3-A includes approximately 3.6 miles of perennial streams, 1.3 miles of intermittent streams, no major waterbodies, and 9.6 acres of reservoirs, lakes, and ponds (Table 3.15-12). In comparison, the corresponding Applicant Proposed Route Link 1 features approximately 2.7 miles of perennial streams, 2.1 miles of intermittent streams, less than 0.1 mile of major waterbodies, and 4.0 acres of reservoirs, lakes, and ponds.

3.19.6.3.2.1.3.2 Alternative Route 3-B

HVDC Alternative Route 3-B is 47.7 miles in length. It corresponds to Applicant Proposed Route Links 1, 2, and 3, which are a combined 49.9 miles in length.

HVDC Alternative Route 3-B could cause impacts to as many as 49 wetlands totaling 16.8 acres within the representative ROW. Table 3.19-69 provides the number of wetlands by type with the associated potential impact acreage for HVDC Alternative Route 3-B. Applicant Proposed Route Links 1, 2, and 3 could cause as much as 9 total acres of impact in a set of 25 wetlands.

Table 3.19-69:
Potential Construction Impacts to Wetlands within the ROW of HVDC Alternative Route 3-B

Wetland Type	Number of Wetlands	Acreage of Potential Impact
PEM	1	0.4
PFO	7	4.1
PUB	19	7.7
PUS	22	4.6
Totals	49	16.8

GIS Data Source: USFWS (2014g)

Eleven 100-year floodplains are predicted to be impacted by construction in the 200-foot-wide ROW along HVDC Alternative Route 3-B. The estimated acreage of impact for these floodplain crossings equal 60.5 acres. Applicant Proposed Route Links 1, 2, and 3 are predicted to impact eight 100-year floodplains, totaling 123.5 acres in the ROW.

The 200-foot-wide ROW of HVDC Alternative Route 3-B includes approximately 4.7 miles of perennial streams, 1.3 miles of intermittent streams, less than 0.1 mile of major waterbodies, and 13.2 acres of reservoirs, lakes, and ponds (Table 3.15-12). In comparison, the corresponding Applicant Proposed Route Links 1, 2 and 3 feature approximately 4.1 miles of perennial streams, 2.1 miles of intermittent streams, less than 0.1 mile of major waterbodies, and 7.2 acres of reservoirs, lakes, and ponds.

3.19.6.3.2.1.3.3 Alternative Route 3-C

HVDC Alternative Route 3-C is 121.6 miles in length. It corresponds to Applicant Proposed Route Links 3, 4, 5, and 6, which are a combined 118.6 miles in length.

HVDC Alternative Route 3-C could cause 90.3 acres of impact to as many as 127 wetlands within the ROW. Table 3.19-70 provides the number of wetlands by type with the associated potential impact acreage for HVDC Alternative Route 3-C. Corresponding Applicant Proposed Route Links 3, 4, 5, and 6 could cause a total of 52.6 acres of impact to a group of approximately 130 wetlands within the representative ROW.

Table 3.19-70:
Potential Construction Impacts to Wetlands within the ROW of HVDC Alternative Route 3-C

Wetland Type	Number of Wetlands	Acreage of Potential Impact
L1UB	1	0.0
PEM	14	6.2
PFO/PSS	3	5.6
PFO	26	55.3
PEM/PSS	2	1.3
PUB	76	17.3
PUS	2	0.3
R2UB	1	1.3
R2US	2	3.0
Totals	127	90.3

GIS Data Source: USFWS (2014g)

Seventeen 100-year floodplains are predicted to be impacted by construction in the 200-foot-wide ROW along HVDC Alternative Route 3-C; the estimated acreage of impact equals 305.6 acres. Applicant Proposed Route Links 3, 4, 5, and 6 are predicted to cross 13 100-year floodplains, with a predicted impact total of 198.2 acres.

The 200-foot-wide ROW of HVDC Alternative Route 3-C includes approximately 5.6 miles of perennial streams, 8.8 miles of intermittent streams, 0.1 mile of major waterbodies, and 20.4 acres of reservoirs, lakes, and ponds (Table 3.15-12). In comparison, the corresponding Applicant Proposed Route Links 3, 4, 5 and 6 feature approximately 7.2 miles of perennial streams, 5.7 miles of intermittent streams, 0.1 mile of major waterbodies, and 32.3 acres of reservoirs, lakes, and ponds.

3.19.6.3.2.1.3.4 Alternative Route 3-D

HVDC Alternative Route 3-D is 39.3 miles in length. It corresponds to Applicant Proposed Route Links 5 and 6, which are a combined 35.1 miles in length.

HVDC Alternative Route 3-D could cause impacts to 66 wetlands totaling up to 37.9 acres within the representative ROW. Table 3.19-71 provides the number of wetlands by type and the associated potential impact acreage for HVDC Alternative Route 3-D. The corresponding Applicant Proposed Route Links 5 and 6 could cause 14.7 acres of impact in 39 NWI-mapped wetlands within the ROW.

Table 3.19-71:
Potential Construction Impacts to Wetlands within the ROW of HVDC Alternative Route 3-D

Wetland Type	Number of Wetlands	Acreage of Potential Impact
PEM	10	5.1
PFO/PSS	3	5.6
PFO	14	19.3
PEM/PSS	2	1.3
PUB	37	6.6
Totals	66	37.9

GIS Data Source: USFWS (2014g)

Seven 100-year floodplains are predicted to be impacted by construction in the 200-foot-wide ROW along HVDC Alternative Route 3-D; the estimated acreage of impact equals 91.5 acres. Applicant Proposed Route Links 5 and 6 are predicted to total approximately 41.6 acres of impact from the crossing of three 100-year floodplains.

The 200-foot-wide ROW of HVDC Alternative Route 3-D includes approximately 0.8 mile of perennial streams, 4.2 miles of intermittent streams, no major waterbodies, and 9.1 acres of reservoirs, lakes, and ponds (Table 3.15-12). In comparison, the corresponding Applicant Proposed Route Links 5 and 6 feature approximately 2.0 miles of perennial streams, 1.9 miles of intermittent streams, less than 0.1 mile of major waterbodies, and 7.1 acres of reservoirs, lakes, and ponds.

3.19.6.3.2.1.3.5 Alternative Route 3-E

HVDC Alternative Route 3-E is 8.5 miles in length. It corresponds to Applicant Proposed Route Link 6, which is 7.7 miles in length.

HVDC Alternative Route 3-E could cause impacts to 12 wetlands totaling 10.9 acres within the representative ROW. Table 3.19-72 provides the number of wetlands by type with the associated potential impact acreage for HVDC Alternative Route 3-E. The corresponding Applicant Proposed Route Link 6 could cause 1.8 acres of impact within seven NWI-mapped wetlands in its representative ROW.

Table 3.19-72:
Potential Construction Impacts to Wetlands within the ROW of HVDC Alternative Route 3-E

Wetland Type	Number of Wetlands	Acreage of Potential Impact
PFO/PSS	3	7.2
PFO	2	2.1
PUB	7	1.6
Totals	12	10.9

GIS Data Source: USFWS (2014g)

Two 100-year floodplains are predicted to be impacted by construction in the 200-foot-wide ROW along HVDC Alternative Route 3-E. The estimated acreage of impact for these 100-year floodplain crossings is predicted to be 21.2 acres.

The 200-foot-wide ROW of HVDC Alternative Route 3-E includes approximately 0.1 mile of perennial streams, 1.5 miles of intermittent streams, no major waterbodies, and 1.3 acres of reservoirs, lakes, and ponds (Table 3.15-12). In comparison, the corresponding Applicant Proposed Route Link 6 features no perennial streams, 0.8 mile of intermittent streams, no major waterbodies, and 1.5 acres of reservoirs, lakes, and ponds.

3.19.6.3.2.1.4 Region 4

3.19.6.3.2.1.4.1 Alternative Route 4-A

HVDC Alternative Route 4-A is 58.4 miles in length. It corresponds to Applicant Proposed Route Links 3, 4, 5, and 6, which are a combined 60.4 miles in length.

HVDC Alternative Route 4-A could cause impacts in as many as 27 NWI-mapped wetlands for a total of 11.3 acres within the representative ROW. Table 3.19-73 provides the number of wetlands by type with the associated potential impact acreage HVDC Alternative Route 4-A. Applicant Proposed Route Links 3, 4, 5, and 6 could have a total of approximately 13.6 acres of impact to wetlands in its representative ROW.

Table 3.19-73:
Potential Construction Impacts to Wetlands within the ROW of HVDC Alternative Route 4-A

Wetland Type	Number of Wetlands	Acreage of Potential Impact
PFO	2	1.8
PEM/PSS	1	1.3
PUB	22	6.8
L2US	2	1.4
Totals	27	11.3

GIS Data Source: USFWS (2014g)

Thirteen 100-year floodplains are predicted to be impacted by construction in the 200-foot-wide ROW along HVDC Alternative Route 4-A. The estimated acreage of impact for these floodplain crossings equals 130.2 acres. Applicant Proposed Route Links 3, 4, 5, and 6 are predicted to total approximately 409.2 acres of temporary impact to 23 100-year floodplains within the ROW.

The 200-foot-wide ROW of HVDC Alternative Route 4-A includes approximately 1.4 miles of perennial streams, 4.3 miles of intermittent streams, 0.1 mile of major waterbodies, and 5.5 acres of reservoirs, lakes, and ponds (Table 3.15-16). In comparison, the corresponding Applicant Proposed Route Links 3, 4, 5, and 6 feature approximately 1.7 miles of perennial streams, 3.9 miles of intermittent streams, 0.2 mile of major waterbodies, and 4.4 acres of reservoirs, lakes, and ponds.

3.19.6.3.2.1.4.2 Alternative Route 4-B

HVDC Alternative Route 4-B is 78.6 miles in length. It corresponds to Region 4, Applicant Proposed Route Links 2–8, which are a combined 81.3 miles in length.

HVDC Alternative Route 4-B could cause impacts to 18 wetlands and 9.0 total acres within the representative ROW. Table 3.19-74 provides the number of wetlands by type with the associated potential impact acreage for HVDC Alternative Route 4-B. By comparison, construction of the Applicant Proposed Route Links 2–8 could result in approximately 13.7 acres of impact to 29 NWI-mapped wetlands in its ROW.

Table 3.19-74:
Potential Construction Impacts to Wetlands within the ROW of HVDC Alternative Route 4-B

Wetland Type	Number of Wetlands	Acreage of Potential Impact
PFO/PSS	1	0.7
PFO	1	2.0
PEM/PSS	1	1.3
PSS	1	0.1
PUB	12	4.1
L2UB	1	0.5
L2US	1	0.3
Totals	18	9

GIS Data Source: USFWS (2014g)

Twelve 100-year floodplains may be impacted by construction in the 200-foot-wide ROW along HVDC Alternative Route 4-B. These impacts are predicted to equal 104.4 acres. Applicant Proposed Route Links 2–8 are predicted to cross approximately 25 100-year floodplains, resulting in the potential for 413.4 acres of impact within the ROW.

The 200-foot-wide ROW would of HVDC Alternative Route 4-B encompasses includes approximately 1.6 miles of perennial streams, 5.9 miles of intermittent streams, 0.1 mile of major waterbodies, and 5.0 acres of reservoirs, lakes, and ponds (Table 3.15-16). In comparison, the corresponding Applicant Proposed Route Links 2, 3, 4, 5, 6, 7 and 8 feature approximately 2.5 miles of perennial streams, 4.8 miles of intermittent streams, 0.2 mile of major waterbodies, and 7.6 acres of reservoirs, lakes, and ponds.

3.19.6.3.2.1.4.3 Alternative Route 4-C

HVDC Alternative Route 4-C is 3 miles in length. It corresponds to Applicant Proposed Route Link 5, which is 2 miles in length.

No NWI-mapped wetlands are documented for the ROW in Alternative Route 4-C. Because NWI data is lacking for this alternative route, NLCD was also queried to estimate wetland acreage within this ROW. NLCD data also documented no wetlands in the ROW.

No 100-year floodplains are mapped in the 200-foot-wide ROW for HVDC Alternative Route 4-C.

The 200-foot-wide corridor of HVDC Alternative Route 4-C includes approximately 0.2 mile of perennial streams, 0.1 mile of intermittent streams, no major waterbodies, and 0.8 acre of reservoirs, lakes, and ponds (Table 3.15-16). In comparison, the corresponding Applicant Proposed Route Link 5 features approximately less than 0.1 mile of perennial streams, 0.2 mile of intermittent streams, no major waterbodies, and 0.3 acre of reservoirs, lakes, and ponds.

3.19.6.3.2.1.4.4 Alternative Route 4-D

HVDC Alternative Route 4-D is 25.3 miles in length. It corresponds to Applicant Proposed Route Links 4, 5 and 6, which are a combined 25.4 miles in length.

HVDC Alternative Route 4-D could cause impacts in two wetlands with a total of 0.3 acre of impacts within the ROW. In comparison, the Applicant Proposed Route Links 4, 5, and 6 could impact 0.1 acre of wetland in a single wetland that is crossed by its representative ROW.

Seven 100-year floodplains are predicted to be impacted by construction in the 200-foot-wide ROW along HVDC Alternative Route 4-D. The estimated acreage of impact for these floodplain crossings equal 47.9 acres. Applicant Proposed Route Links 4, 5 and 6 are predicted to total approximately 409.2 acres of impact from the crossing of 23 100-year floodplains.

The 200-foot-wide ROW of HVDC Alternative Route 4-D includes approximately 0.7 mile of perennial streams, 2.1-miles of intermittent streams, less than 0.1 mile of major waterbodies, and 3.1 acres of reservoirs, lakes, and ponds (Table 3.15-16). In comparison, the corresponding Applicant Proposed Route Links 4, 5, and 6 feature approximately 1.3 miles of perennial streams, 1.3 miles of intermittent streams, 0.1 mile of major waterbodies, 2.9 acres of reservoirs, lakes, and ponds.

3.19.6.3.2.1.4.5 Alternative Route 4-E

HVDC Alternative Route 4-E is 36.7 miles in length. It corresponds to Applicant Proposed Route Links 8 and 9, which are a combined 38.7 miles in length.

There are no documented NWI wetlands in the 200-foot-wide ROW along the route of HVDC Alternative 4-E or along the corresponding Applicant Proposed Route Links 8 and 9 in Region 4. Because NWI data is lacking for this alternative route, NLCD land cover data were also evaluated. That data set documented 0.09 acres of woody wetlands in the ROW. The corresponding Applicant Proposed Route Links 8 and 9 did not have documented wetland land cover within the representative ROW.

Nine 100-year floodplains are predicted to be impacted by construction in the 200-foot-wide ROW along HVDC Alternative Route 4-E for a total of 67.4 acres. Applicant Proposed Route Links 8 and 9 are predicted to total approximately 95.2 acres of impact in existing floodplains.

The 200-foot-wide corridor of HVDC Alternative Route 4-E includes approximately 0.6 mile of perennial streams, 3.8 miles of intermittent streams, 0.1 mile of major waterbodies, and 7.5 acres of reservoirs, lakes, and ponds (Table 3.15-16). In comparison, the corresponding Applicant Proposed Route Links 8 and 9 feature approximately 0.9 mile of perennial streams, 2.9 miles of intermittent streams, less than 0.1 mile of major waterbodies, and 3.2 acres of reservoirs, lakes, and ponds.

3.19.6.3.2.1.5 Region 5

3.19.6.3.2.1.5.1 Alternative Route 5-A

HVDC Alternative Route 5-A is 12.6 miles in length. It corresponds to Region 5, Applicant Proposed Route Link 1, which is 12.3 miles in length.

There are no NWI wetlands mapped in the representative ROW along the route of HVDC Alternative Route 5-A, nor is there NLCD wetland land cover documented in ROW. There are no predicted impacts to NWI wetlands documented within the representative ROW corresponding to Applicant Proposed Route Link 1.

Two 100-year floodplains are predicted to be impacted by construction in the 200-foot-wide ROW along HVDC Alternative Route 5-A for a total of 13.7 acres. Applicant Proposed Route Link 1 is predicted to total approximately 24.6 acres of impact to a single 100-year floodplain within its ROW.

The 200-foot-wide ROW of HVDC Alternative Route 5-A includes approximately 0.1 mile of perennial streams, 0.9 mile of intermittent streams, less than 0.1 mile of major waterbodies, and 0.5 acre of reservoirs, lakes, and ponds (Table 3.15-20). In comparison, the corresponding Applicant Proposed Route Link 1 features approximately 0.3 mile of perennial streams, 0.6 mile of intermittent streams, less than 0.1 mile of major waterbodies, and 0.9 acre of reservoirs, lakes, and ponds.

3.19.6.3.2.1.5.2 Alternative Route 5-B

HVDC Alternative Route 5-B is 71.0 miles in length. It corresponds to Applicant Proposed Route Links 3, 4, 5, and 6, which are a combined 67.1 miles in length. There are no NWI wetlands documented in the representative ROW along the route of Alternative Route 5-B; however, there are 4.3 acres of NLCD wetland land cover (woody wetlands) present in the ROW that could be impacted. Construction of Applicant Proposed Route Links 3, 4, 5, and 6 is not predicted to cause adverse impacts to wetland resources within the representative ROWs based on NWI data. However, NLCD data document a total of 9.3 acres of woody wetland land cover.

Eight 100-year floodplains are predicted to be impacted by construction in the 200-foot-wide ROW along HVDC Alternative Route 5-B for a total of 159.5 acres. Applicant Proposed Route Links 3, 4, 5, and 6 are predicted to impact a total of approximately 64.6 acres within nine 100-year floodplains in the ROW.

The 200-foot-wide ROW of HVDC Alternative Route 5-B includes approximately 1.2 miles of perennial streams, 8.6 miles of intermittent streams, 0.1 mile of major waterbodies, and 10.4 acres of reservoirs, lakes, and ponds (Table 3.15-20). In comparison, the corresponding Applicant Proposed Route Links 3, 4, 5 and 6 feature approximately 1.0 miles of perennial streams, 6.6 miles of intermittent streams, 0.1 mile of major waterbodies, and 13.8 acres of reservoirs, lakes, and ponds.

3.19.6.3.2.1.5.3 Alternative Route 5-C

HVDC Alternative Route 5-C is 9.2 miles in length. It corresponds to Applicant Proposed Route Link 6, which is approximately 9.4 miles in length.

There are no NWI wetlands mapped in the 200-foot-wide ROW along HVDC Alternative Route 5-C; however, there is 0.3 acre of NLCD wetland land cover (woody wetlands) documented in the ROW. There are no NWI wetlands documented within the representative ROW corresponding to Applicant Proposed Route Link 6; however, there are 8.2 acres of woody wetland land cover documented for the 200-foot-wide ROW for this link.

One 100-year floodplain is predicted to be impacted by construction in the 200-foot-wide ROW along HVDC Alternative Route 5-C for a total of 19.2 acres. Construction of Applicant Proposed Route Link 6 is predicted to cross one 100-year floodplain and total approximately 19.3 acres of temporary impacts in the ROW.

The 200-foot-wide ROW of HVDC Alternative Route 5-C includes under 0.4 mile of perennial streams, approximately 0.5 mile of intermittent streams, less than 0.1 mile of major waterbodies, and 0.4 acre of reservoirs, lakes, and ponds (Table 3.15-20). In comparison, the corresponding Applicant Proposed Route Link 6 features approximately 0.2 mile of perennial streams, 0.4 mile of intermittent streams, less than 0.1 mile of major waterbodies, and 1.3 acres of reservoirs, lakes, and ponds.

3.19.6.3.2.1.5.4 Alternative Route 5-D

HVDC Alternative Route 5-D is 21.7 miles in length. It corresponds to Applicant Proposed Route Link 9, which is 20.5 miles in length. HVDC Alternative Route 5-D could cause impacts to 15 wetlands totaling 12.4 total acres within the representative ROW. Table 3.19-75 provides the number of wetlands by type with the associated potential impact acreage for HVDC Alternative Route 5-D. Construction of Applicant Proposed Route Link 9 may result in impacts totaling 11.5 acres in 17 wetlands within its representative ROW.

Table 3.19-75:
Potential Construction Impacts to Wetlands within the ROW of HVDC Alternative Route 5-D

Wetland Type	Number of Wetlands	Acreage of Potential Impact
PEM	2	1.0
PFO	2	4.7
PUB	9	3.0
R2UB	2	3.7
Totals	15	12.4

GIS Data Source: USFWS (2014g)

One 100-year floodplain is predicted to be impacted by construction in the 200-foot-wide ROW along HVDC Alternative Route 5-D for a total of 4.1 acres. Construction of Applicant Proposed Route Link 9 is predicted to result in 1.3 acres of impact within one mapped floodplain.

The 200-foot-wide ROW of HVDC Alternative Route 5-D includes approximately 0.4 mile of perennial streams, 1.7 miles of intermittent streams, 0.1 mile of major waterbodies, and 1.6 acres of reservoirs, lakes, and ponds (Table 3.15-20). In comparison, the corresponding Applicant Proposed Route Link 9 features approximately 0.3 mile of perennial streams, 1.4 miles of intermittent streams, 0.1 mile of major waterbodies, and 2 acres of reservoirs, lakes, and ponds.

3.19.6.3.2.1.5.5 Alternative Route 5-E

HVDC Alternative Route 5-E is 36.3 miles in length. It corresponds to Applicant Proposed Route Links 4, 5, and 6, which are a combined 33.1 miles in length.

There are no predicted impacts to NWI wetlands in the representative ROW along HVDC Alternative Route 5-E. NLCD wetland land cover does document 0.1 acre of woody wetlands within the 200-foot-wide ROW. No NWI wetlands were documented for the representative ROW for the corresponding Applicant Proposed Route Links 4, 5, and 6. However, the NLCD database does document 8.2 acres of woody wetlands within Link 6.

Five 100-year floodplains are predicted to be impacted by construction in the 200-foot-wide ROW along HVDC Alternative Route 5-E for a total of 93.1 acres. Construction of Applicant Proposed Route Links 4, 5, and 6 are predicted to result in the crossing of six 100-year floodplains, with a predicted total of 42.6 acres of impacts.

The 200-foot-wide corridor of HVDC Alternative Route 5-E includes approximately 0.5 mile of perennial streams, 4.3 miles of intermittent streams, less than 0.1 mile of major waterbodies, and 3.2 acres of reservoirs, lakes, and ponds (Table 3.15-20). In comparison, the corresponding Applicant Proposed Route Links 4, 5 and 6 feature approximately 0.4 mile of perennial streams, 3.3 miles of intermittent streams, less than 0.1 mile of major waterbodies, and 7.0 acres of reservoirs, lakes, and ponds.

3.19.6.3.2.1.5.6 Alternative Route 5-F

HVDC Alternative Route 5-F is 22.3 miles in length. It corresponds to Applicant Proposed Route Links 5 and 6, which are a combined 18.7 miles in length.

There are no mapped wetland resources within the representative ROW for either HVDC Alternative Route 5-F or Applicant Proposed Route Links 5 and 6. NLCD data reveal 0.1 acre of woody wetland land cover within the 200-foot-wide ROW for Alternative Route 5-F, and also document 8.2 acres of woody wetland land cover for the ROW for Link 6 of the Applicant Proposed Route.

Three 100-year floodplains are predicted to be impacted by construction along HVDC Alternative Route 5-F for a total impact acreage of 74.7 acres. Construction of Applicant Proposed Route Links 5 and 6 are predicted to result in 38.1 acres of impacts four 100-year floodplains crossed by this ROW.

The 200-foot-wide ROW of HVDC Alternative Route 5-F includes under 0.3 mile of perennial streams, approximately 2.6 miles of intermittent streams, less than 0.1 mile of major waterbodies, and 0.7 acre of reservoirs, lakes, and ponds (Table 3.15-20). In comparison, the corresponding Applicant Proposed Route Links 5 and 6 feature approximately 0.3 mile of perennial streams, 2.1 miles of intermittent streams, less than 0.1 mile of major waterbodies, and 3.4 acres of reservoirs, lakes, and ponds.

3.19.6.3.2.1.6 Region 6

3.19.6.3.2.1.6.1 Alternative Route 6-A

HVDC Alternative Route 6-A is 16.2 miles in length. It corresponds to Region 6, Applicant Proposed Route Links 2, 3, and 4, which are a combined 17.7 miles in length.

HVDC Alternative Route 6-A could cause impacts to 18 wetlands and 25.9 total acres within the representative ROW. Table 3.19-76 provides the number of wetlands by type with the associated potential impact acreage for HVDC Alternative Route 6-A. In comparison, construction of Applicant Proposed Route Links 2, 3 and 4 could result in as much as 3.4 acres of impacts to a set of eight wetlands.

Table 3.19-76:
Potential Construction Impacts to Wetlands within the ROW of HVDC Alternative Route 6-A

Wetland Type	Number of Wetlands	Acreage of Potential Impact
PEM	2	0.4
PFO	11	19.7
PSS	1	1.6
PUB	2	3.2
R2UB	2	1.0
Totals	18	25.9

GIS Data Source: USFWS (2014g)

One 100-year floodplain is predicted to be impacted by construction in the 200-foot-wide ROW along HVDC Alternative Route 6-A for a total of 232.5 acres. Applicant Proposed Route Links 2, 3, and 4 are predicted to cross one 100-year floodplain with a potential to cause 103.2 acres of impacts.

The 200-foot-wide ROW of HVDC Alternative Route 6-A includes approximately 0.3 mile of perennial streams, 2.2 miles of intermittent streams, less than 0.1 mile of major waterbodies, and 0.4 acre of reservoirs, lakes, and ponds (Table 3.15-24). In comparison, the corresponding Applicant Proposed Route Links 2, 3 and 4 feature approximately 0.3 mile of perennial streams, 2.2 miles of intermittent streams, less than 0.1 mile of major waterbodies, and 1.9 acres of reservoirs, lakes, and ponds.

3.19.6.3.2.1.6.2 Alternative Route 6-B

HVDC Alternative Route 6-B is 14.1 miles in length. It corresponds to Region 6, Applicant Proposed Route Link 3, which is 9.6 miles in length.

HVDC Alternative Route 6-B could cause impacts to 10 wetlands and 15.8 total acres within the ROW. Table 3.19-77 provides the number of wetlands by type with the associated potential impact acreage for HVDC Alternative Route 6-B. In comparison, construction of Applicant Proposed Route Link 3 is predicted to result in 3.1 acres of impacts in four wetlands within its representative ROW.

Table 3.19-77:
Potential Construction Impacts to Wetlands within the ROW of HVDC Alternative Route 6-B

Wetland Type	Number of Wetlands	Acreage of Potential Impact
PFO	6	13.2
PSS	1	1.0
PUB	3	1.6
Totals	10	15.8

GIS Data Source: USFWS (2014g)

No 100-year floodplains are predicted to be crossed by HVDC Alternative Route 6-B in its 200-foot-wide ROW.

The 200-foot-wide ROW of HVDC Alternative Route 6-B includes approximately 0.2 mile of perennial streams, 1.5 miles of intermittent streams, no major waterbodies, and 2.4 acres of reservoirs, lakes, and ponds (Table 3.15-24). In comparison, the corresponding Applicant Proposed Route Link 3 features less than 0.1 mile of perennial streams, 1.9 miles of intermittent streams, less than 0.1 mile of major waterbodies, and 0.9 acres of reservoirs, lakes, and ponds.

3.19.6.3.2.1.6.3 Alternative Route 6-C

HVDC Alternative Route 6-C is 23.1 miles in length. It corresponds to Applicant Proposed Route Links 6 and 7, which are a combined 24.8 miles in length.

There are no NWI-mapped wetlands in the representative ROW for either HVDC Alternative Route 6-C, or for Applicant Proposed Route Links 6 and 7. However, NLCD data show that there are 9.4 acres of woody wetland land cover in HVDC Alternative Route 6-D, and Applicant Proposed Route Links 6 and 7 have a combined total of 45.9 acres of woody wetland and emergent herbaceous wetland land cover.

Four 100-year floodplains are predicted to be impacted by construction in the 200-foot-wide ROW along HVDC Alternative Route 6-C for a total of 94.6 acres. Applicant Proposed Route Links 6 and 7 are predicted to cross two 100-year floodplains with a resultant potential for 170.2 acres of wetland impacts in the ROW.

The 200-foot-wide ROW of HVDC Alternative Route 6-C includes approximately 0.4 mile of perennial streams, 1.1 miles of intermittent streams, 0.1 mile of major waterbodies, and 1.6 acres of reservoirs, lakes, and ponds (Table 3.15-24). In comparison, the corresponding Applicant Proposed Route Links 6 and 7 feature approximately

0.3 mile of perennial streams, 1.0 miles of intermittent streams, 0.1 mile of major waterbodies, and 0.1 acre of reservoirs, lakes, and ponds.

3.19.6.3.2.1.6.4 Alternative Route 6-D

HVDC Alternative Route 6-D is 9.2 miles in length. It corresponds to Region 6, Applicant Proposed Route Link 7, which is 8.6 miles in length.

There are no NWI-mapped wetlands in the representative ROW for either HVDC Alternative Route 6-D or for Applicant Proposed Route Link 7. However, NLCD data show that there are 22.1 acres of woody wetland land cover in HVDC Alternative Route 6-C, and Applicant Proposed Route Links 6 and 7 have a combined total of 45.9 acres of woody wetland and emergent herbaceous wetland land cover.

Two 100-year floodplains are predicted to be impacted by construction in the 200-foot-wide ROW along HVDC Alternative Route 6-D for a total of 108.8 acres. In contrast, Applicant Proposed Route Link 7 is predicted to cross one 100-year floodplain, resulting in the potential for 151.0 acres of impact.

The 200-foot-wide ROW of HVDC Alternative Route 6-D includes approximately 0.3 mile of perennial streams, 0.3 mile of intermittent streams, 0.1 mile of major waterbodies, and no acreage of reservoirs, lakes, and ponds (Table 3.15-24). Riparian areas may be associated with many, if not all, of these surface water features. In comparison, the corresponding Applicant Proposed Route Link 7 features approximately 0.1 mile of perennial streams, 0.2 mile of intermittent streams, 0.1 mile of major waterbodies, and no acreage of reservoirs, lakes or ponds.

3.19.6.3.2.1.7 Region 7

3.19.6.3.2.1.7.1 Alternative Route 7-A

HVDC Alternative Route 7-A is 43.2 miles in length. It corresponds to Region 7, Applicant Proposed Route Link 1, which is 28.6 miles in length.

HVDC Alternative Route 7-A could cause impacts in 10 wetlands totaling 26.6 acres within the representative ROW. Table 3.19-78 provides the number of wetlands by type with the associated potential impact acreage for HVDC Alternative Route 7-A. Construction of Applicant Proposed Route Link 1 could result in up to 38.3 acres of impacts to 19 wetlands.

Table 3.19-78:
Potential Construction Impacts to Wetlands within the ROW of HVDC Alternative Route 7-A

Wetland Type	Number of Wetlands	Acreage of Potential Impact
PEM	1	1.9
PFO	7	10.0
L2UB	2	14.7
Totals	10	26.6

GIS Data Source: USFWS (2014g)

Eight 100-year floodplains are predicted to be impacted by construction in the 200-foot-wide ROW along HVDC Alternative Route 7-A for a total of 314.4 acres. Applicant Proposed Route Link 1 is predicted would cross 10 mapped 100-year floodplains resulting in an estimated 247.9 acres of impacts.

As shown in Table 3.15-28, the 200-foot-wide ROW of HVDC Alternative Route 7-A includes approximately 1.8 miles of perennial streams, 4.7 miles of intermittent streams, 0.9 mile of major waterbodies, and 2.4 acres of reservoirs, lakes, and ponds. In comparison, the corresponding Applicant Proposed Route Link 1 features approximately 0.3 mile of perennial streams, 2.7 miles of intermittent streams, 0.6 mile of major waterbodies, and 1.5 acres of reservoirs, lakes or ponds.

3.19.6.3.2.1.7.2 Alternative Route 7-B

HVDC Alternative Route 7-B is 8.6 miles in length. It corresponds to Applicant Proposed Route Links 3 and 4, which are a combined 8.4 miles in length.

HVDC Alternative Route 7-B could cause impacts to five wetland types and 2.6 acres within the ROW. Table 3.19-79 provides the number of wetlands by type with the associated potential impact acreage. In comparison, construction of Applicant Proposed Route Links 3 and 4 could result in approximately 1.4 acre of impacts in a set of two wetlands.

Table 3.19-79:
Potential Construction Impacts to Wetlands within the ROW of HVDC Alternative Route 7-B

Wetland Type	Number of Wetlands	Acreage of Potential Impact
PFO	3	2.0
PSS	1	0.5
PUB	1	0.1
Totals	5	2.6

GIS Data Source: USFWS (2014g)

Three 100-year floodplains are predicted to be impacted by construction in the 200-foot-wide ROW along HVDC Alternative Route 7-B for a total of 50.4 acres. Applicant Proposed Route Links 3 and 4 would cross nine 100-year floodplains with a resultant potential for 47.9 acres of impact.

The 200-foot-wide ROW of HVDC Alternative Route 7-B includes approximately 0.1 mile of perennial streams, 0.6 mile of intermittent streams, no major waterbodies, and no acreage of reservoirs, lakes, and ponds (Table 3.15-28). In comparison, the corresponding Applicant Proposed Route Links 3 and 4 feature approximately 0.1 mile of perennial streams, 0.8 mile of intermittent streams, no major waterbodies, and 0.1 acre of reservoirs, lakes, or ponds.

3.19.6.3.2.1.7.3 Alternative Route 7-C

HVDC Alternative Route 7-C is 23.8 miles in length. It corresponds to Region 7, Applicant Proposed Route Links 3, 4 and 5, which are a combined 13.2 miles in length.

HVDC Alternative Route 7-C could cause impacts to as many as 22 wetlands totaling 16.9 total acres within the ROW. Table 3.19-80 provides the number of wetlands by type with the associated potential impact acreage.

Construction of Applicant Proposed Route Links 3, 4, and 5 could result in approximately 3.5 acres of impacts in four wetlands within its ROW.

Table 3.19-80:
Potential Construction Impacts to Wetlands within the ROW of HVDC Alternative Route 7-C

Wetland Type	Number of Wetlands	Acreage of Potential Impact
PEM	2	0.5
PFO	11	12.9
PSS	3	0.5
PUB	6	3.0
Totals	22	16.9

GIS Data Source: USFWS (2014g)

Fifteen 100-year floodplains are predicted to be impacted by construction in the 200-foot-wide ROW along HVDC Alternative Route 7-C for a total impact acreage of 160.2 acres. Applicant Proposed Route Links 3, 4, and 5 would cross 13 100-year floodplains with a potential for 69.9 acres of total impact.

The 200-foot-wide ROW of HVDC Alternative Route 7-C includes approximately 0.4 mile of perennial streams, 1.9 miles of intermittent streams, less than 0.1 mile of major waterbodies, and 0.9 acre of reservoirs, lakes, and ponds (Table 3.15-28). In comparison, the corresponding Applicant Proposed Route Links 3, 4 and 5 feature approximately 0.2 mile of perennial streams, 1.6 miles of intermittent streams, no major waterbodies, and 0.9 acre of reservoirs, lakes or ponds.

3.19.6.3.2.1.7.4 Alternative Route 7-D

HVDC Alternative Route 7-D is 6.5 miles in length. It corresponds to Applicant Proposed Route Links 4 and 5, which are a combined 6.4 miles in length.

HVDC Alternative Route 7-D could cause impacts to four wetlands and 7.3 total acres within the representative ROW. Table 3.19-81 provides the number of wetlands by type with the associated potential impact acreage. Construction of Applicant Proposed Route Links 4 and 5 could result in approximately 2.3 acres of impacts in a total of three wetlands within its representative ROW.

Table 3.19-81:
Potential Construction Impacts to Wetlands within the ROW of HVDC Alternative Route 7-D

Wetland Type	Number of Wetlands	Acreage of Potential Impact
PFO	3	7.3
PUB	1	0.1
Totals	4	7.4

GIS Data Source: USFWS (2014g)

Nine 100-year floodplains are predicted to be impacted by construction in the 200-foot-wide ROW along HVDC Alternative Route 7-D for a total of 56.2 acres. Applicant Proposed Route Links 4 and 5 would cross seven 100-year floodplains and could potentially impact 43.2 acres within the ROW.

The 200-foot-wide ROW of HVDC Alternative Route 7-D includes approximately 0.3 mile of perennial streams, 0.9 mile of intermittent streams, no major waterbodies, and no acreage of reservoirs, lakes, and ponds (Table 3.15-28). In comparison, the corresponding Applicant Proposed Route Links 4 and 5 feature approximately 0.1 mile of perennial streams, 1.0 mile of intermittent streams, no major waterbodies, and 0.8 acre of reservoirs, lakes, or ponds.

3.19.6.3.2.2 Operations and Maintenance Impacts

The operation and maintenance of the HVDC transmission line in the alternative routes would involve routine and periodic vegetation management according to the TVMP. Impacts related to operations and maintenance may result from use of heavy machinery through wetlands, floodplains, and riparian areas. These impacts can cause soil compaction and mechanical damage or removal of vegetation. These operations and maintenance impacts are anticipated to cover a range from temporary and minor to potentially more severe and long-term/permanent. The estimated acreage of each resource type (wetlands, floodplains, and riparian areas) for each route, is provided in the previous subsections of 3.19.6.3.2.1.

The use of vegetation management would be necessary to protect the Project infrastructure and enhance safety. However, the trimming, mowing, or removal of vegetation can cause changes to plant diversity and function in all three ecosystem types (i.e., wetlands, floodplains, and riparian areas). Vegetation maintenance in wetlands and riparian areas should be kept to a minimum to the extent practicable. Additionally, the use of herbicides can cause minor to severe impacts to vegetation in areas where they are applied. If used, the Applicant would selectively apply herbicides within streamside management zones.

3.19.6.3.2.3 Decommissioning Impacts

The decommissioning impacts relative to the alternative routes would be similar in nature to the set of temporary impacts resulting from initial construction. These temporary impacts would involve use of construction machinery at the various sites of infrastructure (e.g., the lattice structures, lattice crossing structures, monopole structures, guyed structures, fiber optic infrastructure, etc.) to remove aboveground material, and foundation material where required. Use of construction machinery would have the potential to crush or remove vegetation, but no long-term effects are judged to be likely from the decommissioning phase of the Project. Revegetation would be guided by the Project's Decommissioning Plan and by any conditions of a CWA permit, where applicable.

3.19.6.4 Best Management Practices

The Applicant has developed a comprehensive list of EPMs that avoid and minimize impacts to wetlands, floodplains, and riparian areas. A complete list of EPMs for the Project is provided in Appendix F; those EPMs that would specifically minimize the potential for an impact on wetlands, floodplains, and riparian areas are summarized in Section 3.19.6.1. DOE, in consultation with the USACE, has identified the following BMPs to avoid or minimize impacts on wetlands, floodplains, and riparian areas:

- In addition to protection of intermittent and perennial streams, ephemeral streams would also be included in the Applicant's streamside management zones. This BMP would add to EPM W-3.
- In addition to minimization of clearing vegetation within the ROW (GE-3), it is recommended that where tree removal is necessary in the ROW, this removal should be accomplished at ground level leaving root wads in place to aid in the stabilization of soils.

- Limit, to the extent practicable, the amount of vegetation removed along streambanks and minimizing the disruption of natural drainage patterns.
- All permanent and temporary crossings of waterbodies would be suitably culverted, bridged, or otherwise designed and constructed to maintain low flows to sustain the movement of aquatic species. The crossings would also be constructed to withstand expected high flows. The crossings would not restrict or impede the passage of normal or high flows.
- Excavated trenches that are to be backfilled should separate the upper 12 inches of topsoil from the rest of the excavated material. The topsoil should be used as the final backfill.

3.19.6.5 Unavoidable Adverse Impacts

Unavoidable adverse impacts to wetlands, floodplains, and riparian areas from the Project may include, but are not necessarily limited to, the following elements:

- Removal of vegetation in the footprints of new transmission line support structures, access roads, converter stations, and other associated infrastructure, some of which may be wetland vegetation, or vegetation present in floodplains or riparian zones
- Conversion of vegetation structure (e.g., floodplain/riparian forest conversion to grassland/herbaceous or shrub/scrub land cover)
- Changes to species diversity within wetlands, floodplains, and/or riparian areas
- Changes in total cover percentage in wetland, floodplain, and riparian zone vegetation

3.19.6.6 Irreversible and Irretrievable Commitment of Resources

The potential permanent loss or alteration of wetlands, floodplains, and riparian areas would last throughout the life of the Project; however, gradual recovery of these resources is expected after decommissioning. It is reasonable to assume that some wetlands, floodplains, and riparian areas may be irreversibly and irretrievably impacted.

3.19.6.7 Relationship between Local Short-term Uses and Long-term Productivity

The Project would result in a short-term disturbance to wetlands, floodplains, and riparian areas; however, these impacts should not affect the long-term productivity of these resources.

3.19.6.8 Impacts from Connected Actions

3.19.6.8.1 Wind Energy Generation

3.19.6.8.1.1 Construction Impacts

Construction of wind farms in the Oklahoma and Texas panhandle areas would be expected to involve potential impacts to wetlands, floodplains, and riparian areas similar to those described in Section 3.19.6.1 for common construction activities. The potential short-term impacts from construction activities for wind energy generation could include mechanical damage/crushing of vegetation from use of heavy machinery, compaction of soils, sedimentation and turbidity from construction activities adjacent to these resources, alteration of hydrology from access road construction, dewatering activities, and contamination from accidental spills of hazardous substances such as fuels and lubricants. The potential long-term impacts to wetlands, floodplains, and riparian resources from construction in wind development zones could include removal of vegetation during excavations for structure foundations, electrical collection lines, or during permanent access road construction, conversion of forested wetlands and riparian areas to shrubby or herbaceous cover types within the ROW, changes to hydrology from permanent access roads construction, and the introduction of invasive species from construction equipment.

Section 3.19.5.8.1 provides an estimate of the wetlands and floodplains that could potentially be affected in each of the twelve WDZs. Based on the maximum capacity of the Project and information from wind energy developers, it is estimated that 20–30 percent of the potentially suitable land, as identified in Section 2.5.1, would actually be developed for wind energy facilities using transmission capacity from the Project. It is further estimated that during the construction phase, approximately 2 percent of land within a wind energy facility, would be affected (Denholm et al. 2009). That would reduce to 1 percent of the land that would remain disturbed during operations and maintenance of the wind energy facilities.

Wind turbines and associated facilities are typically located outside of wetlands, floodplains, and riparian areas to the extent practicable. Wind lease agreements typically include provisions to minimize the impacts to wetlands, floodplains and riparian areas, including minimizing soil compaction and revegetating temporary work areas.

3.19.6.8.2 Optima Substation

No wetlands, floodplains, or riparian areas are documented for this site. No impacts to wetlands, floodplains, or riparian areas would be expected.

3.19.6.8.3 TVA Upgrades

A precise ROI has not been identified for the TVA upgrades. Where possible, general impacts associated with the required TVA upgrades are discussed below.

Much of the following discussion is relevant for the new 500kV transmission line, or for certain upgrades associated with the 161kV transmission lines. The required TVA upgrades to existing facilities (including existing transmission lines and existing substations) should have no impact to wetlands, floodplains or riparian areas. The construction, operation, and maintenance of the new 500kV transmission line, would have impacts similar to the Project although on a smaller scale. These impacts to wetlands, floodplains, and riparian areas may be largely avoided by spanning these resource areas. Potential impacts from constructing the new transmission line through or adjacent to wetlands, floodplains and riparian areas may include sedimentation and turbidity, placement of fill or dredging, alteration of hydrology, contamination from herbicide runoff or accidental, long-term conversion of forested vegetation types to shrubby or herbaceous cover types within the ROW, changes in flood grade or elevation, mechanical damage/crushing of vegetation, compaction of soils potentially reducing soil's water-holding capacity, introduction of invasive species from construction equipment, and wastewater discharges from concrete batch plants.

3.19.6.9 Impacts Associated with the No Action Alternative

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not be constructed. No impacts on wetlands, floodplains, or riparian areas would occur. The existing diversity, structure, and function of these areas within the ROW would be expected to remain consistent within their current parameters.

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Contents

Tables

3.20 Wildlife, Fish, and Aquatic Invertebrates

3.20.1 Wildlife

3.20.1.1 Regulatory Background

In general, statutes and regulations that influence the evaluation of wildlife resources in the areas crossed by the Project are implemented by the USFWS and state wildlife agencies. The state agencies applicable to this Project include the ODWC, AGFC, TWRA, and TPWD. The wildlife regulations relevant to this Project are presented in Table 3.20.1-1.

Table 3.20.1-1:
Relevant Regulations for Wildlife Species

Regulation	Regulatory Agency	Summary
Endangered Species Act (ESA), (16 USC § 1531 *et seq*.; 50 CFR Part 402)	USFWS	Establishes lists of threatened or endangered species and their designated critical habitats; requires federal agencies to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of listed species or result in adverse modification to designated critical habitat.
Migratory Bird Treaty Act (MBTA) (16 USC §§ 703–712)	USFWS	Prohibits take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such a bird unless expressly permitted by federal regulations or authorized under a MBTA permit.
Executive Order 13186, "Responsibilities of Federal Agencies to Protect Migratory Birds"	USFWS	Directs executive departments and agencies to take certain actions to protect and conserve migratory birds. It provides broad guidelines on conservation responsibilities and requires the development of more detailed guidance in Memoranda of Understanding (MOU).
Bald and Golden Eagle Protection Act (BGEPA), (16 USC §§ 668–668d; 50 CFR Part 22)	USFWS	Prohibits the "take" of bald and golden eagles as defined: pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb without a BGEPA Permit.
Oklahoma Statutes 29-5-412.1 Oklahoma Administrative Code Title 800, "Department of Wildlife Conservation"	ODWC	Establishes list of threatened or endangered species within Oklahoma. Describes the function, organization, powers and duties of the Oklahoma Department of Wildlife Conservation with respect to managing fish and wildlife resources.
Texas Administrative Code 31-65.171–65.177	TPWD	Establishes list of threatened or endangered wildlife within Texas; prohibits the taking, possession, transportation, or sale of threatened or endangered species within the issuance of a permit.
Arkansas Code Annotated 15-45-301–306	AGFC[1]	Prohibits imports, transportation, sale, purchase, hunting, harassment, or possession of threatened or endangered wildlife or their parts.
Tennessee Administrative Code 70-1-101 *et seq*.	TWRA	Establishes a list of threatened or endangered wildlife within Tennessee; prohibits the take, attempt to take, possession, transportation, export, processing, selling, offering to sell, shipment of, or knowing receipt of shipment of threatened or endangered wildlife.

1 Arkansas does not have an endangered species law, but does maintain a list of Species of Special Concern

3.20.1.2 Data Sources

Data sources included a desktop analysis of relevant information; research findings; reports available to the public; a database that includes GIS data from government agencies as well as non-governmental organizations; and information received from both regulatory agencies and stakeholders during the DOE scoping process. All data sources used for this analysis were limited to those that were open source and readily available to the public (i.e., the public may assess them without restrictions). As a result, comprehensive state wildlife agency databases regarding designated habitats types (e.g., extent of big game ranges), species presence, or wildlife use of habitats (e.g., raptor nest or bat hibernacula locations) were not used in this assessment due to data sharing restrictions (i.e., DOE could not ensure the state agencies that these data would not be released to the public without their consent). The lack of comprehensive state wildlife data used in this assessment would constitute “incomplete or unavailable” data per CEQ regulations at 40 CFR 1502.22. Because comprehensive state wildlife data were not used in this assessment, it was assumed that wildlife were present or used habitats if their range overlapped an area and suitable habitats were present (i.e., due to the lack or more robust data, a conservative estimate of species use was used for this assessment). The data sources available to DOE during this analysis are summarized in Table 3.20.1-2.

Table 3.20.1-2:
Summary of Data Sources Wildlife

Resource	Data Source
Representative common wildlife species within each vegetative cover type in the ROI	NatureServe Explorer (http://explorer.natureserve.org/) ODWC WMA Fact Sheets (http://www.wildlifedepartment.com/facts_maps/wmastate.htm) ANHC (http://www.naturalheritage.com/) TDEC Division of Natural Areas (http://www.state.tn.us/environment/natural-areas/natural-areas/) TPWD (http://www.tpwd.state.tx.us/)
Important commercial or recreation species in the ROI	Stakeholder Outreach
Migratory birds	National Audubon Society Important Bird Areas (IBAs) Interactive Map (NAS 2013) USFWS Migratory Bird Program (http://www.fws.gov/migratorybirds/dmbmdbhc.html) Oklahoma Breeding Bird Atlas (http://suttoncenter.org/pages/oklahoma_breeding_bird_atlas) Arkansas Breeding Bird Atlas (http://birdatlas.cast.uark.edu) Tennessee Breeding Bird Atlas (http://www.tnbirds.org/birdatlas.htm) Texas Breeding Bird Atlas (http://txtbba.tamu.edu/)

3.20.1.3 Region of Influence

The ROIs used for the evaluation of potential impacts to wildlife from the Project and connected actions are identical to the ROIs described in Section 3.1.1.

3.20.1.4 Affected Environment

As discussed in Section 3.18, the Project would cross multiple ecoregions that individually support diverse vegetation communities. Overall, the Project is within the Great Plains and Eastern Temperate Forests Level I Ecoregions (EPA 2012). From the western end of the Project (in the Oklahoma Panhandle) moving eastward (across Oklahoma, Arkansas, and western Tennessee), the vegetation changes from arid and semi-arid grasslands to forests, river valleys, and coastal plains. This change in vegetation type results as precipitation and elevation change from west to east. Because of this variation in vegetation type across the seven regions, a variety of wildlife species (both terrestrial and aquatic) are expected to occur within the habitats found within the ROI. The highest species diversity can be expected to occur in areas of greater habitat diversity (Recher 1969; MacArthur and Wilson 1967), such as transitional zones between one habitat type and another (the highest diversity in habitats mostly occurs within Regions 3, 4, and 5).

The following sections provide regional descriptions of resident and migratory species including important recreation species, migratory birds, reptiles, amphibians, and mammals known to occur or that have the potential to occur within the ROI based on habitat associations and known range information.

3.20.1.4.1 Important Recreation Species

Areas managed either wholly or in part for recreational opportunities, such as hunting and fishing, include public and private lands such as WMAs, Public Hunting Areas, Game Management Areas, Wildlife Management Units, various USACE lands, conservation easements, National Recreational Areas, and NWRs. Recreational areas within the ROI are described in detail within Section 3.12.

Texas

Big game species potentially within the ROI for the AC collection system in Texas include white-tailed deer *(Odocoileus virginianus*), mule deer (*Odocoileus hemionus*), and pronghorn *(Antilocapra Americana*) (TPWD 2013).

Small game species potentially within the ROI for the AC collection system in Texas include cottontail *(Sylvilagus* spp.) and jackrabbits (*Lepus* spp.).

Bird species that are hunted within the state (and potentially within the ROI for the AC collection system in Texas) include the white-winged dove (*Zenaida asiatica*), mourning dove (*Zenaida macroura*), as well as various species of duck, pheasant, and quail (TPWD 2013).

Oklahoma

Big game species potentially within the Project's ROI in Oklahoma include white-tailed deer, elk *(Cervus elaphus),* and pronghorn. White-tailed deer hunting occurs statewide. Within the ROI, elk hunting occurs in Sequoyah and Muskogee counties. Pronghorn hunting (referred to as "antelope" by ODWC) occurs in Texas County, west of State Highway 136 (ODWC 2013).

Small game species potentially within the Project's ROI in Oklahoma include squirrels *(Sciurus* spp. *and Tamiasciurus* spp.), cottontail, and jackrabbits. Furbearers hunted in Oklahoma include bobcat *(Lynx rufus),* raccoon *(Procyon lotor),* river otter *(Lontra canadensis),* gray fox *(Urocyon cinereoargenteus),* and red fox *(Vulpes vulpes).* Additionally, year-round seasons are open statewide for coyote *(Canis latrans),* beaver *(Castor canadensis),* nutria *(Myocastor coypus*), and striped skunk *(Mephitis mephitis*) (ODWC 2013).

Bird species that are hunted within the state (and potentially within the Project's ROI in Oklahoma) include the ring-necked pheasant *(Phasianus colchicus),* wild turkey *(Meleagris gallopavo),* northern bobwhite *(Colinus virginianus),* scaled quail *(Callipepla squamata),* sora *(Porzana carolina),* Virginia rail *(Rallus limicola),* common snipe *(Gallinago gallinago),* mourning dove *(Zenaida macroura),* Canada goose *(Branta canadensis),* American woodcock *(Scolopax minor),* common gallinule *(Gallinula galeata)* (previously "moorhen"), and 16 waterfowl species (ODWC 2013).

Arkansas

Big game species potentially within the Project's ROI in Arkansas include white-tailed deer, elk, American alligator (*Alligator mississippiensis),* and American black bear (*Ursus americanus*) (AGFC 2013c).

Small game species that potentially occur within the Project's ROI in Arkansas include squirrels (red and fox) and rabbits (eastern cottontail [*Sylvilagus floridanus*] and swamp rabbit [*Sylvilagus aquaticus*]*)* (AGFC 2013c). Furbearers harvested within the state include beaver, bobcat, coyote, gray fox, mink *(Neovison vison),* muskrat *(Ondatra zibethicus),* nutria, opossum *(Didelphis virginiana),* raccoon, red fox, river otter and striped skunk (AGFC 2013c).

Bird species that are hunted within the state (and potentially within the Project's ROI in Arkansas) include the common gallinule, common snipe, Virginia rail, purple gallinule (*Porphyrio martinica*), mallards (*Anas platyrhynchos*), American woodcock, Eurasian collared-dove (*Streptopelia decaocto),* mourning dove, northern bobwhite, sora, wild turkey, blue-winged teal *(Anas discors),* green-winged teal *(Anas crecca),* cinnamon teal *(Anas cyanoptera),* Canada goose, snow goose *(Chen caerulescens;* also referred to as blue goose depending on the color morph), Ross's goose *(Chen rossii),* greater white-fronted goose *(Anser albifrons),* American coot *(Fulica americana),* and 21 other species of duck (AGFC 2013a, 2013b).

Tennessee

Big game species potentially within the Project's ROI in Tennessee include white-tailed deer, wild turkey, elk, and American black bear.

Small game species that potentially occur within the Project's ROI in Tennessee include nine-banded armadillo (*Dasypus novemcinctus*), bullfrog, Eurasian collared-dove, ruffed grouse (*Bonasa umbellus*), quail, rabbit, squirrel, beaver, bobcat, coyote, fox, groundhog (*Marmota monax*), mink, muskrat, opossum, river otter, raccoon, skunk, and various weasel species (TWRA 2013a, 2013b).

Bird species that are hunted within the state (and potentially within the Project's ROI in Tennessee) include the American coots, crow (*Corvus brachyrhynchos*), purple gallinules, Virginia rail, mourning dove, Wilson snipe, American woodcock, Canada goose, greater white-fronted goose, Ross's goose, snow goose, and thirteen species of duck (TWRA 2013a).

3.20.1.4.2 Migratory Birds

The regulatory use of the term "migratory bird" refers to any bird native to the United States that is protected by the MBTA (USFWS 2011), but does not typically include upland game birds (e.g., pheasants), because they are typically managed at the state level. Section 3.20.1.1 defines the MBTA. As of November 2013, the MBTA protects more than 1,000 species of native birds, hundreds of which have the potential to be present in the Project's ROI (78 FR 65843, November 1, 2013). Species composition and abundance vary by geography, habitat, and time of year; but migratory birds may occur in the ROI either during their migration or throughout the year (Table 3-10 in the Applicant's *Fish, Wildlife, and Vegetation Technical Report* [Clean Line 2013] lists the migratory birds that could potentially occur in the area).

Migratory birds use general north-south flyways, which are main transit corridors between southern wintering grounds and northern breeding areas (USFWS 2009). The Project's ROI crosses both the Central and the Mississippi Flyways. The Central Flyway encompasses the Great Plains west of the Mississippi River Valley as well as the Rocky Mountains of the central United States (Regions 1 through 3 of the Project) (USFWS 2009). The Mississippi Flyway reflects a general path of migration along the Mississippi River and extends across Arkansas and Tennessee (Regions 4 through 7 of the Project).

Along these flyways, the National Audubon Society has identified specific Important Bird Areas (IBAs), which are considered "vital to birds and other biodiversity" (NAS 2013). Two Audubon-designated IBAs are in the ROI for the Project: the Ozark National Forest Global IBA (which is located within the ROI for the Applicant Proposed Route in Region 4) and the Cache-Lower White Rivers Global IBA (which is located in the ROI for the Project in Region 6). The extreme southern edge of the Ozark National Forest IBA intersects the northern extent of the ROI for the Applicant Proposed Route, east of Hagerville (Region 4). The ROI traverses the northernmost extension of the Cache-Lower White Rivers IBA in Region 6, in conjunction with the crossing of the Cache River and associated riparian forest. A third Audubon-designated IBA, the Selman Ranch IBA, occurs 10 miles north of the ROI for HVDC Alternative Route 1-A in Harper County, Oklahoma in Region 1 (NAS 2013). No other IBAs occur within 15 miles of the ROI for the Project.

3.20.1.4.3 Reptiles and Amphibians

Two hundred nineteen common reptile and amphibian species are known to occur or have the potential to occur within the ROI. Species composition and abundance of reptile and amphibian species vary by geography, habitat, and time of year, but reptiles and amphibians may occur in all habitat types found within the Project's ROI throughout the year. The common reptiles and amphibian species are identified by state in Appendix L.

3.20.1.4.4 Mammals

Because the Project is centrally located in the United States, species from the Rocky Mountains, the Great Plains, the eastern deciduous forests, the Southeastern and Gulf Coastal Plain, and the arid Southwest compose the mammalian fauna potentially present within the Project's ROI in Regions 1 through 7 (Caire et al. 1989; Sealander and Heidt 1990). Within the jurisdictional counties of the four states crossed, 81 common mammal species are known to occur or have the potential to occur within the ROI. Species composition and abundance of mammal species varies by geography, habitat, and time of year, but mammals may occur in the Project's ROI throughout the year. The common mammal species, by state, are summarized in Appendix L.

3.20.1.5 Regional Description

As described in Section 3.20.1.4 above, numerous terrestrial wildlife species are known to occur or have the potential to occur within the ROI. A summary of the terrestrial wildlife species and habitat occurrence by Project region is provided in the sections below.

3.20.1.5.1 Region 1

Region 1 is referred to as the Oklahoma Panhandle Region and includes the Oklahoma Converter Station and AC Interconnection Siting Area, AC collection system routes, the Applicant Proposed Route, and the HVDC Alternative Routes I-A through I-D.

The wildlife species that occur in the Project's ROI are adapted to dry or seasonally dry habitat conditions of the semi-arid eastern Oklahoma Panhandle. As described in Section 3.10, the dominant land cover in the ROI of Region 1 is grasslands (i.e., grassland/herbaceous). Other less dominant land cover types in this region include croplands (i.e., cultivated crops) (primarily center-pivot irrigated with some dryland areas), and shrub/scrub. Wetland areas that may be used by wildlife in this region are described in detail in Section 3.19.

As discussed in Section 3.12, wildlife areas that are managed for recreation within Region 1 include the Optima NWR, Optima WMA, and the Schultz WMA.

Optima NWR is managed as a woody wetland and mixed-grass prairie, containing cottonwoods, big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), and indiangrass (*Sorghastrum nutans*). Wildlife species known to occur at Optima NWR include white-tailed deer, coyotes, Rio Grande wild turkeys (*M.g.intermedia*), quail species, and numerous migratory birds that use the NWR as a stopover location during migration. Optima NWR is located within the ROI for the AC Collection System Route E-1.

The Optima WMA contains similar habitats as the Optima NWR, and is managed for recreational hunting (see Section 3.12). The following wildlife species are hunted at Optima WMA: pheasant, quail species, white-tailed and mule deer, Rio Grande wild turkey, rabbit species, coyote, bobcat, raccoon, dove species, and numerous waterfowl species. The Optima WMA is not in the ROI for the Project, but is located 3 miles east of the AC Collection System Route NE-2 centerline.

The Schultz WMA and State Park is managed by the Oklahoma Department of Wildlife Conservation (ODWC 2014). Game species include various species of pheasant, quail, deer, rabbit, and coyote. Habitat at this WMA consists of a mixture of uplands and floodplain habitats, with side oats and buffalo grass common on upland areas and salt cedar and cottonwood dominating the lowlands. The ROIs associated with AC Collection System Routes E-3, SE-1, SE-3, and E-2 would cross the edges of the Schultz WMA and State Park.

Major rivers often serve as stopover habitats or migratory corridors for migrating birds. As discussed in Section 3.15, portions of the Beaver River and its tributaries are located within the ROI for Region 1. This river and its tributaries are within the ROI associated with the HVDC transmission line routes, as well as the ROI for the AC collection system routes.

3.20.1.5.2 Region 2

Region 2 is referred to as the Oklahoma Central Great Plains Region and includes the Applicant Proposed Route as well as Alternative Routes 2-A and 2-B.

The wildlife species that occur in the Project's ROI in Region 2 are adapted to dry or seasonally dry habitat conditions of the semi-arid eastern Oklahoma Panhandle. As described in Section 3.10, the dominant land cover in the ROI of Region 2 is grasslands. Other less dominant land cover types in this region include croplands (primarily center-pivot irrigated with some dryland areas). Wetland areas that may be used by wildlife in this region are described in detail in Section 3.19.

As discussed in Section 3.12, wildlife areas that are managed for recreation within Region 2 include the Major County WMA (which is located within the ROI associated with the HVDC Alternative Route 2-A). Habitat in this WMA consists of mixed grass uplands dissected by deep canyons that support several hardwood tree species including American elm, bur oak, chinquapin oak, Eastern red cedar. Game species known to occur at Major County WMA include northern bobwhite, white-tailed deer, Rio Grande wild turkey, rabbit species, coyote, bobcat, and raccoon.

Major rivers often serve as stopover habitats or migratory corridors for migrating birds. As discussed in Section 3.15, portions of the Cimarron River are located within the ROI for Region 2 (as well as other various creeks/waterbodies). The Cimarron River would be crossed by the Applicant Proposed Route as well as Alternative Route 2-A.

3.20.1.5.3 Region 3

Region 3 is referred to as the Oklahoma Cross Timbers Region and includes the Applicant Proposed Route and Alternative Routes 3-A through 3-E.

The wildlife species that occur in the ROI in Region 3 are adapted to the semi-arid conditions of northwestern Oklahoma and the mesic conditions of north-central Oklahoma. As described in Section 3.10, the dominant land cover in the ROI is grasslands. Other less dominant land cover types in this region include deciduous forests and pasture/hay. Wetland areas that may potentially be used by wildlife in this region are described in detail in Section 3.19.

As discussed in Section 3.15, portions of the Cimarron River are located within the ROI for Region 3 (as well as various creeks/waterbodies). The Cimarron River would be crossed by the Applicant Proposed Route in Payne County, Oklahoma; the route would also occur close to the Arkansas River (the river is located approximately 0.5 mile north of the Applicant Proposed Route in Muskogee County, Oklahoma, at its nearest point).

3.20.1.5.4 Region 4

Region 4 is referred to as the Arkansas River Valley Region and includes the Applicant Proposed Route, including the Lee Creek Variation, and Alternative Routes 4-A through 4-E.

The wildlife species that occur in the ROI of Region 4 are adapted to the mesic conditions of north-central Oklahoma and north-central Arkansas. As described in Section 3.10, the dominant land cover in the ROI is pasture/hay. Other less dominant land cover types in this region include deciduous forest and evergreen forest. As the ROI moves west to east, the percentage of evergreen forests within the ROI increases. Wetland areas that may be used by wildlife in this region are described in detail in Section 3.19.

As discussed in Section 3.12, wildlife areas that are managed for recreation within Region 4 include the Ozark National Forest WMA, Ozark Lake WMA, and Frog Bayou WMA:

- The Ozark National Forest WMA would be crossed by the ROI associated with HVDC Alternative Route 4-B and Applicant Proposed Route Link 9. Habitat within this WMA consists of upland hardwood of oak-hickory with scattered pine and a brushy undergrowth, dominated by such various species of dogwood, maple, redbud, and serviceberry. Game species known to occur at this WMA include white-tailed deer, black bear, quail species, rabbit, squirrel, and crow.
- The Ozark Lake WMA would be crossed by the ROI associated with the Applicant Proposed Route Link 6. The majority of this WMA area consists of moist soil lowlands with a small amount of vegetated uplands. Much of the

area is within levees, containing old fields. Game species known to occur at this WMA include white-tailed deer, quail species, rabbit, squirrel, and crow.

- The Frog Bayou WMA would be crossed by the ROI associated with the Applicant Proposed Route Link 6. This WMA was a former farm that has been restored to a wetland habitat. Game species known to occur at this WMA include white-tailed deer, quail species, rabbit, squirrel, and crow.

As discussed in Section 3.15, portions of the Arkansas River and Lower Illinois River are located within the ROI for Region 4 (as well as various creeks/waterbodies).

The ROI associated with the HVDC Alternative Route 4-B crosses the Ozark-St. Francis National Forests. The ROI for the Applicant Proposed Route also crosses the Ozark National Forest Global IBA (as discussed in Section 3.20.1.4.2).

It should be noted that Region 4 also contains the "Lee Creek Variation," which is a variation of the Applicant Proposed Route. The Lee Creek Variation is 3.4 miles long and none of the route is parallel to existing infrastructure. The land cover in the 200-foot representative ROW is 94.4 percent forest land.

3.20.1.5.5 Region 5

Region 5 is referred to as the Central Arkansas Region and includes the Applicant Proposed Route and Alternative Routes 5-A through 5-F.

The wildlife species that occur in the ROI are adapted to the mesic conditions of north-central Arkansas. As described in Section 3.10, the dominant land cover in the ROI is deciduous forest. Other less dominant land cover types in this region include pasture/hay and evergreen forest. As the ROI moves west to east, the percentage of evergreen forests within the ROI increases. Wetland areas that may be used by wildlife are described in detail in Section 3.19.

As discussed in Sections 3.12, wildlife areas that are managed for recreation within Region 5 include the Ozark Cherokee WMA and the Rainey WMA.

- The Cherokee WMA would be within the western portion of the Arkansas Converter Station Alternative Siting Area and in the western portion of the Arkansas AC Interconnection Siting Area. The Cherokee WMA is also located in the ROI associated with the Applicant Proposed Route, Links 2 and 5. Habitat within this WMA varies from upland hardwood, mixed pine/hardwood, to pine habitats. Game species found within this WMA include various species of turkey, deer, bear, quail, rabbit, squirrel, and crow.
- Rainey WMA would be within the northern portion of the Arkansas Converter Station Alternative Siting Area and in the northeastern portion of the Arkansas AC Interconnection Siting Area. Habitat within this WMA includes mixed hardwoods. Game species found within this WMA include various species of turkey, deer, bear, quail, rabbit, squirrel, and crow.

3.20.1.5.6 Region 6

Region 6 is referred to as the Cache River and Crowley's Ridge Region and includes the Applicant Proposed Route and Alternative Routes 6-A through 6-D.

The wildlife species that occur in the ROI of Region 6 are adapted to the mesic conditions of northeastern Arkansas. As described in Section 3.10, the dominant land cover in the ROI of Region 6 is croplands. Other less dominant land cover types in this region include deciduous forest. Wetland areas that may be used by wildlife are described in detail in Section 3.19.

As discussed in Sections 3.12, wildlife areas that are managed for recreation within Region 5 include the Singer Forest Natural Area/St. Francis Sunken Lands WMA and portions of USFWS acquisition areas associated with the Cache River NWR.

- The Singer Forest Natural Area/St. Francis Sunken Lands WMA is within the ROI associated with the Applicant Proposed Route Link 7. Habitats within this WMA include upland forest and forested wetland habitat. This area is managed for recreationally hunted wildlife species, such as waterfowl, wild turkey, white-tailed deer, quail, rabbit, and squirrel.
- A section of approved acquisition area for the Cache River NWR occurs within the ROI associated with HVDC Alternative Route 6-B near Amagon, Arkansas, and by the ROIs associated with the Applicant Proposed Route Links 3 and 4, and HVDC Alternative Route 6-A north and west of Fisher, Arkansas. The Cache River NWR was specifically designated to provide protection for wetland habitats used by migratory birds as foraging and roosting areas during migration (USFWS 2014). This area contains a large amount of bottomland hardwood forests along the Cache River, White River, and Bayou Deview.

As discussed in Section 3.15, habitats used by wildlife species in Region 6 include sections of the White, Cache, L'Anguille, and St. Francis rivers. The ROI for the HVDC transmission line routes also cross the Cache-Lower White Rivers Global IBA (as discussed in Section 3.20.1.4.2).

3.20.1.5.7 Region 7

Region 7 is referred to as the Arkansas Mississippi River Delta and Tennessee Region and includes the Applicant Proposed Route and Alternative Routes 7-A through 7-D.

The wildlife species that occur in the ROI are adapted to the mesic conditions of northeastern Arkansas and southwestern Tennessee. As described in Section 3.10, the dominant land cover in the ROI of Region 7 is croplands. Other less dominant land cover types in the region include deciduous forest, scrub/shrub, and pasture/hay. Wetland areas that may be used by wildlife are described in detail in Section 3.19.

As discussed in Section 3.15, portions of the St. Francis, Mississippi, and Loosahatchie rivers are located within the ROI for Region 7 associated with the HVDC transmission line routes.

3.20.1.6 Connected Actions

3.20.1.6.1 Wind Energy Generation

Wind energy generation would likely occur within WDZs. The wildlife species that occur in WDZ-A, WDZ-B, WDZ-C, and WDZ-L are adapted to dry or seasonally dry habitat conditions of the semi-arid eastern Texas Panhandle. The wildlife species that occur in WDZ–D, WDZ-E, WDZ-F, WDZ-G, WDZ-H, WDZ-I, WDZ-J, and WDZ-K are adapted to dry or seasonally dry habitat conditions of the semi-arid eastern Oklahoma Panhandle. As described in Section 3.10, the dominant land cover in WDZ-A, WDZ–B, WDZ–E, WDZ–I, WDZ–K, and WDZ–L is croplands (primarily center-pivot irrigated with some dryland areas), while the dominant land cover in WDZ-C, WDZ-D, WDZ-F, WDZ-G, WDZ-H, and WDZ-J is grasslands. Other less dominant land cover types in WDZ-A, WDZ-B, WDZ-E, WDZ-I, WDZ-K, and WDZ-L include grasslands, and shrub/scrub, while less dominant land cover types in WDZ-C, WDZ-D, WDZ-F, WDZ-G, WDZ-H, and WDZ-J include croplands (primarily center-pivot irrigated with some dryland areas) and shrub/scrub habitats. Wetland habitats that may be used by wildlife in these areas are described in detail in Section 3.19.

3.20.1.6.2 Optima Substation

As discussed in Section 3.1, the future Optima Substation may be constructed just east of the Oklahoma Converter Station Siting Area and partially within the AC Interconnection Siting Area in Region 1. The location for the substation occurs on grassland habitats adjacent to croplands. The wildlife species that occur in this area are adapted to dry or seasonally dry habitat conditions of the semi-arid eastern Texas/Oklahoma Panhandle.

3.20.1.6.3 TVA Upgrades

A precise ROI has not been identified for the TVA upgrades. Where possible, general impacts associated with the required TVA upgrades are discussed in the impact sections that follow.

3.20.1.7 Impacts to Wildlife

3.20.1.7.1 Methodology

Within the ROI, Project activities were assessed that could potentially impact wildlife or their habitats. This wildlife assessment references the quantitative assessment of habitat impacts presented in Sections 3.10 and 3.17 (i.e., acres of disturbance listed in the Land Use and Vegetation sections, respectively), as well as the quantitative assessment of potential impacts to waterbodies as presented in Section 3.15 (i.e., waterbody crossings and impacts listed in the Surface Water section).

Wildlife resources that were evaluated in this assessment included important recreational species, migratory birds, reptiles, amphibians, and mammal species that are known to occur or have the potential to occur within the applicable ROI. The impact assessment addressed the following:

- Potential impacts from temporary or long-term displacement of wildlife species
- Potential impacts from fragmentation of wildlife habitat
- Potential disturbance to known populations and/or suitable habitat for wildlife species
- Potential impacts to wildlife movement, migratory birds and flyways (including the Mississippi Flyway, Audubon-designated IBAs, or other federal or state designated bird areas)
- Potential for avian collisions and/or electrocution
- Potential impacts of invasive plant species on wildlife habitats

The Applicant has developed EPMs that would be implemented during design/engineering, construction, and operations and maintenance. The complete list of EPMs is provided in Appendix F. Implementation of these EPMs is assumed throughout the impact analysis for the Project. During the initial construction phase of the Project, both general EPMs and those specific to wildlife resources would be implemented to avoid or minimize impacts to wildlife resources (as described below).

General EPMs for the Project that relate to wildlife resources include the following:

- GE-1: Clean Line will train personnel on health, safety, and environmental matters. Training will include practices, techniques, and protocols required by federal and state regulations and applicable permits.
- GE-2: Clean Line will design, construct, maintain, and operate the Project following current Avian and Power Line Interaction Committee guidelines to minimize risk of avian mortality.
- GE-3: Clean Line will minimize clearing vegetation within the ROW, consistent with a Transmission Vegetation Management Plan filed with NERC, and applicable federal, state, and local regulations.
- GE-4: Vegetation removed during clearing will be disposed of according to federal, state, and local regulations.
- GE-5: Any herbicides used during construction and operations and maintenance will be applied according to label instructions and any federal, state, and local regulations.
- GE-6: Clean Line will restrict vehicular travel to the ROW and other established areas within the construction, access, or maintenance easement(s).
- GE-7: Roads not otherwise needed for maintenance and operations will be restored to preconstruction conditions. Restoration practices may include decompacting, recontouring, and re-seeding. Roads needed for maintenance and operations will be retained.
- GE-9: Clean Line will avoid and/or minimize damage to drainage features and other improvements such as ditches, culverts, levees, tiles, and terraces; however, if these features or improvements are inadvertently damaged, they will be repaired and or restored.
- GE-13: Emergency and spill response equipment will be kept on hand during construction.
- GE-14: Clean Line will restrict the refueling and maintenance of vehicles and the storage of fuels and hazardous chemicals within at least 100 feet from wetlands, surface waterbodies, and groundwater wells, or as otherwise required by federal, state, or local regulations.
- GE-15 Waste generated during construction or maintenance, including solid waste, petroleum waste, and any potentially hazardous materials will be removed and taken to an authorized disposal facility.
- GE-20: Clean Line will conduct construction and scheduled maintenance activities on the facilities during daylight hours, except in rare circumstances that may include, for example, to address emergency or unsafe situations, to avoid adverse environmental effects, to minimize traffic disruptions, or to comply with regulatory or permit requirements.
- GE-21: Clean Line will maintain construction equipment in good working order. Equipment and vehicles that show excessive emissions of exhaust gasses and particulates due to poor engine adjustments or other inefficient operating conditions will be repaired or adjusted.
- GE-22: Clean Line will impose speed limits during construction for access roads (e.g., to reduce dust emissions, for safety reasons, and for protection of wildlife).
- GE-28: Hazardous materials and chemicals will be transported, stored, and disposed of according to federal, state, or local regulations or permit requirements.
- GE-30: Clean Line will minimize the amount of time that any excavations remain open.

Fish, vegetation, and wildlife specific EPMs, or other EPMs that may aid to minimize or avoid impacts to fish and wildlife species, include the following:

- FVW-1: Clean Line will identify environmentally sensitive vegetation (e.g., wetlands, protected plant species, riparian areas, large contiguous tracts of native prairie) and avoid and/or minimize impacts to these areas.

- FVW-2: Clean Line will identify and implement measures to control and minimize the spread of non-native invasive species and noxious weeds.
- FVW-3: Clean Line will clearly demarcate boundaries of environmentally sensitive areas during construction to increase visibility to construction crews.
- FVW-4: If construction- and/or decommissioning-related activities occur during the migratory bird breeding season, Clean Line will work with USFWS to identify migratory species of concern and conduct pre-construction surveys for active nests for such species. Clean Line will consult with USFWS and/or other resource agencies for guidance on seasonal and/or spatial restrictions designed to avoid and/or minimize adverse effects.
- FVW-5: If construction occurs during important time periods (e.g., breeding, migration, etc.) or at close distances to environmentally sensitive areas with vegetation, wildlife, or aquatic resources, The Applicant will consult with USFWS and/or other resource agencies for guidance on seasonal and/or spatial restrictions designed to avoid and/or minimize adverse effects.
- FVW-6: Clean Line will avoid and/or minimize construction within 300 feet of caves known to be occupied by threatened or endangered species.
- W-2: Clean Line will identify, avoid, and/or minimize adverse effects to wetlands and waterbodies. Clean Line will not place structure foundations within the Ordinary High Water Mark of Waters of the United States.
- W-3: Clean Line will establish streamside management zones within 50 feet of both sides of intermittent and perennial streams and along margins of bodies of open water where removal of low-lying vegetation is minimized.
- W-4: If used, Clean Line will selectively apply herbicides within streamside management zones.
- W-5: Clean Line will construct access roads to minimize disruption of natural drainage patterns including perennial, intermittent, and ephemeral streams.
- W-6: Clean Line will not construct counterpoise or fiber optic cable trenches across waterbodies.
- W-7: Clean Line will locate spoil piles from foundation excavations and fiber optic cable trenches outside of streamside management zones.
- W-8: Dewatering will be conducted in a manner designed to prevent soil erosion (e.g., through discharge of water to vegetated areas and/or the use of flow control devices).
- W-9: Clean Line will design converter station sites to avoid adverse changes to the base flood elevation within the 100-year floodplain.
- W-10: Clean Line will minimize fill for access roads and structure foundations within 100-year floodplains to avoid adverse changes to the base flood elevation.

Additional site-specific EPMs may be developed as part of the ongoing consultation process between the Applicant and federal and state agencies.

The following plans would be developed and implemented by the Applicant to avoid or minimize impacts:

- Blasting Plan: This plan will contain measures designed to minimize adverse effects due to blasting.
- Restoration Plan: This plan will describe post-construction activities that would be implemented to reclaim disturbed areas.
- Spill Prevention, Control and Countermeasures (SPCC) Plan: This plan will contain the measures designed to prevent, control, and clean up spills of hazardous materials.

- Storm Water Pollution Prevention Plan (SWPPP): This plan, consistent with federal and state regulations, will describe the practices, measures, and monitoring programs to control sedimentation, erosion, and runoff from disturbed areas.
- Transmission Vegetation Management Plan (TVMP): This plan, to be filed with NERC, will describe how the Applicant will conduct work on its right-of-way to prevent outages due to vegetation.
- Avian Protection Plan (APP): This plan, consistent with APLIC guidelines, will describe a program of specific and comprehensive actions that, when implemented, reduce risk of avian mortality.

3.20.1.7.2 Impacts Associated with the Applicant Proposed Project

This section identifies the potential impacts on wildlife and their habitat that could occur as a result of the Project. The discussion of potential impacts is broken out into the three phases of the Project: (1) construction; (2) operations and maintenance; and (3) decommissioning. The Applicant would conduct each phase of the Project in compliance with applicable state and federal laws, regulations, and permits related to environmental protection. Specific EPMs developed to avoid or minimize impacts are described in Section 3.20.1.7.1.

The impacts discussed in the subsections below are common to all aspects of the Project, while the impacts associated with specific portions of the Project (e.g., converter stations, AC collection system, HVDC routes, as well as their alternatives) are discussed separately following this general impact discussion. Both direct (i.e., impacts that result from the action and occur at the same time and place as the action) and indirect impacts (i.e., impacts that result from the action, but which occur later in time or farther in distance) are addressed. The impacts that could result from activities related to the Project would vary in duration. Some impacts would be temporary, with the resource returning to pre-disturbance conditions after the Project-related disturbance has ceased. Temporary impacts can be further defined as either short-term or long-term impacts. Short-term impacts would continue beyond the completion of construction and last up to 5 years. Long-term impacts would last beyond 5 years (e.g., these impacts often relate to affected resources such as forests that require long recovery periods to return to pre-disturbance conditions), and may last for the duration of the Project life (i.e., 80 years). Permanent impacts result from activities that modify a resource to such an extent that it cannot return to pre-disturbance conditions even after the Project-related disturbance has ceased.

Construction Impacts

Mortality and Injury. Mortality, by definition, would constitute a permanent impact to an individual (i.e., the individual no longer exists); however, the magnitude of effect related to a single mortality on an entire wildlife population (i.e., the effects that a single mortality has to the entire group) can vary depending on the dynamics of the population. Small populations or those that have a low fecundity can be sensitive to individual mortalities (e.g., the death of a single Florida panther can have a major impact to the success rate of the entire population due to the low population number and slow reproduction rate of this species as described in Section 3.14). However, large and/or healthy populations are often less sensitive to the loss of an individual. In general, many small mammals, small birds, and amphibians (i.e., species that typically have a high birth rate and large population sizes) are less sensitive to individual mortality events compared to large mammals and large birds (e.g., raptors). Bats are an exception to this, because although they are small mammals, they typically bear only a single litter per year, produce one young at a time, and do not breed until their second year (Nagorsen and Brigham 1993).

Construction of the Project could result in the direct mortality or injury of wildlife species. Of the construction activities proposed, the clearing of vegetation and preparation of work sites would pose the greatest risk of injuring or killing wildlife. Although some individuals would move away from construction activities given the disruptive nature of these activities (see further discussion of wildlife disturbances in the “Disturbance” subsection below), some individuals would either attempt to hide within the path of disturbance (e.g., small mammals or reptiles may attempt to burrow underground or remain motionless within the vegetation during clearing) or would be unable to relocate away from the disturbed area (e.g., eggs and some juvenile birds would be killed if clearing was conducted during the breeding season). These mortalities/injuries can be minimized by timing the construction activities to avoid sensitive periods (e.g., the breeding seasons), and the Applicant has agreed to consult with the USFWS regarding the appropriate seasonal and/or spatial restrictions that should be applied (see EPM FVW-5); however, some mortality events would still occur even with the implementation of seasonal and spatial restrictions. Based on their life-histories, avian species and small mammals would likely constitute a large component of wildlife injuries and/or mortalities if construction was conducted during the breeding season. Large mammals would likely constitute a low component of wildlife injuries and/or mortalities that are a direct result of vegetation clearing, regardless of the timing of construction (e.g., Project-related large mammal injuries/mortalities would likely result from factors not directly related to vegetation clearing; see further discussion below).

Use of heavy equipment and vehicles during construction of the Project could result in additional wildlife injuries or mortalities (beyond those resulting from vegetation clearing) as wildlife can be struck or run over by vehicles. The likelihood of striking or running over wildlife increases if construction occurs during the night when visibility is limited, or if vehicles are operated at high speeds. In order to minimize this risk, the applicant would implement EPMs GE-6, GE-20, and GE-22.

Wildlife species can become sick or die if they are exposed to hazardous chemicals such as those that would be used during construction of the Project (e.g., oils, fuels, herbicides). Illness and/or mortality can result from direct contact with the toxin, or if the species is indirectly exposed through the food web. Improper use of these chemicals as well as accidental spills can expose wildlife to these chemicals; however, the Applicant would implement EPMs GE-1, GE-5, GE-13, GE-21, and GE-28, as well as the measures that would be outlined in the required SPCCP and SWPPP to minimize these risks.

Construction of the Project could result in the ignition of wildfires. For example, the hot undercarriage of construction vehicles can ignite the grasses found along access roads (see Section 3.8 for more details regarding fire risk). Although many wildlife species are adapted to dealing with fire to some degree (e.g., small mammals and reptiles may burrow underground, while birds and large mammals would move away from the affected area), wildfires could still result in some wildlife mortalities (especially for less mobile species or individuals or in habitats and regions not typically exposed to fire) (Smith 2000).

The Project’s construction has the potential to increase the numbers of predators in the immediate area, due to the presence of trash in the work area. Trash created by construction personnel can attract predators like crows and raccoons (*Procyon lotor*). This would be a short-term impact that would end with the removal of the trash source. The Applicant would minimize risk of attracting predators to the area through the implementation of EPM GE-15. Concern has been expressed by the public that bats may collide with construction equipment during construction of the Project. This sort of collision is unlikely to occur as construction equipment would typically be present in the construction area during daylight hours when bats are not active (however, see further discussion below regarding the possibility of construction occurring at night). Furthermore, bats are capable of avoiding stationary structures via the use of echolocation, so they would likely be able to avoid any Project-related stationary structures that may be present at night; however, bats may collide with and be killed by the turbines found at the associated wind-farms during operation of the Project (see further discussion in the “Impacts from Connected Actions” section below). The greatest risk to bat species during construction of the Project is the potential clearing of trees that are used by bats for daytime roosting habitats (resulting in direct mortality), or the potential disturbance of bats in hibernacula (see the discussion below in the “Disturbance” subsection).

Disturbance. The increased presence of humans as well as the noise and vibrations associated with construction activities could disturb wildlife in the vicinity of the Project. Disturbances associated with elevated noise levels would likely have a farther reaching affect compared to visual disturbances (i.e., depending on limited sight lines due to topography and/or visual screening, noise can potentially affect areas beyond the visual range of an individual). As discussed in Section 3.11, construction noise is typically made up of intermittent peaks and continuous lower levels of noise from equipment cycling through use. Noise levels associated with individual pieces of equipment would generally range between 55 and 85 dBA L_{max} (see Section 3.11). Maximum instantaneous construction noise levels could be as high as 95 dBA L_{eq} at 50 feet from any work site. Table 3.11-4 in Section 3.11 provides noise level data for Project-related construction activities.

The responses of wildlife to disturbances may include temporary habitat displacement or avoidance of the area, stress, and disorientation. This could have negative impacts by causing animals to move to less suitable areas, which could result in less available or lower quality forage, loss of access to preferred nesting/breeding sites, increased exposure to predation, and increased energy expenditure. Individual stress, habitat displacement, and avoidance association with disturbance can take time away from life history activities, including feeding, reproduction, and parental care resulting in reduction of overall fitness. The resulting adverse impacts to adults would be expected to be temporary and short-term, occurring during active construction hours and ceasing after construction activities have moved from a given area (unless the habitat is degraded below its ability to support the species; see further discussion below). However, if adults abandon their young due to these disturbances (e.g., if the adult birds abandoned their nests), these disturbances could result in the death of young (see the “Mortality and Injury” subsection above).

The Applicant has indicated that they would conduct all construction activities during daylight hours to the extent practical (see EPM GE-20); however, EPM GE-20 indicates that nighttime construction may be required under certain conditions (e.g., to address emergency or unsafe situations). Wildlife would likely be more sensitive to disturbance during nighttime hours because natural background noise levels could be lower at night compared to daylight hours (i.e., there would be a larger difference between background noise levels and construction noise at night, resulting in a greater disturbance affect to wildlife if work occurs at night). Furthermore, artificial lighting would be required to safely work at night. Migrating avian species could be attracted to the work areas during the night due to this artificial lighting, thereby exposing these species to increased risks of disturbance or injury. The artificial lighting could also attract insects to the area resulting in exposure of bat species, which feed on insects, to increased risks of disturbance or injury. Artificial lighting could also disrupt natural wildlife processes such as foraging, reproduction, and communication within areas that are artificially lit during nighttime construction.

All wildlife taxa have the potential for habitat displacement and avoidance due to Project-related disturbance. Many bat and bird species are highly sensitivity to disturbances, because disturbed birds may abandon their young (resulting in the death of the young), while roosting bats that are disturbed during the day may abandon hibernaculum thereby expending critical and limited energy resources (potentially resulting in the death of the bat). Big game species (i.e., large mammals) can also be sensitive to disturbance. For example, displacement of big game from both winter and parturition (birthing) areas could affect over-winter survival by causing animals to mobilize stored bodily energy reserves that are needed to survive seasons when food is scarce. This could also impact reproductive success on parturition ranges if females are sufficiently disturbed so as to not provide adequate care for their young.

Habitat Loss and Modification. Construction of the Project would result in the loss or modification of wildlife habitat. Affected habitats may be temporarily lost to wildlife during the construction phase of the Project (e.g., wildlife may not use these habitats during construction), but use of the habitat could be restored once construction disturbances cease in the area and the habitat is restored. However, areas that are occupied by permanent Project features (e.g., towers, substations, etc.) would be permanently lost to wildlife. The Project would also convert some habitats from one type to another. For example, trees and tall shrubs would be cleared within the Project's ROW to prevent this tall vegetation from interfering with or damaging the Project's transmission line (see Section 3.17). This vegetation maintenance within the ROW would convert forested and riparian areas to a grassland and low shrub habitat type (this conversion would be a permanent impact). Conversion of habitats from one type to another could alter the composition of wildlife found within the affected habitat (e.g., shifting from an interior forested wildlife community to a grassland or forest-edge community within the affected area). It should be noted that the entire ROW would be cleared in forested habitats, but not in low vegetation types such as grasslands or croplands (where only areas needed for construction would be cleared as described in Section 3.17). As a result, the acreage of cleared land per mile of Project would be greatest in forested habitats compared to other habitats that contain only low vegetation types.

The amount of time necessary for temporarily impacted habitats to restore to pre-construction conditions would depend on the type and structure of the affected habitat. Grasslands and croplands would be capable of restoring to pre-disturbance levels in a short timeframe (defined as less than 5 years). As a result, impacts could be short-term within the grasslands and croplands habitats that are allowed to restore to pre-construction conditions following completion of construction (i.e., areas not encompassed by the footprint of the converter station, transmission line structures, access roads, etc.). However, forested and riparian areas can take many decades to restore to pre-construction conditions; as a result, habitat loss would have a long-term impact in forested and riparian areas (even for those forested and riparian areas that are allowed to restore to pre-construction conditions).

The Project could indirectly impact wildlife by decreasing habitat quality through habitat fragmentation. Although fragmentation of habitats would begin during construction, the majority of fragmentation related impacts would occur after construction; therefore, fragmentation is discussed below, under the "Operations and Maintenance Impacts" subheading.

The clearing of vegetation and disturbance to soils could promote the spread and or establishment of invasive plant species. Invasive plant species can reduce the quality of habitats for wildlife by competing with native plants for resources such as water and light, changing the community composition, eliminating or reducing native plants, or changing the vegetation structure. All habitat types are susceptible to establishment or invasion by invasive plant species. The Applicant would implement EPM FVW-2 to minimize the risk of spreading or creating new infestations of invasive plant species. Section 3.17 discusses in detail the potential effects of invasive plants species on native habitats, as well as the measures that would be taken to minimize the risk of these effects.

Operations and Maintenance Impacts

The direct and indirect effects on wildlife resources (e.g., mortality and/or injury, disturbance, habitat loss and/or modification) that would occur during the operations and maintenance phase of the Project would generally result from the presence of permanent Project structures, the presence of maintenance personnel and equipment in the area, and vegetation reclamation and maintenance activities that would be conducted. However, the magnitude of these effects would generally be less than what was described above for construction related impacts due to the periodic nature of the required maintenance and reclamation work (see Section 2.1.5 for a detailed description of the estimated operations and maintenance schedule).

Fragmentation refers to the breaking up of contiguous areas of vegetation or habitat into smaller patches. Many wildlife species require contiguous patches of suitable habitat of certain size and connectivity to carry out life functions such as foraging, finding a mate, and the dispersal of young to adjacent suitable habitat areas. For some species, the generally 14 to 16-foot-wide access roads associated with the Project (as well as the cleared ROW in forested and riparian areas) could serve as a barrier to movement, thereby isolating subpopulations and increasing the risk of local extirpation (this would be predominantly experienced by smaller species or those less likely to move through open areas that are either devoid of vegetation or contain modified vegetation). Although the Project may not serve as a barrier to movement for all species (e.g., the presence of access roads, the ROW, or the transmission line itself would not likely limit the movement of large mammals), roads can reduce habitat quality by promoting the spread or establishment of invasive plant species (discussed in detail above).

In addition, the presence of the transmission line itself could exclude some species from areas adjacent to the line or increase predation rates near the line, thereby contributing to the effect and magnitude of habitat fragmentation for some prey species. This is because the presence of the suspended powerline could become an attractant to raptors and ravens/crows for nesting and perching habitats. The numbers of ravens and crows that use existing transmission lines for perching habitat can become quite substantial (Engel et al. 1992), and the potential increase in raptor and raven/crows numbers along the Project could result in an increase in harassment and predation rates on prey species (e.g., small mammals or prey bird species) that are present at or adjacent to the Project (Stahlecker 1978; Steenhof et al. 1993; Manzer and Hannon 2005; Coates and Delehanty 2010). The effect of increased raptor and raven/crow predation rates on prey species would be most prominent where the Project is located in areas that do not contain other tall structures, such as existing transmission lines or trees. Fragmentation and the creation of a cleared ROW in forested and woodland habitats could also facilitate the movement and improve hunting efficiency for some mammalian predators. In forests, for example, coyotes are most abundant in areas of disturbance (Kays et al. 2008). They are also known to travel extensive distances on linear pathways, including transmission line ROWs (Way and Eatough 2006).

In addition to the general effects of fragmentation discussed above, forested and riparian habitats would experience a substantial edge effect. Edge effects result when two different types of habitat are adjacent to each other. Edge effects tend to be more pronounced with increasing differences in the structure, height, density, or complexity of the two adjacent habitat types (e.g., a mature forest adjacent to a grassland). A variety of impacts are associated with edge effects. For example, edge effects can affect wildlife and habitat quality by altering nutrient flows/cycling; increasing the rate of invasion by noxious weeds, invasive wildlife species, and pathogens; lowering the carrying capacity of a habitat/patch; and disrupting meta-population dynamics[1] (Saunders and Hobbs 1991). The creation of habitat edges within forests can impact microclimatic factors such as wind, humidity, and light, and can lead to a change in plant or animal species composition within the adjacent habitat (Murcia 1995). Compared to the interior of a forest, areas near edges receive more direct solar radiation during the day, lose more long-wave radiation at night, have lower humidity, and receive less short-wave radiation. Increased solar radiation and wind can desiccate vegetation by increasing evapotranspiration, can affect which plant species survive along the edge (typically favoring shade-intolerant species), and can impact soil characteristics; all of these factors can alter the composition of wildlife habitats.

The impacts of fragmentation and edge effects do not affect all habitats, taxa, and species equally. Some species will avoid edge habitats, while others species preferentially select edge habitats. For example, crows, blue jays, raccoons, and brown-headed cowbirds are often associated with edge habitats (Masters et al. 2002). Edge habitats provide these species with a diversity of cover types and foraging/feeding opportunities. The creation of edge habitats by the Project in forested areas (primarily in Regions 4 and 5; as well as Regions 3 and 7 to a lesser extent) could result in the numbers of species that prefer edge habitats to increase along the ROW, while decreasing the number of species that prefer dense, continuous, unfragmented habitats. Also, the potential increase in brown-headed cowbirds could adversely affect other avian species in the areas, because this species parasitizes the nests of other birds (Lowther 1993). Fragmentation and edge effects can also affect grassland and other non-forested habitats as well. For example, the increased predation rates experienced along the Project (due to the consolidation of raptors and ravens/crows along the lines) could result in the fragmentation of grassland and other low-vegetation habitats crossed by the Project (see discussion above).

Some avian mortality may occur as a result of collisions with the transmission lines and Project features during operations (CEC 2005). A variety of factors influence the rate of avian collisions with powerlines or other anthropogenic features, including: configuration and location of powerlines; the tendency of certain species to collide with structures; and environmental factors such as weather, topography, and habitat (APLIC and USFWS 2005). Line placement with respect to other structures and topography can influence the collision rate of avian species at a given powerline. Collisions usually occur near water or migration corridors, and occur more often during inclement weather. Less agile birds, such as heavy-bodied birds or birds that travel in flocks, are more likely to collide with overhead lines because they lack the ability to quickly negotiate obstacles. As discussed in Section 3.20.1.5, rivers/waterbodies often serve as stopover habitats or migratory corridors for migrating birds. As a result, the highest rate of Project-related avian species mortalities due to collisions are likely to occur in areas where the transmission line spans waterbodies (Tables 3.15-4, 3.15-5, 3.15-8, 3.15-12, 3.15-16, 3.15-20, 3.15-24, and 3.15-28 provide a list the waterbodies that could potentially be crossed by the Project). In order to minimize the risk of avian collisions, the Applicant would develop and implement an APP (as described in Section 3.20.1.7.1) consistent with APLIC guidelines.

Avian species are also susceptible to electrocutions as a result of powerlines. In order for a bird to become electrocuted it needs to come into contact with two energized conductors at the same time. As a result, multiple factors influence the risk of avian electrocutions including: the spacing between energized conductors, the tendency

[1] Meta-population dynamics refers to the interplay between source and sink populations. Meta-population dynamics are an important factor in gene flow between populations, and disruptions to this dynamic can alter or disconnect sub-populations.

of a species to perch along powerlines or fly near conductors, as well as the avian species body-size and wing-length. Of the avian species in the area, raptors have the highest likelihood of becoming electrocuted because raptors commonly perch along transmission lines and have relatively large-bodies compared to other taxa of birds. Ravens/crows (which also perch on powerlines) and waterbirds (which do not typically perch on powerlines, but can have large wingspans and can potentially come into contact with two energized conductors if they fly close to the power-lines) are also at risk of electrocutions. As described in Appendix F, the spacing for the conductors as currently proposed would minimize the risk of avian species coming into contact with two energized conductors and/or becoming electrocuted. To further minimize the risk of avian electrocutions, the Applicant would develop and implement an APP (as described in Section 3.20.1.7.1) consistent with APLIC guidelines.

Decommissioning Impacts

Decommissioning of the Project would involve methods similar to those that would be required to construct the Project. As a result, the impacts of decommissioning would be similar to those previously described for construction. The Applicant would follow the same general and resource-specific EPMs during decommissioning that would be implemented during construction. In addition, the Applicant would develop a Decommissioning Plan prior to any decommissioning actions for review and approval by the appropriate state and federal agencies.

Although decommissioning would have short-term adverse impacts to wildlife (similar to what was discussed for construction related impacts), it is assumed that decommissioning of the Project would have long-term beneficial impacts to wildlife species and their habitats because it would remove the Project and its related impacts from the environment. However, areas disturbed by the decommissioning activities would still take time to recover from this disturbance (with disturbances in grasslands and croplands recovering within 5 years or less, and recovery in forests taking many decades).

3.20.1.7.2.1 Converter Stations and AC Interconnection Siting Areas

3.20.1.7.2.1.1 Construction Impacts

3.20.1.7.2.1.1.1 Oklahoma Converter Station Siting Area and AC Interconnection Siting Area

The Oklahoma Converter Station and AC Interconnection Sitting Areas are located within Region 1. As discussed in Sections 3.10 and 3.17, grasslands and croplands are the dominant habitat types found at the proposed site for the Oklahoma converter station and AC interconnection. As a result, the wildlife species that would be exposed to Project-related mortality or injury in this area would be those species that inhabit these types of habitats, i.e., those adapted to dry or seasonally dry habitat conditions of the semi-arid eastern Oklahoma Panhandle. Appendix L lists the wildlife species that inhabit this area and could be impacted by the Project.

Grasslands and croplands are capable of restoring to pre-disturbance levels in a short timeframe (defined as less than 5 years). As a result, the majority of Project-related impacts to grasslands and croplands habitats in Region 1 would be short term in nature (i.e., these areas would restore to pre-construction conditions within 5 years or less). However, some permanent loss of grassland and croplands habitats would also occur as a result of the Project's permanent footprint (i.e., some areas would be encompassed permanently by Project structures such as the converter station, transmission line structures, access roads, etc.). Sections 3.10 and 3.17 list the types of habitats that could be affected and the acres that could be impacted by the Oklahoma converter station and AC interconnection.

As currently proposed, the Oklahoma converter station and AC interconnection would be sited within and impact grassland and croplands habitats. Furthermore, the habitats found within Region 1 are relatively common throughout the ROI (i.e., grasslands and croplands dominate the entire area with very few other habitat types present); therefore, potential modifications to the location of the converter station or the route of the AC interconnection within the ROI in Region 1 would not likely substantially alter the types or magnitude of impacts that would occur to wildlife species or their habitats in this area.

3.20.1.7.2.1.1.2 Tennessee Converter Station Siting Area and AC Interconnection Siting Area

The Tennessee Converter Station and AC Interconnection Siting Areas are located within Region 7. As discussed in Sections 3.10 and 3.17, croplands and pasture lands are the dominant habitat types found at the proposed site for the Tennessee Converter Station and AC Interconnection Siting Areas. However, hardwood forests and riparian areas are also present within the ROI for the Tennessee Converter Station and AC Interconnection Siting Areas. As a result, the wildlife species that would be exposed to Project-related mortality or injury in this area would be those species that inhabit these types of habitats. This includes those adapted to the mesic conditions of northeastern Arkansas and southwestern Tennessee. Tables in Appendix L list the wildlife species that inhabit this area and could be impacted by the Project.

Croplands and pasture lands are capable of restoring to pre-disturbance levels in a short timeframe (defined as less than 5 years). As a result, the majority of Project-related impacts to these areas in Region 7 would be short-term in nature (i.e., these areas would restore to pre-construction conditions within 5 years or less). However, some permanent loss of habitats would still occur as a result of the Project's permanent footprint (i.e., some areas would be encompassed permanently by Project structures such as the converter station, transmission line structures, access roads, etc.). Furthermore, because forests and riparian areas are also present with the ROI for the Tennessee Converter Station and AC Interconnection Siting Areas, these types of habitats could also be potentially impacted as well. As previously discussed, forested and riparian areas could take decades to restore to pre-construction conditions if they are disturbed or cleared (i.e., impacts would be long-term in these habitat types). Sections 3.10 and 3.17 list the types of habitats that could be affected and the acres that could be impacted by the Tennessee converter station and AC interconnection.

The exact location of the Tennessee converter station and AC interconnect within the identified siting areas is unknown at this time. The area considered for its placement contains a variety of habitat types that range from forested areas to crop/pasture lands. As discussed above, impacts to wildlife would likely be less if the converter station and AC interconnection were located within the crop and pasture lands, and would be greater if they were located in forested areas due to the effects of long-term habitat loss, the extensive time necessary for forests to regenerate to pre-disturbance conditions, and the impacts associated with edge effects in forested habitats.

3.20.1.7.2.1.2 Operations and Maintenance Impacts

3.20.1.7.2.1.2.1 Oklahoma Converter Station Siting Area and AC Interconnection Siting Area

Operation and maintenance activities would result in long-term impacts to the habitats around the converter station and AC Interconnection siting area (see Section 3.20.1.7.2 for a detailed discussion of potential impacts related to wildlife disturbance and habitat disruption). Furthermore, as discussed above, some permanent loss of habitat would occur as a result of the Project's permanent footprint (i.e., some areas would be encompassed permanently by Project structures such as the converter station, transmission line structures, access roads, etc.). Sections 3.10 and

3.17 list the types of habitats that could be affected and the acres that would be permanently impacted by the Oklahoma converter station and AC interconnection during operations and maintenance.

The permanent loss of habitat related to the Oklahoma converter station and AC interconnection (see Sections 3.10 and 3.17), is unlikely to have substantial long-term impacts to wildlife populations in the area because the type of habitats affected are common in the region and found elsewhere in the vicinity of the Project ROI (i.e., the affected grasslands and croplands are not limited on the landscape).

3.20.1.7.2.1.2.2 Tennessee Converter Station Siting Area and AC Interconnection Siting Area

Operation and maintenance activities would result in long-term impacts to the habitats around the converter station and AC Interconnection siting area (see Section 3.20.1.7.2 for a detailed discussion of potential impacts related to wildlife disturbance and habitat disruption). Furthermore, some permanent loss of habitat would occur as a result of the Project's permanent footprint (i.e., some areas would be encompassed permanently by Project structures such as the converter station, transmission line structures, roads, etc.). Sections 3.10 and 3.17 list the types of habitats that could be affected and the acres that would be permanently impacted by the Tennessee Converter Station and AC Interconnection Siting Areas during operations and maintenance.

The permanent loss of habitat related to the converter station and AC interconnection (see Sections 3.10 and 3.17), is unlikely to have substantial long-term impacts to wildlife populations in the area because the type of habitats affected are common in the region and found elsewhere in the vicinity of the Project ROI (i.e., the affected pasture and croplands are not limited on the landscape).

3.20.1.7.2.1.3 Decommissioning Impacts

Impacts related to the decommissioning of the converter stations and AC interconnections would not substantially differ from the general discussion of decommissioning related to the Project in general (see Section 3.20.1.7.2).

3.20.1.7.2.2 AC Collection System

3.20.1.7.2.2.1 Construction Impacts

The AC collection system would be located entirely within Region 1. As discussed above, the habitat types found within Region 1 are relatively common throughout the ROI (e.g., grasslands and croplands dominate the entire area with very few other habitat types present); therefore, potential modifications to the routes of the AC collection system would not likely substantially alter the types of habitats that could be impacted. The species composition found along the AC collection system routes would be similar to what was discussed above for the Oklahoma Converter Station and the AC Interconnection Sitting Areas (as both of these Project components occur within the same Region).

Table 3.20.1-3 lists the length of the various AC collection system routes, the total acreage within the AC collection system ROW (see Table 3.10-13 in Section 3.10 for more details), the predominant land cover found along each route, and any substantial differences regarding the impacts that would occur under any particular route compared to the other routes. As shown in Table 3.20.1-5, AC Collection System Routes E-1 and NE-2 would have a potentially greater risk of impacting wildlife compared to the other routes, due to these routes' position near important wildlife areas (i.e., both routes are located in close proximity to Optima NWR and Optima WMA[2]), which would elevated the risk of avian collision during the migration seasons (if birds use areas near the Project for stopover habitats). Although AC Collection System Routes NW-1, NW-2, and SE-3 would not have a differential impact to wildlife based on their position (i.e., the types of habitats that could be impacted), they could have a potentially greater impact to wildlife compared to the other routes due to their longer length compared to the other routes (e.g., more habitat would be impacted by these three routes compared to the other routes). It should be noted that these AC collection system routes are not Project alternatives (i.e., one route would not be selected over another as described in Section 2.1.2.3) and the comparison of impacts between these routes is only presented here for impact disclosure purposes.

Table 3.20.1-3:
Summary Information related to Wildlife Resources for the AC Collection System Routes during Construction

AC Collection System Alternatives	Length (miles)	Total Area within the AC ROW (acres)	Predominant Land Cover[1]	Impacts to Wildlife that would be Unique to this Route
E-1	29	708.0	Grasslands (574.2 acres, or 81.1 percent of the ROW)	E-1 would have an elevated risk of avian collision during the migration seasons compared to the other routes, as well as a higher potential for disturbances to important wildlife areas due to this route's proximity to important wildlife areas (i.e., Optima NWR and Optima WMA).
E-2	40	974.4	Grasslands (572.8 acres, or 58.8 percent of the ROW) and croplands (298.6 acres, or 30.6 percent of the ROW)	No substantial difference between this route and the other routes in regards to the types of wildlife impacts that would likely occur as a result of the route's location and position.
E-3	40	977.5	Grasslands (650.3 acres, or 66.5 percent of the ROW)	No substantial difference between this route and the other routes in regards to the types of wildlife impacts that would likely occur as a result of the route's location and position.
NE-1	30	729.8	Grasslands (291.1 acres, or 39.9 percent of the ROI) and croplands (247.2 acres, or 33.9 percent of the ROW)	No substantial difference between this route and the other routes in regards to the types of wildlife impacts that would likely occur as a result of the route's location and position.
NE-2	26	637.4	Grasslands (450.2 acres, or 70.6 percent of the ROW)	NE-2 would have an elevated risk of avian collision during the migration seasons compared to the other routes, as well as a higher potential for disturbances to important wildlife areas due to this route's proximity to important wildlife areas (i.e., Optima NWR and Optima WMA).
NW-1	52	1,265.4	Grasslands (609.5 acres, or 48.2 percent of the ROW) and developed, open space (540.2 acres, or 42.7 percent of the ROW)	No substantial difference between this route and the other routes in regards to the types of wildlife impacts that would likely occur as a result of the route's location and position; however, longer routes would likely have a greater impact due to the greater length and extent of areas impacted.
NW-2	56	1,365.0	Grasslands (629.3 acres, or 46.1 percent of the ROW), croplands (410.9 acres, or 30.1 percent of the ROW), and developed/open	No substantial difference between this route and the other routes in regards to the types of wildlife impacts that would likely occur as a result of the route's location and position; however, longer

[2] These areas are managed for wildlife species, including numerous migratory birds that may use the areas as potential stopover locations during migration

Table 3.20.1-3:
Summary Information related to Wildlife Resources for the AC Collection System Routes during Construction

AC Collection System Alternatives	Length (miles)	Total Area within the AC ROW (acres)	Predominant Land Cover[1]	Impacts to Wildlife that would be Unique to this Route
			space (292.0 acres, or 21.4 percent of the ROW)	routes would likely have a greater impact due to the greater length and extent of areas impacted.
SE-1	40	979.4	Grasslands (513.2 acres, or 52.4 percent of the ROI) and croplands (340 acres, or 34.7 percent of the ROI)	No substantial difference between this route and the other routes in regards to the types of wildlife impacts that would likely occur as a result of the route's location and position.
SE-2	13	325.4	Grasslands (169.9 acres, or 52.2 percent of the ROW) and croplands (130.6 acres, or 40.1percent of the ROW)	No substantial difference between this route and the other routes in regards to the types of wildlife impacts that would likely occur as a result of the route's location and position.
SE-3	49	1,193.6	Grasslands (565.7 acres, or 47.4 percent of the ROW) and croplands (483.9 acres, or 40.5 percent of the ROW)	No substantial difference between this route and the other routes in regards to the types of wildlife impacts that would likely occur as a result of the route's location and position; however, longer routes would likely have a greater impact due to the greater length and extent of areas impacted.
SW-1	13	325.6	Grasslands (312.8 acres, or 96.1 percent of the ROW)	No substantial difference between this route and the other routes in regards to the types of wildlife impacts that would likely occur as a result of the route's location and position.
SW-2	37	901.4	Grasslands (733.0 acres, or 81.3 percent of the ROW)	No substantial difference between this route and the other routes in regards to the types of wildlife impacts that would likely occur as a result of the route's location and position.
W-1	21	507.8	Grasslands (377 acres, or 74.2 percent of the ROW)	No substantial difference between this route and the other routes in regards to the types of wildlife impacts that would likely occur as a result of the route's location and position.

1 Source: Jin et al. (2013)

3.20.1.7.2.2.2 Operations and Maintenance Impacts

Table 3.20.1-4 lists the acreage of permanent habitat loss that would be experienced during operation of the AC collection system.

As discussed above, AC Collection System Routes E-1 and NE-2 would have a greater risk of directly impacting wildlife resources compared to the other routes. The elevated risk of avian collisions along these two routes would be experienced throughout the operational phase of the Project.

Table 3.20.1-4:
Summary Information related to Wildlife Resources for the AC Collection System Routes during Operation

AC Collection System Route	Estimated Footprint of Structures (acres)[1]
E-1	4.1
E-2	5.6
E-3	5.6
NE-1	4.2

Table 3.20.1-4:
Summary Information related to Wildlife Resources for the AC Collection System Routes during Operation

AC Collection System Route	Estimated Footprint of Structures (acres)[1]
NE-2	3.6
NW-1	7.3
NW-2	7.8
SE-1	5.6
SE-2	1.8
SE-3	6.9
SW-1	1.8
SW-2	5.2
W-1	2.9

1 The anticipated footprint of structures assumes seven lattice structures per mile, each of which would have a 28-foot by 28-foot foundation.

3.20.1.7.2.2.3 Decommissioning Impacts

Impacts related to the decommissioning of the AC collection system routes would not substantially differ from the general discussion of decommissioning related to the Project in general (see Section 3.20.1.7.2).

3.20.1.7.2.3 HVDC Applicant Proposed Route

3.20.1.7.2.3.1 Construction Impacts

The Applicant Proposed Route would pass through a variety of habitat types, ranging from grassland and cropland habitats to forested and riparian areas. The Applicant Proposed Route within Regions 1, 2, and 6 would cross predominantly through grassland and cropland habitats. Forested and riparian habitats become more prevalent within Regions 4 and 5 (as well as within Region 3 and 7 to a lesser extent). As discussed above, habitat-related impacts within grassland and croplands would be primarily short-term in nature (with the exception of areas encompassed by permanent Project features); however, habitat-related impacts would be long-term in nature within forested and riparian habitats. These long-term impacts in forested and riparian areas would be related to (1) the long timeframes necessary for forested and riparian areas to restore to pre-construction conditions; (2) the effects of fragmentation and edge effects experienced in dense habitat types; (3) the permanent habitat type conversion resulting from vegetation maintenance conducted within previously forested portions of the ROW; and (4) the elevated risk of wildlife mortalities that would be experienced during the extensive vegetation clearing necessary in forested and riparian areas[3] (see Section 3.20.1.7.2 for more details). As a result, the effects of impacts to wildlife related to the construction of the Applicant Proposed Route would be greatest within Regions 4 and 5 (and to a lesser extent within Regions 3 and 7) compared to Regions 1, 2, and 6.

To minimize impacts to wildlife, the Applicant attempted to route the Project parallel to existing infrastructure when possible. By routing the Project parallel to existing infrastructure, the Project's impacts would be consolidated within

3 As discussed previously, the entire ROW would be cleared in forested habitats, but not in low vegetation types such as grasslands or croplands (where only areas needed for construction would be cleared; see Section 3.17). As a result, the acreage of cleared land per mile of Project would be greatest in forested habitats compared to other habitats that contain only low vegetation types.

areas that have already been impacted by existing infrastructure to some degree, as opposed to routing the Project though previously "un-impacted" areas.

Table 3.20.1-5 lists the approximate length of the Applicant Proposed Route in each region, the total acreage within the HVDC ROW, the predominant habitat type that could be impacted, and how much of the route is parallel to existing infrastructure; however, see Sections 3.10 for a more detailed description regarding the breakdown of vegetation types by acreage (i.e., Tables 3.10-15 through 3.10-21). A description of the dominant wildlife species that are likely to occur within each area is found in Section 3.20.1.4.

Table 3.20.1-5:
Summary Information related to Wildlife Resources for the Applicant Proposed Route

Region	Total Length of HVDC (miles)	Total Area within the HVDC ROW (acres)	Predominant Land Cover found along the HVDC[1]	Length of Route Parallel to Existing Infrastructure (miles)
1	115	2,822.3	Grasslands (1,742.3 acres) and croplands (748.8 acres)	Approximately 20 miles, or 18 percent of the route
2	106	2,586.7	Grasslands (1,299.9 acres) and croplands (788 acres)	Approximately 27 miles, or 25 percent of the route
3	162	3,945.5	Grasslands (1,339.5 acres), deciduous forest (1,098.2 acres), and pasture/hay (941.3 acres)	Approximately 21 miles, or 13 percent of the route
4	126	3,081.8	Pasture/hay (1,436.1 acres), deciduous forest (813.7 acres), and evergreen forest (404.7 acres)	Approximately 11 miles, or 9 percent of the route
5	113	2,753.8	Deciduous forest (810.8 acres), pasture/hay (773.4 acres), and evergreen forest (444.3 acres)	Approximately 15 miles, or 13 percent of the route
6	54	1,326.9	Croplands (1,056.5 acres)	Approximately 11 miles, or 20 percent of the route
7	43	1,045	Croplands (691.8) and deciduous forest (79.1 acres)	Approximately 7 miles, or 17 percent of the route

1 Source: Jin et al. (2013)

3.20.1.7.2.3.2 Operations and Maintenance Impacts

The impacts of the HVDC portion of the Project's operations and maintenance on wildlife and their habitats would be similar to what was described in Section 3.20.1.7.2. As described above, the ongoing impacts related to permanent vegetation maintenance in the ROW, as well as the effects of fragmentation and edge effects, would be greatest in Regions 3, 4, 5, and 7 (due to the presence of forested and riparian areas within the ROW within these regions; see Section 3.20.1.7.2 for more details regarding these effects).

Although the exact placement of the Applicant Proposed Route in relation to waterbodies is unknown at this time, the Applicant Proposed Route in Regions 3, 4, and 5 would likely have a substantial number of waterbody crossings due to the extent of waterbodies in these regions (see Tables 3.15-12, 3.15-16, and 3.15-20). The extent of waterbodies near the HVDC portion of the Project is lower within the remaining regions (see Section 3.15; Tables 3.15-4, 3.15-5, 3.15-8, 3.15-12, 3.15-16, 3.15-20, 3.15-24, and 3.15-28), however, crossings are also likely to occur in these regions as well. As discussed in Section 3.20.1.7.2, there is an elevated risk for avian collisions and mortalities where the Project would span waterbodies.

As described in Section 3.20.1.4.2 above, Regions 1, 2, and 3 of the Applicant Proposed Route occur within the Central Flyway, while Regions 4 through 7 occurs within the Mississippi Flyway. Migrating flocks could potentially occur within the area on an annual basis due to the Applicant Proposed Route's proximity to the:

- Optima NWR, Optima WMA, and Lake Schultz State Park in Region 1
- Major County WMA in Region 2
- Cimarron and Arkansas rivers in Region 3
- Ozark National Forest IBA in Regions 4 and 5
- Cache-Lower White rivers IBA in Region 6
- Various rivers and creeks found within each region (see Section 3.20.1.5 and Section 3.15)

No field studies have been conducted to identify the occurrence and avian use of the ROI; however, the presence of these IBAs implies that resident and migrating birds may use these areas, thereby increasing the risk of impacts to avian species (e.g., habitat disturbance, habitat loss, and risk of collisions with Project structures). The Applicant would develop and implement an APP, consistent with APLIC guidelines, that describes a program of specific and comprehensive actions that when implemented, would reduce risk of avian mortality. EPMs would also be implemented (FVW-2, GE-2, GE-20) as described in Section 3.20.1.7.1, to avoid or minimize impacts to wildlife resources (including avian species).

3.20.1.7.2.3.3 Decommissioning Impacts

Impacts related to the decommissioning of the HVDC portion of the Project would not substantially differ from the general discussion of decommissioning related to the Project in general (see Section 3.20.1.7.2).

3.20.1.7.3 Impacts Associated with the DOE Alternatives

3.20.1.7.3.1 Arkansas Converter Station Alternative Siting Area and AC Interconnection Siting Area

3.20.1.7.3.1.1 Construction Impacts

The Arkansas Converter Station Alternative and AC Interconnection Siting Area are located within Region 5; however, the exact location of the Arkansas Converter Station and AC Interconnection within the siting areas has not been determined to date. As discussed in Section 3.10, the general area being considered for placement of the Arkansas converter station and AC interconnection is dominated by evergreen and deciduous forests as well as pasture/hay fields. As a result, the wildlife species that would be exposed to Project-related mortality or injury in this area would be those species that inhabit these types of habitats. Tables provided in Appendix L list the wildlife species that inhabit the area and could be impacted by the Project in this area.

Given the potential for clearing forested habitats during the construction of this converter station and AC interconnection, the Project could result in long-term impacts to wildlife habitats (due to the timeframes necessary for these forests areas to restore to pre-construction conditions; see previous discussions above). Because the pasture/hay fields that could potentially be impacted are capable of restoring to pre-disturbance levels in a short timeframe (defined as less than 5 years), most impacts to these types of habitats would be short-term in nature (i.e., these areas would restore to pre-construction conditions within 5 years or less). However, some permanent loss of pasture/hay field habitats would still occur as a result of the Project's permanent footprint (i.e., some areas would be encompassed permanently by Project structures such as the converter station, transmission line structures, access roads, etc.). Sections 3.10 and 3.17 list the types of habitats that could be affected and the acres that could be impacted by the Arkansas converter station and AC interconnection.

The area considered for the Arkansas converter station and AC interconnection contains a variety of habitats that range from forested areas to pasture lands. As discussed above, impacts to wildlife would likely be less if the converter station and AC Interconnection were located within the pasture lands, and would be greater if they were located in forested areas (due to the effects of long-term habitat loss, the extensive time necessary for forests to regenerate to pre-disturbance conditions, and the impacts associated with edge effects in forested habitats).

3.20.1.7.3.1.2 Operations and Maintenance Impacts

Operation and maintenance activities would result in long-term impacts to the habitats around the converter station and AC interconnection (see Section 3.20.1.7.2 for a detailed discussion of potential impacts related to wildlife disturbance and habitat disruption). Furthermore, some permanent loss of habitat would occur as a result of the Project's permanent footprint (i.e., some areas would be encompassed permanently by Project structures such as the converter station, transmission line structures, access roads, etc.). Sections 3.10 and 3.17 list the types of habitats that could be affected and the acres that would be permanently impacted by the Arkansas converter station and AC interconnection during operations and maintenance.

The permanent loss of habitat related to the Arkansas converter station and AC interconnection (see Sections 3.10 and 3.17) is unlikely to have substantial long-term impacts to wildlife populations in the area because the type of habitats affected are common in the region and found elsewhere in the vicinity of the Project ROI.

3.20.1.7.3.1.3 Decommissioning Impacts

Impacts related to decommissioning of the Arkansas converter station and AC interconnection would not substantially differ from the general discussion of decommissioning related to the Project in general (see Section 3.20.1.7.2).

3.20.1.7.3.2 HVDC Alternative Routes

3.20.1.7.3.2.1 Construction Impacts

Table 3.20.1-6 lists the approximate length of the HVDC alternative routes by region, the total acreage within the HVDC alternative route's ROW, the predominant habitat type that could be impacted (see Sections 3.10 and 3.17 for more details regarding the acres of impact that could occur), and any substantial impacts that would differ by alternative compared to the Applicant Proposed Route. A description of the dominant wildlife species that are likely to occur within each area is found in Section 3.20.1.4.

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Table 3.20.1-6:
Summary Information Related to Wildlife Resources for the HVDC Alternative Routes

Region	Alternative Route	Total Length of Route (miles)	Total Area within the HVDC ROW (acre)[1]	Predominant Land Cover[2]	Impacts to Wildlife that would Differ Compared to the Proposed Route
1	1-A	123	3,003.1	Grasslands (2,265.4 acres)	This alternative compares to the Applicant Proposed Route Links 2, 3, 4, and 5. No substantial difference between the Applicant Proposed Route and this alternative because similar habitats would be impacted.
	1-B	52	1,268.4	Grassland (886.6 acres)	This alternative compares to the Applicant Proposed Route Links 2 and 3. No substantial difference between the Applicant Proposed Route and this alternative because similar habitats would be impacted.
	1-C	52	1,272.5	Grasslands (892.3 acres)	This alternative compares to the Applicant Proposed Route Links 2 and 3. No substantial difference between the Applicant Proposed Route and this alternative because similar habitats would be impacted.
	1-D	33.5	819.2	Grasslands (568.9 acres)	This alternative compares to the Applicant Proposed Route Links 3 and 4. No substantial difference between the Applicant Proposed Route and this alternative because similar habitats would be impacted.
2	2-A	57	1,396.3	Grasslands (833.5 acres)	This alternative compares to the Applicant Proposed Route Link 2. No substantial difference between the Applicant Proposed Route and this alternative because similar habitats would be impacted.
	2-B	30	727.7	Croplands (440.3 acres), grasslands (240.0 acres)	This alternative compares to the Applicant Proposed Route Link 3. No substantial difference between the Applicant Proposed Route and this alternative because similar habitats would be impacted.
3	3-A	38	919.1	Grasslands (497.3 acres) and deciduous forest (187.7 acres)	This alternative compares to the Applicant Proposed Route Link 1. No substantial difference between the Applicant Proposed Route and this alternative because similar habitats would be impacted.
	3-B	48	1,166.6	Grasslands (645.2 acres) and deciduous forest (219.0 acres)	This alternative compares to the Applicant Proposed Route Links 1, 2, and 3. No substantial difference between the Applicant Proposed Route and this alternative because similar habitats would be impacted.
	3-C	122	2,967.5	Grasslands (1,061.2 acres), deciduous forest (869.2 acres), and pasture/hay (773.4 acres)	This alternative compares to the Applicant Proposed Route Links 3, 4, 5, and 6. This route alternative would impact slightly more forested areas compared to the Applicant Proposed Route.
	3-D	39	958.8	Primarily pasture/hay (491.8 acres), grasslands (188.9 acres) and deciduous forest (184.3 acres) grasslands	This alternative compares to the Applicant Proposed Route Links 5 and 6. No substantial difference between the Applicant Proposed Route and this alternative because similar habitats would be impacted.

Table 3.20.1-6:
Summary Information Related to Wildlife Resources for the HVDC Alternative Routes

Region	Alternative Route	Total Length of Route (miles)	Total Area within the HVDC ROW (acre)[1]	Predominant Land Cover[2]	Impacts to Wildlife that would Differ Compared to the Proposed Route
	3-E	8.5	207.8	Pasture/hay (98.3 acres) and deciduous forest (74.1 acres)	This alternative compares to the Applicant Proposed Route Link 6. No substantial difference between the Applicant Proposed Route and this alternative because similar habitats would be impacted; however, Link 6 would have slightly more deciduous forest and pasture/hay.
4	4-A	58	1,426.0	Deciduous forest (624.0 acres) and pasture/hay (497.4 acres)	This alternative compares to the Applicant Proposed Route Links 3, 4, 5, and 6. No substantial difference between the Applicant Proposed Route and this alternative because similar habitats would be impacted.
	4-B	79	1,919.9	Deciduous forest (873.2 acres) and pasture/hay (459.6 acres)	This alternative compares to the Applicant Proposed Route Links 2–8. Approximately 102 acres of the federally owned land in the Ozark National Forest and an additional 157 acres of private land within the Ozark National Forest boundary (use unknown) are within the ROI for HVDC Alternative Route 4-B, compared to no federal land present in Links 2–8, although approximately 6 acres of state land are present in Link 6. The interspersed land ownership suggests that a variety of land uses may occur along the ROI, and a variety of wildlife species, common to both deciduous forests and pasture/hay land covers may occur. HVDC Alternative Route 4-B would cross into the Ozark National Forest IBA, potentially indirectly impacting wildlife species during construction, as a result of mortality and/or injury, sensory disturbance, and habitat loss or modification.
	4-C	3	82.6	Deciduous forest (32.4 acres) and pasture/hay (19.0 acres)	This alternative compares to the Applicant Proposed Route Link 5. No substantial difference between the Applicant Proposed Route and this alternative because similar habitats would be impacted.
	4-D	25	617.6	Pasture/hay (299.9 acres) and deciduous forest (179.6 acres)	This alternative compares to the Applicant Proposed Route Link 4. This route alternative would impact slightly more forested areas compared to the Applicant Proposed Route.
	4-E	37	897.2	Pasture/hay (395.5 acres) and evergreen forest (218.7 acres)	This alternative compares to the Applicant Proposed Route Links 8 and 9. No substantial difference between the Applicant Proposed Route and this alternative because similar habitats would be impacted.
5	5-A	13	308.5	Evergreen forest (130.4 acres) and deciduous forest (78.8 acres)	This alternative compares to the Applicant Proposed Route Link 1. No substantial difference between the Applicant Proposed Route and this alternative because similar habitats would be impacted.
	5-B	71	1,732.3	Pasture/hay (740.3 acres) and deciduous forest (479.5 acres)	This alternative compares to the Applicant Proposed Route Links 3, 4, 5, and 6. No substantial difference between the Applicant Proposed Route and this alternative because similar habitats would be impacted.

Table 3.20.1-6:
Summary Information Related to Wildlife Resources for the HVDC Alternative Routes

Region	Alternative Route	Total Length of Route (miles)	Total Area within the HVDC ROW (acre)[1]	Predominant Land Cover[2]	Impacts to Wildlife that would Differ Compared to the Proposed Route
	5-C	9	224.6	Deciduous forest (99.9 acres) and pasture/hay (70.9 acres)	This alternative compares to the Applicant Proposed Route Links 6 and 7. No substantial difference between the Applicant Proposed Route and this alternative because similar habitats would be impacted; however, Link 6 would have slightly more forested habitats.
	5-D	22	529.6	Deciduous forest (246.5 acres) and croplands (92.0 acres)	This alternative compares to the Applicant Proposed Route Link 9. No substantial difference between the Applicant Proposed Route and this alternative because similar habitats would be impacted; however, Link 9 would have more croplands.
	5-E	36	885.1	Pasture/hay (383.5 acres) and deciduous forest (249.3 acres)	This alternative compares to the Applicant Proposed Route Links 4, 5, and 6. No substantial difference between the Applicant Proposed Route and this alternative because similar habitats would be impacted.
	5-F	22	544.5	Pasture /hay (209.9 acres) and deciduous forest (153.2 acres)	This alternative compares to the Applicant Proposed Route Links 5 and 6. No substantial difference between the Applicant Proposed Route and this alternative because similar habitats would be impacted.
6	6-A	16	395.7	Croplands (328.6 acres)	This alternative compares to the Applicant Proposed Route Links 2, 3, and 4. No substantial difference between the Applicant Proposed Route and this alternative because similar habitats would be impacted.
	6-B	14	343.7	Croplands (272.1 acres) and woody wetlands (44.6 acres)	This alternative compares to the Applicant Proposed Route Link 3. No substantial difference between the Applicant Proposed Route and this alternative because similar habitats would be impacted.
	6-C	23	565.6	Croplands (410.6 acres)	This alternative compares to the Applicant Proposed Route Links 6 and 7. No substantial difference between the Applicant Proposed Route and this alternative because similar habitats would be impacted.
	6-D	9	223.6	Croplands (205.3 acres)	This alternative compares to the Applicant Proposed Route Link 7. No substantial difference between the Applicant Proposed Route and this alternative because similar habitats would be impacted.
7	7-A	43	1,052.0	Croplands (827.8 acres) and woody wetlands (110.5 acres)	This alternative compares to the Applicant Proposed Route Link 1. No substantial difference between the Applicant Proposed Route and this alternative because similar habitats would be impacted.
	7-B	9	209.9	Croplands (86.4 acres), deciduous forest (42.7 acres), pasture/hay (34 acres) and shrub/scrub (32.7 acres)	This alternative compares to the Applicant Proposed Route Links 3 and 4. No substantial difference between the Applicant Proposed Route and this alternative because similar habitats would be impacted; however, Link 4 would have no forests and more pasture/hay.
	7-C	24	578.6	Croplands (350.6 acres), deciduous	This alternative compares to the Applicant Proposed Route Links 3, 4, and 5. No

Table 3.20.1-6:
Summary Information Related to Wildlife Resources for the HVDC Alternative Routes

Region	Alternative Route	Total Length of Route (miles)	Total Area within the HVDC ROW (acre)[1]	Predominant Land Cover[2]	Impacts to Wildlife that would Differ Compared to the Proposed Route
				forest (58.4 acres), and pasture/hay (72.2 acres), and	substantial difference between the Applicant Proposed Route and this alternative because similar habitats would be impacted; however, Links 3, 4, and 5 would have slightly more deciduous forest and shrub/scrub.
	7-D		159.5	Croplands (76.8 acres), pasture/hay (32.2 acres), and shrub/scrub (20.6 acres)	This alternative compares to the Applicant Proposed Route Links and 5. No substantial difference between the Applicant Proposed Route and this alternative because similar habitats would be impacted.

1 A more detailed breakdown of vegetation types that could be impacted by the HVDC Alternative Routes, by region, can be found in Tables 3.10-22 through 3.10-30 in Section 3.10. A more detailed description of the acreage of vegetation types that could be impacted along each of the Applicant Proposed Route's various links, by region, can be found in Tables 3.10-15 through 3.10-21 in Section 3.10.

2 Source: Jin et al. (2013)

3.20.1.7.3.2.2 Operations and Maintenance Impacts

Direct and indirect impacts to wildlife and their habitat from operations and maintenance of all of the HVDC Alternative Routes (except for 3-C, 4-B, and 4-D; which are discussed below) are anticipated to be similar to the operations and maintenance of the Applicant Proposed Route because the habitat composition is similar between the HVDC alternative routes and the Applicant Proposed Route. As a result, wildlife species occurrence and use of the ROWs along these route alternatives would likely also be similar.

HVDC Alternative Routes 3-C, 4-B, and 4-D would have a differential effect to wildlife and their habitats compared to the Applicant Proposed Route. As shown in Table 3.20.1-6, HVDC Alternative Route 4-B would cross into the Ozark National Forest IBA, potentially indirectly impacting wildlife species to a greater extent than the Applicant Proposed Route due to this route's proximity to an IBA. The interspersed land cover and land ownership along HVDC Alternative Route 4-B suggest that a variety of land uses may occur along the ROW, and a variety of wildlife species common to both deciduous forests and pasture/hay land covers may occur in this area (thereby potentially exposing more wildlife species to project related impacts compared to the Applicant Proposed Route). Furthermore, HVDC Alternative Routes 3-C and 4-D would impact slightly more forested areas compared to the Applicant Proposed Route, thereby increasing the extent of long-term impacts to forested habitat.

3.20.1.7.3.2.3 Decommissioning Impacts

Impacts related to the decommissioning of the HVDC portion of the Project would not substantially differ from the general discussion of decommissioning related to the Project in general (see Section 3.20.1.7.2).

3.20.1.7.4 Best Management Practices

The Applicant has developed a list of EPMs intended to avoid or minimize impacts to wildlife resources. A complete list of EPMs for the Project is provided in Appendix F. Those EPMs that would specifically minimize the potential for impacts to wildlife resources are summarized in Section 3.20.1.7.1. In addition to these EPMs, the following BMP could also be implemented to further minimize impacts to wildlife:

- All vegetation clearing should comply with both state and federal spatial and timing windows, and should not occur during the avian breeding season applicable to each respective Region.

The implementation of this BMP is suggested because without proper implementation of seasonal and spatial restrictions on construction activities (e.g., if vegetation clearing was conducted during sensitive breeding seasons), avian mortalities would be more likely to occur during construction.

3.20.1.7.5 Unavoidable Adverse Impacts

The Applicant would implement EPMs to avoid or minimize impacts. A BMP has been identified that could be implemented to further reduce impacts (see Section 3.20.1.7.4). However, some adverse impacts would occur even with the implementation of these measures. Construction and operations and maintenance of the Project would result in the death of some wildlife species. Mortalities could result from the vegetation clearing activities as well as avian collisions with Project structures during operation. These mortality events would likely be higher if vegetation clearing is conducted during the breeding season (see previous discussion above). Construction-related disturbances to habitats would also result in degradation and loss of some wildlife habitats (through factors that include but are not limited to noise and visual disturbances, as well as the effects of fragmentation, edge effects, and invasive plant species). ROW maintenance in forested habitats as well as the footprint of Project structures would result in a permanent loss of habitats.

3.20.1.7.6 Irreversible and Irretrievable Commitment of Resources

The potential permanent loss or alteration of established trees in mature forests in the eastern Project area (in Regions 3, 4, 5, and 7) would last throughout the life of the Project; however, gradual recovery of habitat may occur once the Project has been decommissioned. Because the exact state of this recovery is not known (e.g., substantial changes related to climate, land-use, and/or weeds or pathogens may occur during the 80-year lifespan of the project), and mature forests are subject to long-term climatic regimes, it is reasonable to assume that some portions of the wildlife habitat in these forests would be irreversibly and irretrievably impacted.

3.20.1.7.7 Relationship between Local Short-term Uses and Long-term Productivity

Both the Applicant Proposed Route and the HVDC alternative routes may result in a short-term disturbance to wildlife resources; however, these impacts should not affect the long-term productivity of populations of wildlife resources.

3.20.1.7.8 Impacts from Connected Actions

3.20.1.7.8.1 Wind Energy Generation

Section 3.1 contains a detailed discussion of how the general WDZs were developed as well as how the estimate of potential wind development related impacts was determined. It should be noted that the exact location of potential wind-farms is not known at this time. The assessment of wind energy generation found in this EIS does not constitute approval or official designation of any area for wind development (i.e., there is no assurance that these areas would be developed); nor does this EIS exert authority over the potential development of these areas.

This EIS assumes the development of multiple commercial-scale wind energy projects in the area, which are considered as connected actions. Although the exact placement or location of potential future wind-farms is unknown, for this assessment, it is assumed that these wind energy projects may be developed somewhere within the WDZs. It is assumed that each phase of a commercial-scale wind energy development in the WDZs would be conducted in such a way as to protect the quality of the environment. It is general industry standard for wind developers to comply with applicable state and federal wildlife regulations (see Table 3.20.1-1 above), implement worker safety policies, practice good housekeeping, manage waste properly, and maintain equipment in good working order, thereby minimizing and/or avoiding impacts on wildlife resources and their habitats.

Areas deemed generally unsuitable for commercial-scale wind energy development, including cities, open water, cemeteries, parks, federal lands, recreational areas, state wildlife management areas, lands within 2.5 miles of public use airports, and areas with sensitive environmental resources, such as native prairie, water bodies, and potential habitat for the lesser prairie-chicken were excluded from the analysis of the WDZs, resulting in 1,082,000 acres of the 1,385,069 total acres in the 12 WDZs that could be considered potentially suitable for wind energy development. Based on the maximum capacity of the Project and information from wind energy developers, it is estimated that 20–30 percent of the potentially suitable land, or between 216,400 and 324,600 acres, could be developed for wind energy facilities using transmission capacity from the Project; however, it should be noted that this is just an estimate and the exact location of footprint for these wind projects is not known.

The impacts discussed below are common to the majority of wind energy development; however, it is unknown what wildlife species would occur within a given wind energy development zone without coordination and consultation with the future wind energy developer. Wind energy developers are expected to develop and construct wind energy projects based on guidance outlined by the USFWS Land-Based Wind Energy Guidance (USFWS 2012) and the APLIC guidelines (APLIC 2012), which may include the development of conservation strategies and which describe a program of specific and comprehensive actions that, when implemented, could reduce the risk of wildlife species and their habitats.

Short-term, impacts to wildlife resources during construction may include disturbance due to increased noise, dust, and traffic. Additionally, there is the potential for short-term indirect impacts to wildlife habitats as a result of the clearing of vegetation and soil disruption during construction. There is the potential for long-term, direct habitat loss related to construction of a wind energy development; however, the extent of that impact is unknown and dependent upon the competing land uses within a specific WDZ.

During the operations and maintenance phase of wind energy developments, approximately 1 percent or less of the land may be affected. For the 12 WDZs, assuming 20 to 30 percent build-out, between 2,164 and 3,246 acres may be temporarily impacted. Once construction has been completed, temporary construction areas would revert to their previous use over a period of time, depending on the habitat type impacted. Only turbine footprints, access roads, generation tie-lines (if necessary), substations, and operations and maintenance buildings would remain. Existing land uses, primarily agriculture and grazing, would be expected to return to almost all areas of the facilities, unless deemed incompatible with the operation of a wind energy development.

Operations and maintenance of wind energy developments are known to have direct impacts on some wildlife species, specifically avian and bat species, due to collisions with wind turbine blades, collisions and electrocutions associated with generation tie-lines, and barotrauma of bat species. Historically, the average number of avian and bat fatalities associated within operations and maintenance of a wind energy development has varied between developments and was considered a function of a number of factors, including the proximity to known maternity colonies, hibernacula, staging areas, winter ranges, nesting sites, migration stopovers or corridors, leks, or other areas of seasonal importance (USFWS 2012). Occurrence of avian and bat species within the WDZ and potential for direct impacts due to the operations and maintenance of the wind energy development would be documented by wind energy developers under the Land-Based Wind Energy Guidelines, and would be in accordance with appropriate state and federal regulations (including the USFWS BMPs, as provided in the Guidelines).

Limited publicly available post-construction mortality studies have been completed in Texas and Oklahoma, and no publicly available studies have been completed within or in the vicinity of the various WDZs. Therefore, conclusions of the direct impacts to avian and bat species related to operations and maintenance of wind energy developments are determined based on publicly available information for the southern Great Plains. A single study completed in Oklahoma at the Oklahoma Wind Energy Center, located approximately 60 miles east of WDZ-K, reports bat fatality estimates of 1.2 bat fatalities per turbine for the brief three-month study period (Piorkowski and O'Connell 2010). During the summer breeding season at the Oklahoma Wind Energy Center, Piorkowski (2006) reported an avian fatality rate of 0.04 to 0.12 birds per turbine.

Table 3.20.1-7 lists the size of each of the 12 WDZs, the primary land cover type, and the estimated acres of impact assuming a 30 percent build-out with 5 percent of the land affected during construction and 1 percent affected during operation. Each of the WDZs is likely to have occurrence and use of bat and avian species potentially susceptible to direct impacts related to the operations and maintenance of wind energy developments; however, the occurrence and use of bat and avian in the area is not known (as the precise location of these potential wind facilities has not been determined).

Table 3.20.1-7:
Summary of the 12 WDZ in Regards to Wildlife Resources

WDZ	Total Size (acres)	Estimated Acres of Impact during Construction	Estimated Acres of Impact during Operation[1]
WDZ-A	109,747	659 acres of primarily croplands and grasslands	329 acres
WDZ-B	125,479	752 acres of primarily croplands and grassland	376 acres
WDZ-C	161,048	966 acres of primarily croplands and grasslands	483 acres
WDZ-D	69,189	415 acres of primarily grassland	204 acres
WDZ-E	47,092	282 acres of primarily croplands and grasslands	141 acres
WDZ-F	112,461	675 acres of primarily grasslands and croplands	337 acres
WDZ-G	187,315	1,124 acres of primarily grasslands and croplands	562 acres
WDZ-H	116,226	697 acres of primarily grasslands and croplands	349 acres
WDZ-I	105,203	631 acres of primarily grasslands and croplands	316 acres
WDZ-J	92,568	555 acres of primarily grasslands	278 acres
WDZ-K	92,893.9	557 acres of primarily grasslands and croplands	279 acres
WDZ-L	165,848	995 acres of primarily grasslands and croplands	498 acres

1 The estimated acres of impact assuming a 30 percent build-out with 2 percent of the land affected during construction and 1 percent affected during operation.

Once the decommissioning phase has concluded, wind energy developments would be restored to their pre-construction conditions. Permanent structures, including wind turbines and generation tie-lines, would be dismantled. Impacts associated with the construction, operations and maintenance of wind turbines, generation tie lines, and other permanent structures would be eliminated as these areas are restored to pre-construction conditions.

3.20.1.7.8.2 Optima Substation

As discussed above, the future Optima Substation may be constructed just east of the Oklahoma Converter Station Siting Area and partially within the AC Interconnection Siting Area in Region 1. The location for the substation occurs on grassland habitats adjacent to croplands. Approximately 160 acres would be disturbed as a result of this substation. Potential impacts to wildlife that would occur if this station were constructed would be similar to those that were discussed above for the Oklahoma Converter Station (see Section 3.20.1.7.2.1) and include habitat loss, disturbance, and mortality.

3.20.1.7.8.3 TVA Upgrades

A precise ROI has not been identified for the TVA upgrades. Where possible, general impacts associated with the required TVA upgrades are discussed below.

The required TVA upgrades related to the construction of new electric transmission line could involve temporary or long-term displacement of wildlife species; fragmentation of wildlife habitat; potential disturbance to general wildlife species and habitats as well as populations and/or habitats for species designated as candidate, threatened and endangered under the ESA; potential impacts to wildlife movement; and potential mortality events related to avian collisions and/or electrocution. The required TVA upgrades that would involve upgrades of existing facilities (i.e., project components where impacts from initial construction as well as operation of the facilities have already occurred or are ongoing) could result in temporary displacement of wildlife species, potential disturbance to general wildlife species and habitats as well as populations and/or habitats for species designated as candidate, threatened and endangered under the ESA; and potential impacts to wildlife movement. Because the specific locations of the required TVA upgrades (including the new electric transmission line) are unknown at this time, the spatial and temporal (i.e., seasonal presence) distributions of known wildlife populations and suitable habitats also are unknown at this time.

Existing TVA facilities would require fewer construction activities to complete upgrades than the new transmission line and would occur to existing facilities (where previous construction related impacts have already occurred). Existing TVA facilities also already experience operations and maintenance activities. As a result, potential impacts are expected to be less substantial in areas affected by upgrades to existing TVA facilities than in areas where the new electric transmission line could be constructed. Impacts to wildlife from the construction and operation of the new transmission line would be similar to those described in Section 3.20.1.7.2.

3.20.1.7.9 Impacts Associated with the No Action Alternative

Under the No Action Alternative, the Project would not be constructed or operated, and impacts to wildlife species and their habitats would be consistent with current levels of disturbance related to natural conditions in the environment, such as annual changes in climates, land use changes, and wildfires. No Project-related disturbances or impacts would occur to wildlife or their habitats under the No Action Alternative.

3.20.2 Fish and Aquatic Invertebrates

3.20.2.1 Regulatory Background

In general, statutes and regulations that influence the evaluation of fish and aquatic invertebrate species in the areas crossed by the Project are primarily implemented by the USFWS and state agencies. The state agencies applicable to the Project include the ODWC, AGFC, TWRA, and TPWD. The fish and aquatic invertebrate species laws and regulations relevant to the Project are discussed further in Section 3.14.2.

3.20.2.2 Data Sources

Data sources included a desktop analysis of relevant information; research findings; reports available to the public; a database that includes GIS data from government agencies as well as non-governmental organizations, and information received from both regulatory agencies and stakeholders during the DOE scoping process. All data sources used for this analysis were limited to those that were open source and readily available to the public (i.e., the public may assess them without restrictions). For general fish classifications within the ROI, the following data sources were reviewed:

- EPA National Rivers and Streams Assessment (http://water.epa.gov/type/rsl/monitoring/riverssurvey/index.cfm)
- USGS National Hydrography Dataset (GIS Data Source: USGS 2014a)
- NPS NRI (GIS Data Source: USGS 1996)

3.20.2.3 Region of Influence

The ROIs used for the evaluation of potential impacts to fish and aquatic invertebrate species from the Project and connected actions are identical to the ROIs described in Section 3.1.

3.20.2.4 Affected Environment

3.20.2.4.1 Oklahoma

There are multiple recreational fishing areas within the Oklahoma portion of the ROI, including the Cimarron River, the Arkansas River, Webbers Fall Reservoir, and the Illinois River. Other important recreational fishing areas located within 10 miles of the Oklahoma Converter Station include Frisco Creek, North Fork Frisco Creek, and Steji Lake (HookandBullet 2014a). Within the ROI for the AC collection system, important recreational fishing areas include Optima Lake, Sunset Lake, Schultz Lake, multiple creeks in Texas County, as well as Webb Lake (HookandBullet 2014a). In addition, although multiple creeks in Beaver County are within the ROI for the AC collection system, very few of them are used in a recreational capacity in this county.

Important recreational fish species potentially occurring in the ROI in Oklahoma include largemouth bass (*Micropterus salmoides*), smallmouth bass (*Micropterus dolomieui*), spotted bass (*Micropterus punctulatus*), striped bass (*Morone saxatilis*), white bass (*Morone chrysops*), channel catfish (*Ictalurus punctatus*), blue catfish (*Ictalurus furcatus*), flathead catfish (*Pylodictis olivaris*), white crappie (*Pomoxis annularis*), black crappie (*Pomoxis nigromaculatus*), bluegill (*Lepomis macrochirus*), rainbow trout (*Oncorhynchus mykiss*), brown trout (*Salmo trutta*), walleye (*Stizostedion vitreum*), sauger (*Sander canadensis*), saugeye (hatchery-produced hybrid cross between walleye and sauger), paddlefish (*Polyodon spathula*), and alligator gar (*Atractosteus spatula*) (ODWC 2014).

There are approximately 57 species of native freshwater mussels in the state of Oklahoma, with the species richness declining from the eastern to the western part of the state. Species with ranges that potentially overlap the ROI include, but are not limited to threeridge (*Amblema plicata*), flat floater (*Anodonta suborbiculata*), Wabash pigtoe or lake pigtoe (*Fusconaia flava*), Plain pocketbook (*Lampsilis cardium*), and yellow sandshell (*Lampsilis teres*) (Mather 2005). Other aquatic invertebrates with a range within the ROI include, but are not limited to, the White River crawfish (*Procambarus acutus acutus*) and the Ohio shrimp (*Macrobrachium ohione*) (USGS 2014).

Appendix L contains a representative listing of fish and aquatic invertebrate species potentially occurring in each state.

3.20.2.4.2 Arkansas

Important recreational fishing areas occur within the ROI in Arkansas, including multiple perennial creeks, the St. Francis River, the White River, and the Mississippi River. There is a reach of the Little Red River crossed in Region 5 in White County, which is officially designated “Trout Waters” from below Greers Ferry Dam to Searcy (Clean Line 2013b).

Important recreational fish species in Arkansas potentially occurring in the ROI include largemouth bass, smallmouth bass, spotted bass, striped bass, white bass, yellow bass (*Morone mississippiensis*), Ozark bass (*Ambloplites constellatus*), yellow bullhead catfish (*Ictalurus natalis*), channel catfish, blue catfish, flathead catfish, white crappie, black crappie, rainbow trout, brown trout, brook trout (*Salvenius fontinalis*), cutthroat trout (*Oncorhynchus clarkii*), walleye, bluegill, longear sunfish (*Lepomis megalotis*), redear sunfish (*Lepomis microlophus*), green sunfish (*Lepomis* *cyanellus*), warmouth (*Lepomis gulosus*), paddlefish, shovelnose sturgeon (*Scaphirhynchus platorynchus*), and alligator gar (AGFC 2011).

There are approximately 75 native mussel species in Arkansas, with many of these potentially found within the ROI (Harris et al. 2009). Recreational and commercial mussel species that potentially overlap the ROI include ebony (*Fusconaia ebena*), lake pigtoe or Wabash pigtoe, washboard (*Megalonaias nervosa*), river pigtoe or Ohio pigtoe (*Pleurobema cordatum*), and mapleleaf (*Quadrula quadrula*) (Anderson 2006; Harris et al. 2009). Other aquatic invertebrates with a range within the ROI include, but are not limited to, Cajun dwarf crayfish (*Cambarellus shufeldtii*), White River crawfish, red swamp crayfish, Mississippi grass shrimp (*Palaemonetes kadiakensis*), and Ohio shrimp (USGS 2014).

3.20.2.4.3 Tennessee

Within the Tennessee portion of the ROI, the Mississippi River is both the largest and most important recreational fishing area. Other important recreational fishing areas located within 10 miles of the Tennessee Converter Station Siting Area include multiple lakes, reservoirs, and creeks (HookandBullet 2014b).

Important recreational fish species potentially occurring in Tipton and Shelby counties include largemouth bass, smallmouth bass, channel catfish, bluegill, crappie, bullhead catfish (*Ameiurus* spp.), yellow perch (*Perca flavescens*), rainbow trout, and walleye (HookandBullet 2014b).

Recreational and commercial mussel species that potentially overlap the ROI include threeridge, elephant ear (*Elliptio crassidens*), ebony, lake pigtoe or Wabash pigtoe, washboard, river pigtoe or Ohio pigtoe, and mapleleaf (TWRA 2011; Clean Line 2013a). Other aquatic invertebrates with a range within the ROI include Cajun dwarf crayfish, White River crawfish, red swamp crayfish (*Procambarus clarkii*), Mississippi grass shrimp, and Ohio shrimp (USGS 2014).

3.20.2.4.4 Texas

Important recreational fishing areas are located within the ROI for the AC collection system, including in Sherman County (Steji Lake, Bryson Lake, Runyun Lake, Kenson Lake), in Hansford County (Palo Duro Reservoir, Venneman Lake, Miller's Lake), and in Ochiltree County (Middle Prong Wolf Creek, Deer Lake, Peckenpaugh Lake) (HookandBullet 2014c).

Important recreational fish species in Texas potentially occurring in the ROI include largemouth bass, smallmouth bass, spotted bass, white bass, yellow bass, striped bass, channel catfish, bluegill, crappie, gar, black bullhead catfish (*Ameiurus melas*) and yellow bullhead catfish (TPWD 2014a).

Recreational and commercial mussel species that potentially overlap the ROI include, but are not limited to threeridge, mapleleaf, pimpleback (*Quadrula* spp.), and bleufer (*Potamilus purpuratus*) (TPWD 2014a).

3.20.2.5 Regional Description

As described in Section 3.20.2.4 above, numerous fish and aquatic invertebrate species are known to occur or have the potential to occur within the ROI. A summary of the fish and aquatic invertebrate species and potential habitat occurrence by Project region is provided in the sections below. Information from ANHC Natural Areas and Focal

Areas and state natural heritage program species occurrence records, including related waterbodies found by Project region, are included in Table 3.20.2-1.

Table 3.20.2-1:
State Natural Heritage Occurrences within the ROI or Waterbodies Crossed by the ROI

Common Name	Scientific Name	State Rank[1] or Status[2]	Waterbody	Project Region
Oklahoma				
Fish				
Arkansas River speckled chub	*Macrhybopsis tetranema*	S4	Cimarron River and Illinois River	3
Pallid shiner	*Notropis amnis*	S1S2	Lee Creek	4
Red River shiner	*Notropis bairdi*	S3	Cimarron River	2, 3
Aquatic Invertebrates				
Crawfish species	*Orconectes palmeri longimanus*	S5	Ross Branch of Little Sallisaw Creek	4
Southern plains crayfish	*Procambarus simulans*	S5	Beaver River	1
White River crawfish	*Procambarus acutus*	S5	Beaver River	1
Arkansas				
Fish				
Autumn darter	*Etheostoma autumnale*	S2 / INV	Ten Mile Creek[4]	5
Sunburst darter	*Etheostoma mihileze*	S3 / INV	Mill Creek[e]	4
Aquatic Invertebrates				
A caddisfly (no common name)	*Paduniella neartica*	S1 /INV	Granny Creek	4
A crayfish (no common name)	*Cambarus causeyi*	S1 / INV	Big Piney Creek[4]	4
Black sandshell	*Ligumia recta*	S2 / INV	Big Piney Creek[4], White River,[3,4] and Tyronza River[4]	4, 5, 7
Elktoe	*Alasmidonta marginata*	S3 / INV	Big Piney Creek[4]	4
Fat mucket	*Lampsilis siliquoidea*	S3 / INV	North Fork Cadron Creek[4]	5
Flutedshell	*Lasmigona costata*	S3 / INV	Frog Bayou[4], Big Piney Creek[4], and West Fork Point Remove Creek[4]	4
Isopod (no common name)	*Lirceus bicuspidatus*	S2 / INV	Unamed Spring[3] and Departee Creek[4]	4
Little spectaclecase	*Villosa lienosa*	S3 / INV	Big Piney Creek[4], West Fork Point Remove Creek[4] and St. Francis floodway ditch[5]	4, 6
Monkeyface	*Quadrula metanevra*	S3S4 / INV	White River[3] and St. Francis River[4]	5, 7
Ohio pigtoe	*Pleurobema cordatum*	S1 / INV	White River[3]	5
Ouachita kidneyshell	*Ptychobranchus occidentalis*	S3 / INV	White River[3]	5
Pondhorn	*Uniomerus tetralasmus*	S2 / INV	St. Francis floodway ditch[4]	6
Purple lilliput	*Toxolasma lividum*	S2 / INV	Frog Bayou[4], Illinois Bayou[4], West Fork Point Remove Creek[4], Jones Creek[3], and Tyronza River[3]	4, 5, 7
Pyramid pigtoe	*Pleurobema rubrum*	S2 / INV	White River[4], and St. Francis River[4], Tyronza River[4]	5, 7
Southern mapleleaf	*Quadrula apiculata*	S2 / INV	Bayou DeView[4]	6
Western fanshell	*Cyprogenia aberti*	S2 / INV	White River[3] and St. Francis River[4]	5, 7

Table 3.20.2-1:
State Natural Heritage Occurrences within the ROI or Waterbodies Crossed by the ROI

Common Name	Scientific Name	State Rank[1] or Status[2]	Waterbody	Project Region
Tennessee				
Fish				
Bigmouth shiner	*Notropis dorsalis*	S1 / D[5]	Bear Creek	7
Texas				
None				

1 State rank is a conservation rank used by State Heritage Programs and The Nature Conservancy that indicates the relative rarity of an element throughout the state. S1 = Critically imperiled; S2 = Imperiled; S3 = Vulnerable; S4 = Apparently secure; S5 = Secure in the state
2 State status: INV = Inventory Element.
3 Occurrence element located within the ROI.
4 Occurrence element located outside the ROI, but within a waterbody that is crossed by the Project.
5 D = Deemed in Need of Management
Sources: ODWC (2014), ANHC (2014), TDEC (2014), TPWD (2014a, 2014b)

3.20.2.5.1 Region 1

Region 1 is referred to as the Oklahoma Panhandle Region and includes the Oklahoma Converter Station Siting Area, AC collection system, the Applicant Proposed Route and the HVDC Alternative Routes I-A through I-D. This region includes Texas, Beaver, Harper, and Woodward counties in Oklahoma. The Cimarron River crosses Beaver, Harper, and Woodward counties in this region. Forested wetland areas crossed by the ROI in Region 1 include Palo Duro Creek, Clear Creek, Beaver River, and Skeleton Creek (Clean Line 2013b). There are many fish and aquatic species that potentially occur in these waterbodies that cross the ROI; fish and aquatic invertebrate species are listed in Appendix L. Although crossing locations within a given drainage vary between the Applicant Proposed Route and the HVDC Alternative Routes I-A through I-D, the potential occurrence of fish and aquatic species within the ROI would generally be similar.

3.20.2.5.1.1 AC Collection System

A description of the AC collection system is provided in Section 2.1.2.3. The AC collection system routes are represented by a 2-mile-wide corridor for analysis purposes. The miles of perennial and intermittent streams, major waterbodies, and the acres of reservoirs, lakes, and ponds reported for each of the AC collection system routes are described in detail in Section 3.15. Wetland areas that may be used by aquatic species in this region are described in Section 3.19. In addition to reporting miles of perennial and intermittent streams, major waterbodies, acres of reservoirs, lakes, and ponds, and wetland areas for the 2-mile-wide corridor, Sections 3.15 and 3.19 also report values for the 200-foot-wide representative ROW because the ROWs for the AC collection system transmission lines would typically be 200 feet wide. Although the ROW is more typical, the 2-mile-wide corridor was used for fish and aquatic invertebrate analysis purposes to account for the various ranges of aquatic species, including the unique and varied habitat that each species potentially occupies, as well as the potential downstream transport of sediment and hazardous materials. NWI-mapped wetlands occur within the ROI, including both forested and non-forested wetlands (Clean Line 2013a). Riparian corridors may also exist along the Beaver River and Coldwater and Palo Duro creeks (Clean Line 2013a). Lake Schultz State Park in Oklahoma is within the 2-mile-wide corridor and is a part of the Schultz WMA (Clean Line 2013a). Forested wetland areas crossed by the AC collection system routes are mostly associated with Palo Duro Creek (Clean Line 2013b). Of the AC collection system routes, E-1, E-2, E-3, SE-1, SE-3, NE-1, NE-2, NW-1, and NW-2 may provide aquatic habitat to fish and aquatic invertebrate species.

AC Collection System Route SE-3 crosses Wolf Creek in Ochiltree County, Texas, a waterbody that has been designated as a high water quality, exceptional aquatic life, and high aesthetic value waterbody. It has diverse benthic macroinvertebrate and fish communities (Clean Line 2013b).

3.20.2.5.2 Region 2

Region 2 is referred to as the Oklahoma Central Great Plains Region and includes the Applicant Proposed Route and HVDC Alternative Routes 2-A and 2-B. This region includes Woodward, Major, and Garfield counties in Oklahoma. The Cimarron River crosses Woodward and Major counties in this region. Link 2 of the Applicant Proposed Route and HVDC Alternative Route 2-A cross the Cimarron River in Major County). Many fish and aquatic invertebrate species potentially occur in these waterbodies that cross the ROI; fish and aquatic species are listed in Appendix L. Although crossing locations on the Cimarron River vary between the Applicant Proposed Route and the HVDC Alternative Routes 2-A and 2-B, the potential occurrence of fish and aquatic species within the ROI would generally be similar.

3.20.2.5.3 Region 3

Region 3 is referred to as the Oklahoma Cross Timbers Region and includes the Applicant Proposed Route and HVDC Alternative Routes 3-A through 3-E. This region includes Garfield, Kingfisher, Logan, Payne, Lincoln, Creek, Okmulgee, and Muskogee counties in Oklahoma. The Cimarron River crosses Logan, Payne, and Creek counties in this region. Link 4 of the Applicant Proposed Route and HVDC Alternative Route 3-C cross the Cimarron River in Payne County. Forested wetland areas crossed by the ROI in Region 3 include Stillwater Creek, the Cimarron River, Browns Creek, Snake Creek, Little Deep Fork Creek, Salt Creek, Pecan Creek, Beaver River, Anderson Creek, Butler Creek, and tributaries to both Cane Creek and Dirty Creek (Clean Line 2013b). Many fish and aquatic invertebrate species potentially occur in these waterbodies; fish and aquatic species are listed in Appendix L. Although crossing locations within a given drainage vary between the Applicant Proposed Route and the HVDC Alternative Routes 3-A through 3-E, the potential occurrence of fish and aquatic species within the ROI would generally be similar.

3.20.2.5.4 Region 4

Region 4 is referred to as the Arkansas River Valley Region and includes the Applicant Proposed Route, including the Lee Creek Variation, and Alternative Routes 4-A through 4-E. This region includes Muskogee and Sequoyah counties in Oklahoma, and Crawford, Franklin, Johnson, and Pope counties in Arkansas. The Applicant Proposed Route Link I crosses the Arkansas River in Muskogee County and the Illinois River in Sequoyah County (Clean Link 2013b). The Applicant Proposed Route Link 6 crosses the Mulberry River downstream of I-40 bridge at the Crawford-Franklin County line (Clean Link 2013b). HVDC Alternative Routes 4-A and 4-B, Applicant Proposed Route Link 3, and the Lee Creek Variation cross Lee Creek in Sequoyah County (Clean Line 2013b). HVDC Alternative Route 4-E and Applicant Proposed Route Link 9 cross Big Piney Creek in Pope County; however, the Applicant Proposed Route Link 9 parallels the Big Piney Creek in Pope County, while HVDC Alternative Route 4-E only crosses Big Piney Creek (Clean Line 2013b). The Mulberry River overlaps with HVDC Alternative Routes 4-A, 4-B, 4-D, and Applicant Proposed Route Link 6 near the Crawford-Franklin County line in Arkansas (Clean Line 2013b). In Oklahoma, one forested wetland area (Sallisaw Creek) is crossed by the ROI in Region 4 (Clean Line 2013b). In

Arkansas, forested wetland areas crossed by the ROI in Region 4 include Short Branch, Cottonwood Slough, Spadra Creek, and Big Piney Creek (Clean Line 2013b). Many fish and aquatic invertebrate species potentially occur in these waterbodies that cross the ROI; lists of fish and aquatic species are provided in Appendix L. Although crossing locations within a given drainage vary between the Applicant Proposed Route and HVDC Alternative Routes 4-A through 4-E, the potential occurrence of fish and aquatic species within the ROI would generally be similar.

3.20.2.5.5 Region 5

Region 5 is referred to as the Central Arkansas Region and includes the Applicant Proposed Route and HVDC Alternative Routes 5-A through 5-F. This region includes Pope, Conway, Van Buren, Faulkner, Cleburne, White, and Jackson counties in Arkansas. The Applicant Proposed Route Link 9 and HVDC Alternative Route 5-D cross the White River in Jackson County (Clean Line 2013b). The Applicant Proposed Route Link 4 and HVDC Alternative Route 5-E cross Cadron Creek in Van Buren County, while HVDC Alternative Route 5-B crosses Cadron Creek in Faulkner County (Clean Line 2013b). HVDC Alternative Routes 5-B, 5-E, and 5-F cross East Fork Cadron Creek in Faulkner County (Clean Line 2013b). HVDC Alternative Route 5-D crosses a reach of the Departee Creek in Arkansas that is considered an Ecologically Sensitive Waterbody because of the presence of the flat floater mussel (*Anodonta suborbiculata*) (Clean Line 2013b). Applicant Proposed Route Link 7 and HVDC Alternative Route 5-C cross the Little Red River in White County, which is designated as “Trout Waters” from below the Greers Ferry Dam to Searcy (Clean Line 2013b). In Arkansas, forested wetland areas crossed by the ROI in Region 5 include West Fork Point Remove Creek, Briar Creek, Oats Creek, and tributaries to both Departee Creek and Mill Creek (Clean Line 2013b). Many fish and aquatic invertebrate species potentially occur in these waterbodies that cross the ROI; fish and aquatic species are listed in Appendix L. Although crossing locations within a given drainage vary between the Applicant Proposed Route and the HVDC Alternative Routes 5-A through 5-F, the potential occurrence of fish and aquatic species within the ROI would generally be similar.

3.20.2.5.6 Region 6

Region 6 is referred to as the Cache River and Crowley’s Ridge Region and includes the Applicant Proposed Route and HVDC Alternative Routes 6-A through 6-D. This region includes Jackson, Cross, and Poinsett counties in Arkansas. The Applicant Proposed Route Link 6 crosses a reach of the L’Anguille River in Cross County, while HVDC Alternative Route 6-C crosses the L’Anguille River in Poinsett County (Clean Line 2013b). HVDC Alternative Route 6-D runs parallel to the Straight Slough in Cross and Poinsett counties, then crosses Straight Slough in Poinsett County; the lower 10 miles of this waterbody is designated as an Ecologically Sensitive Waterbody because of the presence of the fat pocketbook mussel (Clean Line 2013b); which is a special status aquatic invertebrate species and discussed further in Section 3.14.2. Forested wetland areas crossed by the ROI in Region 6 include Bayou DeView, Caney Creek, L’Anguille River, and Ditches No. 10, 123, and 61 (Clean Line 2013b). Many fish and aquatic invertebrate species potentially occur in these waterbodies that cross the ROI; fish and aquatic species are listed in Appendix L. Although crossing locations within a given drainage vary between the Applicant Proposed Route and HVDC Alternative Routes 6-A through 6-D, the potential occurrence of fish and aquatic species within the ROI would generally be similar.

3.20.2.5.7 Region 7

Region 7 is referred to as the Arkansas Mississippi River Delta and Tennessee Region and includes the Applicant Proposed Route and HVDC Alternative Routes 7-A through 7-D. This region includes Poinsett and Mississippi counties in Arkansas and Tipton and Shelby counties in Tennessee. The Applicant Proposed Route Link 1 and

HVDC Alternative Route 7-A cross the St. Francis River in Poinsett County, Arkansas, and the Mississippi River at the Arkansas-Tennessee state line (Clean Line 2013b). Applicant Proposed Route Link 1 and HVDC Alternative Route 7-A cross the Mississippi River in Tipton County; this waterbody is designated as an Exceptional Tennessee Water because of the presence of the pallid sturgeon and the blue sucker (Clean Line 2013b), both of which are special status fish species and discussed further in Section 3.14.2. In Arkansas, forested wetland areas crossed by the ROI in Region 7 include the Cache River and Ditches No. 1 and 47 (Clean Line 2013b). In Tennessee, forested wetland areas crossed by the ROI in Region 7 include the Mississippi River, Sullivan Lake and Big Slough, Dead Timber, Ditch No. 1, a tributary to Cole Creek, and tributaries to Big Creek (Clean Line 2013b). Many fish and aquatic invertebrate species potentially occur in these waterbodies that cross the ROI; fish and aquatic species are listed in Appendix L. Although crossing locations within a given drainage vary between the Applicant Proposed Route and HVDC Alternative Routes 7-A through 7-D, the potential occurrence of fish and aquatic species within the ROI would generally be similar.

3.20.2.6 Connected Actions

3.20.2.6.1 Wind Energy Generation

Acres of woody wetland and emergent herbaceous wetlands that are provided below are from Section 3.10. The land cover in each WDZ is summarized in Section 3.10. Miles of perennial streams and acres of perennial reservoirs, lakes, and ponds are from Section 3.15. A summary of the fish and aquatic species and habitat occurrence by WDZ is provided in the sections below.

3.20.2.6.1.1 WDZ-A

The dominant land cover in WDZ-A is croplands and grasslands, with 19.1 acres of woody wetlands and 79.0 acres of emergent herbaceous wetlands (GIS Data Source: Jin et al. 2013). There are approximately 4.9 miles of perennial streams and 38 acres of perennial reservoirs, lakes, and ponds. WDZ-A intersects the Middle Beaver, Lower Beaver, Palo Duro, and Upper Wolf watersheds. Deer Lake and Peckenpaugh Lake both fall within WDZ-A and are important recreational fishing areas (HookandBullet 2014c). Important recreational fish species in the Texas Panhandle include largemouth bass, smallmouth bass, spotted bass, white bass, yellow bass, striped bass, channel catfish, bluegill, white crappie, and black crappie (TPWD 2014a). Recreational and commercial freshwater mussel species in Texas include threeridge, mapleleaf, pimpleback, and bleufer, among others (TPWD 2014a).

3.20.2.6.1.2 WDZ-B

The dominant land cover in WDZ-B is croplands and grasslands areas, with 15 acres of woody wetlands and 60 acres of emergent herbaceous wetlands. There are approximately 8 miles of perennial streams and 164 acres of perennial reservoirs, lakes, and ponds. WDZ-B intersects the Palo Duro watershed. A portion of the Palo Duro Reservoir, where recreational fishing occurs, is within WDZ-B. In addition, Venneman Lake and Miller’s Lake are both within WDZ-B, and are also important recreational fishing areas (HookandBullet 2014c). Important recreational fish species in the Texas Panhandle include largemouth bass, smallmouth bass, spotted bass, white bass, yellow bass, striped bass, channel catfish, bluegill, white crappie, and black crappie (TPWD 2014a). Recreational and commercial freshwater mussel species in Texas include threeridge, mapleleaf, pimpleback, and bleufer, among others (TPWD 2014a).

3.20.2.6.1.3 WDZ-C

The dominant land cover in WDZ-C is grasslands areas and croplands, with 2 acres of woody wetlands and 4 acres of emergent herbaceous wetlands. There are approximately 6.4 miles of perennial streams and 125 acres of perennial reservoirs, lakes, and ponds. WDZ-C intersects the Coldwater watershed. WDZ-C includes Steji Lake and Bryson Lake, both important recreational fishing areas (HookandBullet 2014c). Important recreational fish species in the Texas Panhandle include largemouth bass, smallmouth bass, spotted bass, white bass, yellow bass, striped bass, channel catfish, bluegill, white crappie, and black crappie (TPWD 2014a). Recreational and commercial freshwater mussel species in Texas include threeridge, mapleleaf, pimpleback, and bleufer, among others (TPWD 2014a).

3.20.2.6.1.4 WDZ-D

The dominant land cover in WDZ-D is grasslands areas and croplands, with 52 acres of woody wetlands (occurring along Hackberry Creek within Lake Schultz Wildlife Management Area). There are approximately 12.7 miles of perennial streams and 57 acres of perennial reservoirs, lakes, and ponds. WDZ-D intersects the Coldwater, Middle Beaver, and Palo Duro watersheds. WDZ-D contains 313.6 acres of Oklahoma Waters of Recreational and/or Ecological Significance. Schultz Lake and Webb Lake both occur within WDZ-D and are important recreational fishing areas. Recreational fish species found in this area of the Oklahoma Panhandle include striped bass, smallmouth bass, largemouth bass, walleye, bluegill, brown trout, and rainbow trout (HookandBullet 2014d).

3.20.2.6.1.5 WDZ-E

The dominant land cover in WDZ-E is croplands and grasslands areas with 9 acres of woody wetlands. There are approximately 2.6 miles of perennial streams and 25 acres of perennial reservoirs, lakes, and ponds. WDZ-E intersects the Coldwater and Middle Beaver watersheds. Recreational fish species found in this area of the Oklahoma Panhandle include striped bass, smallmouth bass, largemouth bass, walleye, bluegill, brown trout, and rainbow trout (HookandBullet 2014d).

3.20.2.6.1.6 WDZ-F

The dominant land cover in WDZ-F is grasslands areas and croplands, with 21 acres of woody wetlands (occurring along the Beaver [North Canadian] River) and 18 acres of emergent herbaceous wetlands. There are approximately 13 miles of perennial streams and 24 acres of perennial reservoirs, lakes, and ponds. WDZ-F intersects the Coldwater and Upper Beaver watersheds. WDZ-F contains 5.8 miles of waters which have been designated by the state of Oklahoma as impaired pursuant to Section 303(d). Recreational fish species found in this area of the Oklahoma Panhandle include striped bass, smallmouth bass, largemouth bass, walleye, bluegill, brown trout, and rainbow trout (HookandBullet 2014d).

3.20.2.6.1.7 WDZ-G

The dominant land cover in WDZ-G is grasslands areas and croplands, with 146 acres of emergent herbaceous wetlands and 2 acres of woody wetlands. There are approximately 6.8 miles of perennial streams and 12 acres of perennial reservoirs, lakes, and ponds. WDZ-G intersects the Upper Beaver watershed. Recreational fish species found in this area of the Oklahoma Panhandle include striped bass, smallmouth bass, largemouth bass, walleye, bluegill, brown trout, and rainbow trout (HookandBullet 2014d).

3.20.2.6.1.8 WDZ-H

The dominant land cover in WDZ-H is grasslands areas and croplands, with 4 acres of woody wetlands and 2 acres of emergent herbaceous wetlands. There are approximately 19.9 miles of perennial streams and 8 acres of perennial reservoirs, lakes, and ponds. WDZ-H intersects the Upper Beaver watershed. Recreational fish species found in this area of the Oklahoma Panhandle include striped bass, smallmouth bass, largemouth bass, walleye, bluegill, brown trout, and rainbow trout (HookandBullet 2014d).

3.20.2.6.1.9 WDZ-I

The dominant land cover in WDZ-I is croplands and grasslands areas, with 49 acres of woody wetlands and 93 acres of emergent herbaceous wetlands. There are approximately 1.7 miles of perennial streams and 17 acres of perennial reservoirs, lakes, and ponds. WDZ-I intersects the Middle Beaver watershed. Recreational fish species found in this area of the Oklahoma Panhandle include striped bass, smallmouth bass, largemouth bass, walleye, bluegill, brown trout, and rainbow trout (HookandBullet 2014d).

3.20.2.6.1.10 WDZ-J

The dominant land cover in WDZ-J is grasslands areas and croplands, with 83 acres of woody wetlands (occurring along the Beaver [North Canadian] River and Fulton Creek). There are approximately 26.2 miles of perennial streams and 123 acres of perennial reservoirs, lakes, and ponds. WDZ-J intersects the Middle Beaver and Palo Duro watersheds. WDZ-J contains 2.3 miles of waters which have been designated by Oklahoma State as impaired pursuant to Section 303(d). Recreational fish species found in this area of the Oklahoma Panhandle include striped bass, smallmouth bass, largemouth bass, walleye, bluegill, brown trout, and rainbow trout (HookandBullet 2014d).

3.20.2.6.1.11 WDZ-K

The dominant land cover in WDZ-K is croplands and grasslands areas, with 50 acres of woody wetlands and 1 acre of emergent herbaceous wetlands. There are approximately 6.3 miles of perennial streams and 60 acres of perennial reservoirs, lakes, and ponds. WDZ-K intersects the Lower Beaver watershed. WDZ-K contains 9.2 miles of waters which have been designated by the state of Oklahoma as impaired pursuant to Section 303(d). Recreational fish species found in this area of the Oklahoma Panhandle include striped bass, smallmouth bass, largemouth bass, walleye, bluegill, brown trout, and rainbow trout (HookandBullet 2014d).

3.20.2.6.1.12 WDZ-L

The dominant land cover in WDZ-L is croplands, grasslands, and shrub/scrub areas, with 19 acres of woody wetlands (occurring along Wolf Creek within Wolf Creek County Park) and 2,286 acres of emergent herbaceous wetlands. There are approximately 31.6 miles of perennial streams and 650 acres of perennial reservoirs, lakes, and ponds. WDZ-L intersects the Upper Wolf watershed. WDZ-L contains 15.6 miles of Wolf Creek; a state of Texas designated Ecologically Unique River and Stream Segment. Wolf Creek is designated as a high quality/exceptional aquatic life/high aesthetic value waterbody. It is also used as a reference stream to develop the regionalized index of biotic integrity for Texas, with diverse benthic macroinvertebrate and fish communities. Fish species found within Wolf Creek include red shiner, sand shiner (*Notropis stramineus*), suckermouth minnow, plains killifish, western mosquitofish, green sunfish, longear sunfish, and largemouth bass (Linam et al. 2002). Wolf Creek and Deer Lake are both important recreational fishing areas within WDZ-L (HookandBullet 2014c). Important recreational fish species in the Texas Panhandle and potentially found in Deer Lake include largemouth bass, smallmouth bass, spotted bass, white bass, yellow bass, striped bass, channel catfish, bluegill, white crappie, and black crappie

(TPWD 2014a). Recreational and commercial freshwater mussel species in Texas include threeridge, mapleleaf, pimpleback, and bleufer, among others (TPWD 2014a).

3.20.2.6.2 Optima Substation

As discussed in Section 3.1, the future Optima Substation may be constructed just east of the Oklahoma Converter Station and partially within the AC Interconnection Siting Area in Region 1. The location for the substation occurs on grassland habitats adjacent to croplands. Because there are no likely waterbodies within the future Optima Substation, no occurrences of fish and aquatic invertebrate species are likely.

3.20.2.6.3 TVA Upgrades

As described in Section 3.1, a precise ROI has not been identified for the TVA upgrades; however, the upgrades would likely occur in central and western Tennessee. Where possible, general impacts associated with the required TVA upgrades are discussed in the impact sections that follow.

3.20.2.7 Impacts to Fish and Aquatic Invertebrates

3.20.2.7.1 Methodology

The methodology for evaluating impacts on fish and aquatic resources included comparisons of impacts of the Applicant Proposed Route to impacts of the HVDC alternative routes. Within the applicable ROI, the analysis assessed Project activities that could potentially impact aquatic species and their habitats. Potential impacts to aquatic resources that were evaluated included stream crossings that fall within the ROI and soil disturbance with the potential to increase erosion and sedimentation into nearby waterbodies. The Project crosses or runs parallel to multiple surface water features (e.g., perennial and intermittent streams, major waterbodies, and reservoirs, lakes, and ponds), including special interest waterbodies, within each region. Because the Project crosses or runs parallel to multiple surface water features that may provide suitable aquatic habitat, the potential occurrence of fish and aquatic invertebrate species varies greatly across the Project. To assess potential occurrences of fish and aquatic invertebrate species and to evaluate potential downstream impacts from Project activities thoroughly and adequately, the 1,000-foot-wide ROI was used to identify potential occurrences of fish and aquatic invertebrate species. Considering the mobility of fish and larval mussels, and the potential transport of sediment and hazardous materials, the 1,000-foot-wide ROI was used for comparisons of impacts of the Applicant Proposed Route to impacts of the HVDC alternative routes. The ROI is extensive enough to account for the various ranges of fish and aquatic invertebrates, including the unique and varied habitat that each species potentially occupies, as well as the potential transport of sediment and hazardous materials. The final alignment within the ROI may have different overall effects depending on location as to the number and types of streams actually crossed or paralleled by Project access roads and transmission line clearings, as well as Project activities that could impact nearby waterbodies (within or outside of the ROI). Potential impacts on aquatic resources include the following and are further discussed for each phase of the Project:

- Potential impacts on aquatic species and their habitats from construction activities, vehicles, equipment, and access roads, including road crossings such as culverts, fords, and bridges, as well increased runoff and sedimentation
- Potential impacts from permanent and temporary removal of vegetation or temporary mechanical damage to vegetation
- Possible spread and/or introduction of invasive plants or animals or listed noxious weed species from the use of construction equipment at waterbody crossings

- Potential impacts associated with ROW vegetation maintenance, including the use of herbicides during operation of the Project
- Potential for sediment loading and introduction of chemicals from spills into aquatic habitats, causing alterations to the habitat or the acute or chronic effects of hazardous chemicals
- Potential changes to stream morphology due to adjacent riparian clearing

The Applicant has developed a comprehensive list of EPMs that would cover the mitigation necessary to avoid or minimize impacts to fish and aquatic invertebrates. Implementation of these EPMs is assumed throughout the impact analysis that follows for the Project. A complete list of EPMs for the Project is provided in Appendix F. General EPMs for the Project that relate to fish and aquatic resources include the following:

- GE-1: Clean Line will train personnel on health, safety, and environmental matters. Training will include practices, techniques, and protocols required by federal and state regulations and applicable permits.
- GE-5: Any herbicides used during construction and operations and maintenance will be applied according to label instructions and any federal, state, and local regulations.
- GE-14: Clean Line will restrict the refueling and maintenance of vehicles and the storage of fuels and hazardous chemicals within at least 100 feet from wetlands, surface waterbodies, and groundwater wells, or as otherwise required by federal, state, or local regulations.
- GE-21: Clean Line will maintain construction equipment in good working order. Equipment and vehicles that show excessive emissions of exhaust gasses and particulates due to poor engine adjustments or other inefficient operating conditions will be repaired or adjusted.

Fish, vegetation, and wildlife EPMs for the Project that relate to fish and aquatic resources include the following:

- FVW-1: Clean Line will identify environmentally sensitive vegetation (e.g., wetlands, protected plant species, riparian areas, large contiguous tracts of native prairie) and avoid and/or minimize impacts to these areas.
- FVW-2: Clean Line will identify and implement measures to control and minimize the spread of non-native invasive species and noxious weeds.
- FVW-3: Clean Line will clearly demarcate boundaries of environmentally sensitive areas during construction to increase visibility to construction crews.
- FVW-5: If construction occurs during important time periods (e.g., breeding, migration, etc.) or at close distances to environmentally sensitive areas with vegetation, wildlife, or aquatic resources, Clean Line will consult with USFWS and/or other resource agencies for guidance on seasonal and/or spatial restrictions designed to avoid and/or minimize adverse effects.

Water EPMs for the Project that relate to fish and aquatic resources include the following:

- W-1: Clean Line will avoid and/or minimize construction of access roads in special interest waters.
- W-2: Clean Line will identify, avoid, and/or minimize adverse effects to wetlands and waterbodies. Clean Line will not place structure foundations within the Ordinary High Water Mark of Waters of the United States.
- W-3: Clean Line will establish streamside management zones within 50 feet of both sides of intermittent and perennial streams and along margins of bodies of open water where removal of low-lying vegetation is minimized.

- W-5: Clean Line will construct access roads to minimize disruption of natural drainage patterns including perennial, intermittent, and ephemeral streams.
- W-6: Clean Line will not construct counterpoise or fiber optic cable trenches across waterbodies.
- W-7: Clean Line will locate spoil piles from foundation excavations and fiber optic cable trenches outside of streamside management zones.

In addition, the Applicant would develop and implement the following plans to avoid or minimize impacts:

- Blasting Plan—This plan will describe measures designed to minimize adverse effects due to blasting.
- Restoration Plan—This plan will describe post-construction activities to reclaim disturbed areas.
- Spill Prevention, Control and Countermeasures (SPCC) Plan—This plan will describe the measures designed to prevent, control, and clean up spills of hazardous materials
- Storm Water Pollution Prevention Plan (SWPPP)—This plan, consistent with federal and state regulations, will describe the practices, measures, and monitoring programs to control sedimentation, erosion, and runoff from disturbed areas.
- Transmission Vegetation Management Plan (TVMP)—This plan, to be filed with NERC, will describe how Clean Line will conduct work on its right-of-way to prevent outages due to vegetation.

3.20.2.7.2 Impacts Associated with the Applicant Proposed Project

This section identifies the potential impacts on fish, aquatic invertebrates, and aquatic habitat that could occur as a result of the Project. The discussion of potential impacts is broken out into three phases of the Project: (1) construction, (2) operations and maintenance, and (3) decommissioning. The Applicant would conduct each phase of the Project in compliance with applicable state and federal laws, regulations, and permits related to environmental protection. Specific EPMs developed to avoid or minimize impacts are described in Section 3.20.2.7.1.

The impacts discussed in the sections below are common to all aspects of the Project; while the potential impacts associated with specific portions of the Project (e.g., converter stations, AC collection system, HVDC routes) are discussed separately following this general impact discussion. Both direct (i.e., impacts that result from the action and occurs at the same time and place as the action) and indirect (i.e., impacts that result from the action, but which occur later in time or farther in distance) impacts are addressed. The impacts that could result from activities related to the Project would vary in duration.

Construction Impacts

The general construction approach to the Project would be to span waterbodies, avoid placement of structures in riparian areas where possible, minimize in-water construction, and avoid or minimize the need for crossings of waterbodies with equipment or vehicles. The Applicant Proposed Project is described in Section 2.1.2 through 2.1.7. Specific EPMs developed to avoid or minimize impacts are described in Section 3.20.2.7.1.

The main cause of potential impacts on fish and aquatic resources would be ground disturbance linked to construction activities in or adjacent to rivers, streams, ponds, and wetlands. Direct construction impacts that could potentially affect fish and aquatic invertebrate species and their habitats include vegetation clearing, grading, access roads, herbicide use, and handling of fuel and lubricants at stream and river crossings. Indirect construction impacts that could potentially affect fish and aquatic invertebrate species and their habitats include vegetation clearing, grading, access roads, herbicide use, and handling of fuel and lubricants at locations where construction activities would result in sedimentation or contaminant runoff. Vegetation clearing has the potential to increase sedimentation and decrease cover. Increased sedimentation can directly or indirectly suffocate, bury, or limit feeding of fish and aquatic invertebrate species. Grading and access roads have the potential to increase sedimentation, decrease cover, and increase runoff. Increased runoff can alter stream and river hydrology and provide a mechanism for delivery of sediment, herbicides, and fuel and lubricants to streams and rivers. Inadvertent release of contaminants (e.g., herbicides, fuel, or lubricants) introduces the potential for those contaminants to concentrate in body tissues of fish and filter-feeding mussels, which can result in death.

To avoid or minimize impacts during the construction phase of the Project, both general EPMs and those specific to fish and aquatic resources, as listed in Section 3.20.2.7.1, would be implemented. Specific to spills and hazardous chemical exposures associated with herbicide use and handling of fuel and lubricants, the Applicant would implement EPMs GE-1, GE-5, GE-13, GE-21, and GE-28, as well as the measures that would be outlined in the required SPCCP and SWPPP to minimize these risks. In addition, the USFWS and other resource agencies would be consulted if construction efforts occur during time periods that are important to a species (e.g., spawning) or near environmentally sensitive areas with important aquatic resources, to avoid or minimize impacts to species (EPM FVW-5). The Applicant would identify, avoid, and/or minimize adverse effects to wetlands and waterbodies (EPM W-2).

Mortality and Injury. Individual fish or aquatic invertebrates, including eggs, could suffer mortality or injury (be crushed) when in-stream excavation occurs or when vehicles or construction equipment travel through water features. Vehicular traffic at or in the vicinity of stream crossings could cause macroinvertebrates to be reduced in numbers, although they would be expected to recover post construction. To potentially avoid or minimize mortality/injury, the Applicant would minimize construction of access roads in special status waters as described in EPM W-1.

Spills of hazardous materials (e.g., diesel fuel, gasoline, oil, hydraulic fluids, cement water fluids, etc.) into aquatic habitats at crossings of the Project, including transport to downstream areas, could cause the loss or injury of individuals. In addition to direct impacts on fish or aquatic invertebrates, spilled hazardous substances could impact habitat quality and suitability. If hazardous materials reach the waterway, chemical residue could also enter the water column, resulting in hazardous conditions. To minimize the potential for direct discharge of fuels or hazardous materials into waterbodies, the Applicant would restrict refueling and maintenance of vehicles and the storage of fuels and hazardous chemicals within at least 100 feet from wetlands, surface waterbodies, and groundwater wells, or as otherwise required by federal, state, or local regulations as described under EPM GE-14.

Impacts could occur if herbicide application goes beyond its intended target through overspraying or drift with aerial applications, which could result in contact with aquatic areas. If these impacts occur at crossings of the Project, mortality of individual fish or aquatic invertebrate species could occur; likewise, if these impacts occur at downstream locations, mortality would be a potential concern. Herbicides that do not immediately enter a wetland or stream could still be transported downhill or underground into streams, rivers, or wetlands. To avoid overspray or drift, the Applicant would apply herbicides according to label instructions and any federal, state, and local regulations as described under EPM GE-5.

Short-term increases in sediment loads and turbidity within aquatic areas could result from ground disturbance due to construction, erosion, or runoff, and may potentially cause loss or injury of individual fish or aquatic invertebrate species sensitive to siltation during spawning or in other life stages. Sediment deposition in the substrate used for spawning could also alter egg development and survival. Increased sedimentation or erosion could result from in-stream excavation or work being done in adjacent uplands, affecting aquatic species at crossings of the Project or at downstream locations. Sediment entering the waterway would be deposited somewhere downstream of the construction area, and the extent of the effects would be dependent on current flow conditions, the individual river or stream path, and the composition of the substrate and soil disturbed. A SWPPP would be implemented by the Applicant that outlines corrective actions to minimize impacts related to increased sediment loads.

Clearing of forested vegetation adjacent to a waterway has the potential to increase stream temperature, which could potentially affect all stages of fish and aquatic invertebrates. Clearing of trees, shrubs, or other vegetation adjacent to or along a waterway, including in-water vegetation, can reduce the amount of cover available to species prone to hiding from prey, and could result in increased predation. The loss of vegetation along a waterway could affect the survival rate of affected fish and aquatic invertebrate species due to loss of cover (easy target for predators), loss of shade (increased water temperatures), and a decrease in food sources (loss of insect and organic matter deposition in water) (EPA 2003, 2014). Potential impacts associated with the loss of vegetation have the highest potential in Regions 3, 4, 5, and 7 where riparian vegetation is most prevalent.

Additionally, blasting associated with Project construction that occurs in or near streams has the potential to directly affect fish mortality. Fish can be affected even by blasting that does not occur directly in waterbodies. Blasting near water produces shock waves that can be lethal to fish, eggs, and larvae by rupturing swim bladders and addling egg sacs (TranBC 2000). Blasting underground produces two modes of seismic waves: 1) body waves that are propagated as compressional primary waves and shear secondary waves; and 2) surface waves produced when a body wave travels to the earth surface and is reflected back (ADF&G 1991). Seismic waves propagated from ground to water are likely less lethal to fish than those from in-water explosions because some energy is reflected or lost at ground-water interface (ADF&G 1991). To protect fish species, the best approach is to limit the instantaneous hydrostatic pressure change (resulting from nearby blasting) to levels below those known to be harmful to fish. ADF&G (1991) reported that a pressure change of 2.7 psi is the level for which no fish mortality occurs. Based on this information, ADF&G (1991) concluded that fish would sufficiently be protected from blasting on land by limiting overpressures to 2.7 psi.

Shallow bedrock is present throughout all regions of the Project, and blasting may be required in or near streams. However, if blasting is necessary, a Blasting Plan would be employed to minimize adverse effects. In addition, the Applicant would request guidance on seasonal and spatial restrictions for species in aquatic resources from the USFWS and other state resource agencies (EPM FVW-5) concerning blasting activities.

Sensory Disturbance. Direct impacts to fish and aquatic invertebrate species could occur as a result of disturbances caused by activities related to the Project. Sensory disturbances include ground vibration and visible activity, as well as any in-water work that creates pressure waves through the water, potentially injuring internal organs of fish. The presence of humans, vehicles, or equipment could cause fish and other mobile species to avoid suitable habitat by hiding under rocks or vegetation when disturbed, or cause stresses that would disrupt normal and essential life processes such as foraging and breeding. These impacts should be short-term and the aquatic species would likely resume normal behavior soon after any sensory disturbance. The Applicant would request guidance on seasonal and spatial restrictions for species in aquatic resources from the USFWS and other state resource agencies as described under EPM FVW-5.

Habitat Loss and Modification. Construction activities could cause a loss or modification of suitable habitat for foraging, spawning, and refuge habitats, all potentially impacting aquatic resources. A loss of native plants and substrates that are important to natural processes of aquatic species could result from in-stream disturbance and sediment deposition. Vegetation along streambanks provides cover for fish, stability for banks, shade, and an increase in food sources due to the deposition of insects and vegetation into the waterway. Riparian vegetation provides woody material deposited into waterways that fish can use as cover or can help form pools, and aid in stream sediment deposition and movement control. Although some habitat loss or modification would be unavoidable due to some construction activities (e.g., riparian vegetation removal) and installation of stream crossing structures (e.g., armored fords, culverts, bridges), to avoid or minimize the loss or modification of habitat, the Applicant would implement the measures described for EPMs FVW-1, FVW-2, FVW-3, and FVW-5.

If construction activities cause spills of hazardous materials and increased sediment loads, it could impact aquatic habitat. This could occur at or downstream of stream crossings, or downstream of sediment runoff from a nearby road into a stream. A spill of hazardous materials could impact water and soil conditions, thereby affecting the health of aquatic plants and nearby riparian vegetation. To avoid spills of hazardous materials, the Applicant would restrict refueling and maintenance of equipment and vehicles as described under EPMs GE-14 and GE-21. The Applicant would avoid or minimize impacts to environmentally sensitive areas as described under EPMs FVW-1, FVW-3, and FVW-5.

If herbicide application goes beyond its intended target through overspraying or drift with aerial applications, impacts could occur if contact with aquatic resources results in the damage or removal of native plants, which could cause isolated degradation of aquatic habitat. If aquatic vegetation is destroyed or altered, the essential life processes for fish and other aquatic species could be altered, including reproduction, foraging, and predator evasion. To avoid overspray or drift, the Applicant would apply herbicides according to label instructions and any federal, state, and local regulations as described under EPM GE-5.

Construction activities could cause the loss or degradation of riparian trees and herbaceous and shrubby vegetation on the banks of streams or ponds. The loss of vegetation could potentially affect habitat quality by raising the water temperature and increasing sediment loads through erosion, caused by the cutting and sloughing of banks. A considerable increase in both water temperature and the level of siltation in the water column or within the interstitial spaces of substrate could cause aquatic habitats to be suboptimal or inadequate for life processes such as breeding and result in long-term impacts. The Applicant would establish streamside management zones within 50 feet of both sides of intermittent and perennial streams and along margins of bodies of open water where removal of low-lying vegetation is minimized as described under EPM W-3.

Certain alterations of the physical condition of streambeds or banks during construction could cause changes in stream characteristics. This may result in the loss of pools or riffles, erosion of stream banks, and lessening the water quality. In-water structures and debris that normally provide cover from predators could be removed or destroyed, which could result in increased predation of aquatic species. Sedimentation could adversely affect macroinvertebrates, especially benthic organisms, through smothering, reduced filtering feeding rates, toxicity from anaerobic sediments, and increased drift rates. Turbidity within the waterbody could also result in reduced light intensity, as well as reduced dissolved oxygen levels and a change in the pH. The Applicant would avoid altering habitat to the extent practicable by following guidelines in EPMs W-1, W-2, W-3, W-5, W-6, and W-7.

Invasive Species. Construction activities could cause impacts on aquatic resources through the introduction of non-native aquatic plants and animals. Vehicles or equipment at stream crossings could potentially transfer invasive species between different streams during construction. The introduction of non-native plants could alter the habitat due to outcompeting of native plants, which are essential to the native aquatic resources. The introduction of non-native aquatic species (e.g., zebra mussels) could impact native species through competition for resources. In order to minimize impacts, the Applicant would identify, control, and minimize the spread of non-native invasive species to the extent practicable as described under EPM FVW-2.

Operations and Maintenance Impacts

The direct and indirect effects on fish and aquatic invertebrate resources (e.g., mortality and/or injury, disturbance, habitat loss and/or modification, invasive species) that would occur during the operations and maintenance phase of the Project would generally result from the presence of permanent Project structures, the presence of maintenance personnel and equipment in the area, and vegetation reclamation and maintenance activities that would be conducted. However, the magnitude of these effects would generally be less than what was described above for construction related impacts due to the periodic nature of the require maintenance and reclamation work (see Section 2.1.5 for a detailed description of the estimated operations and maintenance schedule).

During the operations and maintenance phase, the use of both access roads and the ROW for repair and maintenance activities could result in both direct and indirect impacts. In addition, the maintenance activity of ROW clearing in forested riparian areas could result in both direct and indirect impacts to habitat for fish and aquatic invertebrate species. The potential application of herbicides during operation of the Project could result in indirect impacts, and to a lesser extent, direct impacts. Both general EPMs and those specific to fish and aquatic resources as listed in Section 3.20.2.7.1, would be implemented to avoid or minimize impacts to fish and aquatic resources during the operations and maintenance phase of the Project.

Decommissioning Impacts

Decommissioning of the Project would involve methods similar to those that would be required to construct the Project. As a result, the impacts of decommissioning would be similar to those previously described for construction. The Applicant would follow the same general and resource-specific EPMs during decommissioning that would be implemented during construction. In addition, the Applicant would develop a Decommissioning Plan prior to any decommissioning actions for review and approval by the appropriate state and federal agencies.

Although decommissioning would have short-term adverse impacts to fish and aquatic invertebrate species (similar to what was discussed for construction related impacts), it is assumed that decommissioning of the Project would have long-term beneficial impacts to fish and aquatic invertebrate species and their habitats because it would remove the Project and its related impacts from the environment. However, areas disturbed by the decommissioning activities would still take time to recover from this disturbance (with disturbances in grasslands and croplands recovering within 5 years or less, and recovery in forests taking many decades).

3.20.2.7.2.1 Converter Stations and AC Interconnection Siting Areas

3.20.2.7.2.1.1 Construction Impacts

Construction impacts from the Oklahoma and Tennessee Converter Stations and associated AC Interconnection Siting Areas should be minimal since no major waterbodies or streams are present within the footprint of these areas; however, there are multiple issues that could be a potential concern due to construction activities. If the converter station or AC interconnection siting area is upslope of any waterbodies, there is a potential for runoff to enter the waterway. There is a potential for weeds to spread due to vehicle usage, which could also impact waterbodies. The use of herbicides or an oil spill in areas upslope of a waterbody has the potential to enter the waterway, causing potential impacts to fish and aquatic invertebrate species (see Section 3.20.2.7.2 for a detailed discussion of potential impacts).

3.20.2.7.2.1.1.1 Oklahoma Converter Station Siting Area and AC Interconnection Siting Area

The Oklahoma Converter Station and AC Interconnection Siting Areas are located within Region 1, within the Coldwater watershed. As discussed in Sections 3.10 and 3.17, grasslands and croplands are the dominant habitat types found at these siting areas. As described in Section 3.15, no perennial streams and no major waterbodies are located within the Oklahoma Converter Station Siting Area. Coldwater Creek, a perennial stream, is within 1 mile of the Oklahoma Converter Station Siting Area. Two significant roadways are between the Oklahoma Converter Station Siting Area and Coldwater Creek. Increased sedimentation is not likely to affect Coldwater Creek due to distance and intervening infrastructure; however, if construction occurs near established intermittent waterways, there is the potential for sediment to travel downstream and cause potential impacts to fish and aquatic invertebrate species.

3.20.2.7.2.1.1.2 Tennessee Converter Station Siting Area and AC Interconnection Siting Area

The Tennessee Converter Station and associated AC Interconnection Siting Areas are located within Region 7. As discussed in Sections 3.10 and 3.17, croplands and pasture/hay lands are the dominant habitat types found at these siting areas. However, hardwood forests and riparian areas are also present within the ROI for the Tennessee Converter Station and AC Interconnection Siting Areas. As described in Section 3.15, the Tennessee Converter Station Siting Area includes 0.25 miles of perennial streams and 4.41 miles of intermittent streams. The Tennessee Converter Station Siting Area borders Big Creek, a perennial stream, listed as impaired in 2010 for aquatic resources (fish, shellfish, and wildlife values).

The exact location of the Tennessee converter station within the siting area is unknown at this time. The area considered for its placement contains a variety of habitats that range from forested areas to croplands and pasture/hay lands. Impacts to aquatic resources would likely be less if the converter station and AC Interconnection were located within the croplands and pasture/hay lands, and would be greater if they were located in forested areas (due to the effects of long-term habitat loss from vegetation clearing, the extensive time necessary for forests to regenerate to pre-disturbance conditions and provide sediment retention, shade, and cover, and the impacts associated with edge effects in forested habitats that do not provide sedimentation retention, shade, and cover).

3.20.2.7.2.1.2 Operations and Maintenance Impacts

Potential impacts in the operations and maintenance phase of the Oklahoma and Tennessee converter stations and associated AC interconnections would not substantially differ from the general discussion of operations and maintenance related to the Project, provided in Section 3.20.2.7.2. During the operations and maintenance phase, the use of both access roads and the ROW for repair and maintenance activities could result in both direct and indirect impacts.

3.20.2.7.2.1.2.1 Oklahoma Converter Station Siting Area and AC Interconnection Siting Area

Operation and maintenance activities would not result in long-term impacts to the habitats around the converter station and associated AC Interconnection siting area because no major waterbodies or perennial streams are within the siting area, and downslope streams are approximately one mile away.

3.20.2.7.2.1.2.2 Tennessee Converter Station Siting Area and AC Interconnection Siting Area

The operations and maintenance activities would result in permanent alteration of terrestrial habitat, but impacts to the aquatic environment could occur. The extent of impacts would depend on the location of the structures, roads, and clearing areas within the siting area. A perennial stream flows adjacent and downslope along the western side of the siting area. Additionally, a perennial stream flows through the middle of the siting area. Placement of roads and structures that could result in increased sedimentation from operation and maintenance activities could result in long-term direct and indirect impacts to fish and aquatic invertebrate species or their habitat.

3.20.2.7.2.1.3 Decommissioning Impacts

The decommissioning of both converter stations and the AC interconnections would result in short-term impacts, especially in the form of increased sedimentation during structure and road removal, and surface re-contouring activities. Long-term impacts would benefit fish or aquatic invertebrate species and their habitat, by removing effects from operation and maintenance activities, as well as removal of road and cleared areas that impact hydrology and sedimentation. The Applicant would develop a Decommissioning Plan prior to the start of decommissioning that would be submitted for review and approval by the appropriate federal and state resources agencies.

3.20.2.7.2.2 AC Collection System

A detailed description of the AC collection system is provided in Section 2.1.2.3. Impacts for fish and aquatic invertebrate resources were evaluated for the 2-mile-wide ROI of the AC collection system routes. The 2-mile-wide ROI of the AC collection system routes was used to assess potential occurrences of fish and aquatic invertebrate species to evaluate potential downstream impacts from Project activities thoroughly and adequately. Considering the mobility of fish species with the potential to occur within the AC collection system routes, the 2-mile-wide ROI is extensive enough to account for the various ranges of fish species, including the unique and varied habitat that each species potentially occupies as well as the potential downstream transport of sediment and hazardous materials.

3.20.2.7.2.2.1 Construction Impacts

For the AC collection system routes, as stated in Section 3.20.2.7.1, the Applicant would implement EPMs to avoid or minimize effects to waterbodies, and therefore fish and other aquatic species, to the extent practicable. Table 3.20.2-2 details the miles of perennial and intermittent streams, major waterbodies, and the acres of reservoirs, lakes, and ponds found within the 2-mile-wide corridors in each of the AC collection system routes. Table 3.20.2-3 identifies the major waterbodies and associated fish species that may be encountered by each route.

Table 3.20.2-2:
Water Features Potentially Impacted within the 2-Mile-Wide Corridors of the AC Collection System Routes

AC Route Designation	Perennial Streams (miles)	Intermittent Streams (miles)	Major Waterbodies (miles)	Reservoirs, Lakes, and Ponds (acres)	Impacts to Fish that would be unique to this Route
E-1	9.17	100.18	0	33.83	Along with E-2, E-3, SE-1, and SE-3, crosses Palo Duro Creek, which is considered to have impaired dissolved oxygen for fish and wildlife propagation/warm water aquatic community
E-2	13.47	100.05	0.07	148.99	Along with E-1, E-3, SE-1, and SE-3, crosses Palo Duro Creek, which is considered to have impaired dissolved oxygen for fish and wildlife propagation/Warm water aquatic community

Table 3.20.2-2:
Water Features Potentially Impacted within the 2-Mile-Wide Corridors of the AC Collection System Routes

AC Route Designation	Perennial Streams (miles)	Intermittent Streams (miles)	Major Waterbodies (miles)	Reservoirs, Lakes, and Ponds (acres)	Impacts to Fish that would be unique to this Route
E-3	10.06	137.62	0.01	36.71	Along with E-1, E-2, SE-1, and SE-3, crosses Palo Duro Creek, which is considered to have impaired dissolved oxygen for fish and wildlife propagation/Warm water aquatic community
NE-1	24.11	32.97	0.12	141.04	Crosses Beaver River (North Canadian), OK, which is considered to have impaired dissolved oxygen for fish and wildlife propagation/Warm water aquatic community
NE-2	7.75	78.31	0.10	70.77	Crosses Beaver River (North Canadian), OK, which is considered to have impaired dissolved oxygen for fish and wildlife propagation/Warm water aquatic community
NW-1	13.05	110.93	0.09	167.26	Crosses Beaver River (North Canadian) and Coldwater (Frisco) Creek. Beaver Creek is considered to have impaired dissolved oxygen for fish and wildlife propagation/warm water aquatic community
NW-2	31.13	77.72	0.18	119.20	Crosses Beaver River (North Canadian), Goff Creek, and Coldwater (Frisco) Creek. Beaver Creek is considered to have impaired dissolved oxygen for fish and wildlife propagation/warm water aquatic community
SE-1	21.52	75.70	0.04	677.83	Along with E-1, E-2, E-3, and SE-1, crosses Palo Duro Creek, which is considered to have impaired dissolved oxygen for fish and wildlife propagation/warm water aquatic community
SE-2	0.80	26.67	0	97.95	No significant difference between this route and the other routes in regards to the types of fisheries impacts that would likely occur as a result of the route's location and position.
SE-3	14.47	98.54	0.07	768.03	Along with E-1, E-2, E-3, and SE-1, crosses Palo Duro Creek, which is considered to have impaired dissolved oxygen for fish and wildlife propagation/warm water aquatic community. Wolf Creek is crossed by the 2-mile corridor for this route and is designated as an "ecologically unique river or stream segment" and identifies as a reference stream for development of a regionalized index of biotic integrity for Texas and exhibiting high water quality and diverse benthic macroinvertebrate and fish communities
SW-1	0.97	58.06	0	14.24	No significant difference between this route and the other routes in regards to the types of fisheries impacts that would likely occur as a result of the routes' location and position.
SW-2	7.98	125.14	0.08	57.42	Crosses Coldwater (Frisco) Creek.
W-1	6.16	45.09	0.08	9.27	Crosses Coldwater (Frisco) Creek.

GIS Data Source: USGS (2014a)

Table 3.20.2-3:
Major Waterbodies and Potential Fish Species by AC Collection System Route

Major Waterbodies and Fish Species	AC Collection System Routes												
	E-1	E-2	E-3	NE-1	NE-2	NW-1	NW-2	SE-1	SE-2	SE-3	SW-1	SW-2	W-1
Palo Duro Creek-- largemouth bass channel catfish blue catfish white crappie sunfish walleye	X	X	X					X		X			
Beaver (North Canadian) River-- striped bass largemouth bass channel catfish bluegill walleye carp flathead catfish crappie white bass				X	X	X	X						
Coldwater (Frisco) Creek-- striped bass walleye bluegill brown trout largemouth bass rainbow trout smallmouth bass				X	X	X	X					X	X
Goff Creek-- striped bass walleye bluegill brown trout largemouth bass rainbow trout smallmouth bass							X						

Sources: TPWD (2014b), HookandBullet (2014d)

3.20.2.7.2.2.2 Operations and Maintenance Impacts

During the operations and maintenance phase for the AC collection system, potential impacts to fish and aquatic resources could occur. Potential impacts in the operations and maintenance phase would not substantially differ from the general discussion of operations and maintenance related to the Project in general in Section 3.20.2.7.2. During the operations and maintenance phase, the use of both access roads and the ROW for repair and maintenance activities could result in both direct and indirect impacts to fish and aquatic invertebrate species and their habitats.

Because the area is dominated by grasslands and croplands land cover types, shade impacts from vegetation clearing would likely be minimal; however, maintenance activities involving brush removal and road maintenance could impact streams through increases in sedimentation. The final placement of road-crossing and structures would dictate the level of potential effects operations and maintenance activities may have; highest impacts would be likely to occur where activities are adjacent to fish-bearing streams.

As discussed in Section 3.20.2.7.2.2.1, AC Collection System Route SE-3 includes a portion of Wolf Creek, which is state-designated as a Texas high quality water/exceptional aquatic life/high aesthetic value water. If an access road is required to cross Wolf Creek, additional requirements would be necessary to ensure no adverse impacts occurred while maintaining the access road during operations and maintenance.

3.20.2.7.2.2.3 Decommissioning Impacts

Potential short-term impacts in the decommissioning of the AC transmission lines would not substantially differ from the general discussion of decommissioning related to the Project, provided in Section 3.20.2.7.2. Long-term impacts would benefit fish or aquatic invertebrate species and their habitat by removing effects from operation and maintenance activities, as well as removal of road and cleared areas that impact hydrology and sedimentation. The Applicant would develop a Decommissioning Plan prior to the start of decommissioning that would be submitted for review and approval by the appropriate federal and state resources agencies.

During the decommissioning phase of the Project, all general EPMs and those specific to fish and aquatic resources that were implemented during the construction phase of the Project would continue to be enforced to avoid or minimize impacts to fish and aquatic resources (see Section 3.20.2.7.1 for relevant EPMs).

3.20.2.7.2.3 HVDC Applicant Proposed Route

3.20.2.7.2.3.1 Construction Impacts

The Applicant Proposed Route is described in Sections 2.1.2.2 and 2.4.2. The Applicant Proposed Route would pass through a variety of habitat types, ranging from grassland and croplands habitats to forested and riparian areas (Table 3.20.2-4). The Applicant Proposed Route within Regions 1, 2, and 6 would cross predominantly through grassland and croplands habitats. Forested and riparian habitats become more prevalent within Regions 4 and 5 (as well as within Region 3 and 7 to a lesser extent). Impacts for fish and aquatic invertebrate resources were evaluated within the ROI of the Applicant Proposed Route (1,000-foot-wide corridor). Impacts in Regions 4, 5, and, to a lesser extent, 3 and 7, associated with water temperature and sedimentation would be greater because they include forests and riparian areas with vegetation that would be cleared (Table 3.20.2-4). When considering numbers of stream crossings, stream sensitivity, or potential in-water works areas, Region 3 may have greater impacts than Regions 4 and 5 due to the miles and acres of waterbodies present.

Section 3.15 provides more details associated with perennial and intermittent streams located within the ROI that may necessitate temporary or permanent access stream crossings. Higher numbers of stream crossings increases the potential for sediment or contaminants to be introduced into waterbodies, resulting in potential impacts to aquatic areas where fish and other aquatic species may be present. In addition, Section 3.15 provides more details on the number and miles of special interest surface waters (e.g., National Wild and Scenic Rivers System, Nationwide Rivers Inventory, Oklahoma Outstanding Resource Waters, Oklahoma High Quality Waters, Oklahoma Waters of Recreational and/or Ecological Significance, Oklahoma Scenic River Areas, Arkansas Ecologically Sensitive Waters, Arkansas) that would be crossed or potentially impacted. Special interest surface waters have a high potential to provide aquatic habitat for fish and other aquatic species. These details (i.e., perennial and intermittent streams and special interest surface water) from Section 3.15 were used to develop Table 3.20.2-4 and in assessing and comparing potential impacts to fish and aquatic resources in each region and between the Applicant Proposed Project and DOE Alternatives.

Table 3.20.2-4:
Water Features Potentially Impacted within the ROI for the Applicant Proposed Route

Region	Perennial Streams (miles)	Intermittent Streams (miles)	Major Water Bodies (miles)	Reservoirs, Lakes, Ponds (acres)	Predominant Land Cover	Surface Water Features of Special Interest Crossed
1	5.4	29.3	0.01	49.0	Grassland/herbaceous and croplands	Crosses the Beaver River and multiple tributaries
2	7.3	19.1	0.01	13.6	Grassland/herbaceous and croplands	The route crosses the Cimarron River in an area which is designated as critical habitat by USFWS and the state of Oklahoma. Also is adjacent to the North Canadian River, OK
3	55.3	36.8	0.15	214.8	Grasslands, deciduous forest, and pasture/hay	Crosses the Cimarron River, OK, and tributaries; Deep Fork, Arkansas River, OK; Lake Carl Blackwell, OK;, Eufaula Lake, OK; and Greenleaf Lake, OK
4	18.8	41.9	0.49	93.7	Pasture/hay, deciduous forest, and evergreen forest	Crosses Arkansas River, OK; Lower Illinois River, OK; Sallisaw Creek, OK; Little Lee Creek, OK; Lee Creek, OK; Briar Creek, OK; Lee Creek Reservoir, OK; source-water protection area in Robert S. Kerr Reservoir Watershed, OK; Mulberry River, AR; source-water protection area in Frog-Mulberry watershed, AR; Big Piney Creek, AR; source-water protection area in Dardanelle reservoir watershed, AR
5	11.7	46.6	0.23	70.7	Deciduous forest, pasture/hay, and evergreen forest	Illinois Bayou, AR; source-water protection area in Cadron watershed, AR; Cadron Creek, AR; source-water protection area in Little Red watershed, AR; Little Red River, AR; White River, AR
6	12.5	13.4	0.06	28.6	Croplands	Crosses Cache River and forested wetland areas include Bayou DeView, Caney Creek, L'Anguille River, and Ditches No. 10, 123, and 61, AR; and lower 10 miles of Straight Slough is designated as an Ecologically Sensitive Waterbody. AR
7	4.3	18.3	0.62	21.5	Croplands and deciduous forest	St. Francis River, AR; Mississippi River, TN

3.20.2.7.2.3.2 Operations and Maintenance Impacts

During the operations and maintenance phase for the Applicant Proposed Route, potential impacts to fish and aquatic resources could occur. Potential impacts in the operations and maintenance phase would not substantially differ from the general discussion of operations and maintenance related to the Project, provided in Section 3.20.2.7.2. The use of both access roads and the ROW for repair and maintenance activities could result in both direct and indirect impacts. In addition, the maintenance of ROW clearing in forested riparian areas could result in both direct and indirect impacts to habitat for fish and aquatic invertebrate species. The potential application of herbicides during operation of the Project could result in indirect impacts, and to a lesser extent, direct impacts. During the operations and maintenance phase of the Project, both general EPMs and those specific to fish and aquatic resources, would be implemented to avoid or minimize impacts to fish and aquatic resources. General EPMs for the Project that relate to fish and aquatic resources are defined in Section 3.20.2.7.1.

3.20.2.7.2.3.3 Decommissioning Impacts

Impacts related to the decommissioning of the HVDC portion of the Project would not substantially differ from the general discussion of decommissioning related to the Project in general (see Section 3.20.2.7.2). The short-term impacts during decommissioning of the Applicant Proposed Route would be similar to the impacts that would occur during the construction phase. Structure removal, road decommissioning, and removal of road crossings is likely to have potential impacts to fish and aquatic resources due to increased sedimentation from runoff of disturbed areas and direct impact of removal of in-stream crossing structures. The Applicant would follow the same general and resource-specific EPMs during decommissioning that would be implemented during construction. In addition, the Applicant would develop a Decommissioning Plan prior to any decommissioning actions for review and approval by the appropriate state and federal agencies.

Long-term impacts of Project decommissioning would benefit fish and aquatic invertebrate species due to removal of impacts from Project components, such as roads and road maintenance activities, as well as allowing the vegetation in any cleared ROW areas to regrow.

3.20.2.7.3 Impacts Associated with the DOE Alternatives

This section identifies the potential direct and indirect impacts on fish, aquatic invertebrates, and aquatic habitat related to the DOE Alternatives.

3.20.2.7.3.1 Arkansas Converter Station Alternative Siting Area and AC Interconnection Siting Area

A detailed description of the Arkansas converter station and other terminal facilities is provided in Section 2.4.3.1. Impacts for fish and aquatic invertebrate resources were evaluated for the representative footprints of the converter station and the associated AC interconnection siting areas, as well as the designated ROI for fish and aquatic species.

3.20.2.7.3.1.1 Construction Impacts

The Arkansas Converter Station Alternative and AC Interconnection Siting Areas are located within Region 5; however, the exact location of the Arkansas Converter Station and AC Interconnection within the siting areas has not been determined to date. The construction of the Arkansas converter station and AC interconnection would not likely result in any direct impacts to fish and aquatic invertebrate species or their habitat because no waterbodies are located within the Arkansas Converter Station Alternative and AC Interconnection Siting Areas. Indirect construction impacts from the Arkansas converter station and associated AC interconnection should be minimal since no major waterbodies or streams are present within the footprint of these areas; however, if either siting area is upslope of any waterbodies, there is a potential for runoff to enter the waterway. In addition, the use of herbicides or an oil spill in these areas upslope of a waterbody has the potential to enter the waterway, causing potential indirect impacts to fish and aquatic invertebrate species. To avoid overspray or drift, the Applicant would apply herbicides according to label instructions and any federal, state, and local regulations as described under EPM GE-5. To minimize the potential for direct discharge of fuels or hazardous materials into waterbodies, the Applicant would restrict refueling and maintenance of vehicles and the storage of fuels and hazardous chemicals within at least 100 feet from wetlands, surface waterbodies, and groundwater wells, or as otherwise required by federal, state, or local regulations as described under EPM GE-14.

3.20.2.7.3.1.2 Operations and Maintenance Impacts

The operations and maintenance of the Arkansas converter station and AC interconnection would not likely result in any direct impacts to fish and aquatic invertebrate species or their habitat because no waterbodies are located within the footprint of the construction area, or within the interconnection area. During the operations and maintenance phase, if either siting area is upslope of any waterbodies, there is a potential for runoff to enter the waterway. In addition, the use of herbicides or an oil spill in these areas upslope of a waterbody has the potential to enter the waterway, causing potential indirect impacts to fish and aquatic invertebrate species. To avoid overspray or drift, the Applicant would apply herbicides according to label instructions and any federal, state, and local regulations as described under EPM GE-5. To minimize the potential for direct discharge of fuels or hazardous materials into waterbodies, the Applicant would restrict refueling and maintenance of vehicles and the storage of fuels and hazardous chemicals within at least 100 feet from wetlands, surface waterbodies, and groundwater wells, or as otherwise required by federal, state, or local regulations as described under EPM GE-14.

3.20.2.7.3.1.3 Decommissioning Impacts

The impacts during decommissioning of the Arkansas converter station and AC transmission line would be similar to the impacts occurring during the construction phase. Decommissioning would not likely result in any direct impacts to fish and aquatic invertebrate species or their habitat because no waterbodies are located within the footprint of the construction area, or along the interconnection area. The Applicant would develop a Decommissioning Plan prior to the start of decommissioning that would be submitted for review and approval by the appropriate federal and state resources agencies.

3.20.2.7.3.2 HVDC Alternative Routes

Descriptions of the HVDC alternative routes are provided in Section 2.4.3.2. The impacts that could occur to fish and aquatic invertebrate species from construction and operation of the HVDC Applicant Proposed Route are discussed in Section 3.20.2.7.2.3. The expected types of impacts from construction and operation of the HVDC alternative routes in each region would be similar to those for the Applicant Proposed Route. However, because of differences in routing (i.e., location) the potential for impacts may be different (e.g., the route may be closer to or farther from an important stream or river crossing). The discussion in this section focuses on the differential impacts that could occur under each of the HVDC alternative routes compared to the Applicant Proposed Route. Data used in the impacts comparison comes from Section 3.15 and the Surface Water Technical Report (Clean Line 2013b).

3.20.2.7.3.2.1 Construction Impacts

This section describes construction impacts associated with the 1,000-foot-wide ROI of the HVDC alternative routes. Data used in the impacts comparison come from Section 3.15 and the Surface Water Technical Report (Clean Line 2013b). Surface water features are described within a 1,000-foot-wide corridor of the Applicant Proposed Route. The 1,000-foot-wide corridor is a conservative assessment based on potential impacts to surface water from access roads, which would likely extend beyond the ROW (Clean Line 2013b). Analyses are presented for the ROI in Regions 1 through 7. During the construction phase of the Project, the Applicant would implement the EPMs described in Section 3.20.2.7.1 to avoid or minimize impacts to fish and aquatic resources. Table 3.20.2-5 provides a comparison of water body crossings and stream lengths between the HVDC alternative routes and the corresponding links of the Applicant Proposed Route Section 3.15.5 provides for the values of stream lengths crossed by region.

3.20.2.7.3.2.2 Operations and Maintenance Impacts

Direct and indirect impacts for the HVDC alternative routes would differ, depending on final location of road crossings, access roads and other ground-disturbing activities and extent of riparian clearing. Alternatives requiring maintenance riparian clearing adjacent to or crossing fish-bearing or perennial streams near fish-bearing streams are likely to have greater impacts than clearing further away from these waters. In addition, HVDC alternative routes with greater lengths of perennial and significant waterbodies within the ROW are likely to have more road-crossings once road and ROW locations have been identified. Alternatives with road locations near streams and at high grades would have greater impacts than those with roads further away and at lower grades due to increased risk of increased runoff and sediment inputs into nearby streams.

During the operations and maintenance phase of the Project, the Applicant would implement the applicable EPMs described in Section 3.20.2.7.1 to avoid or minimize impacts to fish and aquatic resources.

3.20.2.7.3.2.3 Decommissioning Impacts

Decommissioning impacts for the HVDC transmission line would be similar to general decommissioning impacts (see Section 3.20.2.7.2). Removal of infrastructure; including roads, structures, and road crossings, is likely to result in some short-term impacts due to increased sedimentation as a result of ground-disturbance. As is discussed in the general Project decommissioning impacts, long-term benefits such as allowing the vegetation to return to the ROW, removal of road and facility maintenance actions and risks, and removal of road crossings would have an overall benefit to the aquatic community relative to the Project during the operations and maintenance phase.

Table 3.20.2-5:
Summary Information related to Fish Resources for the HVDC Alternative Routes

Region	HVDC Alternative Route	Total Length of Route (miles)	Predominant Land Cover	Differences in Significant Water Body Crossings Between Alternatives and Proposed	Relative Comparison of Streamlengths within the Proposed and Alternative Routes
1	1-A	123	Grassland/ herbaceous	This alternative compares to the Applicant Proposed Route Links 2, 3, 4, and 5. Similar impacts to Applicant Proposed Route; however, includes Sand Creek (listed for DO impairment for Fish and Wildlife/Warm Water Aquatic Community), and does not include Clear Creek nor Otter Creek (both listed for Fish and Wildlife/Warm Water Aquatic Community—Benthic macroinvertebrate bioassessment). This alternative would not cross the impaired section Beaver River (North Canadian), OK—listed for lead impairments for fish consumption.	HVDC Alternative Route 1-A has the highest mileage of intermittent streams, but the lowest mileage of perennial streams compared to the other HVDC route alternatives and the Applicant Proposed Route. The corresponding links of the Applicant Proposed Route have a higher value for perennial streams and reservoirs, lakes, and ponds, but a lower value for intermittent streams and major waterbodies.
	1-B	52	Grassland/herb aceous	This alternative compares to the Applicant Proposed Route Links 2 and 3. Similar impacts to Applicant Proposed Route; however, does not include Clear Creek nor Otter Creek (both listed for Fish and Wildlife/Warm Water Aquatic Community—Benthic macroinvertebrate bioassessment), nor Beaver River (North Canadian), OK—listed for lead impairments for fish consumption.	HVDC Alternative Route 1-B has the lowest acreage of reservoirs, lakes, and ponds compared to the other HVDC route alternatives and the Applicant Proposed Route. The corresponding links of the Applicant Proposed Route have a higher value for intermittent streams, but a lower value for perennial streams, major waterbodies, and reservoirs, lakes, and ponds.
	1-C	52	Grassland/ herbaceous	This alternative compares to the Applicant Proposed Route Links 2 and 3. Similar impacts to Applicant Proposed Route; however, does not include Clear Creek nor Otter Creek (both listed for Fish and Wildlife/Warm Water Aquatic Community—Benthic macroinvertebrate bioassessment), nor Beaver River (North Canadian), OK—listed for lead impairments for fish consumption.	The corresponding links of the Applicant Proposed Route have a higher value for intermittent streams and major waterbodies, but a lower value for perennial streams and reservoirs, lakes, and ponds.
	1-D	33.5	Grassland/herb aceous	This alternative compares to the Applicant Proposed Route Links 3 and 4. Similar impacts to Applicant Proposed Route; however, does not include Otter Creek (listed for Fish and Wildlife/Warm Water Aquatic Community—Benthic macroinvertebrate bioassessment), nor Beaver River (North Canadian), OK—listed for lead impairments for fish consumption. Unlike the Applicant Proposed Route and other corresponding Alternatives, 1-D would not cross the impaired section of Palo Duro Creek, OK.	HVDC Alternative Route 1-D has the lowest mileage of intermittent streams compared to the other HVDC route alternatives and the Applicant Proposed Route. The corresponding links of the Applicant Proposed Route have a higher value for perennial streams, intermittent streams, and reservoirs, lakes, and ponds. Mileage of major waterbodies is equal for both the Applicant Proposed Route and HVDC Alternative Route 1-D.

Table 3.20.2-5:
Summary Information related to Fish Resources for the HVDC Alternative Routes

Region	HVDC Alternative Route	Total Length of Route (miles)	Predominant Land Cover	Differences in Significant Water Body Crossings Between Alternatives and Proposed	Relative Comparison of Streamlengths within the Proposed and Alternative Routes
2	2-A	57	Grassland/ herbaceous	This alternative compares to the Applicant Proposed Route Link 2. Alternative crosses additional impaired water bodies under the Fish and Wildlife Propagation/Warm Water Aquatic Community: Main Creek, OK; Griever Creek, OK; and Cottonwood Creek, OK. Unlike the Applicant Proposed Route, this Alternative would not cross the impaired sections of Buffalo Creek, OK (listed for Fish and Wildlife Propagation/Warm Water Aquatic Community—dissolved oxygen impairment), nor the impaired section of the Cimarron River, OK (Fish and Wildlife Propagation/Warm Water Aquatic Community—selenium impairment; Agriculture—sulfates, total dissolved solids, and chloride impairments).	HVDC Alternative Route 2-A has the highest mileage and acreage for perennial streams, major waterbodies, and reservoirs, lakes, and ponds compared to the other Region 2 alternatives and the Applicant Proposed Route, but the lowest mileage of intermittent streams. The corresponding links of the Applicant Proposed Route have a higher value for intermittent streams, but a lower value for perennial streams, major waterbodies, and reservoirs, lakes, and ponds. HVDC Alternative Route 2-A includes a portion of the Cimarron River, designated as critical habitat by the USFWS and the state of Oklahoma. If an access road were to be required within an area designated as critical habitat, the effects of such access road would be the subject of a consultation with USFWS pursuant to Section 7 of the ESA.
	2-B	30	Croplands	This alternative compares to the Applicant Proposed Route Link 3. Similar impacts to the Applicant Proposed Route; however, would not cross impaired section of Cimarron River, OK (Fish and Wildlife Propagation/Warm Water Aquatic Community—selenium impairment; Agriculture—sulfates, total dissolved solids, and chloride impairments).	The corresponding links of the Applicant Proposed Route have a higher value for intermittent streams, but a lower value for perennial streams and reservoirs, lakes, and ponds. Mileage of major waterbodies is equal for both the Applicant Proposed Route and Alternative Route 2-B. Unlike the Applicant Proposed Route and Alternative 2-A, this Alternative would not cross designated critical habitat on the Cimarron River.
3	3-A	38	Grassland/ herbaceous and deciduous forest	This alternative compares to the Applicant Proposed Route Link 1. Unlike the Applicant Proposed Route, this Alternative would not cross Cushing Lake, OK (Surface Water of Special Interest), nor would it cross the following impaired waterbody sections listed for Fish and wildlife impairments Skeleton Creek, Sillwater Creek. This Alternative crosses an additional Surface Water of Special Interest: Lake Carl Blackwell, OK.	The corresponding links of the Applicant Proposed Route has a higher value for intermittent streams and major waterbodies, but a lower value for perennial streams and reservoirs, lakes, and ponds. This Alternative has the highest mileage for perennial streams of any Alternative, but lowest mileage of intermittent streams (same value as 3-B).
	3-B	48	Grassland/ herbaceous and deciduous forest	This alternative compares to the Applicant Proposed Route Links 1, 2, and 3. Unlike the Applicant Proposed Route, this alternative would not cross Cushing Lake, OK (Surface Water of Special Interest), nor would it cross the following impaired waterbody sections listed for Fish and wildlife impairments: Skeleton Creek. This Alternative crosses an	HVDC Alternative Route 3-B has the second highest mileage and acreage for perennial streams, and highest mileage for reservoirs, lakes, and ponds compared to the other Region 3 alternatives and the Applicant Proposed Route, but the lowest mileage for intermittent streams (same as 3-A) and major waterbodies. The corresponding links of the Applicant Proposed Route has a higher value for

Table 3.20.2-5:
Summary Information related to Fish Resources for the HVDC Alternative Routes

Region	HVDC Alternative Route	Total Length of Route (miles)	Predominant Land Cover	Differences in Significant Water Body Crossings Between Alternatives and Proposed	Relative Comparison of Streamlengths within the Proposed and Alternative Routes
				additional Surface Water of Special Interest: Lake Carl Blackwell, OK.	intermittent streams and major waterbodies, but a lower value for perennial streams and reservoirs, lakes, and ponds.
	3-C	122	Grassland/ herbaceous deciduous forest and pasture/hay	This Alternative compares to the Applicant Proposed Route Links 3, 4, 5, and 6. This Alternative would not cross the following impaired waterbody sections listed for Fish and wildlife impairments: Skeleton Creek, OK; Stillwater Creek, OK. This Alternative would cross the following additional stream sections listed fish and wildlife impairments: Butler Creek, OK; Dirty Creek, OK	HVDC Alternative Route 3-C has the highest mileage for intermittent streams compared to the other Region 3 alternative routes and the Applicant Proposed Route, but the lowest acreage of reservoirs, lakes, and ponds. The corresponding links of the Applicant Proposed Route has a higher value for perennial streams, major waterbodies, and reservoirs, lakes, and ponds, but a lower value for intermittent streams.
	3-D	39	Primarily pasture/hay and deciduous forest and grassland/ herbaceous	This Alternative compares to the Applicant Proposed Route Links 5 and 6. Unlike the Applicant Proposed Route, this Alternative would not cross Cushing Lake, OK (Surface Water of Special Interest). This Alternative would not cross the following impaired waterbody sections listed for Fish and wildlife impairments: Skeleton Creek, OK; Stillwater Creek, OK. This Alternative would cross the following additional stream sections listed fish and wildlife impairments: Butler Creek, OK; Dirty Creek, OK.	The corresponding links of the Applicant Proposed Route has a higher value for perennial streams and major waterbodies, but a lower value for intermittent streams and reservoirs, lakes, and ponds.
	3-E	8.5	Pasture/hay and deciduous forest	This Alternative compares to the Applicant Proposed Route Link 6. Unlike the Applicant Proposed Route, this Alternative would not cross Cushing Lake, OK (Surface Water of Special Interest). This Alternative would not cross Skeleton Creek, OK; listed for fish and wildlife impairments. This Alternative would cross the following additional stream sections listed fish and wildlife impairments: Dirty Creek, OK.	HVDC Alternative Route 3-E has the highest mileage of waterbodies compared to the other Region 3 alternatives and the similar mileage as the Applicant Proposed Route. The corresponding links of the Applicant Proposed Route has a lower value for perennial streams, intermittent streams, and reservoirs, lakes, and ponds. Mileage of major waterbodies is equal for both the Applicant Proposed Route and Alternative Route 3-E.
4	4-A	58	Deciduous forest and pasture/hay	This Alternative compares to the Applicant Proposed Route Links 3, 4, 5, and 6. Additional Surface Waters of Special Interest are crossed: Bushy Creek, OK; Webbers Creek, OK; and two additional source-water protection area crossings in the Frog-Mulberry watershed. It does not cross Briar Creek, OK or Lee Creek Reservoir, OK.	HVDC Alternative Route 4-A has the lowest total mileage of waterbodies compared to the other Region 4 alternatives and the Applicant Proposed Route. The corresponding links of the Applicant Proposed Route have a higher value for perennial streams, intermittent streams, major waterbodies, and reservoirs, lakes, and ponds.

Table 3.20.2-5:
Summary Information related to Fish Resources for the HVDC Alternative Routes

Region	HVDC Alternative Route	Total Length of Route (miles)	Predominant Land Cover	Differences in Significant Water Body Crossings Between Alternatives and Proposed	Relative Comparison of Streamlengths within the Proposed and Alternative Routes
	4-B	79	Deciduous forest and pasture/hay	This alternative compares to the Applicant Proposed Route Links 2–8. Additional Surface Waters of Special Interest are crossed: Bushy Creek, OK; and two additional source-water protection area crossings in the Frog-Mulberry watershed. It does not cross Briar Creek, OK; Lee Creek Reservoir, OK; or the source-water protection area crossing in the Robert S. Kerr Reservoir watershed.	HVDC Alternative Route 4-B has the lowest mileage and acreage of perennial streams and reservoirs, lakes, and ponds compared to the other Region 4 alternatives and the Applicant Proposed Route, but the highest mileage of intermittent streams. The corresponding links of the Applicant Proposed Route have a higher value for perennial streams, major waterbodies, and reservoirs, lakes, and ponds, but a lower value for intermittent streams.
	4-C	3	Deciduous forest and pasture/hay	This alternative compares to the Applicant Proposed Route Link 5. This alternative does not vary significantly in Surface Waters of Special Interest Crossed (does not crossing the source-water protection area crossing in the Robert S. Kerr watershed).	HVDC Alternative Route 4-C has the highest mileage of perennial streams and waterbodies compared to the other Region 4 alternatives and the Applicant Proposed Route. The corresponding links of the Applicant Proposed Route have a higher value for intermittent streams, but a lower value for perennial streams and reservoirs, lakes, and ponds. Mileage of major waterbodies is equal for both the Applicant Proposed Route and HVDC Alternative Route 4-C.
	4-D	25	Pasture/hay and deciduous forest	This alternative compares to the Applicant Proposed Route Link 4. This alternative does not vary significantly in Surface Waters of Special Interest Crossed; however it does have two additional crossings in the source-water protection area for the Frog-Mulberry watershed.	HVDC Alternative Route 4-D has the second-lowest mileage of perennial streams, but second highest mileage for reservoirs, lakes, and ponds, compared to the other Region 4 alternatives and the Applicant Proposed Route. The corresponding links of the Applicant Proposed Route has a higher value for perennial streams and major waterbodies, but a lower value for intermittent streams and reservoirs, lakes, and ponds.
	4-E	37	Pasture and evergreen forest	This alternative compares to the Applicant Proposed Route Links 8 and 9. This alternative has one additional crossing of a Surface water of special interest: a crossing of a source-water protection area intake stream in the Dardanelle Reservoir watershed.	HVDC Alternative Route 4-E has the lowest mileage of intermittent streams compared to the other Region 4 alternatives and the Applicant Proposed Route, but it the highest acreage of reservoirs, lakes, and ponds. The corresponding links of the Applicant Proposed Route have a higher value for perennial streams, intermittent streams, and major waterbodies, but a lower value for reservoirs, lakes, and ponds.
5	5-A	13	Evergreen forest and deciduous forest	This alternative compares to the Applicant Proposed Route Link 1. No significant difference in significant surface water crossings.	HVDC Alternative Route 5-A has the lowest mileage of waterbodies (along with HVDC Alternative Route 5-E) compared to the other Region 5 alternatives and the Applicant Proposed Route. The corresponding links of the Applicant Proposed Route have a higher value for perennial streams, major waterbodies, and reservoirs, lakes, and streams, but a lower value for intermittent streams.

Table 3.20.2-5:
Summary Information related to Fish Resources for the HVDC Alternative Routes

Region	HVDC Alternative Route	Total Length of Route (miles)	Predominant Land Cover	Differences in Significant Water Body Crossings Between Alternatives and Proposed	Relative Comparison of Streamlengths within the Proposed and Alternative Routes
	5-B	71	Pasture/hay and deciduous forest	This alternative compares to the Applicant Proposed Route Links 3, 4, 5, and 6. Additional crossings: East Fork Cadron Creek, AR; Cypress Creek, AR (fisheries impaired for copper and zinc), and West Fork Point Remove Creek, AR (Turbidity impairment).	HVDC Alternative Route 5-B has the highest mileage of perennial streams and intermittent streams compared to the other Region 5 alternatives and the Applicant Proposed Route. The corresponding links of the Applicant Proposed Route have a lower value for perennial streams, intermittent streams, major waterbodies, and reservoirs, lakes, and ponds.
	5-C	9	Deciduous forest) and pasture/hay	This alternative compares to the Applicant Proposed Route Links 6 and 7. No additional crossings of water bodies of special interest.	HVDC Alternative Route 5-C has the lowest mileage of perennial streams and intermittent streams compared to the other Region 5 alternatives and the Applicant Proposed Route, but the highest mileage of major waterbodies. The corresponding links of the Applicant Proposed Route have a higher value for perennial streams and intermittent streams, but a lower value for major waterbodies and reservoirs, lakes, and ponds.
	5-D	22	Deciduous forest and croplands	This alternative compares to the Applicant Proposed Route Link 9. Additional crossings: Departee Creek, AR.	HVDC Alternative Route 5-D has the highest acreage of reservoirs, lakes, and ponds compared to the other Region 5 alternatives and the Applicant Proposed Route. The corresponding links of the Applicant Proposed Route have a lower value for perennial streams, intermittent streams, major waterbodies, and reservoirs, lakes, and ponds.
	5-E	36	Pasture/hay and deciduous forest	This alternative compares to the Applicant Proposed Route Links 4, 5, and 6. Additional crossing: East Fork Cadron Creek, AR.	HVDC Alternative Route 5-E has the lowest mileage of major waterbodies (along with 5-A) and the lowest acreage of reservoirs, ponds, and lakes compared to the other Region 5 alternatives and the Applicant Proposed Route. The corresponding links of the Applicant Proposed Route have a higher value for major waterbodies and reservoirs, lakes, and ponds, but a lower value for perennial streams and intermittent streams.
	5-F	22	Pasture/hay and deciduous forest	This alternative compares to the Applicant Proposed Route Links 5 and 6. Additional crossings: East Fork Cadron Creek, AR.	The corresponding links of the Applicant Proposed Route have a higher value for major waterbodies and reservoirs, lakes, and ponds, but a lower value for perennial streams and intermittent streams.
6	6-A	16	Croplands	This alternative compares to the Applicant Proposed Route Links 2, 3, and 4. No significant difference from the Applicant Proposed Route.	HVDC Alternative Route 6-A has the lowest acreage of reservoirs, lakes, and ponds compared to the other Region 6 alternatives and the Applicant Proposed Route. The corresponding links of the Applicant Proposed Route have a higher value for perennial streams, intermittent streams, major waterbodies, and reservoirs, lakes, and ponds.

Table 3.20.2-5:
Summary Information related to Fish Resources for the HVDC Alternative Routes

Region	HVDC Alternative Route	Total Length of Route (miles)	Predominant Land Cover	Differences in Significant Water Body Crossings Between Alternatives and Proposed	Relative Comparison of Streamlengths within the Proposed and Alternative Routes
	6-B	14	Croplands and woody wetlands	This alternative compares to the Applicant Proposed Route Link 3. No significant difference from the Applicant Proposed Route.	HVDC Alternative Route 6-B has the highest acreage of reservoirs, lakes, and ponds compared to the other Region 6 alternatives and the Applicant Proposed Route. The corresponding links of the Applicant Proposed Route have a higher value for perennial streams and major waterbodies, but a lower value for intermittent streams and reservoirs, lakes, and ponds.
	6-C	23	Croplands	This alternative compares to the Applicant Proposed Route Links 6 and 7. This alternative would not cross the L'Anguille River, AR, which is listed on the National Park Service Nationwide Rivers Inventory.	HVDC Alternative Route 6-C has the lowest mileage of perennial streams, intermittent streams, and major waterbodies compared to the other Region 6 alternatives and the Applicant Proposed Route. The corresponding links of the Applicant Proposed Route have a higher value for perennial streams, intermittent streams, and major waterbodies, but a lower value for reservoirs, lakes, and ponds.
	6-D	9	Croplands	This alternative compares to the Applicant Proposed Route Link 7. No significant difference between from the Applicant Proposed Route.	HVDC Alternative Route 6-D has the highest mileage of perennial streams and intermittent streams compared to the other Region 6 alternatives and the Applicant Proposed Route. The corresponding links of the Applicant Proposed Route have a higher value for major waterbodies, but a lower value for perennial streams and intermittent streams. Acreage of reservoirs, lakes, and ponds is equal for both the Applicant Proposed Route and HVDC Alternative Route 6-D.
7	7-A	43	Croplands and woody wetlands	This alternative compares to the Applicant Proposed Route Link 1. No significant difference from the Applicant Proposed Route.	HVDC Alternative Route 7-A has the highest values for all of these areas compared to the other Region 7 alternatives and the Applicant Proposed Route. The corresponding links of the Applicant Proposed Route have a lower value for perennial streams, intermittent streams, major waterbodies, and reservoirs, lakes, and ponds.
	7-B	9	Croplands, deciduous forest, and pasture/hay and shrub/scrub	This alternative compares to the Applicant Proposed Route Links 3 and 4. No significant difference from the Applicant Proposed Route.	HVDC Alternative Route 7-B has the lowest mileage of perennial streams and intermittent streams compared to the other Region 7 alternatives and the Applicant Proposed Route. The corresponding links of the Applicant Proposed Route have a higher value for perennial streams, intermittent streams, and reservoirs, lakes, and ponds. Mileage of major waterbodies is equal for both the Applicant Proposed Route and HVDC Alternative Route 7-B.

Table 3.20.2-5:
Summary Information related to Fish Resources for the HVDC Alternative Routes

Region	HVDC Alternative Route	Total Length of Route (miles)	Predominant Land Cover	Differences in Significant Water Body Crossings Between Alternatives and Proposed	Relative Comparison of Streamlengths within the Proposed and Alternative Routes
	7-C	24	Croplands, pasture/hay, and deciduous forest	This alternative compares to the Applicant Proposed Route Links 3, 4, and 5. No significant difference from the Applicant Proposed Route.	HVDC Alternative Route 7-C has the lowest acreage of reservoirs, lakes, and ponds compared to the other Region 7 alternatives and the Applicant Proposed Route. The corresponding links of the Applicant Proposed Route have a higher value for perennial streams, and reservoirs, lakes, and ponds, but a lower value for intermittent streams. Mileage of major waterbodies is equal for both the Applicant Proposed Route and HVDC Alternative Route 7-C.
	7-D		Croplands, pasture/hay, and shrub/scrub	This alternative compares to the Applicant Proposed Route Links and 5. No significant difference from the Applicant Proposed Route.	The corresponding links of the Applicant Proposed Route have a higher value for intermittent streams and reservoirs, lakes, and ponds, but a lower value for perennial streams. Mileage of major waterbodies is equal for both the Applicant Proposed Route and HVDC Alternative Route 7-D.

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3.20.2.7.4 Best Management Practices

The Applicant has developed a list of EPMs intended to avoid or minimize impacts to fish or aquatic invertebrate species. A complete list of EPMs for the Project is provided in Appendix F; those EPMs that would specifically minimize the potential for impacts to fish or aquatic invertebrates are summarized in Section 3.20.2.7.1. In addition to these EPMs, DOE has identified a BMP that would expand EPM FVW-2 to include the following:

- The Applicant will identify, control, and minimize the spread of non-native, invasive species and noxious weeds to the extent practicable, including ensuring that in-water equipment and vehicles are cleaned between waterbodies to minimize the chance of transferring non-native species between waterbodies.

This BMP would be warranted because without proper implementation of EPM FVM-2, the spread of non-native, invasive species (e.g., zebra mussels) could cause adverse impacts through competition with native species for limited resources. The spread of non-native plants could cause habitat alteration if native plants are outcompeted; many of which are necessary to native aquatic fish and aquatic invertebrates. If in-water equipment and vehicles are not cleaned between use if different waterbodies, and non-native species are transferred between waterbodies, native species could be outcompeted for resources or lose habitat critical to their survival, and potentially be eliminated from a waterbody.

3.20.2.7.5 Unavoidable Adverse Impacts

The Applicant would implement EPMs to avoid or minimize impacts; however, some adverse impacts would occur even with the implementation of the measures. Unavoidable impacts include the potential loss or alteration of aquatic habitat in smaller streams that may require culverts or vehicle crossings, potential loss or disturbance to riparian vegetation along streams on private or public lands where the ROW is adjacent to the stream, and potential short-term sedimentation effects on aquatic resources as a result of vehicular traffic causing disturbances within or adjacent to streams. Although these impacts have the potential to occur, the likelihood of occurrence would be limited through implementation of the EPMs.

3.20.2.7.6 Irreversible and Irretrievable Commitment of Resources

The potential long-term loss or alteration of aquatic habitat in smaller streams that may require road crossings would last throughout the life of the Project, or at least through the duration of use of the access roads; however, gradual recovery of habitat may occur once the road crossing was removed and the stream restored to original conditions. There is the potential that the loss or alternative of aquatic habitat could be permanent because the exact state of recovery is not known (e.g., substantial changes related to climate, land-use, and/or watershed hydrology may occur during the 80 year lifespan of the Project), and aquatic habitat is subject to long-term climatic regimes and changes in land-use and watershed hydrology. Therefore, it is reasonable to assume that some portions of the aquatic habitat for fish and aquatic invertebrate species in these smaller streams would be irreversibly and irretrievably impacted.

3.20.2.7.7 Relationship between Local Short-term Uses and Long-term Productivity

The Project would result in a short-term disturbance to aquatic resources; however, these impacts should not affect the long-term productivity of populations of fish and other aquatic species. The short-term impact of introducing non-native invasive species would be negligible; however, over time, long-term productivity would be affected and species could be eliminated from their native habitat.

3.20.2.7.8 Impacts from Connected Actions

3.20.2.7.8.1 Wind Energy Generation

A wind farm has multiple possible components: wind turbine generators, underground collection cables, substations, generation tie lines, operations and maintenance buildings, meteorological towers, new permanent access roads, and temporary workspaces. The new access roads potentially cross streams, drainages, or waterways. Wind farm construction could require stormwater controls such as ditches, which could alter natural drainage patterns (Clean Line 2014). New culverts may be installed across small streams or natural drainages (Clean Line 2014). Construction of the access roads may also require the removal of vegetative cover, which could impact aquatic species and their habitats. The WDZs contains multiple perennial waterbodies in Oklahoma and Texas. Important recreational fish species and aquatic invertebrates potentially occur within the WDZs.

Impacts to aquatic resources could occur from construction activities including vegetation clearing, grading, construction and use of access roads, herbicide use, and fuel and lubricant handling. Potential impacts can be classified into three categories: mortality/injury, sensory disturbance, and habitat loss/modification. Impacts would be similar to general impacts from construction described above in Section 3.20.2.7.2.

3.20.2.7.8.2 Optima Substation

As there are no waterbodies within the location for the future Optima Substation, there would be no impacts to fish and aquatic invertebrate species.

3.20.2.7.8.3 TVA Upgrades

A precise ROI has not been identified for the TVA upgrades. Because a precise ROI has not been identified, the spatial and temporal (i.e., seasonal presence) distribution of fish and aquatic invertebrate species associated with the TVA upgrades has not been identified. Although the spatial and temporal distribution of fish and aquatic invertebrate species associated with the TVA upgrades has not been identified, where possible, general impacts associated with the required TVA upgrades are discussed as described below.

The construction, operation, and maintenance of the new 500kV transmission line, would have impacts similar to the Project, although on a smaller scale. These impacts may include mechanical damage and/or removal of vegetation by heavy machinery, introduction of invasive species from construction equipment or spread of existing invasive species, alteration of hydrology during road construction, which could affect fish and aquatic invertebrate species habitat, sedimentation from grading, access roads, and stream crossings, and contamination from herbicide drift or runoff or from accidental spills of fuels or lubricants that could cause mortality or injury of fish and aquatic invertebrate species.

The required TVA upgrades to existing facilities (including existing transmission lines and existing substations) would require fewer construction activities to complete than the new 500kV transmission line. Existing TVA facilities already experience operations and maintenance activities. As a result, potential impacts would be expected to be less substantial in areas affected by upgrades to existing TVA facilities than in areas where the new 500kV transmission line would be constructed.

Impacts of concern to fish and aquatic invertebrate species from the required TVA upgrades could include mortality of individuals, sensory disturbance, and aquatic habitat disturbance or modification by construction or operations and maintenance activities associated with the new transmission line. Because the locations of the required upgrades or new 500kV transmission line are unknown at this time, the spatial and temporal distribution of potentially affected fish and aquatic invertebrate species is also unknown.

TVA would consider potential impacts to fish and aquatic invertebrate species and their habitats during the siting of the new 500kV transmission line and while planning the upgrades to existing facilities.

3.20.2.7.9 Impacts Associated with the No Action Alternative

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not be constructed. Impacts to fish and aquatic invertebrate species and their habitats would be consistent with current levels of disturbance related to natural conditions in the environment, such as annual changes in stream flow, erosion, and wildfires. No disturbances would occur due to the Project, including disturbances in waterbodies that could affect fish and aquatic invertebrate species and their habitats. No disturbances related to construction vehicles, equipment, or access roads would affect aquatic resources. No impacts related to the Project would occur related to the removal of vegetation or the use of herbicides.

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4. Cumulative Impacts

Cumulative impacts result from the "incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions"; they can result from "individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7). This chapter describes the identification of past, present, and reasonably foreseeable future actions and provides an evaluation of potential cumulative impacts. Because of the nature of the past, present, and reasonably foreseeable future actions identified, available quantitative data on their potential environmental impacts are limited and, as a result, primarily qualitative evaluations of potential cumulative impacts are presented in this chapter.

Section 4.1 provides broad criteria for identifying actions that could cause cumulative impacts when combined with those of the Project. Section 4.2 presents specific criteria used to identify projects of potential interest, which are then presented by the regions used to define and evaluate the Project in Chapter 3. Section 4.3 presents cumulative impacts, and an overview of the methodology for evaluating cumulative impacts is presented in Section 4.3.1. Sections 4.3.2 through 4.3.20 provide the cumulative impacts for each of the environmental resource areas evaluated in Chapter 3. Numbering of the resource area evaluations (Sections 4.3.2 through 4.3.20) corresponds with numbering of resource area evaluations in Chapter 3 (Sections 3.2 through 3.20) for ease of reference.

4.1 Physical and Temporal Boundaries of Cumulative Impacts

The potential for cumulative impacts depends on both spatial and temporal factors within the environment, which can vary among resource areas. For example, the geographical ROI for cumulative impacts could be limited to the area of disturbance for soil resources but include all vantage points for visual resources. The geographic ROI for cumulative impacts includes the locations in which direct and indirect impacts of the Project would occur on all resource areas; i.e., the locations of the ROIs described for each resource area in Chapter 3. The topic of cumulative impact ROIs and how they might compare with the Project ROIs is addressed further in Section 4.3.1.2. Because the Project ROIs vary by resource area and because the ROI for cumulative impacts can be more extensive than for the just the Project, a conservatively large geographic area was evaluated using professional judgment when attempting to identify the past, present, and reasonably foreseeable future actions for the cumulative impacts evaluation.

The temporal boundaries of cumulative impacts are generally defined by those of the Project's construction period and operation period (i.e., about 36 to 42 months for construction and an expected 80 years, or more, for operations and maintenance), which could begin as early as 2016. Past, present, and reasonably foreseeable future actions with elements coinciding or overlapping with that timeframe, as well as satisfying spatial criteria, would frame the actions with potential to have cumulative impacts with the Project. For most resource areas, the potential impacts evaluated in Chapter 3 are dominated by those that might occur during the Project's construction. If past, present, and reasonably foreseeable future actions are of a similar nature, with impacts occurring primarily during construction, then the temporal boundaries of primary interest for an applicable resource area generally would be when construction periods coincide or overlap. This approach requires flexibility because reasonably foreseeable future actions are often not associated with firm schedules. Even in the case of the Project, starting construction as early as 2016 is only an estimate. As a result, evaluations in this chapter make the reasonably conservative assumption that other actions could possibly coincide or overlap with those of the Project unless there is information to the contrary.

4.1.1 Overview of Project and Connected Actions

As described in Chapter 2, the Applicant Proposed Project would include an overhead ±600kV HVDC electric transmission system and associated facilities. This transmission system would have the capacity to deliver approximately 3,500–4,000 MW, primarily from renewable energy generation facilities in the Oklahoma and Texas Panhandle regions, to load-serving entities in the Mid-South and southeastern United States. This would require an interconnection with TVA in Tennessee and potentially include an interconnection with the Midcontinent Independent System Operator in Arkansas.

If the decision is made to construct the Applicant Proposed Project and DOE elects to continue its participation, DOE Alternatives include an Arkansas converter station and alternative route segments for the HVDC transmission line. This chapter uses “the Project” to refer to elements of the Applicant Proposed Project and/or DOE Alternatives when differentiation between the two is not necessary and recognizing that what would be built could be a combination of project elements.

Connected actions to the Applicant Proposed Project have been identified, as described in Section 2.5, and potential impacts related to these actions are addressed by each resource area in Chapter 3. One of these connected actions includes the construction and operation of reasonably foreseeable future wind energy generation facilities that would interconnect with the Applicant Proposed Project. These wind power facilities are anticipated to be located in parts of the Oklahoma Panhandle and Texas Panhandle within approximately 40 miles of the western converter station in Texas County, Oklahoma. Clean Line anticipates that electricity generated by these facilities would constitute the majority of the transmission capacity of the transmission line. Neither Clean Line nor DOE knows the exact location of wind projects that would be connected to the Project. Further, it is foreseeable that wind power would also be developed in areas not currently under analysis in this EIS. As a result, in an attempt to provide meaningful impacts analysis of wind energy generation that would connect to the Project, Chapter 3 includes a high-level analysis of impacts from wind energy generation within an area of approximately 40 mile radius surrounding the Oklahoma Converter Station Siting Area. Within this radius, wind development would be expected to occur in Oklahoma (Beaver, Cimarron, and Texas counties) and Texas (Hansford, Ochiltree, and Sherman counties).

In addition to the wind energy generation facilities, other connected actions involve facility additions and upgrades to third-party systems that would be required to accommodate the Project. As discussed in Section 2.5.2, the EIS identifies that TVA would need to make substation or transmission line upgrades to accommodate interconnection of the Project to the transmission system in Tennessee. The eastern portion of the Project would interconnect to the existing substation operated by TVA in Shelby County, Tennessee. TVA would make the necessary upgrades to its system, which would include construction of approximately 37 miles of new 500kV transmission line in western Tennessee and upgrades to approximately 350 miles of existing transmission lines, mostly in central and western Tennessee, along with modifications to several substations. These upgrades are evaluated as connected actions in this EIS and the results are also presented in Chapter 3. In addition, a future substation, tentatively named Optima, would be needed at the western end of the HVDC transmission line and would be located within a few miles of the Oklahoma converter station and partially within the Oklahoma AC Interconnection Siting Area. Construction and operation of the future Optima substation is also evaluated as a connected action in this EIS with the results presented in Chapter 3.

4.1.1.1 Region of Influence

The ROI for cumulative impacts is generally defined by the same overall ROI as described in Section 3.1 for the Project. Since the intent of defining an ROI is to bound the geographic area that potentially could be impacted, any impacts of the Project outside of a resource-specific ROI would be expected to be minimal, with negligible cumulative impacts with other actions. There are exceptions or instances where an ROI considered for cumulative impacts could be larger than that for the Project, but the ROIs described in Section 3.1 for both the Applicant Proposed Project and the DOE Alternatives provide a baseline starting point.

Several of the resource sections of Chapter 3 include modifications to the ROI described in Section 3.1. The following statements describe instances where the resource-specific ROI varies from the description of the ROI in section 3.1. If the ROI for a resource is not included below, its ROI is the same as described in Section 3.1.

Air Quality and Climate Change. As identified in Section 3.3.3, the ROI for air quality impacts is conservatively estimated at approximately 300–500 feet from the principal construction activities that would be occurring within the baseline ROIs (Applicant Proposed Project or DOE Alternatives) identified in Section 3.1. This includes areas and populations sensitive to air emissions such as residential areas and higher populations of children or elderly. It is also noted that cumulative impacts of air pollutants can extend over a much wider area than the ROI mentioned in Section 3.1. For example, air pollutants can travel relatively large distances, and when the quantities are relatively large, measurable impacts can be identified several states away or even intercontinentally. However, for emissions on the scale of the Project and the previously identified present and reasonably foreseeable future actions, the evaluation of cumulative impacts for air quality planning is typically evaluated on the scale of air quality control regions (AQCRs), which are on the scale of one or more counties, or portions of counties. For GHGs, as noted in Section 3.3.3.1, the impacts are on a global scale.

Electrical Environment. As presented in Section 3.4.8, the electrical environment ROI considered in this document is a total of 300 feet on either side of centerline for the HVDC transmission lines (Applicant Proposed Route and HVDC alternative routes) and AC collection system routes. As described in Section 3.4.8, electrical effects associated with AC converter stations can be reduced or eliminated by the use of various equipment and construction methods, so they were not evaluated separately from the overhead transmission lines that enter and exit the stations.

Environmental Justice. As described in Section 3.5.3, the ROI for identifying low-income and minority populations consists of the Census Blocks or Census Block Groups within or intersected by the baseline ROIs (Applicant Proposed Project or DOE Alternatives) identified in Section 3.1.

Geology, Paleontology, Minerals, and Soils. For the evaluation of geology, paleontology, and minerals, Section 3.6.1.3 adds area to the baseline ROI identified in Section 3.1. Specifically, an additional 1,500-foot buffer was added to both sides of the 1,000-foot-wide Applicant Proposed Route or HVDC alternative routes creating a 4,000-foot-wide corridor for identifying oil and gas wells and mines and a 1,500-foot buffer was added on the Oklahoma, Tennessee, and Arkansas Converter Station Siting Areas for potential expansion of oil, gas, and mineral extraction operations. The baseline ROI elements in Section 3.1 were used for the evaluation of soils.

Groundwater. For the purpose of identifying water wells, area was added to the baseline ROIs as described in Section 3.7.3.1 to account for possible effects of blasting should it be required during construction. Specifically, the groundwater ROI includes expanding the outer bounds of the Oklahoma, Tennessee, and Arkansas converter station siting areas by 150 feet on all sides, and expanding the 1,000-foot-wide corridors of the Applicant Proposed Route and the HVDC alternative routes by 150 feet on both sides to create 1,300-foot-wide corridors.

Historic and Cultural Resources. The ROI for the evaluation of historic and cultural resources contains the same baseline elements described in Section 3.1, but for evaluating potential visual effects to historic and cultural resources, Section 3.9.3 expands the HVDC and AC transmission line routes to a 1-mile-wide corridor (i.e., a 0.5-mile zone on either side of the proposed centerline) and for converter station locations extends the ROI outward 0.5 mile from the site.

Socioeconomics. The ROI for socioeconomics, as presented in Section 3.13.3, encompasses 33 counties in the four states where the Project components (AC converter stations, HVDC transmission lines, and the AC collection system) would be located. Twenty-nine of the 33 counties are crossed by the HVDC transmission line routes; the other four counties are only crossed by one or more of the AC collection system routes. In some cases, particularly where larger communities are located in adjacent or nearby counties, impacts would also likely occur outside the 33 counties due to the availability of services, housing, and workers. To address such instances, an additional or secondary ROI is considered in the socioeconomic impact analysis that includes portions of counties where no components of the Project would be located. This additional area consists of six MSAs that are either partially included in or adjacent to the primary ROI. The potentially affected MSAs are (1) Oklahoma City MSA for Region 3, (2) Tulsa MSA for Region 3, (3) Fort Smith MSA for Region 4, (4) Little Rock-North Little Rock-Conway MSA for Region 5, (5) Jonesboro MSA for Region 6, and (6) Memphis MSA for Region 7.

Special Status Wildlife and Fish Species. For special status wildlife species, Section 3.14.1.3 adds the following to the baseline ROI elements described in Section 3.1:

- Lesser prairie-chicken—A 1.25-mile-wide addition from each edge of the 1,000-foot-wide corridor of the Applicant Proposed Route, HVDC alternative routes, and AC collection system when they coincide with the estimated occupied range of the LEPC or known occurrences of LEPC leks.
- Whooping crane—A 15-mile-wide buffer addition from each edge of the 1,000-foot-wide corridor of the Applicant Proposed Route and the HVDC alternative routes when they are within the mapped whooping crane 95 percent migration corridor.
- Protected bat species—A 2-mile-wide addition from each edge of the 1,000-foot-wide corridor of the Applicant Proposed Route and the HVDC alternative routes in proximity of known occurrences of bat species designated as candidate, threatened, or endangered under the ESA.
- Interior least tern—A 5-mile-wide addition from each edge of the 1,000-foot-wide corridor of the Applicant Proposed Route and the HVDC alternative routes in proximity of known occurrences of interior least tern nesting sites.
- Bald and golden eagles—A 1-mile-wide addition from each edge of the 1,000-foot-wide corridor of the Applicant Proposed Route and the HVDC alternative routes in proximity of known bald eagle nests or roosting areas and potential golden eagle roosting areas.

For special status fish, aquatic invertebrate, and amphibian species, Section 3.14.2.3 adds the following to the baseline ROI elements described in Section 3.1:

- A 3-mile buffer (1.5 miles upstream and 1.5 miles downstream) is added to the 1,000-foot-wide ROI of the Applicant Proposed Route and HVDC alternative routes along waterbodies that have known occurrences of candidate, threatened, or endangered species under the ESA

Transportation. The description of the transportation ROI (Section 3.16.3.1) incorporates the baseline ROI elements described in Section 3.1, then makes modifications as follows:

- Roadway transportation resources—A 6-mile buffer is added to each side of the centerlines of the Applicant Proposed Route, HVDC alternative routes, and the AC collection system routes.
- Railroads—Identified based on the potential encroachment within the above expanded ROI.
- Airports and airstrips—Identified based on a 4-mile-wide corridor from the HVDC transmission line and AC collection system route centerlines.

Visual Resources. As described in Section 3.18.3, the ROI for visual resources includes the baseline ROI elements described in Section 3.1, but expands the corridors associated with the transmission line routes (i.e., the Applicant Proposed Route, AC collection system routes, and HVDC alternative routes) to 6 miles, 3 miles on either side of the referenced centerline. The ROI for visual resources also includes a 3 mile buffer from the boundary of the converter stations and interconnection siting areas.

The preceding discussion is focused on the ROIs considered in the Project's affected environment and impacts discussions of Sections 3.2 through 3.20, but cumulative impacts may encompass greater areas in some instances, based on professional judgment.

4.2 Past, Present, and Reasonably Foreseeable Future Actions

Past actions are those actions that occurred within the geographic ROI of cumulative impacts and have shaped the current environmental conditions in the Project regions. For the purposes of this EIS, actions that have occurred in the past and their impacts are now part of the existing environment and are included in the affected environment described in Chapter 3. As such, they are included in the cumulative impact analysis. Past actions are identified in this chapter only if it appears they may have occurred after the timeframe captured in the Chapter 3 description of the affected environment.

The following sections summarize the present and reasonably foreseeable future actions that have been identified to possibly contribute to cumulative impacts. Present actions include those that are currently under construction and impact any of the same resources as the Project and that would occur in the same space and time as identified by the Project alternatives. To avoid speculating about other future actions, reasonably foreseeable future actions for this evaluation are those that are actively proposed or planned and would occur in the same space and time as identified by the Project. Actions of possible interest were first identified by looking at a broad range of actions that are occurring or might reasonably occur in the same general area as components of the Project. Counties where components of the Project would be located, as well as adjacent counties, were often used to define the general area of review. Sources used to identify possible actions included the following:

- An action was identified during the public outreach or scoping process for this EIS or during preliminary public outreach efforts by the Applicant. Other projects in a position to attract public attention or publicity (i.e., high-profile) in the local region, such as relatively large bridge, highway, or oil and gas pipeline projects, also were considered.

- An action was identified by federal or state agencies or by county planning offices during the EIS scoping process.
- A permit application for an action has been submitted to an appropriate permitting agency such as a state or local air quality agency.
- State, federal, county, or local agencies or commercial entities have publically announced an action is moving forward into more detailed planning or design (this could include the preparation of environmental review documentation).

Considering the list of actions obtained from the above sources, DOE then screened the actions based on when they could possibly occur and whether they would be located where they could impact any of the same resources as the Project. The present and reasonably foreseeable future actions identified by region in the sections below were those that passed this screening. Actions identified through public outreach or scoping or based on their high-profile nature (the first bullet above) may be addressed even if they are outside the Project ROI. Many of the actions identified in this section consist of state-planned road work. For purposes of this evaluation, it is assumed that, unless identified otherwise, the state road projects in Oklahoma, Arkansas, and Tennessee, are maintenance or rehabilitation activities performed on existing roads and structures within existing ROWs and, accordingly, do not involve areas of new land use. The information available for these projects is often limited, consisting of little more than maps of planned work areas. However, the assumption is based on what would be expected from most road projects (more maintenance than new construction), titles of projects where available (e.g., pavement rehabilitation or widen and resurface), and maps showing work locations coinciding with existing roadways. Also, reviewed maps consistently have a unique designation for locations of new road construction.

The present and reasonably foreseeable future actions are identified and described by Project region (i.e., Regions 1 through 7). The locations of these actions are provided in Figure 4.2-1 (located in Appendix A). Section 4.3 provides the cumulative impacts information for each of the environmental resource areas evaluated in Chapter 3. Cumulative impacts analysis must be conducted within the context of the resource areas. “The magnitude and extent of the effect on a resource depends on whether the cumulative effects exceed the capacity of the resource to sustain itself and remain productive” (CEQ 1997). For each resource area, the section provides a summary of the cumulative impacts that could occur from the Project and present and reasonably foreseeable future actions. The individual resource area discussions include identification of the Project region where cumulative impacts would be greatest for that resource.

Tables 4.2-1a and 4.2-1b provide a summary listing of the present and reasonably foreseeable future actions described in more detail below and the resource areas for which cumulative impacts might be expected. The actions are identified by region. Table 4.2-1a presents the first 10 resource areas and Table 4.2-1b presents the remaining nine. In the instances where a resource area does not contain a check (is blank) for a specific action, no cumulative impact is expected to occur.

4.2.1 Region 1—Present and Reasonably Foreseeable Future Actions

Region 1 is referred to as the Oklahoma Panhandle Region and includes the Applicant Proposed Route and HVDC Alternative Routes 1-A through 1-D, as well as the Oklahoma converter station and its associated AC interconnection. The AC collection system routes are also at the western end of Region 1. The region includes

Texas, Beaver, Harper, and Woodward counties in Oklahoma; and Hansford, Ochiltree, and Sherman counties in Texas. The area is primarily rural; small towns are scattered throughout the region. The wind energy generation projects that would be connected to the Project via the AC collection system routes are analyzed as connected actions in each of the resource area discussions in Chapter 3 and, as a result, are not identified here as present and reasonably foreseeable future actions.

Oklahoma Gas and Electric—OG&E has two actions in Region 1 that could have cumulative impacts with the Project, and which are summarized as follows:

- *Hitchland-Woodward 345kV Transmission Line.* OG&E recently constructed about 100 miles of new 345kV transmission line from its Woodward District Extra High Voltage Substation, located south of Woodward, Oklahoma, north and west through the Oklahoma Panhandle to a Southwestern Public Service interconnection point at the Beaver-Texas County line. The 200-foot-wide ROW corridor has steel monopole structures with a typical height of up to 170 feet and 1,200-foot spans between structures (OG&E 2014a). The transmission line, put into service on May 1, 2014 (Xcel Energy 2014), runs the same path as the Applicant Proposed Route through Beaver County, then at a point about 2 miles east of the Beaver-Harper County line, veers to the southeast, away from the Applicant Proposed Route and toward the Woodward Substation. The impacts associated with the Hitchland-Woodward 345kV transmission line would be similar in nature to those impacts from the Project, but on a smaller scale, being restricted to a much shorter length of transmission line.
- *Beaver County Substation.* The OG&E Beaver County Substation is the western connecting point for the Hitchland-Woodward transmission line described above and was put into service on May 1, 2014, along with the transmission line (Xcel 2014). It is at the western edge of Beaver County and, like the transmission line in this area, is located within the ROI for the Applicant Proposed Route. The substation was proposed as a new 345kV terminal for interconnecting with a non-specific wind generating facility within OG&E's service territory (SPP 2013). The route for an interconnecting wind farm has not been proposed, but impacts of wind farm construction would be consistent with those already addressed in this document (Chapter 3) as a connected action.

Because the above transmission line and substation were completed prior to the initiation of the Project, the construction activities would not contribute to cumulative impacts, and any impacts have been captured in all areas of Chapter 3's characterization of the affected environment. In this evaluation of cumulative impacts, construction of these projects is considered to be a precursor to the Project, but their continued presence, operation, and maintenance are considered.

Oklahoma Department of Transportation—OKDOT is planning or has implemented several actions within the vicinity of Region 1 and the AC collection system. OKDOT actions that could have cumulative impacts with the Project are summarized as follows:

- *Hackberry Creek Bridge.* A new replacement bridge is proposed to be constructed over Hackberry Creek in Texas County, Oklahoma. The total length of the project is 0.25 miles, including the bridge and approaches. The OKDOT put out a bid request in September 2013. The proposed work involves concrete work, paving, saw cut, and excavation (Oklahoma Bid Network 2013). The activity is located on county road NS-107, 3.2 miles south of State Highway 3 and about 2.8 miles north of Link 2 of the Applicant Proposed Route. The location also lies between HVDC Alternative Routes 1-A/1-C, about 2.7 miles to the north, and HVDC Alternative Route 1-B, about 0.6 mile to the south.

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Table 4.2-1a:
Summary of Present and Reasonably Foreseeable Future Actions and the Resource Areas of Potential Cumulative Impacts by Region

Present and Reasonably Foreseeable Future Action (Map ID Numbers, as Applicable)[1]	Resource Areas with Potential Cumulative Impacts (✓)									
	Agricultural Resources	Air Quality and Climate Change	Electrical Environ-ment	Environ-mental Justice	Geology, Paleontology, Soils, and Minerals	Ground-water	Health, Safety, and Intentional Destructive Acts	Historical and Cultural Resources	Land Use	Noise
Region 1										
(1-1) OG&E Hitchland-Woodward 345kV Transmission Line	✓	✓	✓	✓[2]	✓	✓	✓	✓	✓	✓
(1-2) OG&E Beaver County Substation	✓	✓		✓[2]	✓	✓	✓	✓	✓	✓
(1-3) ODOT Hackberry Creek Bridge		✓		✓[2]		✓	✓			✓
ODOT Construction Work Plan – (1-4-1) State Highway 136 – (1-4-2) U.S. Highway 54/64 – (1-4-3) State. Highway 3 – (1-4-4) State Highway 23 – (1-4-5) State Highway 149 – (1-4-6) U.S. Highway 183		✓		✓[2]		✓	✓			✓
Region 2										
(2-1) OG&E Woodward-Thistle 345kV Transmission Line	✓	✓	✓	✓[2]	✓	✓	✓	✓	✓	✓
(2-2) Glass Mountain Crude Oil Pipeline	✓	✓		✓[2]	✓	✓	✓	✓	✓	✓
ODOT Construction Work Plan – (2-3-1) State Highway 50B – (2-3-2) U.S. Highway 60		✓		✓[2]		✓	✓			✓
(2-4) Mammoth Plains Wind Farm Project	✓	✓		✓[2]	✓	✓	✓	✓	✓	
Region 3										
ODOT Construction Work Plan – (3-1-1) State Highway 51 (Kingfisher and Logan counties) – (3-1-2) State Highway 51 (Western Payne County) – (3-1-3) State. Highway 33		✓		✓[2]		✓	✓			✓

Table 4.2-1a:
Summary of Present and Reasonably Foreseeable Future Actions and the Resource Areas of Potential Cumulative Impacts by Region

Present and Reasonably Foreseeable Future Action (Map ID Numbers, as Applicable)[1]	Resource Areas with Potential Cumulative Impacts (✓)									
	Agricultural Resources	Air Quality and Climate Change	Electrical Environ-ment	Environ-mental Justice	Geology, Paleontology, Soils, and Minerals	Ground-water	Health, Safety, and Intentional Destructive Acts	Historical and Cultural Resources	Land Use	Noise
– (3-1-4) State Highway 99 – (3-1-5) State Highway 66 – (3-1-6) State Highway 16 – (3-1-7) U.S. Highway 75A – (3-1-8) U.S. Highway 75 – (3-1-9) U.S. Highway 62 – (3-1-10) U.S. Highway 69										
(2-2) Glass Mountain Crude Oil Pipeline	✓	✓		✓[2]	✓	✓	✓	✓	✓	✓
(3-2) USACE Bridge Replacement		✓		✓[2]		✓	✓			
(3-3) R.L. Jones Jr. Airport (Jones Riverside Airport)		✓		✓[2]		✓	✓			
(3-4) OG&E Seminole to Muskogee Transmission Line	✓		✓	✓[2]			✓		✓	✓
Region 4										
ODOT Construction Work Plan – (4-1-1) State Highway 10A – (4-1-2) Interstate 40 (near Junction with State Highway 82) – (4-1-3) Interstate 40 (south side of Sallisaw, OK) – (4-1-4) U.S. Highway 64 – (4-1-5) U.S. Highway 59 – (4-1-6) State Highway 101		✓		✓[2]		✓	✓			✓
(4-2) Cherokee Nation Hydroelectric Power Plant	✓	✓		✓[2]	✓	✓	✓	✓	✓	
AHTD Status Map, District 4, Crawford County – (4-3-1) State Highway 59 bridge – (4-3-1) Interstate 40		✓		✓[2]		✓	✓			✓

Table 4.2-1a:
Summary of Present and Reasonably Foreseeable Future Actions and the Resource Areas of Potential Cumulative Impacts by Region

Present and Reasonably Foreseeable Future Action (Map ID Numbers, as Applicable)[1]	Resource Areas with Potential Cumulative Impacts (✓)									
	Agricultural Resources	Air Quality and Climate Change	Electrical Environ-ment	Environ-mental Justice	Geology, Paleontology, Soils, and Minerals	Ground-water	Health, Safety, and Intentional Destructive Acts	Historical and Cultural Resources	Land Use	Noise
– (4-3-1) Interstate 540 – (4-3-1) U.S. Highway 71 (deferred work)										
AHTD Status Map, District 4, Crawford County – (4-3-1) U.S. Highway 71 (new construction)	✓	✓		✓[2]	✓	✓	✓	✓	✓	✓
AHTD Status Map, District 8, Johnson County – (4-3-2) Interstate 40		✓		✓[2]		✓	✓			✓
Region 5										
AHTD Pope County – (5-1-1) State Highway 7 (Dover, AR bypass)	✓	✓		✓[2]	✓	✓	✓	✓	✓	✓
AHTD Status Map, District 8, Conway County – (5-1-2) State Highway 247 – (5-1-2) State Highway 92		✓		✓[2]		✓	✓			✓
AHTD Status Map, District 8, Van Buren County – (5-1-3) U.S. Highway 85		✓		✓[2]		✓	✓			✓
AHTD Status Map, District 8, Faulkner County – (5-1-4) State Highway 285		✓		✓[2]		✓	✓			✓
AHTD Status Map, District 5, Jackson County – (5-1-7) U.S. Highway 167		✓		✓[2]		✓	✓			✓
(5-2) CEGT Central Arkansas Natural Gas Pipeline Enhancement Project	✓	✓		✓[2]	✓	✓	✓	✓	✓	
Region 6										
AHTD Status Map, District 5, Jackson County – (6-1-1 through 6-1-4) State Highway 14 bridge work (4 bridges)		✓		✓[2]		✓	✓			✓

Table 4.2-1a:
Summary of Present and Reasonably Foreseeable Future Actions and the Resource Areas of Potential Cumulative Impacts by Region

Present and Reasonably Foreseeable Future Action (Map ID Numbers, as Applicable)[1]	Resource Areas with Potential Cumulative Impacts (✓)									
	Agricultural Resources	Air Quality and Climate Change	Electrical Environ-ment	Environ-mental Justice	Geology, Paleontology, Soils, and Minerals	Ground-water	Health, Safety, and Intentional Destructive Acts	Historical and Cultural Resources	Land Use	Noise
AHTD Status Map, District 1, Cross County – (6-4-1 through 6-4-4)State Highway 42 bridge work (4 bridges)		✓		✓[2]		✓	✓			✓
(6-5) Rebuild 161kV Transmission Line from Trumann to Trumann West, AR (Entergy Arkansas, Inc.)	✓	✓		✓[2]	✓	✓	✓	✓	✓	
(6-6) Highway 63, Poinsett Co., AR (includes new construction in new ROW)	✓	✓		✓[2]	✓	✓	✓	✓	✓	✓
Region 7										
AHTD Status Map, District 10, Poinsett County – (7-1-1) U.S. Highway 63 (at Marked Tree, AR)		✓		✓[2]		✓	✓			✓
AHTD Status Map, District 10, Mississippi County – (7-1-2) Interstate 55		✓		✓[2]		✓	✓			✓
(7-2) Great River Super Site, Osceola, AR (industrial park)	✓	✓		✓[2]	✓	✓	✓	✓	✓	✓
(7-3) Interstate 69 Extension, TN	✓	✓		✓[2]	✓	✓	✓	✓	✓	✓
(7-4) Green Meadows Development at Munford, TN (planned community)	✓	✓		✓[2]	✓	✓	✓	✓	✓	✓
(7-5) Southern Gateway Project, TN	✓	✓		✓[2]	✓	✓	✓	✓	✓	✓

1 Map ID numbers provided with project titles can be found on Figure 4.2-1 (located in Appendix A).

2 There could be cumulative impacts to low-income and minority populations, but none would be expected to rise to the "disproportionally high and adverse" level as described in Section 3.5.

Table 4.2-1b:
Summary of Present and Reasonably Foreseeable Future Actions and the Resource Areas of Potential Cumulative Impacts by Region

Present and Reasonably Foreseeable Future Action (Map ID Numbers, as Applicable)[1]	Resource Areas with Potential Cumulative Impacts (✓)								
	Recreation	Socio-economics	Special Status Wildlife and Fish Species	Surface Water	Trans-portation	Vegetation Communities	Visual Resources	Wetlands, Floodplains, and Riparian Areas	Wildlife and Fish
Region 1									
(1-1) OG&E Hitchland-Woodward 345kV Transmission Line		✓	✓	✓		✓	✓	✓	✓
(1-2) OG&E Beaver County Substation			✓	✓		✓	✓	✓	✓
(1-3) ODOT Hackberry Creek Bridge	✓	✓		✓			✓		
ODOT Construction Work Plan – (1-4-1) State Highway 136 – (1-4-2) U.S. Highway 54/64 – (1-4-3) State. Highway 3 – (1-4-4) State Highway 23 – (1-4-5) State Highway 149 – (1-4-6) U.S. Highway 183	✓	✓	✓	✓			✓		✓
Region 2									
(2-1) OG&E Woodward-Thistle 345kV Transmission Line	✓	✓	✓	✓		✓	✓	✓	✓
(2-2) Glass Mountain Crude Oil Pipeline	✓	✓	✓	✓		✓	✓	✓	✓
ODOT Construction Work Plan – (2-3-1) State Highway 50B – (2-3-2) U.S. Highway 60			✓	✓			✓		✓
(2-4) Mammoth Plains Wind Farm Project		✓	✓	✓		✓		✓	✓
Region 3									
ODOT Construction Work Plan – (3-1-1) State Highway 51 (Kingfisher and Logan counties) – (3-1-2) State Highway 51 (Western Payne County) – (3-1-3) State. Highway 33	✓		✓	✓			✓		✓

Table 4.2-1b:
Summary of Present and Reasonably Foreseeable Future Actions and the Resource Areas of Potential Cumulative Impacts by Region

Present and Reasonably Foreseeable Future Action (Map ID Numbers, as Applicable)[1]	Resource Areas with Potential Cumulative Impacts (✓)								
	Recreation	Socio-economics	Special Status Wildlife and Fish Species	Surface Water	Trans-portation	Vegetation Communities	Visual Resources	Wetlands, Floodplains, and Riparian Areas	Wildlife and Fish
– (3-1-4) State Highway 99 – (3-1-5) State Highway 66 – (3-1-6) State Highway 16 – (3-1-7) U.S. Highway 75A – (3-1-8) U.S. Highway 75 – (3-1-9) U.S. Highway 62 – (3-1-10) U.S. Highway 69									
(2-2) Glass Mountain Crude Oil Pipeline	✓	✓	✓	✓		✓	✓	✓	✓
(3-2) USACE Bridge Replacement				✓					
(3-3) R.L. Jones Jr. Airport (Jones Riverside Airport)				✓					
(3-4) OG&E Seminole to Muskogee Transmission Line		✓	✓	✓		✓	✓	✓	✓
Region 4									
ODOT Construction Work Plan – (4-1-1) State Highway 10A – (4-1-2) Interstate 40 (near Junction with State Highway 82) – (4-1-3) Interstate 40 (south side of Sallisaw, OK) – (4-1-4) U.S. Highway 64 – (4-1-5) U.S. Highway 59 – (4-1-6) State Highway 101	✓			✓	✓		✓		
(4-2) Cherokee Nation Hydroelectric Power Plant									
AHTD Status Map, District 4, Crawford County – (4-3-1) State Highway 59 bridge – (4-3-1) Interstate 40 – (4-3-1) Interstate 540 – (4-3-1) U.S. Highway 71 (deferred work)	✓			✓	✓		✓		

Table 4.2-1b:
Summary of Present and Reasonably Foreseeable Future Actions and the Resource Areas of Potential Cumulative Impacts by Region

Present and Reasonably Foreseeable Future Action (Map ID Numbers, as Applicable)[1]	Resource Areas with Potential Cumulative Impacts (✓)								
	Recreation	Socio-economics	Special Status Wildlife and Fish Species	Surface Water	Trans-portation	Vegetation Communities	Visual Resources	Wetlands, Floodplains, and Riparian Areas	Wildlife and Fish
AHTD Status Map, District 4, Crawford County – (4-3-1) U.S. Highway 71 (new construction)	✓	✓	✓	✓	✓	✓	✓	✓	✓
AHTD Status Map, District 8, Johnson County – (4-3-2) Interstate 40				✓	✓		✓		
Region 5									
AHTD Pope County – (5-1-1) State Highway 7 (Dover, AR bypass)	✓	✓	✓	✓	✓		✓	✓	✓
AHTD Status Map, District 8, Conway County – (5-1-2) State Highway 247 – (5-1-2) State Highway 92				✓	✓		✓		
AHTD Status Map, District 8, Van Buren County – (5-1-3) U.S. Highway 85				✓	✓		✓		
AHTD Status Map, District 8, Faulkner County – (5-1-4)State Highway 285	✓			✓	✓		✓		
AHTD Status Map, District 5, Jackson County – (5-1-7) U.S. Highway 167				✓	✓		✓		
(5-2) CEGT Central Arkansas Natural Gas Pipeline Enhancement Project									
Region 6									
AHTD Status Map, District 5, Jackson County – (6-1-1 through 6-1-4) State Highway 14 bridge work (4 bridges)	✓		✓	✓			✓		✓
AHTD Status Map, District 1, Cross County – (6-4-1 through 6-4-4) State Highway 42 bridge work (4 bridges)	✓		✓	✓			✓		✓
(6-5) Rebuild 161kV Transmission Line from Trumann to Trumann West, AR (Entergy Arkansas, Inc.)									

Table 4.2-1b:
Summary of Present and Reasonably Foreseeable Future Actions and the Resource Areas of Potential Cumulative Impacts by Region

Present and Reasonably Foreseeable Future Action (Map ID Numbers, as Applicable)[1]	Resource Areas with Potential Cumulative Impacts (✓)								
	Recreation	Socio-economics	Special Status Wildlife and Fish Species	Surface Water	Trans-portation	Vegetation Communities	Visual Resources	Wetlands, Floodplains, and Riparian Areas	Wildlife and Fish
(6-6) Highway 63, Poinsett Co., AR		✓	✓	✓		✓	✓	✓	✓
Region 7									
AHTD Status Map, District 10, Poinsett County – (7-1-1) U.S. Highway 63 (at Marked Tree, AR)				✓	✓		✓		
AHTD Status Map, District 10, Mississippi County – (7-1-2) Interstate 55	✓			✓	✓		✓		
(7-2) Great River Super Site, Osceola, AR (industrial park)	✓	✓	✓		✓	✓	✓	✓	✓
(7-3) Interstate 69 Extension, TN		✓	✓		✓	✓	✓	✓	✓
(7-4) Green Meadows Development at Munford, TN (planned community)		✓	✓		✓	✓	✓	✓	✓
(7-5) Southern Gateway Project, TN	✓	✓	✓		✓	✓	✓	✓	✓

1 Map ID numbers provided with project titles can be found on Figure 4.2-1 (located in Appendix A).

- *OKDOT (8-Year) FFY-2014 through FFY-2021 Construction Work Plan.* The latest OKDOT 8-Year Construction Work Plan (OKDOT 2013a) was reviewed for possible road and bridge work in the Region 1 vicinity. According to the Work Plan, projects identified for completion in the first three years of the plan (i.e., federal fiscal year [FFY] 2014 through 2016) should be considered firm, or locked-in, with changes being made only through a formal program revision process; projects in the fourth year have low flexibility and are being prioritized and evaluated for transition into the "locked-in" group; and those in the last four planning years have moderate flexibility in terms of scope, schedule, and budget and have varying levels of project development. Region 1 is located entirely within OKDOT Division 6 and the Division 6 Construction Work Plan Map (OKDOT 2013b), with project locations, was the source of project-specific information used in this evaluation. OKDOT projects from the Work Plan documents considered to possibly coincide with ROIs of the Project are identified by location, moving generally from west to east, as follows:

    - SH-136 from Guymon south to the Oklahoma/Texas State Line. This 13-mile stretch of highway is more than 5 miles from the west end of the Applicant Proposed Route, but would be crossed by AC Collection System Routes NW-1, W-1, and SW-2 where they overlap. Planned activities on this highway segment include (1) grade, drain, and surface a 2.5-mile segment on the south side of Guymon (FFY 2020), (2) widen and resurface a 3.5-mile segment near the center of the 13-mile stretch (FFY 2019), (3) perform work on a bridge over Frisco Creek (FYY 2018), and (4) grade, drain, and surface a 5-mile segment north from the State line (FFY 2019/2020).
    - US-54/64 between Guymon and Hooker. This 20-mile stretch of highway is more than 10 miles northwest from the nearest segment of the Applicant Proposed Route, but would be crossed by AC Collection System Routes NE-1 and NW-2. Planned activities on this highway segment include (1) perform work on a bridge over Pony Creek (FFY 2016), (2) resurface about 5 miles of the road to the southwest of Hooker (FFY 2019), and (3) grade, drain, and surface more than 2 miles of the road on the northeast side of Guymon (FFY 2021).
    - SH-3 from Guymon east to the Texas/Beaver County Line. This 30-mile stretch of highway would be crossed by AC Collection System Routes NE-1/NW-2, NE-2, and E-3, and its eastern end parallels Route E-3 and Routes 1-A/1-C, running 0.9 mile south of E-3 and 0.5 mile north of 1-A/1-C. Planned activities on this highway segment include (1) resurface 7 miles of the road beginning about 7 miles east of Guymon and running east (FFY 2020), and (2) resurface 3 miles of the road starting 9 miles west of the Texas/Beaver County Line and running east (FFY 2021). AC Collection System Route NE-2 would cross the larger road resurfacing; the smaller road resurfacing is in the proximity of E-3 and 1-A/1-C as identified above.
    - SH-23 at the Oklahoma/Texas State Line. A planned activity to widen and resurface a 2-mile segment of the road starts 1 mile south of the State Line and runs north (FFY 2017). The northern extent of the planned activity is about 1 mile southeast of Link 2 of the Applicant Proposed Route.
    - SH-149 between US-283 and State Highway 46. There is a planned activity to put a bridge over the Beaver River in this road segment (FFY 2014). The work area lies about 1.5 miles south of HVDC Alternative Route 1-A.
    - US-183 from Buffalo south to the Harper/Woodward County Line. This 17-mile stretch of highway would be crossed by Link 5 of the Applicant Proposed Route and HVDC Alternative Route 1-A in Harper County. Planned activities on this highway segment include (1) grade, drain, bridge, and surface 5 miles of road beginning about midway in the stretch and running north (FFY 2021), (2) perform work on a bridge over Gyp

Creek (FFY 2018), (3) grade, drain, bridge, and surface a 4-mile segment starting 4.6 miles north of the county line and running north (FFY 2016), and (4) widen and resurface a 4.6-mile segment starting at the county line and running north (FFY 2020). HVDC Alternative Route 1-A would cross the first activity's highway segment and the Applicant Proposed Route would cross over the fourth activity's highway segment.

4.2.2 Region 2—Present and Reasonably Foreseeable Future Actions

Region 2 is referred to as the Oklahoma Central Great Plains Region and includes the Applicant Proposed Route and HVDC Alternative Routes 2-A through 2-B. The region extends through Woodward, Major, and Garfield counties in Oklahoma. These counties are mostly rural; the largest communities are the towns of Woodward and Fairview.

Oklahoma Gas and Electric—The Region 2 OG&E planned activity that could have cumulative impacts with the Project is summarized as follows:

- *Woodward-Thistle 345kV Transmission Line.* OG&E is currently constructing new electric transmission facilities in west-central Oklahoma. The activity involves the construction of roughly 90 miles of new double-circuit 345kV transmission line connecting OG&E's Woodward District Extra High Voltage Substation with the Thistle Substation near the Oklahoma-Kansas border. The transmission line's alternative routes run north and east from south of Woodward, Oklahoma, to the Oklahoma-Kansas border about 2 miles southeast of Hardtner, Kansas. The structures consist of steel monopole with a typical height of 150 feet and approximately 1,200-foot spans between the structures. It is expected to be in service by December 2014. This new electrical transmission line crosses Link 1 of the Region 2 Applicant Proposed Route approximately 6 to 8 miles east of Mooreland, Oklahoma, and one of the OG&E line alternative routes in this area appears to be within the 1,000-foot ROI for HVDC Alternative Route 2-A for roughly 20 miles before veering to the northeast. The other OG&E alternative route in this area stays well north after crossing the Applicant Proposed Route (OG&E 2011). The impacts associated with the Woodward-Thistle 345kV transmission line would be similar in nature to those impacts from the Project, but on a smaller scale, being restricted to a much shorter length of transmission line.

Glass Mountain Crude Oil Pipeline. The Glass Mountain Crude Oil Pipeline is a joint venture between SemGroup Corporation and Gavilon, LLC to build a 210-mile crude oil pipeline that extends through both Regions 2 and 3. The new pipeline was designed to have an initial capacity of approximately 140,000 barrels per day and 440,000 barrels of intermediate storage. The pipeline consists of two laterals: the first lateral originating near the town of Alva in Woods County, Oklahoma, and the second lateral originating near the town of Arnett in Ellis County, Oklahoma. The laterals intersect near Cleo Springs in Major County, Oklahoma, and the line continues east to Gavilon's Cushing (Oklahoma) facility (SemGroup 2014a). The constructed pipeline was put into service in February 2014 (SemGroup 2014b). Link 2 of the Region 2 Applicant Proposed Route and HVDC Alternative Route 2-A would cross the pipeline lateral from Alva in the area of the Woodward-Major county line. The pipeline from Cleo Springs to Cushing would be crossed several times by the Applicant Proposed Route and HVDC alternative routes within Region 3.

Oklahoma Department of Transportation. As described for Region 1, the latest OKDOT 8-Year Construction Work Plan (OKDOT 2013a) was reviewed for possible road and bridge work in the Region 2 vicinity. Region 2 is located within OKDOT Divisions 4 and 6 and the corresponding Construction Work Plan Maps (OKDOT 2013b, 2013c), with project locations, was the source of specific information for planned activities used in this evaluation. OKDOT planned activities from the Work Plan documents that could have cumulative impacts with the Project are summarized by location, moving generally from west to east, as follows:

- *SH-50B East of Woodward, Oklahoma.* OKDOT planned activities include a bridge and approach over Bull Creek on SH-50B almost 7 miles east of Woodward (FYY 2021). Link 1 of the Region 2 Applicant Proposed Route would run northwest-southeast about 0.2 to 0.3 mile west of the Bull Creek bridge location.
- *US-60 Southwest of Cleo Springs, Oklahoma.* There is a planned activity for a bridge and approaches at the Cimarron River about 2 miles southwest of Cleo Springs (FYY 2017). The work area lies as close as about 0.6 mile north of HVDC Alternative Route 2-A.

The above planned activities are those within about 2 miles of the Project routes and are both in OKDOT Division 6. Other OKDOT planned activities within about 2 to 6 miles of the Project include bridges and approaches over the North Canadian River on both State Highways 34 and 60 in Woodward and Major counties, respectively; bridge and road resurfacing work on SH-3/US-270 in southeast Woodward County and on US-412 in northwest Major County; widening and resurfacing of SH-8 in north-central Major County; and a bridge and approaches at Turkey Creek on SH-132, southwest of Enid, Oklahoma, in Garfield County (OKDOT District 4). The OKDOT 8-Year Construction Work Plan identifies numerous other road maintenance and bridge repair or replacement activities at greater distances from the Project, but these relatively small construction-type activities would have little potential for cumulative impacts at the greater distances (i.e., these relatively small construction-type activities would be expected to have an ROI similar to the Project and at the greater distance the ROIs would not overlap).

Mammoth Plains Wind Farm Project. The Mammoth Plains Wind Project would be located in Dewey and Blaine Counties, Oklahoma. It is a 199 MW proposed wind farm owned by NextEra Energy Resources of Juno Beach, Florida. A Power Purchase Agreement is in place as of November 2013 between NextEra and SPS, an Xcel Energy company (KEIN 2014). At its closest (the northeast corner), the property designated for this wind farm (Xcel Energy 2013) is approximately 14 miles south of Link 2 of the Region 2 Applicant Proposed Route. Xcel Energy describes the energy from the Mammoth Plains Wind Project as being targeted for its New Mexico and Texas customers (Amarillo Globe News 2013), so it would not be expected to use transmission lines associated with the Project and so is not considered a connected action.

4.2.3 Region 3—Present and Reasonably Foreseeable Future Actions

Region 3 is referred to as the Oklahoma Cross Timbers Region and includes the Applicant Proposed Route and HVDC Alternative Routes 3-A through 3-E. Region 3 extends through Garfield, Kingfisher, Logan, Payne, Lincoln, Creek, Okmulgee, and Muskogee counties in Oklahoma. Large communities in Region 3 include Stillwater, Cushing, Drumright, and Muskogee.

Oklahoma Department of Transportation. As described for Region 1, the OKDOT 8-Year Construction Work Plan (OKDOT 2013a) was reviewed for possible road and bridge work in the Region 3 vicinity. Region 3 is located within OKDOT Divisions (from west to east) 4, 3, 8, and 1 and the corresponding Construction Work Plan Maps (OKDOT 2013c, 2013d, 2013e, 2013f), with activity locations, was the source of specific information for planned activities used in this evaluation. OKDOT activities from the Work Plan documents that could have cumulative impacts with the Project are summarized by location, moving generally from west to east, as follows:

- *SH-51, East from US-81 in Kingfisher and Logan counties, Oklahoma.* There are a series of bridge activities planned for this 30-mile stretch of east-west highway in the northern portions of the two counties. The last five to the east, consisting of one in Kingfisher County and four in Logan County are over Skeleton Creek (FFY 2017), Bridge Creek (FFY 2018), West Beaver Creek (FFY 2017), Middle Beaver Creek (FFY 2017), and East Beaver Creek (FFY 2018). The Applicant Proposed Route, running northwest-southeast, would cross SH-51 about 1 mile east of the Skeleton Creek Bridge, then turn to the east, running about 5 miles south of the last four bridge activities. HVDC Alternative Route 3-A/3-B would cross SH-51 about midway between the Bridge Creek and West Beaver Creek bridges, about 2 miles from each, then turn to the east, running about 0.3 mile south of the last three bridge activities.
- *SH-51 Western Payne County, Oklahoma.* There is an OKDOT planned activity for a bridge and approaches on SH-51 at an unnamed creek about 5.5 miles east of the Logan-Payne county line (FYY 2017) HVDC Alternative Route 3-A/3-B would run about 0.3 mile southwest of the bridge location.
- *SH-33 at North Little Avenue in Payne County, Oklahoma.* An OKDOT planned activity to modify the intersection and rehabilitate pavement on SH-33 (FYY 2018) is about 2 miles east of Link 4 of the Region 3 Applicant Proposed Route.
- *SH-99 in Northeast Corner of Lincoln County, Oklahoma.* An OKDOT planned activity calls for bridges and approaches on SH-99 at Sand Creek and an unnamed creek to the north of Sand Creek (FYY 2021). Link 4 of the Region 3 Applicant Proposed Route would run east-west about 0.2 mile south of the Sand Creek Bridge and about 1.1 miles south of the unnamed creek.
- *SH-66 from Depew to Bristow, Creek County, Oklahoma.* The stretch of SH-66 from Depew to Bristow is to be graded, drained, and surfaced under two planned activities: (1) the first mile from Depew (FFY 2019), and (2) the rest of the way to the Bristow city limits (FFY 2021). HVDC Alternative Route 3-C would cross SH-66 near the dividing point between the two activities.
- *SH-16 East from SH-48, Creek County, Oklahoma.* There are several OKDOT planned activities along SH-16: (1) a widening and resurfacing activity for the stretch of road from SH-48 to 6 miles to the east (FFY 2020), (2) a bridge and approaches activity at Skull Creek near the east end of the 6-mile stretch (FFY 2014), and (3) a bridge and approaches activity at Chicken Creek about 2 miles further east and south (FFY 2018). Link 4 of the Region 3 Applicant Proposed Route would be about 1 mile to the northeast of the first project's eastern extent and also about 1 mile to the northeast of both bridge activities.
- *US-75A from Beggs to the County Line (7.5 miles to the north), Okmulgee County, Oklahoma.* The stretch of US-75A is to be graded, drained, and surfaced (FFY 2016). Link 4 of the Region 3 Applicant Proposed Route would cross US-75A about 2 miles north of Beggs.
- *US-75 North of Okmulgee, Okmulgee County, Oklahoma.* Three activities are planned for this segment of US-75 that runs north from the community of Okmulgee across SH-16 to a point about 2 miles north of SH-16: (1) left turn lane intersection modifications from Okmulgee to about Preston (FFY 2020), (2) left turn lane intersection modifications from about Preston to 2 miles north of SH-16 (FFY 2017), and (3) bridge and approaches for the overpass over SH-16 (FFY 2016). Link 4 of the Region 3 Applicant Proposed Route would cross US-75 at about the northern extent of the third activity and would be about 1.6 miles to the northeast of the overpass location. HVDC Alternative Route 3-C would cross US-75 in the first activity's highway segment.
- *US-62, Northwest Corner of Muskogee County, Oklahoma.* OKDOT plans two bridge and approaches activities on US-62 at Cane Creek crossings: (1) about 1.3 miles south of where US-62 joins SH-72 and turns south (FFY 2015), and (2) about 1.6 miles east of SH-72 (FFY 2015). Link 5 of the Region 3 Applicant Proposed

Route would cross US-62 about 0.1 mile north of the first activity and run parallel to and 1.5 miles south of the section of US-62 where the second activity is located.

- *US-69 North of Muskogee-McIntosh County Line, Oklahoma.* OKDOT plans a pavement rehabilitation project on 8.5 miles of US-69 north of the county line (FFY 2020). HVDC Alternative Route 3-C/3-D would cross US-69 about 1.2 miles north of the county line.

As with Region 2, the above planned activities are those within about 2 miles of the Project routes. The OKDOT 8-Year Construction Work Plan identifies more than 20 other road maintenance and bridge repair or replacement activities within about 2 to 6 miles of the Project routes, but these relatively small construction-type activities are judged to have little potential for cumulative impacts at the greater distances. In Kingfisher County, these other OKDOT planned activities include resurfacing and bridge work on SH-51. In Logan County, there are bridge activities on SH-74 and SH-74D. In Payne County, there are bridge activities on State Highways 51 and 33, and resurfacing on US-177 and SH-18. In Lincoln County, there are bridge activities on US-177 and SH-105, SH-18, and SH-99. In Creek County, there are two bridge activities on SH-16. In Okmulgee County, there is a bridge activity on US-62. In Muskogee County, there are bridge activities on SH-10 and US-62, US-69, and US-26, and surfacing activities on SH-10A and US-64.

Glass Mountain Crude Oil Pipeline. See the activity description in Section 4.2.2. The activity extends through both regions.

Bridge Replacement. The USACE is replacing the Highway 151 Bridge over the Keystone Dam. The construction started in October 2013 and will proceed for 13 months (USACE 2013). The road will be closed to traffic during that time. At its closest, Link 4 of the Region 3 Applicant Proposed Route would be about 17 miles southeast from this action. This action is outside the ROI but was evaluated because of its high-profile nature.

R.L. Jones Jr. Airport (Jones Riverside Airport). The Jones Riverside Airport in southwest Tulsa has been approved for several updates to occur over the 2014 to 2018 timeframe. Rehabilitation work is being completed at the Jones Riverside Airport. The planned activities include widening and asphalt overlays on runways and improvements to sewer, drainage, and roadway infrastructure (Arnold 2014). The airport, in Tulsa County, is located about 17 miles north of Link 4 of the Region 3 Applicant Proposed Route.

Oklahoma Gas and Electric. The Region 3 OG&E planned activity that could have cumulative impacts with the Project is summarized as follows:

- Seminole to Muskogee Transmission Line. OG&E has constructed or is constructing several new electric transmission facilities in east-central Oklahoma. This activity involved the construction of a new, double-circuit 345kV electrical transmission line connecting the existing OG&E Seminole Power Plant substation in Seminole County to the existing Muskogee Power Plant substation in Muskogee County. The activity is approximately 125 miles with a 150-foot-wide right-of-way corridor. The typical structure height is 90 feet with an 800-foot span between structures. The activity was completed in December 2013 (OG&E 2014b). The Applicant Proposed Route and the HVDC alternative routes cross this new transmission line in the area south-southeast of Muskogee, Oklahoma. Since this transmission line is already in service, its construction would not contribute to cumulative impacts with the Project, but impacts of the transmission line's presence, operation, and maintenance are considered. As described for two planned activities in Region 1 (Section 4.2.1), construction of the transmission line is considered a precursor to the Project and it is noted that impacts from its recent construction have been captured in the Chapter 3 affected environment.

4.2.4 Region 4—Present and Reasonably Foreseeable Future Actions

Region 4 is referred to as the Arkansas River Valley Region and includes the Applicant Proposed Route, including the Lee Creek Variation, and HVDC Alternative Routes 4-A through 4-E. Region 4 extends through Muskogee and Sequoyah counties in Oklahoma and through Crawford, Franklin, Johnson, and Pope counties in Arkansas. Large communities in the region include Sallisaw, Fort Smith, and Clarksville.

Oklahoma Department of Transportation. The OKDOT 8-Year Construction Work Plan (OKDOT 2013a) was reviewed for possible road and bridge work in the Oklahoma portion of Region 4, which is entirely within OKDOT Division 1. The corresponding Construction Work Plan Map (OKDOT 2013f), with activity locations, was the source of specific information for planned activities used in this evaluation. OKDOT activities from the Work Plan documents that could have cumulative impacts with the Project are summarized by location, moving generally from west to east, as follows:

- *SH-10A in Muskogee and Sequoyah Counties, Oklahoma.* An activity is planned to grade, drain, and surface the stretch of SH-10A that runs between SH-10 and SH-100. At its closest, Link 1 of the Region 4 Applicant Proposed Route would be about 1.7 miles southwest of the activity location.
- *I-40 near its Junction with SH-82, Sequoyah County, Oklahoma.* There are two OKDOT planned activities along this section of I-40: (1) a bridge and approach activity over Vian and Little Vian Creeks (FFY 2020), and (2) 6 miles of pavement rehabilitation (FFY 2019/2020). At its closest, Link 3 of the Region 4 Applicant Proposed Route would be about 1.5 miles northeast of this section of I-40.
- *I-40 along the South Side of Sallisaw, Sequoyah County, Oklahoma.* There are multiple OKDOT planned activities along this section of the highway: (1) 5 miles of pavement rehabilitation (FFY 2014), (2) a bridge and approach over Big Sallisaw Creek (FFY 2019), (3) a bridge and approach over a county road and railroad (FFY 2018), and (4) the I-40/US-64 interchange. This section of I-40 runs about 3 to 3.5 miles south of Link 3 of the Region 4 Applicant Proposed Route.
- *US-64 West of Sallisaw, Sequoyah County, Oklahoma.* OKDOT has a bridge and approaches activity at Big Sallisaw Creek (FFY 2014). The site is about 2.4 miles south of Link 3 of the Region 4 Applicant Proposed Route.
- *US-59 in Sallisaw, Sequoyah County, Oklahoma.* An activity is planned to grade, drain, and surface 3.5 miles of US-59, north from its intersection with US-64 (FFY 2016). Link 3 of the Region 4 Applicant Proposed Route would cross the highway location at about 2.6 miles north of US-64.
- *SH-101 East of Sallisaw, Sequoyah County, Oklahoma.* OKDOT has a bridge and approaches activity planned at an unnamed creek (FFY 2019). The proposed site is about 0.6 mile north of Link 3 of the Region 4 Applicant Proposed Route.

The above planned activities are generally those within about 2 miles of the Project routes. The exception is the group associated with the segment of I-40 running along the south side of Sallisaw. Although 3 or more miles away from the Applicant Proposed Route, activities in this section of roadway are identified specifically because concerns were raised during the EIS scoping process about potential impacts due to road construction on the US-64/I-40 interchange in this region. The OKDOT 8-Year Construction Work Plan identifies one other road maintenance activity within about 2 to 6 miles of the Project routes, but it would have little potential for cumulative impacts at the greater distances. This other planned activity is another pavement rehabilitation project on a 7.6-mile stretch of I-40 to the southeast of Sallisaw.

New Hydroelectric Power Plant. A new hydropower plant has been proposed by the Cherokee Nation, with a location on the Arkansas River at the existing W.D. Mayo Lock and Dam, south of Muldow (Dandridge 2012) and about 9 miles southwest of Fort Smith. Per a 2014 article (Maxwell 2014), a spokesman for the Cherokee Nation describes the power plant project as being only in the planning stage with no concrete plans yet developed. The 2014 article was triggered by the U.S. House of Representatives May 2014 release of a Water Resources Reform and Development Act Conference Report (U.S. House of Representatives 2014), which acted to lift "a federal halt on the Cherokee Nation's ability to construct, operate and market power for a hydropower facility on the W.D. Mayo Lock and Dam" (Maxwell 2014). The Water Resources Reform and Development Act of 2014, Public Law 113-121, was subsequently passed on June 10, 2014 and authorizes (in Section 1117) the Cherokee Nation of Oklahoma to design and construct one or more hydroelectric generating facilities at the W.D. Mayo Lock and Dam and to market the electricity generated from any such facility. The proposed hydropower plant site is approximately 12 miles south of Link 3 of the Region 4 Applicant Proposed Route.

Arkansas State Highway and Transportation Department. The AHTD publishes "Status of Improvement" maps (status maps) for each of its districts showing the status of roadway activities as "completed, under construction, programmed, or deferred" and, as applicable, new roadway construction. Most of the information presented here comes from these maps, which are in the form of individual maps for the counties within each district. Region 4 of the Applicant Proposed Route would pass through AHTD District 4 (Crawford and Franklin counties) and part of District 8 (specifically Johnson and Pope counties). This evaluation of cumulative impacts considered whether ROIs of the Project would cross or be in proximity to roadway activities either in the "programmed" or "deferred" categories, assuming those could be the activities occurring in the future. Roadway activities identified as "under construction" were not included in the evaluation because the activities, unless identified as new roadway construction, consist of maintenance or rehabilitation of existing structures. By their nature, they would be expected to be relatively short term and likely complete by the time the Project started. Once complete, impacts associated with use of the roads would be expected to be the same as before construction (i.e., consistent with the affected environment characterization). The maps contain no information on specific dates or detailed information on the nature of the roadway improvements, but those that could have cumulative impacts with the Project as well as planned activities identified through other sources are summarized by District and County as follows:

- *AHTD District 4, Crawford County, Arkansas.* Activities shown on the status map for Crawford County (AHTD 2014a) that could have cumulative impacts with the Project include (1) programmed bridge work on SH-59 at Lee Creek, (2) programmed work on I-40 from the Oklahoma-Arkansas state line east to just west of Dyer, (3) programmed road work on I-540 from Alma north to Mountainburg, (4) deferred work on US-71 from Alma north to a point southwest of Mountainburg, and (5) new construction of US-71 from Alma south, to the east of Kibler, and to the Arkansas River southeast of Fort Smith. HVDC Alternative Route 4-A would pass within about 2 miles south of the first activity. Link 6 of the Applicant Proposed Route would cross the second and fifth activity segments. HVDC Alternative Route 4-A/4-B/4-D would cross the third and fourth activity segments. A new section of US-71, south of the Arkansas River (i.e., south of the fifth activity above) and between US-22 and existing US-71, is currently under construction (to be completed in 2014) and almost 9 miles from the nearest segment of the Applicant Proposed Route (AHTD 2012).

- *AHTD District 4, Franklin County, Arkansas.* The status map for Franklin County (AHTD 2014a) shows no programmed or deferred activities being crossed by or adjacent to the Applicant Proposed Route or the alternative routes. The closest is programmed road work on SH-23 that begins over 4 miles to the north of HVDC Alternative Route 4-B and then extends northward.
- *AHTD District 8, Johnson County, Arkansas.* Activities shown on the status map for Johnson County (AHTD 2014b) that could have cumulative impacts with the Project are limited to programmed road work on I-40 from its junction with SH-164 east to just beyond where it crosses SH-352 (Wire Road). HVDC Alternative Route 4-E would roughly parallel this segment of I-40 at distances of 0.5 to 0.9 mile to the south until it veers to the north and crosses I-40 just east of the AHTD activity's eastern end.
- *AHTD District 8, Pope County, Arkansas.* The status map for Pope County (AHTD 2014b) shows no programmed or deferred activities being crossed by or adjacent to the Region 4 Applicant Proposed Route or the alternative routes. The closest is programmed road work on a short segment of SH-7 about 5 miles to the east of Link 9 of the Region 4 Applicant Proposed Route.

4.2.5 Region 5—Present and Reasonably Foreseeable Future Actions

Region 5 is referred to as the Central Arkansas Region and includes the Applicant Proposed Route and HVDC Alternative Routes 5-A through 5-F and the Arkansas converter station alternative. Region 5 extends through Pope, Conway, Van Buren, Cleburne, White, and Jackson counties in Arkansas.

Arkansas State Highway and Transportation Department. As described in more detail in the Region 4 discussion, the AHTD "Status of Improvement" maps (status maps) were reviewed for roadway activities that could involve impacts cumulative with the Project. Region 5 of the Applicant Proposed Route would pass through AHTD District 8 (specifically Pope, Conway, Van Buren, and Faulkner counties) and District 5 (Cleburne, White, and Jackson counties). Road activities from the Status of Improvement maps or other sources that could have cumulative impacts with the Project are summarized by District and County as follows:

- *AHTD District 8, Pope County, Arkansas.* The status map for Pope County (AHTD 2014b) shows no programmed or deferred activities being crossed by, or adjacent to the Region 5 Applicant Proposed Route or the alternative routes. The closest is programmed road work on a short segment of SH-27 about 2.4 miles to the north of Link 1 of the Region 5 Applicant Proposed Route. Although not shown on the status map, the AHTD has announced plans to construct a Highway 7 bypass to the west of Dover (Crabtree 2013). At its closest, Link 1 of the Region 5 Applicant Proposed route would be about 3 miles to the north of the Highway 7 bypass.
- *AHTD District 8, Conway County, Arkansas.* Activities shown on the status map for Conway County (AHTD 2014b) that could have cumulative impacts with the Project include (1) programmed work on SH-247 from the Pope-Conway county line east to its junction with SH-213 and (2) programmed road work on SH-92 from 2.9 miles east of the junction with SH-9 east to the Conway-Van Buren county line. HVDC Alternative Route 5-B would run roughly parallel with the first activity as close as 0.8 mile to the south of the road. Link 3 of the Region 5 Applicant Proposed Route would run roughly parallel with the second activity as close as 0.9 mile to the south of the road.
- *AHTD District 8, Van Buren County, Arkansas.* Activities shown on the status map for Van Buren County (AHTD 2014b) that could have cumulative impacts with the Project are limited to programmed road work on US-65 from Bee Branch to about 3 miles south. At its nearest, Link 3 of the Region 5 Applicant Proposed Route would be about 1.7 miles to the south of the activity's southern end.

- *AHTD District 8, Faulkner County, Arkansas.* Activities shown on the status map for Faulkner County (AHTD 2014b) that could have cumulative impacts with the Project are limited to programmed road work on SH-285 from its junction with SH-124 to about 4 miles south. At its nearest, HVDC Alternative Route 5-B would be about 1 mile to the north of the activity's northern end.
- *AHTD District 5, Cleburne County, Arkansas.* The status map for Cleburne County (AHTD 2014c) shows no programmed or deferred activities being crossed by or adjacent to the Region 5 Applicant Proposed Route or the alternative routes.
- *AHTD District 5, White County, Arkansas.* The status map for White County (AHTD 2014c) shows no programmed or deferred activities being crossed by or adjacent to the Region 5 Applicant Proposed Route or the alternative routes.
- *AHTD District 5, Jackson County, Arkansas.* Potentially cumulative activities shown on the status map for Jackson County (AHTD 2014c) are limited to programmed road work on US-167 in the small segment of the road going through the western edge of the county. Link 9 of the Region 5 Applicant Proposed Route would cross the road segment.

Central Arkansas Natural Gas Pipeline Enhancement Project. CenterPoint Energy Gas Transmission Company, LLC (CEGT) is proposing the Central Arkansas Natural Gas Pipeline Enhancement Project for the transportation of natural gas to the central Arkansas cities and towns of Conway, Mayflower, Maumelle, North Little Rock, and Little Rock. As part of the Central Arkansas Natural Gas Pipeline Enhancement Project, CEGT is proposing the installation of approximately 28 miles of 12-inch-diameter natural gas pipeline and ancillary facilities in Pulaski and Faulkner counties in Arkansas. The proposed pipeline, to be named Line BT-39, will be constructed primarily on a new alignment and will provide replacement transmission service for a portion of two existing CEGT natural gas pipelines (Lines B and BT-14). Construction was proposed to begin in March 2014 (CenterPoint Energy 2014), but the EA for the action was not released by FERC until mid-April 2014 (FERC 2014) and as of July 2014, the FERC was still involved in permitting decisions. Although CEGT has not announced a new construction start date, it is assumed this action is still reasonably foreseeable and could occur at the same time as the Project. The closest point of this new pipeline is approximately 16 miles south of the HVDC Alternative Route 5-B. The southern-most point of the proposed pipeline is more than 30 miles from the route. This action is outside the ROI but was evaluated because of its high-profile nature. Steps in the construction process include clearing, grading and trenching; stringing and welding pipe segments together; depositing the pipeline, backfilling and testing; and restoration (CenterPoint Energy 2013).

4.2.6 Region 6—Present and Reasonably Foreseeable Future Actions

Region 6 is referred to as the Cache River and Crowley's Ridge Region and includes the Applicant Proposed Route and HVDC Alternative Routes 6-A through 6-D. Region 6 extends through Jackson, Cross, and Poinsett counties in Arkansas.

Arkansas State Highway and Transportation Department. As described in more detail in the Region 4 discussion, the AHTD "Status of Improvement" maps (status maps) were reviewed for roadway activities that could involve impacts cumulative with the Project. In Region 6, the Applicant Proposed Route would pass through AHTD District 5 (specifically Jackson County), District 10 (Poinsett County), and District 1 (Cross County). Planned activities from the status maps or other sources that could have cumulative impacts with the Project are summarized by District and County as follows:

- *AHTD District 5, Jackson County, Arkansas.* Activities shown on the status map for Region 6 in Jackson County (AHTD 2014c) that could have cumulative impacts with the Project are limited to programmed work on four bridge structures on SH-14 near the community of Amagon. Two of the bridge structures are at the Cache River crossing and the other two are about 1 mile to the east over wetlands areas on the west side of Amagon. HVDC Alternative Route 6-B would run adjacent to SH-14 along this same stretch of road and cross over or very near to these bridge structures.
- *AHTD District 10, Poinsett County, Arkansas.* The status map for Poinsett County (AHTD 2014d) shows no programmed or deferred activities being crossed by or adjacent to the Region 6 Applicant Proposed Route or the alternative routes. The closest activity is a short segment of SH-1 within the community of Harrisburg, which is more than 5 miles north of HVDC Alternative Route 6-C.
- *AHTD District 10, Craighead County, Arkansas.* Although not crossed by routes of the Project, Craighead County to the north of Poinsett County was identified as having several planned road tasks, primarily in the Jonesboro area, being recently completed or started. These included the US-67 extension at SH-226 intersection and the widening of Highway 226 east to US-49 (AHTD 2013). The reference identified these tasks as either being completed or starting construction in 2012. These road construction activities are more than 20 miles north of the Region 6 routes.
- *AHTD District 1, Cross County, Arkansas.* Planned activities shown on the status map for Region 6 in Cross County (AHTD 2014e) that could have cumulative impacts with the Project are limited to programmed work on four bridge structures on SH-42 between Hickory Ridge and Cherry Valley. Link 6 of the Region 6 Applicant Proposed Route would run roughly parallel to and 2 miles north of the eastern half of this road segment where two of the bridge activities are located. Programmed road work on SH-163 to the southeast of Cherry Valley doesn't get closer than about 3.5 miles from the Applicant Proposed Route.

Rebuild 161kV Transmission Line from Trumann to Trumann West, Arkansas. Entergy Arkansas, Inc. plans to rebuild the 161kV transmission line from Trumann to Trumann West by replacing the current wooden structures with steel monopoles. This transmission line replacement is proposed for 2021 (Entergy 2013). This transmission line runs generally north-south compared to the east-west direction of the Project. The nearest segment of the Trumann to Trumann West transmission line is approximately 10 miles north of the Applicant Proposed Route. Because the activity includes replacement of structures, the impacts associated with the transmission line rebuild would be similar to those anticipated for the Project, although on a smaller, more localized scale.

US-63, Poinsett County, Arkansas. The FHWA, in cooperation with the AHTD, is studying an access road located adjacent to US-63 between Marked Tree and Payneway, Arkansas, in Poinsett County. An Environmental Assessment was completed in January 2012 (FHWA and AHTD 2012). US-63 between I-55 to the southeast and Jonesboro to the northwest is to be converted to I-555 in the future. The section of Highway 63 has already been upgraded to meet interstate criteria with the exception of a short segment to the west of Marked Tree that crosses the St. Francis River floodway (designated the St. Francis Sunken Lands), which does not have access control. This highway access road will support local traffic by providing an alternative route across the floodway so that access to Highway 63 can be controlled and the conversion to I-555 completed. The FHWA and AHTD action includes six bridges, which will span the St. Francis River and numerous water bodies within the St. Francis Sunken Lands, and will require some new ROW over what has been established for Highway 63. The roadway typical cross-section consists of two 10-foot-wide travel lanes, one in each direction, with 4-foot-wide outside shoulders. The total length of the action is approximately 4.7 miles. At its closest, the proposed access road segments are more than 2 miles to the north of Link 8 of the Region 6 Applicant Proposed Route and about 4 miles from HVDC Alternative Routes 6-C/6-D. However, an access road segment is only about 0.8 mile to the northwest of to HVDC Alternative Route 7-A.

4.2.7 Region 7—Present and Reasonably Foreseeable Future Actions

Region 7 is referred to as the Arkansas Mississippi River Delta and Tennessee Region and includes the Applicant Proposed Route, HVDC Alternative Routes 7-A through 7-D, and the Tennessee converter station. Region 7 extends through Poinsett and Mississippi counties in Arkansas and Tipton and Shelby counties in Tennessee.

Arkansas State Highway and Transportation Department. As described in more detail in the Region 4 discussion, the AHTD "Status of Improvement" maps (status maps) were reviewed for roadway activities that could involve impacts cumulative with the Project. Region 7 of the Applicant Proposed Route would pass through AHTD District 10 (specifically Poinsett and Mississippi counties). Road activities from the status maps or other sources that could have cumulative impacts with the Project are summarized by District and County as follows:

- *AHTD District 10, Poinsett County, Arkansas.* Actions shown on the status map for Region 7 in Poinsett County (AHTD 2014d) that could have cumulative impacts with the Project are limited to programmed work on a short segment of US-63 within the community of Marked Tree. HVDC Alternative Route 7-A would be 0.7 mile to the southeast of the near end of the road segment.
- *AHTD District 10, Mississippi County, Arkansas.* Actions shown on the status map for Region 7 in Mississippi County (AHTD 2014d) that could have cumulative impacts with the Project are limited to programmed work on an almost 17-mile section of I-55 from the Mississippi-Crittenden county line north to a point between Marie and Keiser. Link 1 of the Region 7 Applicant Proposed Route would cross I-55 in the southern portion of this segment and HVDC Alternative Route 7A would run adjacent and parallel to a 3.5-mile segment of the I-55 segment before crossing it in the northern portion.

Great River Super Site, Osceola, Arkansas. The Great River Super Site in Osceola, Arkansas, is a 4,800-acre site owned by Entergy and private entities. This site is part of the State of Arkansas, Mississippi County Economic Development Area. All environmental clearances (i.e., Phase I Environmental Site Assessments) have been completed and the area is planned to be developed for heavy industry. The site has direct access to the Mississippi River. Anticipated industries to develop in this area include steel industries (Mississippi County Economic Development 2014). The northern-most point of HVDC Alternative Route 7-A would be only about 0.4 mile to the southwest of the 4,800-acre site; Link 2 of the Region 7 Applicant Proposed Route would be about 11 miles to the south.

I-69 Expansion, Tennessee. I-69 is a multi-state highway, planned to connect Canada and Mexico and its route includes western Tennessee. Segments of I-69 in north and south Tennessee have been completed, others are under construction, and the Tennessee Department of Transportation expects completion of some segments to stretch well into the future. Current construction work of segments in Union City will likely not be completed until the 2017 time frame and it may be a 10-year program to complete segments that would extend it south to Troy. That would leave only the middle 65-mile section between Dyersburg and Millington to complete Tennessee's portion of the route. There was no federal funding designated for this transportation project as of February 2013, so no schedule has been established, but the plans are still being considered by the TNDOT (Dyersburg State Gazette 2013). The middle section of the I-69 activity, from Dyersburg to Millington, would go through the ROI of the Project, which ends just to the northeast of Millington. Current plans show the I-69 route running to the west of US-51/SH-3 near Millington (TNDOT 2014) where it would cross Link 3 of the Region 7 Applicant Proposed Route as well as HVDC Alternative Routes 7-B and 7-C.

Green Meadows Development at Munford, Tennessee. Concerns were raised during the EIS scoping process that a housing development was planned that should be considered in the cumulative impacts for this EIS. This development (the Green Meadows Development) is a planned community being constructed by the Green Meadows Development Corporation in Munford, Tennessee. The planned community will eventually consist of 695 single family homes with multiple construction phases and varying lot and house sizes over a 370-acre parcel. The development will also include a small commercial district (e.g., retail and shopping center, restaurants, and professional space), community parks, several ponds, and a Green Belt walking trail system. A retirement community along with fitness center, tennis courts, and a pool is also planned as part of this planned community (Green Meadows 2014). It was reported in mid-2012 that building approvals had been obtained and Phase 1 construction, including utilities, would begin in 2013 (Epley 2012). However, Tipton County property assessment data for 2014 indicate there are still no water, sewer, or gas utilities serving the parcel, and it is still classified as a farm (Tipton County 2014), so it appears Phase 1, if started, is not yet complete. The 370-acre parcel appears to be about 0.2 mile away from the eastern end of HVDC Alternative Route 7-D and 2 miles from the east end of the Region 7 Applicant Proposed Route.

Southern Gateway Project, Tennessee. The TNDOT conducted broad studies to determine the feasibility of a new Mississippi River bridge in the metropolitan Memphis, Tennessee area. These studies included the Mississippi River Crossing Feasibility and Location Study (Wilbur Smith Associates 2006), which was completed in June 2006 and identified potential locations for a new bridge. These studies collected preliminary data on the existing highway transportation system, natural environment and socio-economic characteristics of the area. The feasibility study focused on highway corridors and several bridge locations were screened based on their potential environmental and community impacts, engineering issues and estimated cost. These studies determined that a new bridge is feasible and recommended how to move forward to the next level of detail.

The Southern Gateway Project is a continuation of these earlier studies and is being developed through a collaborative effort of multiple agencies, including TNDOT, AHTD, Mississippi Department of Transportation (MSDOT), Memphis and West Memphis Metropolitan Planning Organizations (MPOs), and the FHWA. One of the potential river crossing corridors considered in a 2011 “Purpose and Need” study (TNDOT 2011) for the Southern Gateway Project is designated Corridor V1-7 and crosses the Mississippi River in the area of the Tipton-Shelby county line in Tennessee. This is the northern-most of the crossing corridors described in the study and, from west to east, starts in Arkansas at the junction of I-55 and US-63 and proceeds eastward, with a slight loop to the north, then southeast to just west of Millington in Tennessee. Were this corridor selected, it would require a new bridge and connecting roadways plus about 1 mile of new rail line in the Millington area. An EIS for the Southern Gateway Project will be developed that will outline the anticipated costs, benefits, and impacts of the alternatives, and is expected to be completed in 2015 (TNDOT 2011). Corridor V1-7 goes as far north as about the Crittenden-Mississippi county line in Arkansas before dipping back to the southeast. At its northern-most extent, Corridor V1-7 appears to be about 3 miles south of Link 1 of the Region 7 Applicant Proposed Route and about 4 miles south at the respective river crossings. Corridor V1-7 would, however, likely cross HVDC Alternative Route 7-C before ending on the west side of Millington. Other possible corridors addressed in the Purpose and Need study are all in the immediate area of Memphis or to its south and no closer than about 8 to 10 miles from routes of the Project.

4.3 Resource Area Cumulative Impacts

4.3.1 Evaluation Methodology

4.3.1.1 Cumulative Impacts Presentation

Cumulative impacts within each of the Chapter 3 resource areas are discussed in the sections that follow. Each resource area includes a discussion of the potential impacts from the present and reasonably foreseeable future actions described in Section 4.2 that could be cumulative with those of the Project. Each resource area discussion first summarizes the Project's potential impacts for the resource area, as were identified and described in the applicable methodology section of Chapter 3. If both the Project and the applicable present or reasonably foreseeable future actions would be expected to impact a resource, then there would be potential for cumulative impacts.

The discussion of potential cumulative impacts does not attempt to describe the impacts for every action for each region, because of the wide range of affected environments in Regions 1 through 7 and the large number of present and reasonably foreseeable future actions identified in Section 4.2. Rather, the evaluation and discussion follows DOE's graded approach by focusing on those projects within each region that would have the highest potential for significant impacts to the specific resource area. In addition, the nature of the information generally available for the actions identified in Section 4.2 limits the evaluation of cumulative impacts to qualitative analyses.

4.3.2 Agricultural Resources

Agricultural resource impacts of concern for the Project are associated with the potential for direct impacts to agricultural land and structures from construction and to agricultural operations given the long-term presence of Project components and their need for periodic maintenance. Also of concern are potential indirect impacts to agricultural production on adjacent lands due to the presence of transmission infrastructure changing aerial application patterns of fertilizers, insecticides, and herbicides; and economic impacts to farmers and ranchers due to the impacts to agricultural lands (such as reduced productivity).

To the extent that the present and reasonably foreseeable future actions described in Section 4.2 involve new disturbance of agricultural lands, their impacts could be additive with those of the Project. Impacts during construction could involve additional loss of vegetation and soil at construction sites and along travel routes; possible temporary loss of the use of structures such as barns, ponds, and silos; and possible curtailment of actions such as animal feeding operations. These types of construction-related impacts likely would be short term, although it is possible that loss of the use of structures could be long-term. During operations and maintenance, if the actions were for new electrical transmission lines, buried oil or natural gas pipelines, or similar actions, agricultural activities could resume to a large extent on most disturbed areas, but there would likely be some constraints and limitations. This could include land use limitations within ROWs, physical interference with agricultural equipment operations, and periodic loss of access during maintenance activities. Also during operations, permanent structures such as electric transmission structures and conductors could affect aerial spraying activities often used in agricultural areas. This could involve requiring the spraying to be performed at higher altitudes resulting in more chance for overspray or drift that could affect adjoining properties, or it could eliminate aerial spraying in some areas. There could also be effects on the economic value of livestock production by a combination of decreasing forage land available and by increasing management costs of controlling noxious and invasive vegetation species introduced during construction and costs of moving livestock around project-related structures and ROWs. All of these types of impacts could be cumulative with those of the Project if they were to occur within the same landowner's property or if measured in terms of the overall quantity of crops or livestock produced from the region.

Many of the actions identified in Section 4.2, particularly those associated with upgrades or maintenance actions for existing roadways, bridges, or airports, would not be expected to involve any substantial disturbance of agricultural lands and, accordingly, would be unlikely to affect agricultural resources.

As described in Sections 3.2.4 and 3.2.5, agriculture is the predominant land use in each of the seven regions. However, the counties in which Regions 1 and 2 are located have the highest percentages of agricultural land, averaging more than 90 percent, in comparison to the counties in other regions. Region 3 is the next closest, with the counties averaging about 80 percent agricultural land. The amount of agricultural land in the other four regions varies with averages ranging from 42 to 72 percent. The actions identified in Section 4.2 for Regions 1 and 2 also include several projects that would involve new land disturbance. Therefore, the present and reasonably foreseeable future projects identified for Regions 1 and 2 would likely have a higher potential for impacts to agricultural resources that would be cumulative with impacts of the Project. As described in Sections 4.2.1 and 4.2.2, both regions have OG&E transmission line planned activities as well as a new OG&E substation in Region 1. Potential impacts to agricultural resources for these actions would be the same as summarized above and described in detail in Section 3.2.6 for the Project. The Glass Mountain Crude Oil Pipeline project in Region 2 would be expected to have impacts similar to a transmission line action in the sense that it has a linear construction and agricultural uses could resume to some extent after construction was complete. But, there would be greater ground disturbance expected for the oil pipeline action, which increases the potential for invasive weeds to establish.

Region 2 also contains the Mammoth Plains Wind Farm project and its potential impacts to agricultural resources would be similar to the connected action described in detail in Section 3.2.6.8. Some agricultural lands would be taken out of service during construction, but because of the large distance between wind turbines, the land taken out of service would be very small in comparison to the total wind farm area. After construction was complete and agricultural activities reestablished in the disturbed areas, only a minimal area of existing agricultural land would be permanently removed from production. As described in Section 3.2.6.8 for connected actions, wind farm developers are typically able to micro-site turbines and other facility components to avoid displacing or damaging agricultural structures, including irrigation system components.

4.3.3 Air Quality and Climate Change

Air quality and climate change impacts of concern for the Project, as described in Section 3.3.6, are associated primarily with construction and include the following:

- Fugitive dust emissions
- Exhaust from construction equipment exhausts
- Portable concrete batch plant emissions
- Vehicle exhaust for work travel and movement of supplies

Air quality and climate change impacts during operations and maintenance of the Project would be limited to the emission of small amounts of pollutants associated with combustion of fossil fuels for work vehicles and maintenance equipment.

The present and reasonably foreseeable future actions described in Section 4.2 are similar to the Project in that the air emissions associated with the Section 4.2 actions would also be primarily from construction actions and would therefore result in effects similar to those listed above. None of the identified actions involve long-term operations with notable air emission sources. Based on available information, transportation related projects (i.e., roadway maintenance, bridge replacement, airport improvements, and even new road construction) are not anticipated to result in significant increases in traffic over what would occur without the activities. By its intended purpose, the Great River Super Site industrial park development in Region 7 is a possible exception to the earlier statement that the present and reasonably foreseeable future actions involve no notable long-term air emission sources. However, no specific future actions were identified for this site at the current time. Construction air emissions from the present and reasonably foreseeable future actions would be cumulative with those of the Project if they were to occur at the same time and in the same general area. However, most of the actions would involve air emissions, like the Project, characterized as intermittent and short term, with only minor temporary impacts on air quality in the vicinity of the construction activities.

As described in Section 3.3.5, the counties in the vicinity of the Memphis metropolitan area represent the only area along the general route of the Project that is currently classified as nonattainment with respect to any of the air quality standards. This area, consisting of Shelby County, Tennessee, Crittenden County, Arkansas, and the northern portion of De Soto County, Mississippi, is characterized as a marginal nonattainment area with respect to the 8-hour ozone standard. As a result, all actions occurring in this area that require some type of federal approval are subject to provisions of Transportation Conformity regulations (40 CFR 93 Subpart A) or General Conformity regulations (40 CFR 93 Subpart B), and sufficiently large actions are required to explicitly demonstrate conformity with State Implementation Plans (SIPs) for air quality; these regulatory requirements are in place specifically for the purpose of addressing cumulative impacts. Regions 6 and 7 of the Applicant Proposed Route are the closest of any of the regions to the nonattainment area and, therefore, might be considered the regions where cumulative air quality impacts could have the most serious adverse impacts. Present and reasonably foreseeable future actions in Regions 6 and 7 also happen to include some of the largest construction activities of any identified in Section 4.2. Specifically, US-63 access road construction in Region 6 and the I-69 extension and the Southern Gateway Project in Region 7 represent significant construction efforts. A construction date for the US-63 action was not available, but it is assumed it could be in the same time as the Project. Fugitive dust emissions would be localized; if construction overlapped between the US-63 action and the Project, short-term exhaust from vehicles and equipment could be additive but short-term and localized. It is unlikely that the two Region 7 actions (i.e., the I-69 extension and the Southern Gateway Project) would have construction impacts cumulative with the Project because neither of the actions have firm schedules; because of their large scale both are likely many years away. Also, based strictly on where most of the corridors for the Southern Gateway Project are being considered, its ultimate location, if implemented, will likely be south of the Project.

As was identified in Sections 3.3.5.3 through 3.3.5.5, air quality monitors in Regions 3, 4, and 5 show ozone levels that exceed NAAQS, so existing emissions sources that reach those monitors have a cumulative impact of exceeding the NAAQS. However, in several cases, the monitors nearest the Project were 30 or 40 miles away and were located much closer to urban centers (such as Oklahoma City and Little Rock). Monitors closer to the Project (e.g., those near Tulsa) are more relevant, yet are still well outside the ROI of the construction projects and are dominated by emissions from other sources. Therefore, while the combination of the Project and other actions would generate cumulative impacts on air quality near the Project, the Project itself would have a negligible contribution (and are also temporary and therefore do not contribute to air quality impacts on a continued basis).

For GHGs, as mentioned in Section 3.3.6.8, approximately 40 percent of national GHG emissions are from the power generation sector, and therefore actions such as the one connected to the Project—i.e., the development of wind farms for power generation, which emit almost no pollutants—can cumulatively have a significant positive impact by avoiding emissions (and are typically promoted for this very reason). In general and as identified in Section 3.3.6.8, actions connected to the Project—i.e., the development of wind farms—would generate relatively few emission during construction, and possibly more than the construction of the identified present and reasonably foreseeable future actions as well, although the locations of the emissions reductions may be completely different from the locations of the construction emissions.

4.3.4 Electrical Environment

Electrical environment impacts of concern for the Project, as described in Section 3.4.11, are associated with operation of AC and DC transmission lines and include the following:

- AC or DC electric fields that exists around charged objects (in this case, the transmission lines) and which are stronger near the charged object and decrease with distance
- AC or DC magnetic fields generated by an electric current, or flow of electrical charges (in this case, through the transmission lines), and which decrease in intensity with distance
- Audible noise cause by the natural phenomenon of electrical discharge, or corona, from energized surfaces such as a transmission line conductor
- Radio and television noise interference when electromagnetic energy from corona discharges includes the same frequencies as radio and television bands
- Ozone and air ions created by corona from a transmission line

The above effects are all associated with energized transmission lines so there would be no electrical effects of concern from potentially cumulative actions during construction.

The present and reasonably foreseeable future actions described in Section 4.2 include several for construction and operation of new electrical transmission lines. These are the only actions that potentially would involve electrical impacts cumulative with those of the Project. Present and reasonably foreseeable future actions with these traits are limited to Regions 1, 2, and 3. The Region 6 Trumann to Trumann West transmission line is outside of the electrical environment ROI and therefore too far to have additive effects with the Project. No electrical transmission line projects are identified for Regions 4, 5, or 7. In Regions 1, 2, and 3 the actions of interest are all OG&E transmission line actions: Hitchland-Woodward in Region 1, Woodward-Thistle in Region 2, and Seminole-Muskogee in Region 3. In Region 1, the OG&E line runs parallel to the Applicant Proposed Route through Beaver County. In Region 2, the OG&E line crosses Link 1 of the Applicant Proposed Route and one of the OG&E alternatives appears to parallel portions of HVDC Alternative Route 2-A. In Region 3, the OG&E line crosses the Applicant Proposed Route as well as the HVDC alternative routes.

These OG&E actions are all high voltage AC transmission lines, whereas the Project is an HVDC transmission line (with associated high voltage AC collector lines and interconnections). Transmission lines within the United States are operated either as DC (Direct Current or constant/static/fixed frequency of 0 Hertz) or AC (Alternating Current or alternating frequency of 60 Hertz). Static electric and magnetic fields (such as those created by HVDC transmission lines) are also naturally present in the earth's environment. For example, the earth creates a natural static electric field in fair weather and underneath clouds, and a natural static magnetic field allows compass needles to point to the magnetic North Pole. However, AC electric and magnetic fields only occur near AC electrical sources (such as AC transmission lines and electrical appliances). Electric and magnetic fields produced by AC electrical sources reverse direction at a frequency of 60 cycles per second (60 Hertz) whereas static fields are constant and do not change direction. Comparisons between DC and AC fields may therefore not be straightforward, especially when combining fields from both DC and AC sources.

The OG&E transmission lines have 345kV capacities and, individually, their electrical impacts would be expected to be similar to impacts from the 345kV double circuit AC interconnection line associated with the Oklahoma converter station described in Section 3.4.11.2.1 and the 345kV single circuit AC collection system routes described in Section 3.4.11.2.2. However, as described in Section 3.4.11, impacts at or near ground level can vary substantially based on the height of the structure and on the structure/line configuration as well as the electrical energy transmitted. The loading (or anticipated MW capacity) will specifically impact magnetic field levels.

Areas where transmission lines of the Project and present and reasonably foreseeable future actions would potentially have cumulative impacts are limited to crossing points and collocated stretches (with centerlines within about 600 feet of one another). The evaluation of impacts from the Project considered other transmission lines already present in the Project regions and, in Section 3.4.10, states that electrical effects from existing transmission lines may influence the electrical effects associated with the Project's transmission line and that those effects could be additive or subtractive. Section 3.4.10 then indicates that because the route for the HVDC transmission line has not yet been selected and because of the numerous existing transmission lines in the various regions, calculations of the combined electrical effects were not performed at this time. The same holds true for the newly identified transmission line actions. However, without performing calculations, it can be reasoned that locations where transmission line routes crossed would likely be sites of the highest cumulative impacts, but the affected area would be contained within the limits of the generated fields, which are relatively small as described in Section 3.4. On the other hand, collocated transmission line routes would require adequate separation so the magnitude of the cumulative effects would be less, but the area affected would be greater as described in Section 3.4.

4.3.5 Environmental Justice

Disproportionately high and adverse effects to low-income and minority populations can result if actions cause disproportionately high and adverse human health or environmental effects to minority or low-income populations. Section 3.5.5 identifies locations within the ROI for this resource where Census data indicate locations with a high percentage of minority or low-income residents. Minority populations include individuals who are Black or African American, American Indian and Alaska Native, Asian, Native Hawaiian and other Pacific Islander, other non-white race, or persons of two or more races and Hispanic or Latino (CEQ 1997). For the evaluation in this EIS, minority population areas of concern are those where 50 percent or more of the population within the Census Block is minority or if the percentage of the minority population is 10 percent or more above the minority population of the county as a whole. Low-income population areas of concern are those where 20 percent or more of the households within the Census Block Group have incomes below the poverty level.

For the impact evaluations of the Project (Section 3.5.6), it was concluded for each of the Project components that while there is potential for impacts, it is anticipated that such impacts would not be disproportionately high and adverse and would affect all populations in the ROI equally. Accordingly, the Project would not result in disproportionately high and adverse effects to minority or low-income populations. The significance of "disproportionately high and adverse effects" is identified in Section 3.5.1 and the methods used in evaluating potential impacts for the Project are presented in Section 3.5.6.1. The present and reasonably foreseeable future actions described in Section 4.2 could involve cumulative environmental justice concerns if, in combination with the Project, impacts were raised to a “disproportionately high and adverse” level as described in Section 3.5.6.1.

In the Section 3.5.6.2.3 discussion of impacts associated with the HVDC Applicant Proposed Route, it is noted that potential low-income and minority populations are identified in all of the counties crossed in Regions 4, 5, and 7. In the other regions, only some of the counties have qualifying minority and low-income populations. Accordingly, Regions 4, 5, and 7 would be most likely to present cumulative impacts that could raise environmental justice concerns. In the case of Regions 4 and 5, identified present and reasonably foreseeable future actions are limited primarily to road maintenance plus a hydroelectric plant proposed in Region 4 that is 12 miles from the nearest Project route (although within a county affected by the Project) and a natural gas pipeline project in Region 5 that is 16 miles from the nearest Project route. The pipeline project is outside of the counties affected by the Project and therefore not expected to contribute to impacts that would be cumulative with those of the Project. The roadway activities might be considered no more than short-term changes to an existing source of impacts (i.e., impacts associated with traffic and highway operations). Based on the best available information, it is not known whether the hydroelectric plant would result in disproportionately high and adverse effects to low-income and minority populations. Because the hydroelectric plant and the Project would affect different areas of the same county, separated by many miles, they would not affect the same individuals of the population. For these reasons, it is unlikely that impacts from any of these actions or activities could combine with those of the Project to reach disproportionately high and adverse levels. In the case of Region 7, it has two of the largest scale present and reasonably foreseeable future actions of any of the regions (the I-69 expansion and the Southern Gateway Project). However, as described in Section 4.3.3 on cumulative air quality impacts, the two large projects (I-69 and Southern Gateway) currently do not have firm schedules so are unlikely to be constructed in the same time frame, and the Southern Gateway action is unlikely to be in the same area as the Project’s construction so there would be little potential for cumulative impacts. Region 7 also has two development areas planned: an industrial park (Great River Super Site) and a housing community (Green Meadows). Based on the best available information, it is not known whether these development areas would result in impacts to low-income and minority populations. Because of the relatively small size and large distance between the Great River Super Site and the Project, disproportionately high and adverse cumulative impacts to low-income and minority populations are not anticipated. The Green Meadows development would occur in an area of Tipton County identified as farmland (Epley 2012), which is still classified as a farm in the Tipton County property assessment of 2014 (Section 4.2.7), and is, therefore, not anticipated to displace low-income and minority populations. As a result, disproportionately high and adverse cumulative impacts to low-income and minority populations from the development and the Project are not anticipated.

4.3.6 Geology, Paleontology, Minerals, and Soils

Consistent with the presentation of the affected environment and impacts in Chapter 3, this section’s discussion is presented in two separate groupings: (1) geology, paleontology, and minerals; and (2) soils.

4.3.6.1 Geology, Paleontology, and Minerals

Geology, paleontology, and mineral impacts of concern for the Project, as described in Section 3.6.1.6, include the following:

- Geologic hazards in the form of seismicity, landslides, subsidence related to karst, and seismically induced liquefaction
- Paleontological resources and the potential for loss of important fossils as a result of the Project's ground-disturbing activities or from vandalism or unauthorized collection given the increased access generated by the Project
- Mineral resources and the potential for the Project to interfere with existing mineral extraction operations, reduce access to underlying minerals, and interfere with future mineral extraction operations

Most impact evaluations are performed to assess the effects of the Project on the site's natural conditions. For geology, however, an evaluation of concern is the potential for damage to the Project from the natural geological conditions or characteristics of the Project site. As such there would be no cumulative impacts from other present or reasonably foreseeable future actions because, like the Project, the actions described in Section 4.2 would not be expected to increase geologic hazards. Landslide hazards are the exception in that they are evaluated both for the possibility of adverse impacts to the Project and for the Project to aggravate natural conditions such that landslide risks are increased for other entities or properties. For the Project, the potential to impact landslide risks would occur only during construction and this would also be the expected case for present and reasonably foreseeable future actions. In addition, other actions would have to be quite close to the Project (i.e., within its ROI) to have cumulative impacts on landslide risks.

The Project's potential impact (Section 3.6.1.6) on mineral resources is addressed by identifying the following EPMs that would be implemented by the Applicant: (1) the Project would be designed to avoid crossing any active oil or gas well pads or impeding access to these such resources; (2) the Applicant would work with landowners and operators of active oil and gas wells, utilities, and other infrastructure to identify and verify the location of Project components and to minimize adverse impacts; and (3) the Applicant would coordinate with landowners to site access roads and temporary work areas to minimize impacts to existing operations and structures to the extent practicable. Since no adverse impacts to mineral resources were identified in the evaluation of the Project, there would be no contribution to cumulative impacts. Conversely, any potential adverse impacts associated with present and reasonably foreseeable future actions would have no bearing on the decision to implement the Project.

No known fossil bed sites have been identified within the ROI of the Project, but it is recognized that grading and excavation activities have the potential to uncover and impact paleontological resources. To minimize the potential for such impacts personnel will be trained in the practices, techniques, and protocols required by federal and state regulations and applicable permits (EPM GE-1 in Appendix F). In accordance with EPMs, construction footprints would also be minimized, which would reduce the potential for impact to paleontological resources. In this case, any present or reasonably foreseeable future action located within the ROI and involving ground-disturbance would be expected to have the same potential to impact paleontological resources as the Project. These impacts would be cumulative only to the extent that increases in the amount of ground disturbed might be expected to increase the probability for encountering paleontological resources. There is no means to evaluate how much the probability might change, but it would be expected to be minimal.

Considering the above limitations or conditions on what actions could be cumulative with those of the Project, it appears landslide-prone areas in the ROI could be locations where cumulative actions could occur. Regions 3, 4, 5, and 7 are the only regions identified in Section 3.6.1.6 with areas of moderate or high susceptibility for landslides and the Project would avoid sloped areas whenever practicable. It is assumed that the road maintenance work identified in Section 4.2 for Regions 3, 4, 5, and 7 would not involve areas of new ground disturbance, so landslide conditions would not be aggravated even if the work took place in areas of concern. With the road work eliminated, only the OG&E Seminole-Muskogee transmission line activity in Region 3 would appear to involve construction action within the Project's ROI. However, since construction of the Region 3 OG&E transmission line has already been completed, its construction activities would not contribute to cumulative impacts (Section 4.2.3) and any crossed areas of landslide risk would have been stabilized to protect the equipment. Therefore, no cumulative impacts with respect to increasing landslide risks would be expected.

In Region 4, the possible hydroelectric plant is well outside the Project's ROI and the only other construction action is the new section of Highway 71 south from Alma, Oklahoma. Link 6 of the Applicant Proposed Route crosses the path where the new road is planned but the applicable area to the south of Alma has only mild slopes, so no landslide risks would be expected. In Region 5, the only construction actions (the Highway 7 Dover bypass and the CEGT Natural Gas Pipeline) are outside the Project's ROI.

Several of the present and reasonably foreseeable future actions in Region 7 involve construction actions; however, the Great River Site and the Green Meadows developments are both outside the Project's ROI. The I-69 Extension and the northern-most corridor (i.e., Corridor V1-7) being evaluated for the Southern Gateway Project would cross the Applicant Proposed Route or one of the HVDC alternative routes, but both in areas just outside of Millington, Tennessee, where there is farming and scattered housing developments, without significant slopes. Landslide risks would not be expected in these areas.

4.3.6.2 Soils

Soil impacts of concern for the Project, as described in Section 3.6.2.6 and which could involve cumulative impacts, include the following:

- Designated Farmlands—Construction disturbance could result in a decrease in productivity and quality of designated farmland and in places of permanent structures some farmland could be taken out of production.
- Soil Limitations—Site specific soil conditions could result in the following: (1) exposure of erosion-prone soil to conditions of increased erosion potential; (2) soil with high compaction potential would be susceptible to compaction from construction vehicles and equipment; and (3) disturbance of areas of steep slopes could cause increased erosion hazards.

Per the Section 3.6.2.6 evaluations, designated farmlands are present to some degree within the ROI of each of the Project's primary components, which includes the Applicant Proposed Route and the HVDC alternative routes in each of the regions. Similarly, soils with high compaction potential and with moderate to high wind erosion potential are present within each ROI and soil with high water erosion potential is present in most. With respect to designated farmland, the evaluations in Section 3.6.2.6 conclude that construction disturbance could result in a decrease in the productivity and quality of designated farmland. Because of the prevalence of designated farmland, the present and reasonably foreseeable future actions described in Section 4.2 that involve new ground disturbance would be expected to involve impacts that could be additive with those of the Project. Similarly with regard to the soil limitations of concern, other actions involving ground disturbance would be expected to have cumulative impacts. In this case, the cumulative impacts would be additional soil areas of increased erosion potential and of susceptibility to compaction.

Many of the actions identified in Section 4.2, particularly those associated with upgrades or maintenance actions for existing roadways, bridges, or airports, would be expected to involve minimal, if any, new disturbance of ground and, accordingly, would be unlikely to affect designated farmland or soil limitations. As has been noted in preceding evaluations, the transmission line activities identified in Section 4.2 for Regions 1, 2, and 3, are representative of present and reasonably foreseeable future actions that could involve new ground disturbance within the ROI of the Project. Accordingly, these are the actions and regions most likely to involve cumulative impacts to designated farmlands and soil limitations. As mitigating factors, these Section 4.2 actions, like the Project, are linear (long, narrow) activities with relatively small amounts of ground disturbance considering the amount of area crossed. Also, once the construction is complete and disturbed ground has been recovered, use of the disturbed ground can be resumed to some extent and adverse impacts lessened.

4.3.7 Groundwater

Groundwater impacts of concern for the Project are associated with the potential for groundwater contamination, changes to infiltration rates, effects on water availability, and physical damage to well systems. As noted in the Section 3.7.6 discussion of impacts, these concerns would be limited primarily to the construction phase of the Project. The present and reasonably foreseeable future actions described in Section 4.2 for each of the regions would present similar concerns and, likewise, would appear to present possible concerns primarily during construction. Accordingly, there were no specific actions identified that would appear to involve long-term operations that could adversely affect groundwater, including no actions that would be expected to use large quantities of water during long-term operations.

The actions identified in Section 4.2 would be expected to involve the presence of the same type of potential contaminants (primarily fuels and lubricants in equipment) during construction and to implement the same type of measures to ensure those contaminants were not released. The actions would be expected to involve relatively minor changes to infiltration rates and, to decrease their own liability, would be expected to take precautions to ensure that equipment movement and excavations did not unknowingly damage well systems. As with typical construction activities, water likely would be needed for actions such as dust suppression, soil compaction, equipment cleaning, and concrete formulation. However, like the Project, these water demands would be relatively minor and short term. Potential impacts to groundwater from construction of the Project and from construction of the actions described in Section 4.2 would be minor.

Of the actions described in Section 4.2, it is estimated that Regions 3 and 7 could have the greatest potential for cumulative impacts with the Project. None of the specific actions identified in Section 4.2 would be expected to have high water use or high potential for groundwater contamination during operations and maintenance, so potential impacts during construction would be the primary concern and actions in Regions 3 and 7 appear to be associated with the greatest number and size of construction actions. Region 3 has many road tasks planned, an action to replace a dam bridge, an action to improve airport pavements, and construction of another transmission line. Possibly the largest single action in the region, the dam bridge, is scheduled to be completed prior to the construction start of the Project. The road and transmission line actions involve only modest construction efforts, with relatively small disturbances scattered over a large area, just as with the Project.

Region 7 is the smallest region in terms of the length of the Applicant Proposed Route, but has some of the largest potential actions. Specifically, the I-69 extension and the Southern Gateway Project represent significant construction efforts. Also the Great River Super Site is being developed as an industrial park that could ultimately involve a wide range of industrial activities. However, it is likely that neither of the first two actions would have construction impacts cumulative with the Project. The I-69 extension in the area of the Project lacks a firm schedule and is likely many years away. The Southern Gateway Project may also be many years away since the EIS has yet to be completed and, based strictly on where most of the corridors are being considered, its ultimate location, if implemented, will likely be south of the Project. The Great River Super Site can only be identified as involving potential cumulative impacts because the reference material does not identify any specific actions currently being planned or initiated; it is simply being identified as a location where industrial actions may take place. Construction and operation of heavy industries, such as a steel industry, would be expected to include use of hazardous materials that could pose a threat of groundwater contamination if spilled or leaked, similar to the threat posed by fuels and lubricants that would be present during construction of the Project. Like the Project, any new heavy industry would be expected to incorporate the structures, plans, and procedures required by environmental regulations to minimize the potential to cause groundwater contamination. Heavy industries may also have high water demands, but being adjacent to the Mississippi River, it is likely that high volume uses such as for cooling would come from surface water rather than groundwater. The other action of note in Region 7, the Green Meadows housing development, is also outside of the ROIs for groundwater and would not be expected to involve impacts to groundwater other than contributing to consumptive uses.

4.3.8 Health, Safety, and Intentional Destructive Acts

As described in Section 3.8.5, the impact areas of potential concern from the Project in the category of health, safety, and intentional destructive acts include the following: (1) worker and public health and safety, including management of hazardous materials, (2) aircraft operations, (3) fire hazards, (4) natural events and disasters, (5) intentional destructive acts, and (6) protection of children. The last item, protection of children, is addressed in a manner similar to what is described in Section 4.6.2 for environmental justice in that it addresses whether the Project could cause disproportionately high and adverse effects on child health and safety. Section 3.8.5 describes potential effects of the Project in these impact areas during construction, operations and maintenance, and decommissioning.

The above impact areas can only be addressed in very general terms or based on statistical records from previous implementation of similar actions (i.e., historical records). Regardless, adverse effects are not expected to worsen from any of the present and reasonably foreseeable future actions described in Section 4.2. Essentially any work action is associated with a certain level of risk to workers and to the public. Accordingly, the more work is being done, the higher the probability there will be injuries or even fatalities while that work is being performed. Restated, the greater the amount of work and the greater the number of workers involved, the greater the number of incidents that would be predicted, based on statistical records, for a given amount of time. In the sense that these numbers of predicted incidents would increase, then the Section 4.2 actions are cumulative, but more significantly there would be a high concern if expected rates of health and safety incidents for any action were expected to increase because of synergistic or proximity effects of another action. There is no reason to expect this type of cumulative impacts would occur. The impact area of natural events and disasters provides a good example of this reasoning. The more work and people in a single area, the greater the number of injuries that would be expected if hit by an intense earthquake or violent weather, but the probability or risk of an intense earthquake or violent weather striking that area does not change.

The impact area of aircraft operations might be considered an outlier to the preceding discussion because increasing the number of structures, such as for transmission lines, in any area might be considered as increasing the risk of collisions with individual aircraft. Similarly, helicopters may be used during the Project for surveying, structure installation, and line and conductor stringing. If other transmission line projects were to be constructed at the same time and in the same area, there could be an increased risk of aircraft accidents from such operations.

4.3.9 Historic and Cultural Resources

Historic and cultural resource impacts of concern for the Project are associated with following types of resources and applicable impacts:

- Archaeological sites—These sites are primarily vulnerable to soil-disturbing activities, but in rare cases the site's relationship to the surrounding environment is an essential characteristic and could be subject to visual impacts.
- Historic properties (buildings, structures, objects, and landscape features)—Assuming the Project would avoid any direct impacts to these properties, impacts could involve introduction of non-historic visual or, occasionally, auditory elements.
- Tribal lands or historic properties of religious and cultural significance to an Indian Tribe (as determined from background research and Indian Tribe consultations per Section 3.9.2)—These could be subject to impacts from direct physical disturbances or from changes to the visual surrounding, auditory field, or other characteristics of their setting.

Although sufficient information is available to complete this EIS, it is recognized in the Section 3.9.6 evaluation of impacts that detailed information on the historic and cultural resources that could be within the Project ROI is currently limited and that more detailed assessments will be made prior to construction.

The assessment of potential impacts for the Project is based on regional geography and archaeological, historic, and tribal resources available from background research, primarily of information on file with the respective SHPOs and the NPS. Based on the available information, Section 3.9.6.2.3.1 presents descriptions of the potential for construction activities to encounter historic and cultural resources within each region's ROI. Region 7 is described as having the potential for numerous historic and cultural resources, while Regions 3, 4, 5, and 6 contain a moderate number of resources. Region 7 contains 13 inventoried archaeological sites and 40 inventoried historic buildings (although none are on the NRHP), which is the most inventoried sites for any of the regions. This may be attributed to there being more surveys in the Region 7 area that happen to have some overlap with the Project ROI, but for purposes of this discussion it is assumed that actions in Region 7 would be most likely to involve cumulative impacts. Although regions are singled out in this discussion as having higher potential for adverse impacts, it should be noted that the evaluations of impacts in Section 3.9.6 conclude that with proper precautions, such as implementing appropriate cultural resource surveys and incorporating micro-siting adjustments as needed in Project engineering, impacts to cultural resources would likely be minimal throughout all Project regions.

To the extent that the present and reasonably foreseeable future actions described in Section 4.2 involve new ground disturbance or changes in the visual or auditory characteristics of the area, their impacts on historic or cultural resources could be additive with those of the Project. However, unless ground disturbance areas overlapped or were in very close proximity to one another, visual changes were in the same viewshed, and sound changes were close enough to be additive, the impacts would be on different sites. Accordingly, as described for several other resource areas, cumulative impacts would be more likely to involve increased potential to adversely impact historic or cultural resources in general, rather than the same resource site.

The Section 4.2 actions in Region 7 include two of the largest scale present and reasonably foreseeable future actions of any of the regions (the I-69 expansion and the Southern Gateway project) as well as two development areas, one as an industrial park (Great River Super Site) and another as a housing community (Green Meadows). The only other action identified in Section 4.2 consists of road maintenance, which would not be expected to involve significant new ground disturbances. As described in Section 4.3.3 on cumulative air quality impacts, the two large actions are unlikely to be constructed in the same time frame as the Project's construction, and the Southern Gateway project is unlikely to be constructed in the same area, so there would be little potential for cumulative impacts. With regard to the two development areas, there could be cumulative impacts during construction, but nothing has been identified of specific consequence in either area and given their stage of development, both areas have likely been surveyed for resources.

4.3.10 Land Use

The evaluation of potential land use impacts associated with the Project is focused on the types of existing land uses within the transmission line ROWs, converter station construction sites, and other land areas that would change by being tied up for the operational life of the Project. It differentiates between those areas of fully dedicated Project use (e.g., sites of converter stations, structures, and permanent access roads) from ROW areas where existing land use may continue after construction, but with certain limitations. It also addresses potential effects of those land areas where Project use or disturbance would only occur during construction, including areas used for such things as equipment staging, temporary access roads, tensioning and pulling sites, and fly yards.

To the extent that the present and reasonably foreseeable future actions described in Section 4.2 involve new land uses, their impacts could be cumulative with those of the Project. Like the Project, impacts of the Section 4.2 actions could involve land use changes during construction that would be relatively short term and others that would last for the duration of the action. Other transmission line tasks, such as those identified for Regions 1, 2, and 3, would be expected to have a similar distribution of short- and long-term impacts to those of the Project.

Many of the actions identified in Section 4.2, particularly those associated with upgrades or maintenance actions for existing roadways, bridges, or airports, would be expected to involve minimal, if any, changes to existing land uses and, accordingly, would be unlikely to generate impacts that would be cumulative with the potential impacts from the Project. As has been noted in other evaluations, the transmission line actions identified in Section 4.2 for Regions 1, 2, and 3, may be the best examples of present and reasonably foreseeable future actions that could involve new ground disturbance and changes in land use within the ROI of the Project, which is the area where Project impacts, if more than negligible, would be expected to occur. Accordingly, these are the actions and regions most likely to involve cumulative impacts to land use. Potential impacts to land use for these actions would be very similar to those described in detail in Section 3.10.6 for the Project. Land uses in areas affected by the other transmission line actions would be expected to be similar, although with different distributions in percentages of land cover and development levels than described in Section 3.10.6 for the Project. The Section 4.2 actions, like the Project, are primarily long, narrow activities with relatively small amounts of ground disturbance considering the amount of area crossed, which tends to minimize the amount of land use changes on a regional basis. Also, once the construction is complete, much of the affected land could return to previous land uses such as agriculture (grazing and crops); however, there would be new restrictions on land uses that would be permitted in the future within the ROW including limitations on buildings or structures, on changes to grading and land contours, and on some infrastructure like fences and irrigation lines. Other transmission lines crossing or running adjacent to those of the Project could also exacerbate

ROW-type limitations because of the odd shaped parcels or narrow bands of land created by the intersecting or parallel ROWs. Such parcels could be outside of the ROW and therefore have no land use restrictions, but their size or configuration could effectively limit the types of land use that would be feasible.

4.3.11 Noise

Noise impacts for the Project are identified at NSAs receiving unacceptably high levels of noise during construction or operations. For construction activities the evaluation in Section 3.11.6 uses limits set by the Federal Highway Administration of the U.S. Department of Transportation for its construction projects, which are 90 dBA L_{eq} for daytime activities and 80 dBA L_{eq} for nighttime activities. For operation and maintenance activities, the Project is evaluated against a guideline set by EPA of 55 dBA L_{dn}. The methodology in Section 3.11.6 used noise modeling techniques to determine critical distances from the noise sources, which are defined as the distance at which limits are first met. Examples of the critical distance values used in the Project evaluation include (1) for construction of HVDC transmission lines, within 100 feet would be at or above the daytime noise level limit of 90 dBA L_{eq} and 325 feet for the nighttime noise level limit of 80 dBA L_{eq}, and (2) the critical distance for operation and maintenance noise from the HVDC transmission lines would be 130 feet to be at or above the noise level limit of 55 dBA L_{dn}. Adverse impacts would be expected if NSAs are located within the critical distances of construction, which is assessed from the Project's representative ROW limit and of operation, which is assessed from the representative ROW centerline.

All of the present and reasonably foreseeable future actions described in Section 4.2 involve sources of noise that, when considered in conjunction with the Project, could result in potential cumulative noise impacts at the NSAs. The magnitude of potential cumulative noise impacts directly corresponds to the proximity of the actions described in Section 4.2 relative to the Project and the noise generated by the Section 4.2 actions. As a general rule, doubling the amount of sound energy at a location would increase received sound levels by 3 dBA. If one source is approximately 10 dBA louder than another source then it will dominate the other sound source. Also, doubling the distance from a linear noise source decreases the sound level by about 3 dBA and doubling the distance from a point source decreases the sound level by about 6 dBA.

In comparing the number of NSAs in Regions 1 through 7, Table 3.11-9 in Section 3.11.6.2.3 identifies Region 4 as having the greatest number of NSAs within daytime and nighttime critical distances (i.e., the distances within which NSAs would experience excessive noise levels) for construction of HVDC transmission lines. Based on this, it might be assumed that present and reasonably foreseeable future actions in Region 4 would have a greater potential for adverse cumulative impacts than in other regions. However, most of the Section 4.2 actions in Region 4, consisting of numerous roadway projects and construction of a hydroelectric plant, are more than 0.5 mile from components of the Project, so cumulative noise impacts would not be expected. Region 3 contains the next highest number of NSAs and Section 4.2 actions in Region 3 include multiple roadway and bridge maintenance actions that are within 0.5 mile of Project components (either segments of the Applicant Proposed Route or HVDC alternative routes). In several instances, the Project routes cross the roadway segment identified for action. There are no implementation dates identified for the Arkansas road activities, but if the Project and an Arkansas road activity were to occur at the same time at a crossing point (a conservative assumption for cumulative impacts to occur), there are some approximations of construction noise that could be made with regard to potential impacts. It is likely that a roadway maintenance action would not involve noise levels as high as those projected for construction of the Project, but if it generated noise levels similar to the Project then the criteria evaluated in Section 3.11.6 would increase by up to 3 dBA. This would act to expand the critical distances beyond the 100 feet for the daytime noise level of 90 dBA L_{eq} and 325 feet for the nighttime noise level of 80 dBA L_{eq} and the increased area would potentially encompass additional NSAs into the area of potential adverse impacts. However, the expanded critical distances would be less than double those used for the Project, because doubling the distance would act to reduce noise levels by about 6 dBA. Accordingly, there would be potential for cumulative impacts, but they would not be expected to involve large numbers of additional NSAs. Moreover, the amount of time the Project would be a crossing point with some other action, such that noise sources would coincide, would be relatively small.

The Section 4.2 present and reasonably foreseeable future actions in Region 3 also include a transmission line activity that would be crossed by the Project. In this case the Seminole to Muskogee transmission line is already constructed, so associated noise would not be cumulative with the Project. Noise associated with operation and maintenance of the Seminole to Muskogee line could be cumulative with the Project, but would be expected to be minor.

4.3.12 Recreation

Potential recreation impacts of concern for the Project, as described in Section 3.12.6, include possible direct effects from construction such as the interruption of recreational activities (including hunting, fishing, wildlife viewing, hiking, camping, and canoeing) due to temporary closure of a recreational area or interruptions from noise, human activity, or visual disturbance in a recreational area. After construction, potential long-term impacts of concern include effects to the scenic landscape of a recreational area, both from the transmission lines and structures and from the changes in vegetation and habitat associated with the ROW, along with periodic interruption of recreational activities that might be caused by maintenance activities. Also of concern over the long-term would be the potential to cause indirect impacts such as decreased use of the recreation area from users opting for a similar recreation area without transmission lines or associated facilities. This last effect could be accompanied by increased visitation at other recreational sites in the area, which could be detrimental to other recreational sites (if overloaded). The impact evaluations in Section 3.12.6 conclude that no components of the Project would permanently preclude use of or access to any existing recreation areas.

To the extent that the present and reasonably foreseeable future actions described in Section 4.2 could involve similar effects on the same recreational sites, their impacts could be additive with those of the Project. For example, any other construction action in similar proximity to a recreation area could have the same potential for interruptive impacts (noise, visual disturbance, access restrictions) as the Project. Per the Section 3.12.5 descriptions of the seven regions, Region 4 appears to encompass the greatest number and variety of recreational areas, including the following Oklahoma and Arkansas areas (from Section 3.12.5.4):

- Robert S. Kerr Lake and Webber Falls Reservoir
- Ozark-St. Francis National Forest
- Ozark National Forest WMA
- Frog Bayou WMA
- Ozark Lake WMA
- Arkansas Scenic Byways: State Highway 540/Boston Mountains Scenic Loop; State Highway 23/Pig Trail Byway; and State Highway 21/Ozark Highlands Scenic Byway
- Arkansas Scenic Highways: State Highway 220, State Highway 59, Interstate Highway 40, U.S. Highway 71
- The Trail of Tears National Historic Trail
- Portions of the Lee and Little Lee creeks wild and scenic rivers managed by the OWRB and listed on the NRI

Therefore, it is assumed the present and reasonably foreseeable future actions identified for Region 4 would likely have the highest potential for recreation impacts that would be cumulative with impacts of the Project.

As was described in the preceding discussion of cumulative noise impacts, the Section 4.2 actions in Region 4 consist of numerous roadway activities, in both Oklahoma and Arkansas, and construction of a hydroelectric plant. However, the only Region 4 activities within 0.5 mile of the Project components are the road actions planned within Crawford County, Arkansas, of which two are crossed by the Applicant Proposed Route and two others are crossed by the HVDC alternative routes. Several of the recreation areas identified within Region 4 are located in Crawford County so cumulative impacts on those areas would be possible. No implementation dates are identified for the Arkansas road actions, but if the Project and an Arkansas road action in Crawford County were to occur at the same time (a worse case assumption), there could be cumulative impacts. Since the applicable Section 4.2 actions are road activities, interruption of access to recreation areas could occur. The noise and visual disturbances associated with road maintenance or construction actions could also be cumulative impacts. Once road maintenance tasks were complete, no additional impacts of a cumulative nature would be expected. However, one of the Crawford County actions identified in Section 4.2 is for a new road, so its completion could represent a new long-term impact similar to the Project in that its presence could involve detrimental impacts to the scenic landscape.

4.3.13 Socioeconomics

The socioeconomic impact analysis for the Project in Section 3.13.6 evaluated potential impacts to population, economic conditions, including the agricultural sector, housing, property values, community services, including law enforcement and fire protection, medical facilities and education, and tax revenues. Section 4.2 identifies a number of present and reasonably foreseeable future actions that could contribute to cumulative impacts, including other transmission lines, oil and natural gas pipelines, other energy facilities, and road and highway improvement activities.

In cases where other construction activities coincide in space and time with the Project, there would likely be an increase in the projected influx of temporary workers and increased demand for temporary housing resources and goods and services. Peak temporary increases in population for the Project are expected to range from less than 0.1 percent (Region 7) to 1.5 percent (Region 1) of the existing 2012 populations for the affected regions. These potential impacts and associated cumulative effects would be short term and temporary. Operation of the Project facilities would require an estimated permanent staff of about 87 workers spread across the different regions. This expected permanent employment would not likely have a noticeable effect on existing short- or long-term population trends and demand for housing and goods and services.

Local expenditures, employment, and construction-related earnings from the Project would have a positive impact on the local economy and employment for the duration of construction. These positive impacts would be increased if other ongoing and reasonably foreseeable future construction actions were to coincide in time with the Project. The resulting cumulative effects would be positive and short term. Long-term economic impacts from the Project would be primarily associated with operation and maintenance-related expenditures of materials and supplies and ad valorem tax revenues. Economic impacts associated with operation and maintenance would be small, especially when compared to the construction-related and ad valorem tax impacts, and the incremental addition of these impacts to other ongoing and reasonably foreseeable future actions would be relatively minor.

Viewed in conjunction with the Project, the combined impacts of the present and reasonably foreseeable future actions identified in Section 4.2 are unlikely to noticeably affect overall agricultural production and employment in the affected counties. Cumulative impacts could, however, be potentially significant for individual agricultural operations due to direct impacts to agricultural land and structures from construction and to agricultural operations given the long-term presence of Project components and their need for periodic maintenance, and as further discussed in Section 4.3.2.

A temporary influx of construction workers associated with other ongoing and reasonably foreseeable future construction actions that coincide in time with the Project could add to the demand for temporary housing resources and goods and services. Viewed in conjunction with the Project, this could result in shortages in housing for temporary construction workers in some locations depending on actual construction schedules (which would be affected by permitting processes, prevailing economic conditions, and the availability of construction contractors), as well as demand from other sectors of the economy, including the oil and gas and travel and tourism industries. This is especially likely to be the case in Region 1 where there is limited housing availability. Unlike other regions of the HVDC Applicant Proposed Route, there are no large communities within 2 hours commuting distance of Region 1 and economic development organizations in the Oklahoma Panhandle region have identified a potential shortage in permanent housing in and around the city of Guymon in Texas County. The potential for a shortage of temporary housing in Region 1 is increased by the fact that the Project includes multiple components (i.e., converter station, AC collection system, and HVDC transmission line) that could feasibly be under construction at the same time or with overlapping times. This potential issue is further exacerbated by the potential construction and operation of the future wind energy facilities in Region 1 that are evaluated as connected actions to the Project in Section 3.13.5.1.

The actions in Region 1 (Section 4.2) consist of two by OG&E (a transmission line and a substation) and several planned by the OKDOT. The OG&E actions are complete and in service, so cumulative impacts associated with housing demand would not be expected. Review of the latest OKDOT 8-Year Construction Work Plan (OKDOT 2013a) identified a number of potential road and bridge actions in Region 1. Currently planned to take place over multiple years (2014 through 2021), one or more of the planned actions could coincide in time with the Project and potentially add to the demand for temporary housing resources and goods and services in and around Region 1. Incremental additions in demand associated with planned OKDOT activities would be small compared to housing demand associated with the Project, with potential demand reduced if the planned work were performed by OKDOT employees or construction companies based in nearby areas. For the purpose of socioeconomic analysis and demand on resources, it is reasonably assumed local workers are already established within their communities and would not contribute to cumulative impact.

The temporary relocation of construction workers to the socioeconomic ROI would create increased demand for community services such as education, medical facilities, municipal services, police, and fire in addition to retail services. Other ongoing and reasonably foreseeable future construction actions that coincide in time with the Project could add cumulatively to this demand. These potential cumulative effects would be short term and temporary given the nature of construction associated with linear facilities. Workers would relocate to new locations once the majority of their work is completed in an area and they relocate to another segment of an activity. Construction associated with converter stations would occur in a given location and construction workers would not be considered transient in nature, although cumulative impacts would still be considered short term and temporary. Peak periods of cumulative impact would occur when transmission line and convertor station construction schedules coincide.

Construction of the Project would generate sales and use tax revenues through expenditures on construction supplies and equipment. Construction of the other reasonably foreseeable future actions identified in Section 4.2

would likely result in similar short-term increases in tax revenues, depending on the size and nature of the activity. This would also be the case with ad valorem revenues, with other activities potentially adding to the increase in ad valorem tax revenues in the affected counties.

4.3.14 Special Status Fish, Aquatic Invertebrate, and Amphibian Species

Consistent with the presentation of the affected environment and impacts in Chapter 3, this section's discussion is presented in two separate groupings: (1) special status terrestrial wildlife species, and (2) special status fish, aquatic invertebrate, and amphibian species.

4.3.14.1 Special Status Terrestrial Wildlife Species

Impacts of concern to special status wildlife species from the Project include mortality or injury of individuals (e.g., collisions, electrocution, or habitat clearing), temporary or long-term displacement by disturbance (i.e., human activity, noise), and habitat loss or fragmentation by Project construction or operation and maintenance activities. Because the spatial and temporal (i.e., seasonal presence) distribution of special status species varies by Project region, potential impacts also would vary by region. Special status species in the Project's ROI are discussed in Section 3.14.1.4 and distribution of these species by region is discussed in Section 3.14.1.5.

To the extent that the present and reasonably foreseeable future actions described in Section 4.2 involve mortalities or new disturbances of habitat used (e.g., for breeding, nesting, brood-rearing, wintering, or foraging) by special status wildlife species, impacts could be additive with those of the Project. Impacts during construction could include loss of habitat from land clearing, temporary disturbance displacement, and possible mortality or injury by vehicles and construction equipment. Most of these impacts would be short term except for habitat loss on sites used for Project structures or access (i.e., roads). During operations and maintenance of the Project, activities could impact special status wildlife species through periodic disturbance (i.e., human activity, noise) and habitat modification (e.g., mowing, cutting, or herbicide spraying of vegetation in ROWs). If present and reasonably foreseeable future actions involved the erection of aboveground structures such as transmission structures, powerlines, and wind turbines, mortality and injury of wildlife species from collisions and electrocutions could occur. Construction and operation and maintenance impacts could be cumulative with those of the Project.

Many of the actions identified in Section 4.2, particularly those for upgrades and maintenance for existing roadways, bridges, or airports would either not involve significant disturbances of new land or would be limited to disturbances along existing disturbed ROWs (e.g., road widening). Most of these types of actions also would not involve construction of aboveground structures that could pose a hazard to special status wildlife species. Therefore, many of these actions would not result in cumulative impacts.

As described in Sections 3.14.1.4 and 3.14.1.5, special status wildlife species occur in each of the seven regions. In Region 1, species that could be affected are the piping plover, whooping crane, lesser prairie chicken, bald eagle, and golden eagle. The reasonably foreseeable future bridge and road activities in Region 1 are unlikely to have cumulative impacts on these species as work would be limited to existing disturbances (i.e., road ROWs) or cause minor new disturbances adjacent to the existing ROWs (e.g., road widening). The Project could have cumulative impacts to other reasonably foreseeable future electrical transmission projects in Region 1, potentially impacting the lesser prairie chicken, whooping crane, and golden eagle. The lesser prairie chicken occupies the grassland/herbaceous vegetation that is common throughout Region 1. The primary migratory route for whooping cranes occurs to the east of Region 1. The golden eagle is a both a seasonal and year-around resident in Region 1.

The reasonably foreseeable future bridge and road actions in Region 2 are unlikely to have cumulative impacts on these species as work would be limited to existing disturbances (i.e., road ROWs) or cause minor new disturbances adjacent to the existing ROWs (e.g., road widening). Potential impacts to whooping cranes, interior least terns, lesser prairie chickens, and bald eagles from the Project could be cumulative with similar impacts from reasonably foreseeable future electrical transmission lines and wind energy projects in Region 2.

Special status species that could be potentially impacted in Region 3 include the gray bat, Sprague's pipit, piping plover, whooping crane, interior least tern, American burying beetle, and bald eagle. The reasonably foreseeable future bridge and road actions in Region 3 are unlikely to have cumulative impacts on these species as work would be limited to existing disturbances (i.e., road ROWs) or cause minor new disturbances adjacent to the existing ROWs (e.g., road widening). To the extent that these actions would not impact special status species, impacts from the Project would not be cumulative.

Four protected bat species, northern long-eared bat, Ozark big-eared bat, gray bat, and Indiana bat, and several protected bird species including the Sprague's pipit, interior least terns, piping plovers, and bald eagle potentially occur in the ROI in Region 4. In addition, the American burying beetle potentially occurs in the ROI. Considering that most of the reasonably foreseeable future actions in Region 4 consists of road and bridge tasks in eastern Oklahoma and in western Arkansas represent actions on existing disturbances (i.e., road ROWs), impacts of the Project are unlikely to be cumulative. One of the Region 4 road actions, however, is for construction of a new segment of US-71 and impacts of Project actions could be cumulative in specific areas of the new road construction.

All four protected bat species, interior least tern, piping plover, and bald eagle potentially occur in the ROI in Region 5. Reasonably foreseeable future actions in Region 5 include road maintenance and construction and a gas transmission pipeline. To the extent that the road actions would occur in existing disturbed ROWs, no cumulative impacts are expected. Any impacts of the Project could be cumulative with impacts from any new road construction. No cumulative impacts are anticipated to the impacts of the gas transmission pipeline as the nearest point of construction is 16 miles.

In Region 6, three species of protected bats (northern long-eared bat, gray bat, and Indiana bat) potentially occur in the ROI. The interior least tern, piping plover, and bald eagle also occur with the ROI. With the exception of a potential new access road (4.7 miles) to be constructed along US-63 in Poinsett County, Arkansas, reasonably foreseeable future road and bridge actions in Region 6 would occur in or along existing disturbed road ROWs and no cumulative impacts are expected. The Project may have some cumulative impacts with construction of the access road in Poinsett County related to land clearing of vegetation.

Region 7 traverses eastern Arkansas to the termination of the Project in Shelby or Tipton county, Tennessee. Two of the four protected species of bats potentially occur in the ROI as well as the interior least tern and bald eagle. The potential impacts of the Project could be cumulative with the impacts of several other reasonably foreseeable future actions in Region 7 (see Section 4.2.7). An industrial development in Osceola, Arkansas on 4,800 acres and a 370-acre residential and commercial development in Munford, Tennessee could have impacts to special status species from habitat loss and disturbance. The expansion of I-69 and the Southern Gateway Project in Tennessee could have impacts similar to the Project.

4.3.14.2 Special Status Fish, Aquatic Invertebrate, and Amphibian Species

Impacts of concern to special status fish, aquatic invertebrate, and amphibian species from the Project include mortality of individuals, sensory disturbance, aquatic habitat disturbance or modification by Project construction or operation and maintenance activities. Because the spatial distribution of special status species varies by Project region, potential impacts also would vary by region. Special status species in the Project's ROI are discussed in Section 3.14.2.4 and distribution of these species by Project region is discussed in Section 3.14.2.5.

To the extent that the present and reasonably foreseeable future actions described in Section 4.2 involve mortalities of special status species or new disturbances of aquatic habitat used by special status fish, aquatic invertebrate, and amphibian species, impacts could be additive with those of the Project. Impacts during construction could include loss of habitat or mortality from in stream disturbances and habitat degradation (e.g., sedimentation, vegetation clearing). Most of these impacts would be short term, although removal or modification of vegetation along stream banks or shorelines could cause longer term impacts. During operations and maintenance of actions, activities could impact special status fish, aquatic invertebrate, and amphibian species through in stream disturbance and habitat modification (e.g., sedimentation). Accidental spraying of herbicides in aquatic habitat or runoff of chemicals into waterbodies could cause mortalities.

Many of the actions identified in Section 4.2, particularly those for upgrades and maintenance for existing roadways and airports would not involve disturbances of aquatic habitats. Most of these types of projects also would not involve construction near aquatic habitats (e.g., stream banks or shorelines) and would not be a hazard to special status fish, aquatic invertebrate, and amphibian species. Therefore, many of these actions would not create cumulative impacts. Potential bridge actions may involve disturbances of aquatic habitats and could create cumulative impacts.

As described in Sections 3.14.2.4 and 3.14.2.5, special status fish, aquatic invertebrate, and amphibian species occur in each of the seven Regions. In Region 1 and 2, species that could be affected are the Arkansas darter and Arkansas River shiner. The bridge actions over the Beaver River on SH-149 (Region 1), Bull Creek on SH-50B (Region 2), and Cimarron River on SH-60 (Region 2) could have cumulative impacts on the Arkansas darter and Arkansas River shiner from potential habitat disturbance during construction but would be limited to the crossing locations. The Project could have cumulative impacts to other reasonably foreseeable future electrical transmission actions in Regions 1 and 2, but potential impacts would be limited to aquatic habitats crossed by the actions. Potential cumulative impacts are expected to be minor as disturbances to aquatic habitat would either not occur at river crossings or be short term and done under specific protocols to limit impacts, such as the EPMs and other measures described in Section 3.14.2.7.

Special status fish species that could be potentially impacted in Region 3 include the Arkansas River shiner and the Arkansas darter. Several reasonably foreseeable future bridge actions are proposed in Region 3 (see Section 4.2.3). The Arkansas River shiner is known to occur in streams and rivers in Kingfisher, Logan, Payne, and Okmulgee counties; the Arkansas darter is expected to be outside the Region 3 ROI, and impacts from these actions, including the potential for increased sedimentation into streams and rivers during construction, would be of potential concern. Any impacts of the Project could be cumulative with potential impacts that could occur from the construction of bridges over streams and rivers in Region 3 that contain potential habitat for the Arkansas River shiner or Arkansas darter. The Project could have cumulative impacts to other reasonably foreseeable future electrical transmission actions in Region 3, but potential impacts would be limited to aquatic habitats crossed by the projects. Potential cumulative impacts are expected to be minor as disturbances to aquatic habitat would either not occur at river crossings or be short term and done under specific protocols to limit impacts.

Two special status fish species, the Arkansas darter and the Ozark cavefish, are known to occur north of the Region 4 ROI, but because of their mobility are also considered to be of potential concern in Region 4. Four protected aquatic invertebrate species, spectaclecase, speckled pocketbook, Neosho mucket, and scaleshell mussel potentially occur in the ROI in Region 4 in the state of Arkansas. The reasonably foreseeable future actions in Region 4 consist of road and bridge tasks in eastern Oklahoma and in western Arkansas that represent actions on existing disturbances (i.e., road ROWs) or bridges (SH-59, Lee Creek), so effects on aquatic habitats would be unlikely, but possible. Any adverse impacts would be limited to the crossing location and would be cumulative with impacts of the Project.

Six protected fish and aquatic invertebrate species, yellowcheek darter, pink mucket, speckled pocketbook, scaleshell mussel, fat pocketbook, and rabbitsfoot potentially occur in the ROI in Region 5 in Arkansas. Reasonably foreseeable future actions in Region 5 include road maintenance and construction and a gas transmission pipeline. To the extent that the road projects would occur in existing disturbed ROWs and no construction or impacts would occur in aquatic habitats, no cumulative impacts are expected. Any impacts of the Project could be cumulative with impacts from any new road construction. No cumulative impacts are anticipated to the impacts of the gas transmission pipeline as the nearest point of construction is 16 miles from the HVDC transmission line routes.

In Region 6, four protected aquatic invertebrate species, pink mucket, scaleshell mussel, fat pocketbook, and rabbitsfoot potentially occur in the ROI in Arkansas. Several actions involve work on existing bridge structures in Jackson and Cross counties. These would be unlikely to result in any disturbance or degradation of the aquatic habitat underneath the bridges, but if they did, the Project could have cumulative impacts with these actions. The bridge and road construction associated with Highway 63 in Poinsett County, Arkansas, could have impacts to aquatic invertebrates (fat pocketbook) where six bridges would be constructed to span the St. Francis River and associated waterbodies. The impacts of the Project could be cumulative with the potential impacts of the Highway 63 bridge and road construction.

The Project in Region 7 traverses eastern Arkansas, crosses the Mississippi River, to the end of the Project in Shelby County or Tipton County, Tennessee. Two protected species, the pallid sturgeon and fat pocketbook, potentially occur in the ROI. The potential impacts of the Project would not be cumulative with the impacts of several other reasonably foreseeable future actions in Region 7 (see Section 4.2.7). An industrial development in Osceola, Arkansas, on 4,800 acres and a 370-acre residential, commercial development in Munford, Tennessee, and I-69 expansion would not have impacts to either the pallid sturgeon or the fat pocketbook mussel. The Project is unlikely to impact either species in Region 7. The fat pocketbook mussel occurs northwest of the ROI and construction across the Mississippi River would not affect the pallid sturgeon. Therefore, any impacts of the Southern Gateway Project in Tennessee (potential new bridge across the Mississippi) would not have impacts cumulative with the Project.

4.3.15 Surface Water

Surface water impacts of concern for the Project are associated with the potential for runoff and receiving water contamination, changes to runoff rates, disturbances to surface water or drainage channels, and effects on water availability. As noted in the Section 3.15.6 discussion of impacts, these concerns would be limited primarily to the construction phase of the Project. The present and reasonably foreseeable future actions described in Section 4.2 for each of the regions would present similar concerns and, likewise, would appear to present possible concerns primarily during construction. There were no specific actions identified that would appear to involve long-term operations that could adversely affect surface water. The possible new hydroelectric power plant identified in Region 4 would likely involve long-term impacts to surface water, but at 12 miles from the nearest segment of the Applicant Proposed Route (and farther from other Project components), it is unlikely that its impacts would be cumulative with those of the Project. The effect on water availability is the possible exception to there being long-term impacts, but even in this area of concern, the actions currently identified for evaluation of possible cumulative impacts include none that would be expected to involve use of large quantities of water during long-term operations.

The actions identified in Section 4.2 would involve typical construction activities and, compared to the Project, would be expected to involve the presence of the same type of potential contaminants (primarily fuels and lubricants in equipment) during construction and to implement the same type of measures to ensure those contaminants were not released. The actions would be expected to involve relatively minor changes to runoff rates and, to decrease their own liability and comply with Clean Water Act and other relevant regulations, would be expected to take precautions to minimize damage or alterations to surface water or drainage channels. As with typical construction activities, water would be needed for actions such as dust suppression, soil compaction, equipment cleaning, and concrete formulation. However, like the Project, these water demands would be relatively minor and short term. Potential impacts to surface water from construction of the Project and from construction of the actions described in Section 4.2 would be minor, even if they were to occur in the same time and place such that impacts were cumulative.

Of the actions described in Section 4.2, it is estimated that Regions 3 and 7 could have the greatest potential for cumulative impacts with the Project. As described in Section 3.15.5.4, Region 4 has the greatest number of surface waters of special interest, but the present and reasonably foreseeable future actions described in Section 4.2 for Region 4 are relatively minor, limited primarily to roadway maintenance.

Region 3 has many road actions planned: replacement of a dam bridge, improvement of airport pavements, and construction of another transmission line. Possibly the largest single action in the region, the dam bridge, is scheduled to be completed prior to the construction start of the Project and the road and transmission line actions involve only modest construction efforts, with relatively small disturbances scattered over a large area, just as with the Project.

Region 7 is the smallest region in terms of the length of the Applicant Proposed Route, but has some of the largest potential actions. Specifically, the I-69 extension and the Southern Gateway Project represent significant construction efforts. Also the Great River Super Site is being developed as an industrial park that could ultimately involve a wide range of industrial activities. However, it is likely that the I-69 and Southern Gateway actions would not have construction impacts cumulative with the Project. The I-69 extension in the area of the Project lacks a firm schedule and likely is many years away. The Southern Gateway Project may also be many years away since the EIS for that project has yet to be completed and, based strictly on where most of the corridors are being considered, its ultimate location, if implemented, will likely be well south of the Project. The Great River Super Site can only be identified as involving potential cumulative impacts because the reference material does not identify any specific projects activities being planned or initiated; it is simply being identified as a location where industrial actions may take place. Construction and operation of heavy industries, such as a steel industry, would be expected to include use of hazardous materials that could pose a threat of surface water contamination if spilled or leaked, similar to the threat posed by fuels and lubricants that would be present during construction of the Project. Like the Project, any new heavy industry would be expected to incorporate the structures, plans, and procedures required by environmental regulations to minimize the potential to cause surface water contamination. Heavy industries may also have high water demands and, because of the location adjacent to the Mississippi River, it is likely that high volume uses such as for cooling would come from surface water. The other action of note in Region 7, the Green Meadows housing development, is also outside of the ROI for surface water.

The present and reasonably foreseeable future actions identified for Regions 3 and 7, although possibly greater in scope than actions in other regions, are still typical, for the most part, because they present only minor potential for adverse impacts to surface water. The exception would be the possible construction of a new bridge over the Mississippi River that would be part of the Southern Gateway Project, which would likely involve significant work directly in the river. However, the Project would not involve any similar work in the Mississippi River, so would not pose cumulative impacts in this regard even if the actions were to occur at the same time and in close proximity to one another. Possibly the greatest threat to surface waters from the construction actions being considered would be from the accidental release of contaminants such as fuels or lubricants, or failed measures to control stormwater runoff that could then carry sediments from disturbed areas to receiving waters. Having multiple actions in the same area with similar potential for incidents might increase the probability for an accident to occur, but with properly managed construction sites and control measures, the probability would still be low.

4.3.16 Transportation

Transportation impacts of concern evaluated in Section 3.16.6 for the Project are as follows:

- Roadways—increases in traffic would result from workers commuting to work sites and from hauling materials and equipment, and could include incidental congestion and delays
- Railways—there would be potential for vehicle, railroad, or transmission line conflicts at railroad crossings
- Airports and airfields—transmission lines and the associated structures are a navigation issue and potentially hazardous if located too close to operating areas

The Section 3.16.6 evaluation of impacts from the Project does not identify any notable issues with regard to railway crossings or airports and airfields. Standard precautions and requirements would minimize concerns at railroad crossings and there were no airports or airfields identified in close enough proximity to Project components to present a particular concern. Impacts to roadway traffic are, therefore, the primary topic for this discussion of cumulative impacts.

The methodology used to evaluate potential impacts to roadway traffic from the Project consists primarily of developing LOS rankings representative of existing traffic conditions and traffic conditions with the Project during construction (the Project's period of highest traffic loading). These "before and after" rankings were developed for the roadways that would likely be used by the Project within the expanded ROI. As described in Section 3.16.6.1, these rankings measure the quality of service of a roadway and are set up comparable to academic grades with LOS-A indicating the best and LOS-F indicating the worst operation conditions. According to national guidelines, an LOS-C or better is acceptable on rural roadways and an LOS-D is considered the minimum acceptable within urban areas.

Evaluations for the Project, including the HVDC alternative routes, typically resulted in a LOS decrease of one-level for the evaluated roadways, although in some cases there was no LOS drop. (Also, there were drops of two levels in some of the connected action evaluations.) Locations of primary concern identified in this manner were roadway segments where Project traffic could result in LOS-D conditions (no LOS-F roadways were predicted). The LOS-D conditions were predicted for 12 roadway segments in Region 4 of the Applicant Proposed Route, one roadway segment in Region 5, and 10 roadway segments in Region 7. LOS-D conditions were also predicted in the Tennessee converter station evaluation, which considered the same roadways as the Region 7 evaluation. As would be expected, the evaluations of the HVDC alternative routes had the same or very similar results as the Applicant Proposed Route because they generally considered the same roadways.

Roadways in the vicinity of components of the Project that have existing LOS-C conditions are logically found in or near urban areas. Dropping those levels to LOS-D might still be considered acceptable levels of traffic based on national guidelines. It should be noted that local jurisdictions can establish specific guidelines and requirements that differ from the national guidelines. Based on the evaluation in Section 3.16.6, it is assumed that the most likely areas where there could be cumulative traffic impacts of concern are the areas of Regions 4, 5, and 7. This evaluation of cumulative impacts looks at Regions 4 and 7 because they had the highest number of roadway segments dropping to an LOS-D. Region 5 consists mostly of forested lands, open agricultural lands, and rural residential developments, so it is expected that potential impacts to roadway traffic would not be of major concern.

Although no traffic loading estimates are available, to the extent that the present and reasonably foreseeable future actions described in Section 4.2 involve traffic increases, their impacts could be additive with traffic increases of the Project. The Section 4.2 actions in Region 4 consist of numerous roadway actions in both Oklahoma and Arkansas, and construction of a hydroelectric plant. The hydroelectric plant location is outside of the expanded roadway ROI, so it is not likely that the two actions would have significant traffic effects on the same roadway sections (i.e., the further apart, the more likely traffic associated with either action would be spread out over many roads, lessening impacts). However, all of the Region 4 roadway actions identified in Section 4.2 are within, or have portions within, the expanded ROI. Because these other actions consist primarily of road maintenance work, potential impacts to existing roadway traffic are compounded; the actions could involve added traffic moving to and from work sites as well as the congestion and delays inherent with the work. For the most part, the Region 4 roadway projects would be expected to be relatively small and occur over a number years. Since these are actions undertaken by the respective state transportation agencies, it is reasonable to assume they would be planned and implemented in a manner to minimize impacts on existing traffic flow. Further, because of the state agency's involvement, there should be mechanisms in place that would allow for coordination such that impacts to area traffic and the Project are minimized.

Similar to Region 4, the present and reasonably foreseeable future actions described in Section 4.2 for Region 7 do not include estimates of traffic loading. The Region 7 roadway maintenance actions would be expected to have the same type of concerns and potential impacts as described above for Region 4 if they were to occur at the same time as construction actions for the Project. The I-69 extension and the Southern Gateway Project in Region 7 represent significant construction efforts, but are potentially many years from construction. Both projects could reasonably involve increases to roadway traffic that would be cumulative with those of the Project were they to occur in the same general area, at the same time. However, neither action currently has a well-defined schedule and, based on where most of the corridors for the Gateway Project are being considered, its ultimate location, if implemented, would likely be well south of the Project. Other Region 7 present and reasonably foreseeable future actions include the two development areas: Great River Super Site for industrial and Green Meadows for housing. Increases in construction traffic and even commercial traffic in the case of the Great River Super Site could be cumulative with Project construction traffic if they occurred at the same, but no defined activities or schedules were identified to gauge the likelihood of this occurring.

4.3.17 Vegetation Communities and Special Status Plant Species

The Project's potential impacts of concern to vegetation communities and special status plant species are associated with several different types of activities. Project actions and potential impacts of concern are summarized in the following:

- Clearing and grading—Potential impacts include mechanical damage and/or removal of vegetation by heavy machinery, compaction of soils thereby reducing its water-holding capacity and inhibiting plant growth, and introduction of invasive species from construction equipment or spread of existing invasive species on newly cleared land.
- Placement of structural foundations—Potential impacts include mechanical damage and/or removal of vegetation.
- Access road construction—Potential impacts include alteration of hydrology, which could affect plant growth, mechanical damage, and/or removal of vegetation.
- Excavation for grounding wires, fiber optic regeneration cables, and transmission line structural foundations—Potential impacts include mechanical damage and/or removal of vegetation by heavy machinery, compaction of soils thereby reducing its water-holding capacity and inhibiting plant growth, long-term conversion of forested and shrublands to herbaceous cover type within ROWs, which includes effects of habitat fragmentation, and introduction of invasive species from construction equipment or spread of existing invasive species on newly cleared land.
- Blasting—Potential impacts include mechanical damage of vegetation.
- Herbicide use—Potential impacts include contamination from herbicide drift or runoff that could stunt plant growth or inhibit the onset of growth.
- Hazardous materials handling—Potential impacts include contamination from accidental spills of hazardous substances, such as fuels and lubricants, which could stunt plant growth or inhibit the onset of growth.

To the extent that the present and reasonably foreseeable future actions described in Section 4.2 involve new disturbance of vegetated lands, their impacts could be additive with those of the Project. Impacts during construction could involve additional loss of vegetation, damage or inhibition of native vegetation with potential for introduction of invasive or noxious species, and segmentation of habitat. Many of these construction-related impacts would be short term, but vegetation loss in areas of structures and access roads would be long-term. During operations and if the actions were for new electrical transmission lines, buried oil or natural gas pipelines, or similar actions, vegetation could reestablish on most disturbed areas. However, in ROWs vegetation would be managed so maintenance activities would not be affected, especially in forested areas where trees could restrict access or, in the case of transmission lines, adversely affect operations if allowed to reestablish. Similarly, woody vegetation (shrubs or trees) would be restricted above oil or natural gas pipelines to prevent root damage to the pipeline. As described in Section 3.17.5, two federally-protected plant species have the potential to occur along the ROI of the Project and state-recognized special status plants may also occur. Special status plant species could be impacted the same as other vegetation unless, as described for the Project, plant surveys are carried out prior to construction activities and there is a commitment to mark special status species and avoid them to the maximum extent possible. All of these types of impacts could be cumulative with those of the Project if they were to occur within the same vegetation community.

Many of the actions identified in Section 4.2, particularly those associated with upgrades or maintenance actions for existing roadways, bridges, or airports, would be expected to involve only minor amounts, if any, of new disturbance to vegetation communities and, accordingly, would be unlikely to affect vegetation or special status plant species. Therefore, those projects would not create cumulative impacts to the Project and are not addressed further in the following discussions of individual regions.

In Regions 1 and 2, the Hitchland-Woodward and Woodward-Thistle Transmission Line actions, respectively, could have similar impacts of the Project, but on a smaller scale, being restricted to a much shorter length of transmission line. Impacts from the transmission lines could be cumulative with the impacts of the Project. The Mammoth Plains Wind Farm Project in Region 2 is 14 miles from the closest corridor of the Project, and therefore is unlikely to have cumulative impacts to vegetation. No federal or state threatened or endangered plant species are known to occur in the ROI in Regions 1 or 2. Therefore, the Project would have no cumulative impacts on any special status plant species.

No cumulative impacts would likely occur in Region 3 and no federal or state threatened or endangered plant species are known to occur in the ROI in Region 3.

Region 4 occurs in eastern Oklahoma and western Arkansas. The actions in Oklahoma and most in Arkansas would not involve cumulative impacts. No federal or state threatened or endangered plant species are known to occur in the ROI in the Oklahoma portion of Region 4. In Crawford County, of western Arkansas, new construction on Highway 71 could involve new disturbance of land and vegetation and impacts could be cumulative with those of the Project depending the selected alternative routes. The ovate-leaf catchfly (*Silene ovata*) is an Arkansas state listed endangered plant species that is known to occur in Crawford County. Potential impacts to this species from the Project could be cumulative with potential highway construction but could be mitigated by conducting surveys and avoiding known populations.

In Region 5, the present and reasonably foreseeable future actions would be unlikely to have impacts to vegetation that are cumulative with the Project. The Central Arkansas Natural Gas Pipeline Enhancement Project (natural gas pipeline) would be 16 miles from the nearest route alternative of the Project and would not have impacts cumulative with the Project. Thirteen special status plant species occur in Region 5. Because the present and reasonably foreseeable future actions in Region 5 would likely not have impacts to special status species, impacts from the Project would not be cumulative with those actions.

As was described in Section 4.3.3 with respect to air quality, the present and reasonably foreseeable future actions in Regions 6 and 7 include some of the largest construction activities of any identified in Section 4.2. Accordingly, it is assumed that Regions 6 and 7 actions could have the highest potential for vegetation community impacts that are cumulative with those of the Project. The US-63 access road construction in Region 6 and the I-69 extension and the Southern Gateway Project in Region 7 represent significant construction efforts. A construction date for the work on

US-63 was not available, but it is assumed it could be in the same time as the Project. With regard to the two actions in Region 7, it is likely there would only be cumulative impacts on a general, regional basis (i.e., contribute to loss of vegetation in the region). The I-69 extension lacks a firm schedule and likely is many years away, and the Southern Gateway Project may also be many years away because the EIS has yet to be completed, but both actions could reasonably involve loss of regional vegetation that would be cumulative with vegetation losses associated with the Project as well as any other action that expands urban area. Also, based on where most of the corridors for the Gateway Project are being considered, its ultimate location, if implemented, would likely be well south of the Project. Other Region 7 actions include two development areas, one as an industrial park (Great River Super Site) and another as a housing community (Green Meadows) where loss of vegetation would be expected from construction, although in this case the land area being converted appears to consist mostly of agricultural land. Two special status plant species occur in Region 6 and the Arkansas portion of Region 7. Six special status plant species potentially occur in the ROI of the Tennessee portion of Region 7. Potential impacts to these species from the Project could be cumulative if populations of those species occur in areas impacted by the present and reasonably foreseeable future construction projects. Impacts could be mitigated by performing plant species surveys and avoiding any identified populations.

4.3.18 Visual Resources

The Chapter 3 evaluation of the Project's impacts on visual resources uses concepts and tools from the Bureau of Land Management's Visual Resource Management system on lands other than National Forest. The evaluation of visual impacts to National Forest land (applicable only to HVDC Alternative Route 4-B) follows the U.S. Forest Service's Scenery Management System to determine whether Scenic Integrity Objectives and landscape character goals would be met. The evaluation methodology is presented in Section 3.18.6.1 and, for areas not crossing National Forest land, entails a process of rating the existing scenic quality of the landscape and the sensitivity of the viewers, then evaluating impacts from the Project at key observation points (KOPs), which are selected based on a separate set of criteria. The evaluation results in assigning impact ratings ranging from low to high with several intermediate levels, including a central "moderate" rating. For purposes of this evaluation of cumulative impacts, the Chapter 3 evaluations identify "high impacts" where Project components would be dominant or readily apparent from KOPs and would introduce form, line, color, and texture changes inconsistent with the existing landscape. The overall impact ratings are a combination of visual, scenery, and sensitive viewer impacts that individually have the following criteria for when "high" impacts occur:

- Visual Impacts—Where Project components are dominant or readily apparent from KOPs. Project components would introduce form, line, color, and texture changes that are inconsistent with the existing landscape.
- Impacts to Scenery—Distinct or Common landscapes substantially altered by the Project (i.e., where similar facilities do not exist in the landscape).
- Impacts to Sensitive Viewers—Where the Project is dominant with a view and highly noticeable by the casual observer, or where the Project introduces a high level of contrast to the existing landscape.

Based on the Chapter 3 evaluations of potential impacts to visual resources, Region 4 could be characterized as having the highest combination of scenic landscape and viewer concern and, correspondingly, as the region that would experience the highest potential for visual impact from the Project. As described in Section 3.18.6.2.3, the Region 4 Applicant Proposed Route contains a high density of existing landscape of the highest scenic quality (i.e., Distinct), there are 44 KOPs in Region 4 compared to 17 for the next highest region (Region 5), and potential impacts from the Project are rated at "high" at 11 of the Region 4 KOPs compared to the next highest region (also Region 5), which would have only five "highly" impacted KOPs. The HVDC alternative routes within Region 4, evaluated in Section 3.18.6.3.2 contain similar characteristics and with regard to HVDC Alternative Route 4-B, segments of the Project would cross USFS land and would include areas that would not comply with Scenic Integrity Objectives. Based on these characteristics, it is reasonable to assume that present and reasonably foreseeable future actions within Region 4 would have a higher potential for adverse impacts to visual resources than other regions, which could then be cumulative with those of the Project. For that reason, the following discussion focuses primarily on potential cumulative impacts in Region 4 and also considers other Regions.

The actions described in Section 4.2.4 for Region 4 are largely limited to roadway actions in Oklahoma and Arkansas. The Cherokee Nation Hydroelectric Power Plant, the only non-road action identified in Region 4, is about 12 miles from the nearest segment of the Applicant Proposed Route or HVDC alternative routes and likely would not be visible from any of the KOPs that could be affected by the Project. The Region 4 roadway actions are within 2 to 3 miles of the Project routes and are all reasonably close to, and likely visible from, at least one KOP. For example, OKDOT road work on I-40 (near Highway 82) is near to Vian Lake and Highway 82 KOPs; and the OKDOT road work on the more eastern section of I-40, as well as Highways 64, 59, and 101 are all near the Sallisaw KOP. In Arkansas, AHTD road work on Highway 59 is near three KOPs (Fire Tower Lookout, Trail of Tears Route 59, and Route 220 Scenic Highway) and the road work on I-540 and Highway 71 (roughly parallel to one another) are near three other KOPs (Frog Bayou Creek, Route 71 Scenic Byway, and Alma). Visual impacts from the roadway actions to these and other KOPs in Region 4 would be cumulative with those from the Project if they occurred at the same time. Exceptions would be in those instances where an evaluated KOP indicated no impacts from the Project. For example, the OKDOT planned activity on Highway 10A extends to a point that is quite close (less than 2 miles) to the Tenkiller State Park KOP, but the overall impact of the Project (for either the Applicant Proposed Route or HVDC Alternative Route 4-A/4-B) at that location is "no impact." As a result, the Project would have no cumulative visual impacts with the Highway 10A activity at that KOP.

Although the roadway actions in Region 4 could involve visual impacts cumulative with those of the Project, with a single exception, the roadway actions would be short-term visual intrusions involving construction vehicles, equipment, workers, and possibly visible dust in areas where viewers would be accustomed to seeing vehicle traffic. Also, as relatively short duration impacts, they would not be directly comparable to the overall impacts or ratings given to KOPs in Chapter 3 because those ratings are based on the long-term presence of structures (primarily transmission line structures) associated with the Project. Accordingly, the roadway actions could have cumulative impacts with the Project, but they would not be expected to affect the overall impact ratings associated with long-term operations under the Project. The exception identified above for involving short-term impacts, is the roadway activity involving construction of a new section of Highway 71. This planned section of new road would start near the community of Alma and extend southward to loop around the east side of Kibler. In this segment, the new road would cross Link 6 of the Region 4 Applicant Proposed Route and be very near the Alma KOP. The overall impact rating at the Alma KOP from the Project is "moderate" (Table 3.18-12) and visual impacts of the new section of Highway 71 would be cumulative over the long-term with those of the Project.

Outside of Region 4, a majority of the present and reasonably foreseeable future actions described in Section 4.2 consist of road work or other actions not involving high structures and, as such, potential impacts to visual resources would likely be much more localized than those associated with the Project. Notable exceptions would be the transmission line actions and the wind farm development that involve tall structures like the Project. The Region 2 wind farm action is about 14 miles from the nearest component of the Project so cumulative visual impacts, if any, would be expected to be minor. With regard to other transmission line actions, the OG&E Hitchland-Woodward Transmission Line in Region 1 and the OG&E Seminole to Muskogee Transmission Line in Region 3 have both been recently completed and the Chapter 3 evaluation of visual impacts includes the presence of existing transmission lines in those areas when rating the impacts of the Project. There is no similar mention of existing transmission lines in Chapter 3 in the area that would be crossed by the OG&E Woodward-Thistle Transmission Line in Region 2 because it is still under construction.

4.3.19 Wetlands, Floodplains, and Riparian Areas

The Project's potential impacts of concern to wetlands, floodplains, and riparian areas are associated with several different types of activities. Project actions and potential impacts of concern include:

- Clearing and grading—Potential impacts include sedimentation and turbidity from activities adjacent to wetlands, alteration of hydrology, placement of fill or dredging in wetlands, and alteration of hydrology in floodplains and riparian areas.
- Herbicide use—Potential impacts include contamination from herbicide runoff that could reach wetlands or riparian areas through overland runoff paths.
- Placement of structural foundations—Potential impacts include alteration of hydrology, placement of fill or dredging in wetlands, long-term conversion of forested wetlands to shrubby or herbaceous cover type within the ROW, and in floodplains there could be changes in flood grade or elevations.
- Tensioning of lines—Potential impacts include sedimentation and turbidity from activities adjacent to wetlands.
- Construction equipment usage—Potential impacts include mechanical damage/crushing of wetland vegetation; compaction of wetland or floodplain soils, potentially reducing soil's water-holding capacity; and introduction of invasive species from construction equipment.
- Excavation and dewatering within wetlands or riparian areas for grounding wires, fiber optic regeneration cables, and transmission line structural foundations—Potential impacts include mechanical damage/crushing of wetland or riparian vegetation and alteration of hydrology.
- Blasting—Potential impacts include alteration of hydrology and sedimentation and turbidity from activities adjacent to wetlands.
- Hazardous materials handling—Potential impacts include contamination from accidental spills into wetlands or which could reach wetlands through overland runoff paths.
- Wastewater discharges from concrete batch plants—Potential impacts include contamination which could reach wetlands through overland runoff paths.

Because wetlands, floodplains, and riparian areas are attributes or features of the land, the present and reasonably foreseeable future actions described in Section 4.2 most likely to affect these features are those involving new land disturbances. Or, in the case of wetlands and riparian areas, they could be affected by contaminated runoff from projects, with or without new land disturbance. Impacts of the Project and the present and reasonably foreseeable future actions in Section 4.2 actions could be cumulative in the general sense (e.g., the combined acreage of impacted wetlands in a region is increased) or they could be cumulative in terms of a specific wetland, floodplain, or riparian area, depending on the physical proximity of the actions. In the case of floodplains, actions not in close proximity, but crossing floodplains of the same surface water feature, could have cumulative impacts by individually altering flood levels over a wide area and the affected areas overlap.

In Regions 1 and 2, transmission line actions would have impacts similar to the Project (although on a smaller scale because of the much shorter length) and could have cumulative impacts to wetlands, floodplains, and riparian zones. However, those impacts generally would be limited to locations where the wetland, floodplain, or wetland was crossed and in some cases construction in such locations could be avoided by spanning the area. Several road actions include bridges, which may have some impacts to wetland, floodplain, or riparian areas in a localized area if it is new construction. However, the potential impacts (disturbance of wetland, floodplain, or riparian vegetation or sedimentation from runoff), are expected to be small and would not overlap impacts of the Project.

Actions in Regions 3 and 4, where the number of potential wetland, floodplain, and riparian area crossings are the highest of any of the regions (Section 3.19.5) could have a higher likelihood of affecting such areas. Present and reasonably foreseeable future actions in Regions 3 and 4 include multiple road maintenance actions, a bridge replacement, and improvements at an existing airport (Section 4.2). All of which would be expected to primarily involve work on already disturbed land. No new structures would be expected as part of these actions, so no changes in flood elevations or floodplains would be expected. As with the Project, construction equipment would carry fuels and lubricants that could result in contaminated stormwater runoff if accidentally released and not quickly cleaned up. Otherwise, there would be minimal potential for adverse impacts to wetlands and riparian areas from these maintenance- and refurbishment-types of actions. In addition, the bridge and airport actions are well removed (each about 17 miles) from the nearest segment of the Applicant Proposed Route.

The present and reasonably foreseeable future actions in Regions 3 and 4 also include a transmission line and a hydroelectric plant. The transmission line would be expected to involve potential impacts very similar to those described in Section 3.19.6.1 for the Project, although at a smaller scale. Also, because the transmission line location is crossed by the Applicant Proposed Route as well as the HVDC alternative routes, there could be cumulative impacts to the same wetlands, floodplains, or riparian areas. The hydroelectric plant, being on the Arkansas River, could involve impacts to wetlands, floodplains, and riparian areas, but because the proposed plant site is about 12 miles from the nearest component of the Project, any cumulative impacts would likely not be to the same specific wetlands, floodplains, or riparian areas.

Region 5 actions consist of road actions that would occur in existing disturbed ROWs. To the extent that these actions are not adjacent to wetlands, floodplains, and riparian areas and would not cause sedimentation or alter the hydrology, the Project would not contribute to cumulative impacts. The Central Arkansas Natural Gas Pipeline Enhancement Project is 16 miles from the nearest possible route alternative and any impacts would be not be cumulative with any impacts to wetlands, floodplains, or riparian areas along the Project.

The present and reasonably foreseeable future actions in Region 6 include road and bridge actions and a rebuild of a transmission line. The transmission line could have cumulative impacts to the Project if wetlands, floodplains, and riparian areas occur at the location where the two actions cross. Most of the road and bridge actions involve work in existing road ROWs and on existing bridge structures and no impacts to wetlands, floodplains, and riparian areas are expected. Proposed road and bridge construction in Poinsett County, Arkansas for the Highway 63 access road (4.7 miles) would include six bridges and a new road that would cross the St. Francis River and adjacent waterbodies (see Section 4.2.6). Several Project alternative routes are in the general vicinity (0.8 to 4 miles) of the construction. Potential impacts could be cumulative with the road and bridge construction if any of these alternative routes are selected for the Project.

Region 7 actions include some of the largest construction activities along the Project ROI. The I-69 extension and the Southern Gateway Project in Region 7 represent significant construction efforts, but are potentially many years from construction. Both actions could reasonably involve loss of regional wetlands, floodplains, and riparian areas that would be cumulative with losses associated with the Project as well as any other action that expands the urban area. Also, based on where most of the corridors for the Southern Gateway Project are being considered, its ultimate location, if implemented, would likely be well south of the Project. Other Region 7 present and reasonably foreseeable future actions include two development areas, one as an industrial park (Great River Super Site) and another as a housing community (Green Meadows) where loss of wetlands, floodplains, and riparian areas could occur, although most of the land area being developed appears to be agricultural land. Potential impacts to wetlands, floodplains, and riparian areas from the Project would likely be cumulative only on a general, regional basis unless specific alternative routes near these projects were selected.

4.3.20 Wildlife, Fish, and Aquatic Invertebrates

Consistent with the presentation of the affected environment and impacts in Chapter 3, this section's discussion is presented in two separate groupings: (1) wildlife, and (2) fish and aquatic invertebrates.

4.3.20.1 Wildlife

As identified in Section 3.20.1.7.1, wildlife resources evaluated include important recreational species, migratory birds, reptiles and amphibians, and mammal species known to occur or have the potential to occur within the ROI. Wildlife impacts of concern for the Project are as follows:

- Potential impacts from short or long-term displacement of wildlife species
- Fragmentation of wildlife habitat, including significant grassland habitat in central Oklahoma
- Potential disturbance to known populations and/or suitable habitat for wildlife species
- Potential impacts to old growth forests
- Potential impacts to wildlife movement, migratory birds and flyways (including the Mississippi Flyway, Audubon-designated Important Bird Areas, or other federal or state designated bird areas)
- Potential for avian collisions and/or electrocution
- Potential impacts of invasive plant species on wildlife habitats

Potential impacts would vary by region because the spatial and temporal (i.e., seasonal presence) distribution of wildlife species varies by Project region (1 through 7). Wildlife species in the Project's ROI are discussed in Section 3.20.1.3 and distribution of these species by Region is discussed in Section 3.20.1.5.

To the extent that the present and reasonably foreseeable future actions described in Section 4.2 involve wildlife mortalities or injuries, displace wildlife by disturbance (short- or long-term), and disturb habitats used by wildlife species (e.g., for breeding, nesting, brood-rearing, wintering, or foraging), impacts could be additive with those of the Project. Impacts during construction could include loss of habitat from land clearing, temporary disturbance displacement, and possible mortality or injury by vehicles and construction equipment. Most of these impacts would be short term except for habitat loss on sites used for project structures, access (i.e., roads), or ROW maintenance. During operations and maintenance of projects, activities could impact wildlife species through periodic disturbance (i.e., human activity, noise) and habitat modification (e.g., mowing, cutting, or herbicide spraying of vegetation in ROWs) as well as continuous disturbance via the presence of transmission lines and structures. If present and reasonably foreseeable future actions involved the erection of aboveground structures such as transmission structures, power lines, and wind turbines, mortality and injury of wildlife species from collisions and electrocutions could occur. Construction and operation and maintenance impacts could be cumulative with the Project.

Many of the actions identified in Section 4.2, particularly those for upgrades and maintenance for existing roadways, bridges, or airports would either not involve significant disturbances of new land or would be limited to disturbances along existing disturbed ROWs (e.g., road widening). Most of these types of actions also would not involve construction of aboveground structures that could pose a hazard to wildlife species (e.g., migratory birds or bats). Therefore, those actions would not create cumulative impacts and are not addressed further in the following discussions of individual regions.

Because the climate and vegetation varies from west to east, the wildlife species present in each Region also varies from west to east. The wildlife species that could be impacted are described in Sections 3.20.1.4 and 3.20.1.5. Potential impacts to wildlife from the Project could be cumulative with similar impacts from reasonably foreseeable future electrical transmission lines and wind energy developments in Regions 1 and 2.

Considering that most of the reasonably foreseeable future actions in Region 4 consist of road actions, impacts could be cumulative in specific areas where road actions consist of new construction and could cause wildlife mortality, disturbance, and habitat loss.

In Region 5, any impacts of the Project could be cumulative with impacts from any new road construction. No cumulative impacts are anticipated to the impacts of the gas transmission pipeline as the nearest point of construction is 16 miles.

In Region 6, a potential new access road (4.7 miles) to be constructed along US-63 in Poinsett County, Arkansas would be expected to involve cumulative impacts to wildlife related to land clearing of vegetation.

Region 7 traverses eastern Arkansas to the termination of the project in Shelby County or Tipton County, Tennessee. The potential impacts to wildlife of the Project could be cumulative with the impacts of several other reasonably foreseeable future actions in Region 7 (see Section 4.2.7). An industrial development in Osceola, Arkansas on 4,800 acres and a 370 acre residential and commercial development in Munford, Tennessee could have impacts to wildlife species from mortality, habitat loss, and disturbance. The expansion of I-69 and the Southern Gateway Project in Tennessee could have impacts similar to the Project that would be cumulative.

4.3.20.2 Fish and Aquatic Invertebrates

As identified in Section 3.20.2.6.1, aquatic resources evaluated include river, stream, or creek crossings as well as any perennial waterbodies within the ROI. Fish and aquatic invertebrate impacts of concern for the Project are as follows:

- Potential impacts from construction activities, vehicles, equipment, and access roads on aquatic species and their habitats
- Potential impacts from permanent removal of vegetation or temporary mechanical damage to vegetation
- Possible spread and/or introduction of invasive plants or listed noxious weed species from the use of construction equipment at waterbody crossings

- Potential impacts associated with ROW vegetation maintenance, including the use of herbicides during operation of the Project
- Potential for sediment loading and introduction of chemicals from spills in aquatic habitat, causing alterations to the habitat or the introduction of hazardous materials.
- Potential changes to stream morphology due to adjacent riparian clearing

Impacts of concern to fish and aquatic invertebrate species from the Project include mortality of individuals and aquatic habitat disturbance or modification by Project construction or operation and maintenance activities. Because the spatial distribution of species varies by Project region, potential impacts also would vary by region. Fish and aquatic invertebrate species in the Project's ROI are discussed in Section 3.20.2.3 and distribution of these species by Project region is discussed in Section 3.20.2.5.

To the extent that the present and reasonably foreseeable future actions described in Section 4.2 involve mortalities of fish and aquatic invertebrate species or new disturbances of aquatic habitat used by fish and aquatic invertebrate species, impacts could be additive with those of the Project. Impacts during construction could include loss of habitat or mortality from in-stream disturbances and habitat degradation (e.g., sedimentation, vegetation clearing). Most of these impacts would be short term, although removal or modification of vegetation along stream banks or shorelines could cause longer term impacts. During operations and maintenance of projects, activities could impact fish and aquatic invertebrate species through in-stream disturbance and habitat modification (e.g., sedimentation). Accidental spraying of herbicides in aquatic habitat also could cause mortalities.

Many of the actions identified in Section 4.2, particularly those for upgrades and maintenance for existing roadways and airports would not likely involve disturbances of aquatic habitats. Most of these types of actions also would not involve construction near aquatic habitats (e.g., stream banks or shorelines) and would not be a hazard to fish and aquatic invertebrate species considering the standard requirements for management and control of runoff from construction sites. Therefore, many of these actions would not create cumulative impacts. Potential bridge actions may involve disturbances of aquatic habitats and could create cumulative impacts.

The Project could have cumulative impacts with other present and reasonably foreseeable future electrical transmission actions in the regions, but potential impacts would be limited to aquatic habitats crossed by the actions. Potential cumulative impacts are expected to be minor as disturbances to aquatic habitat would either not occur at river crossings or be short term and done under specific protocols to limit impacts.

Reasonably foreseeable future actions in Region 5 also include a gas transmission pipeline; however, no cumulative impacts are anticipated to the impacts of the gas transmission pipeline as the nearest point of construction is 16 miles.

The potential impacts of the Project would not be cumulative with the impacts of several reasonably foreseeable future actions in Region 7 (see Section 4.2.7). An industrial development in Osceola, Arkansas on 4,800 acres and a 370-acre residential, commercial development in Munford, Tennessee, and Interstate 69 expansion would not have impacts to aquatic habitats. Construction of the Project across the Mississippi River would not affect aquatic habitats as equipment would not be in the river. Therefore, any impacts of the Southern Gateway Project in Tennessee (potential new bridge across the Mississippi) would not have impacts cumulative with the Project.

5. List of Preparers

Table 5-1:
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6.3.14 Special Status Wildlife Fish, Aquatic Invertebrate, and Amphibian Species

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6.5 GIS Data Sources

This section provides source information for GIS data used or referenced in the development of the EIS, including those used to produce the maps in Appendix A. The data files are not provided on the Reference CD accompanying the EIS because the file sizes can be very large and the files also require specialized software to view. The data sources that were analyzed are available at the links provided below.

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7. Glossary

100-Year Floodplain	The area that would be inundated by a flood with a recurrence interval of once in 100 years, on average. This can also be stated as areas that have a 1 percent chance of being flooded in a given year. (See Floodplain.)
600kV DC Transmission Line	A transmission line with a capacity of approximately 600 kilovolts of direct-current electricity.
AADT (Annual Average Daily Traffic)	The total volume of traffic passing a point or segment of a roadway facility in both directions for 1 year divided by the number of days in the year.
AC Collection System	AC collection system is made up of thirteen 2-mile-wide routes in Oklahoma (Beaver, Cimarron, and Texas counties) and Texas (Hansford, Ochiltree, and Sherman counties) within which four to six AC transmission lines would be sited; depending on the location of future wind energy development. The AC collection system would collect energy from generation resources. Components of the AC collection system include: • ROW easements for the transmission line, with a typical width of approximately 150 to 200 feet • Tubular or lattice steel structures used to support the transmission line • Electrical conductor • Communications/control and protection facilities (optical ground wire (OPGW) and fiber optic regeneration sites)
AC/DC (Alternating Current/Direct Current)	An alternating current (AC) power line alternates as a rate of 50 to 60 times a second (Hz), while a direct current (DC) power line produces a static electric field that does not alternate.
Access road	Roads constructed to each structure site first to build the tower and line, and later to maintain and repair it. Access roads are built where no roads exist. Where county roads or other access is already established, access roads are built as track roads to the structure site except where they pass through cultivated land. There, the road is restored for crop production after construction is completed.
Advisory Council on Historic Preservation	Established by the National Historic Preservation Act in 1966, the Advisory Council on Historic Preservation is an independent Federal agency that promotes the preservation, enhancement, and productive use of the advisory agency for the president and congress on historic preservation policy.
Aerial Photography	Used to identify and verify land uses within the Project corridors and ROWs.
Affected Environment	The affected environment section of the EIS describes the baseline conditions with regard to a specific resource to provide the context for understanding the environmental impacts associated with the Project.
Agriculture	Agriculture: The science, art, or practice of cultivating the soil, producing crops, and raising livestock. A land use characterized by land cultivated for crop production and raising livestock.
Alluvium	Deposits left by flowing water, usually clay, silt, sand, or gravel.
Alternative	Options that a federal agency considers to address the significant issues and meet the purpose of and need for a proposed project in an environmental analysis. Also used to describe other routes under consideration.

Alternative Routes	Multiple individual transmission line routes that each traverse from point A to point B in a separate and distinct way. In addition to the Applicant Proposed Route, DOE has identified and compared two to six alternative routes within each of the seven geographic regions: • Region 1: Oklahoma Panhandle in Texas, Beaver, Harper, and Woodward counties, Oklahoma • Region 2: Oklahoma Central Great Plains in Woodward, Major, and Garfield counties, Oklahoma • Region 3: Oklahoma Cross Timbers in Garfield, Kingfisher, Logan, Payne, Lincoln, Creek, Okmulgee, and Muskogee counties in Oklahoma • Region 4: Arkansas River Valley in Sequoyah County, Oklahoma and Crawford, Franklin, Johnson, and Pope counties, Arkansas • Region 5: Central Arkansas in Pope, Conway, Van Buren, Faulkner, Cleburne, White, and Jackson counties, Arkansas • Region 6: Cache River, Crowley's Ridge Area, and St. Francis Channel in Jackson, Cross, and Poinsett counties • Region 7: Arkansas Mississippi River Delta and Tennessee in Poinsett and Mississippi counties, Arkansas and in Tipton and Shelby counties, Tennessee
Anthropogenic	Made by people or resulting from human activities.
APE (Area of Potential Effect)	The geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if any such properties exist. Additionally, the APE is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking (36 CFR 800.16(d)).
APP (Avian Protection Plan)	A plan, consistent with Avian Power Line Interaction Committee (APLIC) guidelines that describes a program of specific and comprehensive actions that, when implemented, would reduce the risk of avian mortality.
Applicant	Clean Line Energy Partners LLC of Houston, Texas, the parent company of Plains and Eastern Clean Line LLC and Plains & Eastern Clean Line Oklahoma LLC (collectively referred to as Clean Line or the Applicant in the Plains and Eastern Environmental Impact Statement.
Applicant Proposed Project	Based on Clean Line's proposal to DOE, the basic elements include converter stations in Oklahoma and Tennessee, AC interconnections at each converter station, an AC collection system, and an HVDC transmission line from the Oklahoma Panhandle to western Tennessee. The Applicant Proposed Project is described in Sections 2.1.2 through 2.1.7.
Applicant Proposed Route	The single route alternative defined by Clean Line to connect the converter station in the Oklahoma Panhandle Region to the converter station in western Tennessee. The Applicant Proposed Route is defined in Section 2.4.2. Alternatives to the Applicant Proposed Route are described as part of the DOE Alternatives in Section 2.4.3.
Aquatic	Occurring in, or closely associated with, water.
Arkansas Converter Station Alternative AC Interconnection Siting Area	A 2-mile-wide corridor within which one or more potential AC transmission line route(s) would be sited from the Arkansas converter station alternative to an interconnection point(s) (5 acres) to an existing 500kV transmission line.
Arkansas Converter Station Alternative Siting Area	An approximate 20,000-acre siting area in Pope County or Conway County, Arkansas, within which the converter station and associated AC switchyard (45 to 60 acres total) and access road(s) would be sited.
ARPA (Archaeological Resources Protection Act)	Prohibits unauthorized collecting and excavation at archaeological sites on federal and tribal lands.
Attainment Area	An area considered to have air quality as good as or better than the National Ambient Air Quality standards as defined in the Clean Air Act.

Audible Noise	The natural phenomenon of corona from a transmission line can create audible noise. Audible noise is measured in decibels (dB) of sound pressure with respect to the threshold of human hearing. The decibel is a dimensionless unit used to compare the level of some quantity to a reference level and it always needs a reference quantity to have meaning.
Bedrock	Solid rock beneath the soil and superficial rock (rock fragments or unconsolidated rock materials).
BGEPA (Bald and Golden Eagle Protection Act)	A law that prohibits the take, possession, selling, purchasing, bartering, or transporting of live or dead bald or golden eagles, or any parts, nests, or eggs of these birds.
BIA (Bureau of Indian Affairs)	Established in 1824, the Bureau of Indian Affairs is responsible for the administration and management of 55 million surface acres and 57 million acres of subsurface minerals estates held in trust by the United States of American Indian, Indian tribes, and Alaska Natives.
Big Game	Large animals that may be taken by hunters, pursuant to local government restrictions and regulations.
Biological Assessment	A Biological Assessment documents a federal agency's conclusions and the rationale to support those conclusions regarding the effects of the proposed action on protected resources. Although there are no statutory or regulated contents for a Biological Assessment recommended elements are identified in 50 CFR §402.12(f).
Blading	Use of a bulldozer, grader, or other construction equipment to level or shape a travel surface.
BMPs (Best Management Practices)	Some resource sections have included BMPs. In these resources, implementation of the EPMs would not be able to completely avoid or minimize potential adverse effects resulting from construction, operations and maintenance, and decommissioning of the Project. BMPs have been identified to further avoid or minimize these potential adverse effects. The ROD or other appropriate Federal decision document would include conditions of approval (e.g., BMPs) imposed by DOE or other agency that has a decision to make or a consultation responsibility (e.g., TVA, USACE, USFWS) regarding the Project. The DOE-Applicant participation agreement would require a monitoring plan to ensure implementation of all such conditions of approval.
Border Zone	A zone on each side of the wire zone to the edge of the ROW, maintained to exclude tall vegetation. Vegetation within the border zone is limited to low-growing grasses, legumes, herbs, crops and shrubs where the conductor is 50 feet or less from the ground.
CAA (Clean Air Act)	The federal law that defines the Environmental Protection Agency's responsibilities for protecting and improving the nation's air quality and the stratospheric ozone layer. The last major change in the law, the Clean Air Act Amendments of 1990, was enacted by Congress in 1990. Legislation passed since then has made several minor changes. The Clean Air Act was incorporated into the United States Code as Title 42, Chapter 85.
Candidate Species	Taxa for which the U.S. Fish and Wildlife Service has on file sufficient information on biological vulnerability and threat(s) to support issuance of a proposal to list, but issuance of a proposed rule is currently precluded by higher priority listing actions (61 FR 7596-7613;February 28, 1996).
Capacity	Refers to the amount of power a transmission facility (line, transformer, etc.) can reliably deliver. Capacity is measured in megawatts and is limited by the current (in amperes) that the facility can carry or the minimum voltage levels present at a substation (under either steady-state or outage conditions).
CDE (Carbon Dioxide Equivalent)	Carbon dioxide equivalency is a quantity that describes, for a given mixture and amount of greenhouse gas, the amount of carbon dioxide that would have the same global warming potential, when measured over a specified timescale (generally, 100 years).
Centerline	A line on a map or flagged on the ground that indicates the location of a linear feature such as a road or a transmission line. The linear feature is further defined by its total width, either for construction or operation, which is bisected into two equal parts by the centerline.
CEQ (Council on Environmental Quality)	Coordinates federal environmental efforts and works closely with agencies and other White House offices in the development of environmental policies and initiatives. CEQ was established within the Executive Office of the President by Congress as part of the National Environmental Policy Act of 1969 (NEPA) and additional responsibilities were provided by the Environmental Quality Improvement Act of 1970.

Circuit	An electrical device that provides a path for electrical current to flow, or along which an electrical current can be carried. In the case of high-voltage transmission, a set of wires energized at transmission voltages extending beyond a substation which has its own protection zone and set of breakers for isolation.
Clean Line	Clean Line Energy Partners LLC of Houston, Texas, is the parent company of Plains and Eastern Clean Line LLC and Plains and Eastern Clean Line Oklahoma LLC (collectively referred to as Clean Line). Clean Line develops long-haul transmission lines to connect renewable energy resources in North America to communities and cities that lack access to affordable renewable power.
CO (Carbon Monoxide)	An odorless and colorless gas formed from one atom of carbon and one atom of oxygen. CO is typically released as an air emission from internal combustion engines.
Colluvium	Rock fragments, sand, etc., that accumulate on steep slopes or at the foot of cliffs.
Concrete Batch Plant	Concrete would be obtained from commercial ready-mix concrete producers to the extent practicable. In locations where haul times exceed 45 minutes, concrete would be dispensed from portable concrete batch plants located within a multi-use construction yard. The batch plants would consist of bins of materials that when combined in a mixer, form concrete (e.g., sand, water, aggregate, cement, etc.). Concrete would be required for construction of foundations for transmission structures, foundations for transformers and electrical equipment at converter stations, and foundations at fiber optic regeneration sites. Concrete would be delivered to structure sites and ancillary facilities in concrete trucks.
Conductor	The wire cable strung between transmission towers through which electric current flows.
Contrast	The degree of visual change that occurs in the landscape due to the construction and operations and maintenance of a project.
Contrast Rating	A method of analyzing the potential visual impacts of Project components.
Connected Actions	Connected actions are those that are "closely related" to the proposal. Actions are considered connected if they automatically trigger other actions which may require environmental impact statements, cannot or will not proceed unless other actions have been taken previously or simultaneously, or are interdependent parts of a larger action and depend on the larger action for their justification (40 CFR 1508.25).
Converter Station	Converter stations are similar to a typical AC substation, with additional equipment to convert between AC and DC. Ancillary facilities such as communications equipment and cooling equipment would be required at each converter station. In addition, AC transmission lines would connect each converter station to the existing grid. Each converter station would include: • DC switchyard • DC smoothing reactors • DC filters • Valve halls (which contain the power electronics for converting AC to DC and vice versa) • AC switchyard • AC filter banks • AC circuit breakers and disconnect switches • Transformers
Cooperating Agency	Any federal agency other than a lead agency which has jurisdiction by law or special expertise with respect to any environmental impact involved in a proposal (or a reasonable alternative) for legislation or other major Federal action significantly affecting the quality of the human environment. The selection and responsibilities of a cooperating agency are described in 40 CFR 1501.6. A state or local agency of similar qualifications or, when the effects are on a reservation, an Indian Tribe, may by agreement with the lead agency become a cooperating agency (40 CFR 1508.5).
Corona	Corona occurs in regions of high electric field strength on conductors, insulators, and hardware when sufficient energy is imparted to charged particles to cause ionization (molecular breakdown) of the air.

Corresponding Links	Links or portions of the Applicant Proposed Route similar in length to the alternative routes. Alternative routes are compared to corresponding links of the Applicant Proposed Route in the impact analysis for each resource.
Criteria Pollutants	The U.S. Environmental Protection Agency has set NAAQS for seven principal pollutants, which are called "criteria" pollutants. The six air pollutants listed below are criteria pollutants for which the agency has developed NAAQS: • Sulfur Dioxide (SO_2) • Carbon monoxide (CO) • Nitrogen Dioxide (NO_2) • Ozone (O_3) • Particulate matter with a diameter equal to or smaller than 10 micrometers (PM_{10}) • Particulate matter with a diameter equal to or smaller than 2.5 micrometers ($PM_{2.5}$) • Lead and its compounds (measured as lead)
Critical Habitat	For Endangered Species Act (ESA)-listed species consists of: (1) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of section 4 of the act on which are found those physical or biological features (constituent elements) (a) essential to the conservation of the species and (b) which may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 4 of the act, upon a determination by the Secretary that such areas are essential for the conservation of the species (ESA §3 (5)(A)). Designated critical habitats are described in 50 CFR §17 and 226.
CRP (Conservation Reserve Program)	CRP lands are administered by the USDA Farm Service Agency. The CRP provides technical and financial assistance to eligible farmers and ranchers to address soil, water, and related natural resource concerns on their lands in an environmentally beneficial and cost-effective manner. The CRP encourages farmers to convert highly erodible cropland or other environmentally sensitive acreage to vegetative cover, such as tame or native grasses, wildlife plantings, trees, filter strips, or riparian buffers. Farmers receive an annual rental payment for the term of the multi-year contract.
Cultural Modification	Human/man-made modifications to the landscape.
Cultural Resources	The term "cultural resource" includes all landscapes, buildings, sites, districts, structures, or objects that have been created by or associated with humans and are considered to have historical or cultural value. Cultural resources also include Traditional Cultural Properties.
Culvert	A corrugated metal or concrete pipe used to carry or divert runoff water from a drainage; usually installed under roads to prevent washouts and erosion.
Cumulative Effects (Impacts)	Effects that result when the effects of an action are added to or interact with other effects in a particular place and within a particular time. Such impacts may individually have minor impacts, but collectively may have significant impacts.
Current	The amount of electrical charge flowing through a conductor (as compared to voltage, which is the force that drives the electrical charge), which is measured in amperes or amps.
CWA (Clean Water Act)	The framework that regulates water quality standards and pollutant discharges into waters of the United States. Sections 303d and 305b require that water quality of streams, rivers, and lakes are assessed on a regular basis, that waters found to be in violation of water quality standards are listed as impaired, and that priorities be set for actions to improve the water quality.
dB(A)	Sound levels measured as A-weighted decibels. Used to measure sound level via a logarithmic unit used to describe a ratio and weighted based on the human response to sound.
Decibel (dB)	A decibel is a unit for expressing relative difference in power, usually between acoustic signals, equal to 10 times the common logarithm of the ratio of two levels.

Decommissioning	Removal of Project facilities at the end of the operational life of the facilities.
Dewatering	Removal or draining groundwater or surface water from a construction site by pumping or evaporation.
Direct Effects or Direct Impacts	Direct effects are those caused by the Project at the same time and place as the impact, such as soil disturbance.
Distance Zone	A subdivision of the landscape as viewed from an observer position. The subdivision (zones) includes foreground-middleground (0-3 miles), background (3 miles or more) and seldom seen.
Distribution Line	The structures, insulators, conductors, and other equipment used to deliver electricity directly to the customer, including commercial facilities, small factories, or residences.
DOE (U.S. Department of Energy)	DOE is the lead federal agency for the preparation of this Plains & Eastern EIS. DOE has prepared this EIS pursuant to NEPA, the Council on Environmental Quality (CEQ) NEPA regulations (40 Code of Federal Regulations [CFR] Parts 1500 through 1508), and the DOE NEPA implementing regulations (10 CFR Part 1021). DOE's purpose and need for agency action is to implement Section 1222 of the EPAct.
DOE Alternatives	DOE has chosen to analyze potential environmental impacts for several alternatives in addition to the Applicant Proposed Project. These alternatives include an Arkansas converter station and alternative routes for the HVDC transmission line. The DOE Alternatives are described in Section 2.4.3.
DOE's Proposed Action	To participate, acting through and in consultation with the Administrator of Southwestern, in the Applicant Proposed Project in one or more of the following ways: designing, developing, constructing, operating, maintaining, or owning a new electric power transmission facility and related facilities located within certain states in which Southwestern operates, namely Oklahoma, Arkansas, and possibly Texas.
Double-Circuit Transmission Line	A transmission line composed of six electrical phases (two independent circuits of three phases each) and two lightning protection shield wires. One of the lighting protection shield wires is a steel overhead ground wire, and the other is an optical ground wire (OPGW).
Early Successional (or Early Seral)	An immature forest often characterized by a single-age class and open canopies; stands are between 1 and 30 years old.
Ecoregion	Area where the ecosystems, and the type, quality, and quantity of environmental resources are generally similar as defined by the analysis of patterns and composition of biotic and abiotic phenomena including geology, physiography, vegetation, climate, soils, land use, wildlife, and hydrology.
Edge Effect	The gradual to abrupt transition from one habitat type to a different habitat type. Edge effects can include obvious changes in the structure of vegetation, such as an abrupt change from forest to herbaceous cover, but the effects can be more subtle and include differences in temperature, humidity, and plant and wildlife species use of an area.
EIS (Environmental Impact Statement)	Part of compliance with the National Environmental Policy Act (NEPA), an EIS is a comprehensive public document that analyzes the impacts of a major federal action that may significantly affect the quality of the human environment. When complete, it is a tool for decision making as the EIS describes the positive and negative environmental effects of a proposed action, describes alternative actions and provides an analysis of environmental impacts and ways to mitigate such impacts across all alternatives considered in detail.
Emergent	Plants that have their bases submerged in water.
EMF (Electric and Magnetic Fields)	Fields describing properties of a location or point in space and its electrical environment, including the forces that would be experienced by a charged body in that space by virtue of its charge or the movement of charges. The voltage, which is the "pressure," produces an electric field that moves the electricity through wires. The current produces a magnetic field, which is a measure of how much electricity is flowing. Thus, wherever there is electric current flowing (including through any type of wiring), there is both an electric and a magnetic field.
Endangered species	Any species officially listed pursuant to the Endangered Species Act (ESA) (16 USC § 1531 et seq.) by the U.S. Fish and Wildlife Service or NOAA Fisheries as being in danger of extinction throughout all or a significant portion of their range.

Energy	In the electric utility industry, it represents the amount of power used or transmitted over a given amount of time.
Environmental Justice	As defined by the EPA, environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, sex, national origin, or income with respect to the development, implementation and enforcement of environmental laws, regulations, and policies. Executive Order 12898 was issued in 1994 and directs federal agencies to identify and address the disproportionately high and adverse human health or environmental effects of their actions on minority and low-income populations, to the greatest extent practicable and permitted by law.
EPA (Environmental Protection Agency)	The EPA is a federal agency that was created in 1970 for the purpose of protecting human health and the environment. The EPA is recognized to have jurisdiction by law and/or has special expertise in environmental laws, Executive Orders, and NEPA assessment and procedures. Under Section 309 of the Clean Air Act, the EPA is required to review and publicly comment on the environmental effects of major federal actions, including actions that are the subject of EIS documents. If the EPA determines that the action is environmentally unsatisfactory, it is required by Section 309 to refer the matter to the CEQ.
Ephemeral Stream	A stream that flows only in direct response to precipitation and whose channel is at all times above the water table.
EPMs (Environmental Protection Measures)	EPMs are measures developed by the Applicant to avoid or minimize potential adverse effects of the Project resulting from construction, operations and maintenance, and decommissioning. EPMs are an integral part of the Project and their implementation was assumed throughout the impact analysis of the EIS.
ERS (U.S. Department of Agriculture Economic Research Service)	The mission of the ERS is to inform and enhance public and private decision making on economic and policy issues related to agriculture, food, the environment, and rural development.
Federal Aviation Act	This act was passed to continue the Civil Aeronautics Board as an agency of the United States, to create a Federal Aviation Agency, to provide for the regulation and promotion of civil aviation in such manner as to best foster its development and safety, and to provide for the safe and efficient use of the airspace by both civil and military aircraft, and for other purposes (P.L. 85-726, 72 Stat. 731).
Farmland of Statewide Importance	This is land, in addition to prime and unique farmland, that is of statewide importance for the production of food, feed, fiber, forage, and oil seed crops. Criteria for defining and delineating this land are to be determined by the appropriate state agency or agencies. Generally, additional farmlands of statewide importance include those that are nearly prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some may produce as high a yield as prime farmlands if conditions are favorable. In some states, additional farmlands of statewide importance may include tracts of land that have been designated for agriculture by state law.
Fault	A planar fracture or discontinuity in a volume of rock, across which there has been significant displacement along the fractures as a result of earth movement. Energy release associated with rapid movement on active faults is the cause of most earthquakes. A fault line is the surface trace of a fault, the line of intersection between the fault plane and the Earth's surface.
Feasible	Capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, regulatory, technical, and safety factors.
Federally Listed	Species listed as Threatened or Endangered pursuant to the Endangered Species Act (ESA) (16 USC § 1531 et seq.) by the U.S. Fish and Wildlife Service or NOAA Fisheries.
FHWA (U.S. Department of Transportation, Federal Highway Administration)	The Federal Highway Administration is an agency within the Department of Transportation that would be responsible for issuing encroachment permits if the proposed Project crosses federally funded highways.
Fiber Optic Regeneration Sites	As a data signal passes through fiber optic cable, the data signal degrades with distance. The signal must be regenerated or amplified every 50 to 55 miles at fiber optic regeneration sites. A typical fiber optic regeneration site is approximately 100 feet by 100 feet with a fenced area of approximately 75 feet by 75 feet.

Floodplain	That portion of a river valley adjacent to the stream channel which is covered with water when the stream overflows its banks during flood stage.
Fly yard	A Project-material staging area used specifically to support helicopter use.
Forb	An herbaceous plant that is not a grass or not grasslike.
Forest/Woodland	A habitat type characterized by being dominated by trees. Forests are densely covered by trees and have a continuous or nearly continuous canopy and little shade reaching the forest floor. In a woodland, trees are more widely scattered and sunlight reaches the floor, often supporting an understory of shrubs, grasses, and/or forbs.
FPPA (Farmland Protection Policy Act)	The Farmland Protection Policy Act (FPPA) authorizes the USDA to develop criteria for identifying the effects of federal programs on the direct or indirect conversion of farmland to nonagricultural uses. For the purposes of the law, federal programs include construction projects—such as highways, airports, dams, and federal buildings—sponsored or financed in whole or part by the federal government and the management of federal lands. Federal agencies are directed to: (1) use the developed criteria, (2) identify and take into account the adverse effects of federal programs on the preservation of farmland, (3) consider appropriate alternative actions that could minimize potential adverse effects to farmland, and (4) ensure that such federal programs, to the extent practicable, are compatible with state and local units of government, as well as private programs and policies, so that farmland is protected. Farmland protected by the FPPA is either: (1) prime or unique farmland, which is not already committed to urban development or water storage, or (2) other farmland, which is of statewide or local importance as determined by the appropriate local governmental agency with the concurrence of the Secretary of Agriculture. Farmland subject to FPPA is not required to be currently used for cropland. Farmland can be forestland, pastureland, cropland, or other land.
Fragmentation	The breaking up of contiguous areas of vegetation/habitat into smaller patches.
FSA (Farm Service Agency)	The Farm Service Agency ensures the well-being of American agriculture, the environment, and the American public through the administration of farm commodity programs; farm ownership, operating, and emergency loans; conservation and environmental programs; emergency and disaster assistance; and domestic and international food assistance.
Fugitive Dust	Visible emissions released from sources other than stacks; for instance, dust blown from storage piles, road dust, or emission leaking from sides of buildings or open areas in buildings.
Gauss	A unit of magnetic induction.
GHG (Greenhouse Gas)	Any gas that absorbs infrared radiation in the atmosphere. Greenhouse gases include, but are not limited to, carbon dioxide, methane, nitrous oxide, and ozone.
GIS (Geographical Information System)	A computer representation of data that is geographically distributed in three dimensions. These data can be generated and displayed to show their physical location. Each data set with a certain type of information constitutes a "layer" in the GIS. GIS layers can be superimposed to show the spatial relationships of different items.
Grasslands	Habitat types dominated by grasses (family Poaceae) with little woody vegetation or other forbs. In the regions of influence, most grasslands are dominated by introduced grass species, though some native grasslands are present.
GRP (Grassland Reserve Program)	The GRP was established to prevent grazing and pasture land from being converted into cropland, used for urban development, or developed for other non-grazing uses. Participants in the program voluntarily limit future development of their grazing and pasture land, while still being able to use the land for livestock grazing and activities related to forage and seed production.

Habitat Types	Generally described as place(s) where a plant or animal naturally or normally lives or grows. Habitat types also includes the physical elements of the environment, as well as the biotic elements that a given species interacts with.
Hazardous Materials	Defined in various ways under a number of regulatory programs, can represent potential threats to both human health and the environment when not properly managed. Includes hazardous waste.
High Voltage	Lines with 230kV or above electrical capacity.
Historic	Period wherein non-native cultural activities took place, based primarily upon European roots, having no origin in the traditional Native American culture(s).
Historic Property	Any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior.
HVDC (High Voltage Direct Current) Transmission Line	Unlike an AC transmission line, the voltage and current on a direct current (DC) transmission line are not time varying, meaning they do not change direction as energy is transmitted. DC electricity is the constant, zero-frequency movement of electrons from an area of negative (-) charge to an area of positive (+) charge. HVDC transmission facilities include: • ROW easements for the transmission line, with a typical width of approximately 150 to 200 feet • Tubular and lattice steel structures used to support the transmission line • Electrical conductor and metallic return • Communications/control and protection facilities (optical ground wire [OPGW] and fiber optic regeneration sites)
Hydric Soils	Soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part. These soils are typically associated with jurisdictional wetlands, which must meet three required criteria: hydric soils, wetland hydrology, and hydrophytic vegetation, except in “difficult wetland situations” where not all criteria are evident.
Hydrology	The science of dealing with the properties, distribution, and circulation of water.
Hz (Hertz)	The unit of frequency in cycles per second; power systems in the U.S. operate with a frequency of 60 Hz.
Indian Tribe	An Indian tribe, band, nation, or other organized group or community, including a native village, regional corporation, or village corporation, as those terms are defined in section 3 of the Alaska Native Claims Settlement Act (43 USC 1602), which is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians. Government-to-government consultation is required for any project between the federal government and the government of any potentially impacted tribe.
Indirect Effects	Effects caused by the action that are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.
Insulator	A ceramic or other non-conducting material used to keep electrical circuits from jumping over to ground.
Intentional Destructive Acts	Security of the components of the Project facilities can involve a variety of different regulatory and reporting structures, authorities, and agencies. Intentional acts of destruction, sabotage, vandalism, theft, or other mischief, whether from terrorist activities or other criminal behavior, would be addressed through law enforcement and Project design protocols.
Interconnections	The electric transmission system provides a pathway for power among interconnected power producers, or generators, and distribution companies, or load. For power generation and delivery electric transmission interconnections are required. The Project includes are three possible points of interconnection: the Oklahoma Southwestern Public Service/Southwest Power Pool Interconnection, the Arkansas/Entergy/Mid-Continent Independent System Operator Interconnection, and the Tennessee Valley Authority Interconnection. System planning studies and system impact studies are required for interconnection.

Intermittent or Seasonal Stream	One which flows only at certain times of the year when it receives water from springs or from some surface source such as melting snow in mountainous areas.
Invasive Species	A species that is not native to the habitat under consideration and whose introduction causes, or is likely to cause, economic or environmental harm (Executive Order 13112). Invasive plants are typically adaptable, aggressive, and have a high reproductive capacity.
Invertebrates	Animals that lack a back bone and are represented by a wide variety of taxonomic groups in freshwater environments.
Irreversible and Irretrievable Commitment of Resources	A commitment of resources is irreversible when its primary and secondary impacts limit the future options for a resource. An irretrievable commitment refers to the use or consumption of a resource that is neither renewable nor recoverable for use by future operations.
KOP (Key Observation Point)	Viewing locations chosen to be generally representative of visually sensitive areas where it can be assumed that viewers may be affected by a change in the landscape setting from the Project. Views from KOPs are described by distance zones and are based on perception thresholds (changes in form, line, color, and texture).
kV (kilovolt)	One thousand volts (see volt).
Landslide	Any mass-movement process characterized by downslide transport of soil and rock, under gravitational stress, by sliding over a discrete failure surface; or the resultant landform. Can also include other forms of mass wasting not involving sliding (rockfall, etc.).
Lattice Tower	A freestanding steel framework tower that is often used to support electrical transmission lines with voltages above 100 kilovolts.
L_{dn}	The day-night sound level comprised of average hourly L_{eq} sound levels with a 10 dB penalty added to sound levels at night.
Lead Agency	The agency or agencies preparing, or having taken primary responsibility for preparing an environmental document as required by NEPA. For the Plains & Eastern Clean Line Transmission Project, DOE is the lead agency
L_{eq}	The energy averaged sound level for a given period of time.
Lithic Scatter	Consists of stone material that has been left behind or dropped and can include stone tools such as projectile points, knives, or simply debris from stone tool manufacture or lithic procurement activities.
Load	The amount of electrical power or energy delivered or required at any specified point or points on a system. Load originates primarily at the energy-consuming equipment of customers.
MBTA (Migratory Bird Treaty Act)	A law enacted in 1918 that prohibits pursuing, hunting, taking, capturing, killing, possessing, selling, bartering, purchasing, delivering, transporting, and receiving any migratory birds, parts, nests, or eggs.
mG (MilliGaus)	A unit used to measure magnetic field strength; one- thousandth of a gauss.
Migratory Bird	A bird that moves seasonally to different ranges to maximize breeding and feeding opportunities.
Mineral Resources	In the ROI, the primary mineral resource production is from the fossil fuels oil, natural gas, and coal. Additional minerals mined include limestone, building stone, sand and gravel, gypsum, clay and shale, granite, volcanic ash, tripoli, salt, bentonite, iron ore, and chat.
Mitigation	(1) Avoiding or reducing possible adverse impacts to a resource by limiting the timing, location, or magnitude of an action and its implementation. (2) Rectifying possible adverse impact by repairing, rehabilitating or restoring the affected environment or resource. (3) Reducing or eliminating adverse impacts by preservation and maintenance operations during the life of an action.

MSA (Metropolitan Statistical Area)	MSAs have at least one urbanized area with 50,000 or more residents, plus adjacent territory that has a high degree of social and economic integration with the core as measured by commuting ties. These areas represent larger communities that form regional markets for labor, goods and services, and information. MSAs typically include an urbanized node and economically related surrounding counties.
Multi-use Construction Yards	Multi-use construction yards are for staging of construction personnel and equipment and for material storage to support construction activities. Multi-use construction yards would be used for temporary concrete batch plants, where needed. The multi-use construction yards would be located outside of the ROW at intervals of approximately 25 miles. Typical sites would include areas designated for a field office, crew parking, sanitation, waste management, fueling, equipment wash, material storage, and equipment storage.
MW (Megawatts)	A megawatt is one million watts, or one thousand kilowatts; an electrical unit of power.
NAAQS (National Ambient Air Quality Standards)	Established by the U.S. Environmental Protection Agency, the NAAQS represent maximum acceptable concentrations that generally may not be exceeded more than once per year, except the annual standards, which may never be exceeded (40 CFR 50).
NAGPRA (Native American Graves Protection and Repatriation Act)	NAGPRA was established in 1990 to provide a means for museums and curation facilities to return certain collected items to Native American and Native Hawaiian groups. The act pertains to the repatriation of human remains, funerary objects, sacred objects, and objects of cultural patrimony. Federal grants are awarded to indigenous groups and institutions holding collections under the act to assist in the repatriation process, which is overseen by the Native American Graves Protection and Repatriation Review Committee.
National Emissions Standards for Hazardous Air Pollutants	National Emission Standards for Hazardous Air Pollutants (NESHAPS) are stationary source standards for hazardous air pollutants. Hazardous air pollutants (HAPs) are those pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects. NESHAPs are found in 40 CFR Part 61 and 40 CFR Part 63.
National Scenic Byway	To be designated as a National Scenic Byway, a road should have at least one of six scenic byway intrinsic qualities (archaeological, cultural, historic, natural, recreational, and scenic) that is regionally significant (DOT 2008). The Federal Highway Administration is responsible for administering the National Scenic Byways Program (23 USC 162) through the Intermodal Surface Transportation Efficiency Act of 1991 (IS TEA; PL 102-240). A scenic byway is a public road with special scenic, historic, recreational, cultural, archaeological, and/or natural qualities that have been recognized as such through legislation or official declaration. Easements associated with scenic byway ROWs may prohibit construction of transmission structures or other structures that degrade the scenic quality of the road.
National Wild and Scenic Rivers System	A system of nationally designated rivers and their immediate environments that have outstanding scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values and are preserved in a free-flowing condition.
NEPA (National Environmental Policy Act of 1969)	Federal statute that contains procedures to ensure that federal agency decision makers take environmental factors into account. The two major purposes of the NEPA process are citizen involvement and better informed decisions. The act establishes national environmental policy and goals for the protection, maintenance, and enhancement of the environment, and it provides a process for implementing these goals within the federal agencies. The act also establishes the Council on Environmental Quality (CEQ) and requires an environmental impact statement on all major Federal actions significantly affecting the quality of the human environment (42 USC 4332 2(2)(C)).
New Source Performance Standards	Section 111 of the Clean Air Act authorized the EPA to develop technology based standards which apply to specific categories of stationary sources. These standards are referred to as New Source Performance Standards (NSPS) and are found in 40 CFR Part 60. The NSPS apply to new, modified and reconstructed affected facilities in specific source categories such as manufacturers of glass, cement, rubber tires and wool fiberglass. The NSPS are developed and implemented by EPA and are delegated to the states. However, even when delegated to the states, EPA retains authority to implement and enforce the NSPS.
NHL (National Historic Landmark)	A historic property that the Secretary of the Interior has designated a National Historic Landmark.

NHPA (National Historic Preservation Act of 1966, as amended)	Act directing federal agencies to consider the effects of their programs and projects on properties listed or eligible for listing on the National Register of Historic Places. If a proposed action might impact any archaeological, historical, or architectural resource, this act mandates consultation with the proper agencies.
NHTs (National Historic Trails)	A congressionally designated trail that is an extended, long-distance trail, not necessarily managed as continuous, that follows as closely as possible and practicable the original trails or routes of travel of national historic significance.
Nitrogen Oxide	A group of compounds consisting of various combinations of nitrogen and oxygen atoms.
No Action Alternative	This Plains & Eastern EIS analyzes a No Action Alternative, under which DOE would not participate with Clean Line in the Project. DOE assumes for analytical purposes that the Project would not move forward and none of the potential environmental effects associated with the Project would occur.
NOI (Notice of Intent)	A public notice, published in the *Federal Register*, that an environmental impact statement will be prepared and considered in the decision making for a proposed action. It also provides background information on the proposed project in preparation for the scoping process.
Nonattainment Area	An area that does not meet air quality standards set by the Clean Air Act for specified localities and periods.
Noxious Weed	A legal term, meaning any plant officially designated by a federal, state, or local agency as injurious to public health, agriculture, recreation, wildlife, or property.
NPS (National Park Service)	Established in 1916, the purpose of the National Park Service is to "conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such a manner and by such means as will leave them unimpaired for the enjoyment of future generations".
NRCS (Natural Resources Conservation Service)	The NRCS is a federal agency within the Department of Agriculture and is a conservation leader in all natural resources; ensuring that private lands are conserved, restored, and more resilient to environmental challenges. NRCS is recognized to have jurisdiction by law and/or has special expertise in the following areas: a. Farmland Protection Policy Act (7 USC 4201 et seq.; 7 CFR Part 658) b. Watershed and Flood Prevention Act, Public Law 83-566, as amended (16 USC 1001–1009) c. Wetland Reserve Program (16 USC 3837, et seq.) d. Grassland Reserve Program (16 USC 3838N-3838q.) e. Healthy Forests Restoration Act of 2003, Public Law 108–148 (16 USC § 6501) f. The 1996 U.S. Farm Bill, Public Law 104–127 (110 Stat. 888–1197)
NRHP (National Register of Historic Places)	The official register of districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, and culture, established by the National Historic Preservation Act of 1966, as amended, and maintained by the National Park Service on behalf of the Secretary of the Interior.
NSTs (National Scenic Trails)	A congressionally designated trail that is a continuous and uninterrupted extended, long-distance trail so located as to provide for maximum outdoor recreation potential and for the conservation and enjoyment of the nationally significant resources, qualities, values, and associated settings and the primary use or uses of the areas through which such trails may pass.
NWR (National Wildlife Refuge)	NWRs are administered by the USFWS under the National Wildlife Refuge System Administration Act (16 USC 668dd). The National Wildlife Refuge System's purpose is to administer a national network of lands and waters for the conservation, management, and restoration of fish, wildlife, and plant resources and their habitats for the benefit of present and future generations. Each NWR is to be managed to fulfill the specific purposes for which the refuge was established. This act allows easements or ROWs for power lines so long as it is determined the power line is compatible with the purposes for which an NWR was established.
Oklahoma AC Interconnection Siting Area	An approximate 870-acre corridor within which an AC transmission interconnection route from the Oklahoma converter station to the future Optima Substation would be sited.
Oklahoma Converter Station Siting Area	An approximate 620-acre area in Texas County, Oklahoma, within which the converter station and associated AC switchyard (45 to 70 acres total) and access road(s) would be sited.

OPGW (Optical Ground Wire)	Optical ground wire would be installed to protect the transmission line from direct lightning strikes. The ground wires and structures would transfer current from the lightning strikes though the ground wires and structures into the ground.
OSHA (Occupational Safety and Health Administration)	OSHA has jurisdiction over most occupational health and safety issues within each state crossed by the Project. Industrial construction and routine workplace operations are governed by the Occupational Safety and Health Act of 1970, specifically 29 CFR 1910 (general industry standards) and 29 CFR 1926 (construction industry standards).
Outage	Events caused by a disturbance on the electrical system that requires the provider to remove a piece of equipment or a portion or all of a line from service. The disturbances can be either natural or human-caused.
Overstory	The overstory is a layer of tall mature trees that rise above the shorter understory trees, including the trees in a timber stand.
Ozone	Relatively unstable form of oxygen (O_3) that is associated with the corona discharge of high-voltage transmission lines. Rapidly recombines back to the more stable oxygen (O_2).
Palustrine	National Wetlands Inventory system that includes wetlands dominated by trees, shrubs, and persistent emergent plants associated with water bodies that cover less than 20 acres or with water less than 6.6 feet deep.
Parturition Areas	Areas where habitat is appropriate for female big game animals to seclude themselves while giving birth to young in late spring or early summer. Such areas are usually characterized by ample hiding cover and forage.
Peak Hour	The hour of the day that observes the highest traffic volumes for a roadway or intersection. Typically two peak hours are reported, one in the AM and one in the PM.
Perennial Stream	One that flows with water present continuously during an average water year.
Physiographic	Pertaining to the features and phenomena of nature.
Plant Protection Act	Under the Plant Protection Act of 2000 (7 USC 104), which encompasses the Federal Noxious Weed Act of 1974 (7 USC 2801 et seq.), the federal government lists 137 regulated noxious weeds. States typically have their own noxious weed lists and county weed control boards or districts that monitor weed infestations and provide guidance on weed control.
Prevention of Significant Deterioration	Federal pre-construction review for affected sources located in attainment areas for air quality. It is intended to prevent a new source from causing air quality to deteriorate beyond acceptable levels.
Prime Farmland	As defined by the USDA (7 CFR §657.5), prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses (the land could be cropland, pastureland, rangeland, forest land, or other land, but not urban built-up land or water).
Programmatic Agreement (PA)	A PA establishes a process for consultation, review, and compliance with one or more federal laws, most often with those federal laws concerning historic preservation. On February 19, 2014, the ACHP notified the DOE that ACHP would participate in consultation to develop a PA for the referenced undertaking due to the undertaking's potential to substantially impact historic properties and to the potential for procedural questions since DOE proposes to use the substitution process in the ACHP regulations (36 CFR 800.8(c)).
Project (the)	A broad term that generically refers to elements of the Applicant Proposed Project and/or DOE Alternatives when differentiation between the two is not necessary. The term also refers to whatever combination of project elements that would be built if a decision was made by DOE to participate with Clean Line.

Purpose and Need	Under the National Environmental Policy Act of 1969 (NEPA), the need to take an action may be something the agency identifies itself, or it may be a need to make a decision on a proposal brought to it by someone outside of the agency, for example, an applicant for a permit. Alternatives are measured against how well they meet the underlying need and best achieve the purposes to be attained. DOE's purpose and need for agency action is to implement Section 1222 of the EPAct. To that end, DOE needs to decide whether and under which conditions it would participate in Clean Line's proposed Project.
Raptor	A bird of prey such as eagles, hawks, falcons, or owls.
Reclamation	Returning disturbed lands to a form and productivity that will be ecologically balanced.
Reliability	Transmission systems must be built with sufficient levels of redundancy to enable the transmission system to reliably operate in the event of the loss of any single element (i.e., transmission line segment or substation element).
Representative ROW (Right-of-Way)	The analysis of impacts for the HVDC Applicant Proposed Route, AC Collection System, and HVDC alternative routes were based on a representative 200-foot ROW (100 feet on either side of a representative centerline). Quantitative data regarding the resources directly intersected by the representative 200-foot-wide ROW were used to analyze the potential impacts of the Project.
Revegetation	The reestablishment and development of self-sustaining plant cover. On disturbed sites, this normally requires human assistance, such as reseeding.
Riparian Areas	Vegetation communities that occur adjacent to waterways such as streams, rivers, springs, ponds, lakes, or tidewater and that provide habitat for numerous plant and animal species. They generally occupy transitional areas between aquatic and upland habitats and may function as vegetative buffers for aquatic resources.
Riverine System	Wetland inventory system that includes wetlands not dominated by trees, shrubs, or persistent emergents that are contained within a river channel.
Rivers and Harbors Act	Section 10 of the act prohibits the unauthorized obstruction or alteration of any navigable water of the U.S. without a permit from the U.S. Army Corps of Engineers.
Roadless area	An area of undeveloped public land t within which there are no improved roads maintained for travel by means of motorized vehicles intended for highway use.
ROD (Record of Decision)	The ROD is the formal agency decision document for the EIS process. DOE's ROD would announce and explain DOE's decision on whether to participate in the Project and describe any conditions, such as mitigation commitments, that would need to be met. DOE may issue a ROD no sooner than 30 days after EPA's Notice of Availability for the Final EIS is published in the *Federal Register.*
ROI (Region of Influence)	To examine the potential impacts of the Project components, the EIS examines the area potentially affected by the Applicant Proposed Project and the DOE Alternatives. The EIS defines the area potentially affected by the Project as the ROI. A description of the ROI is provided in Section 3.1. The ROI may be expanded or modified on a resource specific basis where appropriate as described in each resource section.
Sage-Grouse Lek	A location used by male sage-grouse, generally every year, to assemble during the mating season and engage in competitive displays that attract females.
Scenery	The aggregate of features that give character to a landscape.
Scenic Byway	A public road having special, scenic, historic, recreational, cultural, archeological, and/or natural qualities that have been recognized as such through legislation or some other official declaration.
Sensitivity Levels	Measures (e.g., high, medium, low) of public concern for the maintenance of a particular existing landscape.

Scoping (Public Scoping)	A formal part of the federal environmental analysis process required under NEPA where issues are identified for detailed analysis. Scoping includes, but is not limited to, a formal scoping period early in the analysis process in which members of the public are invited to review the proposed action and identify possible issues or concerns with the project. Public scoping begins with the issuance of a Notice of Intent (NOI) in the *Federal Register* and includes public meetings in the vicinity of the Project. For the Plains & Eastern EIS, public scoping began with DOE's publication of the NOI on December 21, 2012. The public scoping period continued for ninety days through March 21, 2013. DOE held 13 public scoping meetings in communities along the proposed and alternative routes and five interagency meetings during the scoping period.
Section 106 of the NHPA	Under Section 106 of the National Historic Preservation Act of 1966, as amended, federal agencies must identify and evaluate cultural resources and consider the impact of undertakings they fund, license, permit, or assist on historic properties eligible for inclusion in the National Register of Historic Places. The federal agencies must afford the State Historic Preservation Officer and the Advisory Council on Historic Preservation the opportunity to comment on these undertakings.
Section 1222 of EPAct (Energy Policy Act of 2005)	Section 1222 of the EPAct, in relevant part, authorizes the Secretary of Energy, acting through and in consultation with the Administrator of Southwestern (provided the Secretary determines that certain statutory requirements have been met), to participate with other entities in designing, developing, constructing, operating, maintaining, or owning new electric power transmission facilities and related facilities located within any state in which Southwestern operates.
Sedimentation	The deposition or accumulation of sediment.
Seismic Hazards	Seismic hazards include faults and seismicity. Seismicity refers to the intensity and geographic and historical distribution of earthquakes.
Sensitivity Levels	Sensitivity levels are the measure of public concern for scenic quality. Public lands are assigned high, medium, or low sensitivity levels.
Seral	Pertaining to the stages of ecological succession occurring in communities of plants and animals until the climax is reached.
SHPO (State Historic Preservation Office[r])	Created under Section 101 of the NHPA to survey and recognize historic properties, review nominations for properties to be included in the National Register of Historic Places, review undertakings for the impact on the properties as well as support federal organizations, state and local governments, and the private sector. States are responsible for setting up their own SHPO; therefore, each SHPO varies slightly on rules and regulations.
Shrubland	A habitat type characterized by woody vegetation smaller than trees (in general, having multiple main stems and being less than 20 feet in height and six inches diameter at breast height at maturity).
Single-Circuit Transmission Line	A transmission line composed of three electrical phases and two lightning protection shield wires. One of the lightning protection shield wires is a steel overhead ground wire and the other is typically an optical ground wire (OPGW).
SIO (Scenery Integrity Objective)	To describe the goals of a landscape relative to its assumed natural state: Very High (Unaltered), High (Appears Unaltered), Moderate (Slightly Altered), Low (Moderately Altered), and Very Low (Heavily Altered). When discussing SIOs, the degree of alteration is measured in terms of visual contrast with the surrounding natural landscape.
SMS (Scenery Management System)	The SMS provides an overall framework for the orderly inventory, analysis, and management of scenery. The system applies to all national forests and grasslands administered by the Forest Service and to Forest Service management activities. This system applies only to HVDC Alternative 4-B that crosses the Ozark National Forest. The SMS process uses particular ecosystems as the environmental context for aesthetics.
SO_2 (Sulfer dioxide)	Sulfur dioxide is one of a group of highly reactive gasses known as "oxides of sulfur."
Soil Compaction	Operation of motorized vehicles on moist soils, especially heavy equipment, is likely to cause compaction of the surface layer, which may increase runoff, decrease infiltration and aeration, and reduce soil productivity by making it more difficult for plant roots to establish or obtain soil moisture and nutrients.

Soil Erosion	The movement of soil particles, usually as a result of wind or water forces. Many factors affect soil erosion, including soil grain size, cohesion factor, soil moisture content, type and amount of vegetative cover, precipitation amount and intensity, steepness of slope, and wind speed.
Soil Liquefaction	Liquefaction may occur when loose, cohesionless, and water-saturated soils lose strength and stiffness in response to stress, such as the ground shaking from an earthquake, causing the soil to behave like a liquid. It is most often observed in fluvial, lacustrine, or eolian deposits of Holocene age or younger that have not compacted or cohered. Liquefaction potential in a soil layer increases with decreasing fines content and plasticity of the soil. Cohesionless soils having less than 15 percent (by weight) of particles smaller than 0.005 millimeter, a liquid limit less than 35 percent, and an in situ water content greater than 0.9 times the liquid limit may be susceptible to liquefaction. Liquefaction is more likely to occur in soil/sediment layers with at least 80 to 85 percent saturation and located within 50 feet of the ground surface.
Span Length	The distance between two transmission support structures traveled by the conductors, measured either horizontally or along the conductors from the end of one insulator string to the end of the next insulator string.
Special Status Species	Species of plants or animals that have been designated by government agencies as needing special monitoring, conservation, or protection, usually due to declining populations. This group includes federally endangered and threatened species as well as other designations.
Species	A group of interbreeding individuals not interbreeding with another such group; similar and related species are grouped into a genus.
Staging Area	A fenced, generally flat location where materials, equipment, and vehicles are stored prior to their use in construction of the transmission line or its ancillary facilities.
Stray Voltage	Stray voltage is an extraneous voltage that appears on grounded surfaces in buildings, barns, and other structures, including utility distribution systems.
Structures	The structures used to support the HVDC or AC transmission lines would be constructed of either tubular or lattice steel and would typically range in height from 120 to 200 feet.
Subsidence (Soil)	Subsidence hazards involve either the sudden collapse of the ground to form a depression or the slow movement downward or compaction of the sediments near the earth's surface. The most common types of subsidence are the subsidence due to erosion of soil or rock and collapses involving the dissolution of carbonate rocks (limestones) beneath the surface.
Substation	A fenced site containing switching and transformation equipment needed to transform one voltage to another and for protecting and controlling transmission and distribution lines. A substation is used to raise voltages for long distance transmission and to lower transmission voltage for distribution to the end users.
Switches	Devices used to mechanically disconnect or isolate equipment; found on both sides of circuit breakers.
System planning	System planning evaluates the operations of the electric transmission system and uses that information to assess future transmission system needs. System planning studies were required to study the interconnections and between the Applicant Proposed Project and the existing electrical grid.
Tap	The point at which a transmission line is connected to a substation or other electrical device to provide service to a local load.
TCP (Traditional Cultural Property)	A property that is eligible for the NHRP because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community.
Temporary Construction Areas	Temporary construction areas would be required to support construction. Temporary multi-use construction yards and fly yards (landing areas for helicopters used during construction) would be used for staging construction personnel and equipment, and for storage of materials to support construction activities. Tensioning and pulling sites and wire-splicing sites would also be staged at 2- to 3-mile intervals along the Project ROW.

Tennessee Converter Station Siting Area	An approximate 740-acre area in Shelby County or Tipton County, Tennessee, within which the converter station and associated AC switchyard (45 to 70 acres total), access road(s), and the AC transmission interconnection route from the Tennessee converter station to the existing Shelby Substation would be sited.
Tensioning Areas	Tensioning and pulling sites would be used for the tensioning equipment to establish and maintain tension on the ground wire or conductor while they are fastened to the structures. Tensioning and pulling sites would be approximately 2 to 3 miles apart and would be entirely within the ROW or partially outside the ROW.
Terrestrial	Occurring on land.
TES (Threatened and Endangered Species)	Threatened and endangered species listed or candidates for listing under the federal Endangered Species Act (ESA).
THPO (Tribal Historic Preservation Office[r])	Tribal officials tasked with advising and assisting Federal agencies in carrying out responsibilities under Section 106 of the NHPA.
Threatened Species	Those species officially listed by the U.S. Fish and Wildlife Service that are likely to become endangered within the foreseeable future throughout all or a significant portion of their range (ESA §3(20)).
Topsoil	The uppermost soil layer, generally ranging from a few inches to less than one foot in thickness. Topsoil is the site of greatest organic content, contains the most soil nutrients, and supports the greatest amount of plant life.
Toxic air Pollutants	Chemicals and chemical classes which often have carcinogenic, mutagenic, or other especially hazardous properties and are typically subsets of criteria pollutants.
Transformers	Electrical equipment usually contained in a substation that is needed to change voltage on a transmission system.
Transmission Line	A system of structures, wires, insulators, and associated hardware that carry electric energy from one point to another in an electric power system. Lines are operated at relatively high voltages varying from 69kV up to 765kV, and are capable of transmitting large quantities of electricity over long distances.
Trip	A single or one-direction vehicle movement with either the origin or the destination inside the study site.
Turbidity	The state or condition of opaqueness or reduced clarity of a fluid due to the presence of suspended matter.
TVA (Tennessee Valley Authority)	TVA is a federally owned corporation that provides electricity to about 9 million people in parts of seven southeastern states. TVA is recognized to have jurisdiction by law by virtue of the approvals that would need to be obtained from TVA before interconnecting the Project to the transmission system TVA operates in the Tennessee Valley region.
Understory	Foliage layer beneath the forest canopy. Young trees that are growing beneath the tall mature trees in a timber stand.
Undertaking	A federal undertaking is defined as a decision involving federal expenditure of funds or issuance of permit, license, or other approval.
USFS (U.S. Department of Agriculture, Forest Service)	A federal agency under the Department of Agriculture that manages 193 million acres of public land for multiple uses and benefits and for the sustained yield of renewable resources such as water, forage, wood, recreation, fish and wildlife habitat, wilderness areas, and archaeological, paleontological and historical sites.

USFWS (U.S. Fish and Wildlife Service)	USFWS is a bureau within the Department of Interior whose mission is to conserve, protect, and enhance fish, wildlife, and plants and their natural habitats for the continuing benefit of the American people. USFWS is recognized to have jurisdiction by law and/or has special expertise in the following areas: • Endangered Species Act (16 USC § 1531et seq.) • Migratory Bird Treaty Act (16 USC § 703 et seq.) • Bald and Golden Eagle Protection Act (16 USC § 668 et seq.) • The National Wildlife Refuge System Administration Act (16 USC § 668dd–68ee) • Executive Order 13186 and DOE and USFWS Memorandum of Understanding
Vegetation Communities	A combination of dominant plant species that live together in the same region or on the same landform.
Viewing Location	Public and private areas (including Key Observation Points) within a landscape where a project could be visible and where concerns for changes to the landscape exist.
Viewshed	The landscape that can be directly seen under favorable atmospheric conditions, from a viewpoint or along a transmission corridor.
Visual Elements	Form, line, color and texture of an existing landscape. Contrast in the landscape is determined by comparing visual elements of the existing landscape with the visual elements of the Project (i.e., transmission structures, converter stations, access road, etc.).
Visual Resources	Visible features of the landscape (e.g., land, water, vegetation, animals, structures, and other features).
Visual Sensitivity	A measure of viewer concern for scenic resources and potential changes to the resource and is based on volume of use, frequency of views and viewing duration.
Volt	The international system unit of electrical potential and electromotive force—a measure of electrical "pressure."
Voltage	The electrical potential difference between two points expressed in volts; the driving force that causes a current to flow in an electrical circuit.
VRM (Visual Resource Management) System	The Bureau of Land Management system identified four VRM Classes (I through IV) with specific management prescriptions for each class. The system is based on an inventory of the existing scenic quality, viewer sensitivity, and viewing distance zones. The management class for a given area is typically arrived at by comparing the scenic quality, visual sensitivity, and distance zone with the overall goals set forth for the area.
Watershed	The area that drains to a common waterway.
WDZ (Wind Development Zone)	Twelve wind development zones were identified to consider potential connected actions for the Project. These zones are areas within a 40-mile-radius of the Oklahoma Converter Station Siting Area with adequate wind resource and in which wind energy developers may consider future development of wind energy facilities.
Wetlands	The USACE and EPA jointly define wetlands as "Those areas that are inundated or saturated by surface or ground water (hydrology) at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation (hydrophytes) typically adapted for life in saturated soil conditions (hydric soils). Wetlands generally include swamps, marshes, bogs, and similar areas (CFR 328.3 and 40 CFR 232.2(r))."
Wire Splicing Sites	Conductors and shield wires are strung into their supporting structures over a length of two reels. The wire from the two reels is mechanically joined at the wire ends with a temporary wire-gripping sleeve (stringing sock) which passes through the stringing blocks. After the wire is strung and secured, the stringing sock is replaced with a compression splice connector. The location of the splice connector installation is the wire splicing site. Typical wire splicing sites include a wire splicing truck and a line truck to facilitate installation and are located within the ROW.
Wire Zone	A linear zone under the transmission wires and extending 10 feet beyond them and maintained in vegetation cover less than 5 feet high.

WMA (Wildlife Management Area)	Wildlife Management Areas are lands that are protected for conservation of sensitive resources and for their recreation opportunities.
Waters of the United States	Broadly defined by statute, regulation, and judicial interpretation to include all waters that were, are, or could be used in interstate commerce such as rivers, streams (including ephemeral streams), reservoirs, lakes, and adjacent wetlands. The USACE Wetlands Delineation Manual and its current supplements must be used to determine whether an area has sufficient wetland characteristics to be a water of the United States.
WRP–Wetland Reserve Program	The NRCS Wetlands Reserve Program (WRP) is a voluntary program offering landowners the opportunity to protect, restore, and enhance wetlands on their property. The program provides technical and financial support to help landowners with their wetland restoration efforts.
Zoning	Regulations used to guide growth and development; typically involve legally adopted restrictions on uses and building sites in specific geographic areas to regulate private land use.

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