Grain Belt Express Transmission Line Draft Environmental Impact Statement

January 2025

U.S. Department of ENERGY

Loan Programs Office

EXECUTIVE SUMMARY

Grain Belt Express LLC, (the Applicant), applied for federal financial assistance via a loan guarantee from the United States (U.S.) Department of Energy (DOE) Loan Programs Office (LPO) under Title XVII of the Energy Policy Act of 2005 (EPAct) (42 U.S. Code [U.S.C.] 16513), as amended. Section 1703 of Title XVII (the Clean Energy Financing Program) defines eligible projects as those that, "avoid, reduce, or sequester air pollutants or anthropogenic emissions of greenhouse gases [GHGs]; and employ new or significantly improved technologies as compared to commercial technologies in service in the United States at the time the guarantee is issued" (Public Law [P.L.] 109-58, Section 1703(a)).

DOE LPO determined that the Phase 1 Grain Belt Express Transmission Project (the Project), as proposed by the Applicant, is eligible for a loan guarantee to support the development, construction, and startup of the Project. This Draft Environmental Impact Statement (EIS) for the Project was prepared in accordance with the National Environmental Policy Act (NEPA) (42 U.S.C. 4321 et seq.), the Council on Environmental Quality (CEQ) NEPA implementing regulations (40 Code of Federal Regulations [CFR] Parts 1500-1508), and the DOE NEPA implementing regulations (10 CFR Part 1021).

DOE's Purpose and Need

The purpose and need for the proposed action is implementation of DOE LPO's Section 1703 authority to provide federal financial assistance via a loan guarantee for projects that avoid, reduce, or sequester air pollutants or anthropogenic emissions of GHGs.

DOE LPO is using the NEPA process to assist in determining whether to provide federal financial assistance via a loan guarantee to the Applicant to support the Project. DOE LPO is not responsible for the design, engineering, construction, startup, commissioning, and shakedown of eligible projects under EPAct. Rather, DOE LPO performs comprehensive due diligence for such elements, including the environmental impacts in accordance with NEPA, as well as a review of relevant supply and offtake agreements, and makes a recommendation of the Project's reasonable prospect of repayment to the Secretary of Energy, who ultimately decides on providing a loan guarantee. Therefore, the decision before DOE is to either issue a loan guarantee for the Project as proposed by the Applicant (Proposed Federal Action), or not issue a loan guarantee for the Project (No Action Alternative).

Proposed Action and Project

The federal financing provided by DOE LPO will apply to eligible project costs that include the design, engineering, financing, construction, startup, commissioning, and shakedown of the Project, which comprises the following elements:

- A 542-mile, overhead 600-kilovolt (kV) high-voltage direct current (HVDC) transmission line that would extend between Ford County in southwestern Kansas and Monroe County in northeastern Missouri (HVDC Line);
- The Tiger Connector, an approximately 36-mile, overhead 345-kV alternating current (AC) transmission line that would extend from the HVDC converter station in Monroe County, Missouri, to the existing McCredie Substation, owned and operated by Associated Electric Cooperative Incorporated (AECI), and the existing Burns Substation, owned and operated by Ameren, in Callaway County, Missouri;

- The Ford County Interconnect, an approximately 0.2-mile, overhead 345-kV AC transmission line located in Ford County, Kansas that would extend from the HVDC converter station to the existing Saddle Substation, owned and operated by ITC Great Plains;
- Two HVDC converter stations and associated infrastructure, one located in Ford County, Kansas and one located in Monroe County, Missouri; and
- Optical regeneration facilities in support of the HVDC Line and associated driveways;
- Temporary workspaces needed for construction, including temporary access routes, workspaces around transmission structures, pull or tension sites, multi-use construction yards, concrete batch plants, and fly yards and helipads.

Environmental Consequences

No Action Alternative

Under the No Action Alternative, DOE LPO would not provide federal financial support (a federal loan guarantee) to the Applicant for construction and interconnection of the Project. While this would not preclude the Applicant's Project from being constructed using non-federal funding, for the purposes of analysis, this EIS assumes that the Project would not be built.

Consequently, no impacts from the Project would occur to or be associated with the following resources: air quality, paleontology and soils, water resources, vegetation, cultural resources and Native American traditional resources and values, wildlife, special designations, transportation, land use, recreation, noise, visual resources, environmental justice, and public health and safety.

Implementation of the No Action Alternative would result in the following impacts to greenhouse gas emissions and on social, economic, and community resources. Under the No Action Alternative, the potential reduction or avoidance of between 2.8 to 3.1 million tons of GHG emissions annually would not be realized and transmission line losses associated with equivalently sized AC transmission systems (up to 16 percent compared to HVDC transmission) would persist. Thus, the No Action Alternative would not support attainment of the U.S. government's established target to reduce GHG emissions by 50 to 52 percent from 2005 levels economy-wide by 2030. Under the No Action Alternative, there would be no Project-related jobs created or Project-related changes to population, housing and public services, property values, or government revenues in the socioeconomic analysis area. However, energy transmission in the region as a result of the Project would not occur, nor would the Project be available to contribute to regional objectives.

Proposed Action

Air Quality

During construction, the increase in county-wide emissions of criteria pollutants would be less than 3 percent across the air quality analysis area. Air emissions in the Project area would be lower than the pollutant *de minimis* levels and National Ambient Air Quality Standards (NAAQS) thresholds (except for carbon monoxide [CO]); the small increase in emissions from construction activities (including CO) would not cause an exceedance of NAAQS and would maintain each county's attainment status. Minimal air quality impacts from construction would be expected. During construction, total greenhouse gas (GHG) emissions would be approximately 45,190.82 metric tons (MT) of carbon dioxide equivalents (CO_2e), which equates to annual emissions of approximately 15,063.61 MT CO_2e. Thus, annual GHG emissions would be less than the annual 25,000 MT CO_2e threshold for the Mandatory GHG Reporting Rule. The estimated annual operations and maintenance emissions would be less than the respective general conformity pollutant de minimis level of 100 tons per year. Therefore, Project operations and maintenance activities would not cause an exceedance of NAAQS, nor would they affect each county's attainment status throughout the life of the Project. Total annual GHG emissions from operations and maintenance activities are estimated to be 761.52 MT CO_2e per year. The Project's estimated operations and maintenance GHG emissions would be below the annual 25,000 MT CO_2e threshold for the Mandatory GHG Reporting Rule. By facilitating access to the electric grid for new renewable energy projects, the Project, once operational, could also help reduce overall GHG emissions, potentially leading to the replacement of existing fossil-fuel power plants, while providing additional power to expanding renewable energy markets. Based on the Project transmission capacity of 2,500 Megawatts (MW; approximately 21.9 million megawatt-hours [MWh] per year), operations at 60 percent capacity equals approximately 13.14 million MWh annually. Compared with the GHG emissions associated with the average US Grid generation emissions, the development and use of wind and/or solar generation assets for the Project represents a potential reduction or avoidance of up to 5.15 million tons of GHG emissions annually. In addition, the Project is expected to reduce electrical line losses by at least 16 percent compared to an equivalently sized AC system, further increasing transmission efficiency of the electricity delivered by the Project. During decommissioning, criteria pollutant emissions would be similar to or less than construction-related emissions and would be lower than federal pollutant *de minimis* and NAAQS threshold levels. The increase in emissions from decommissioning activities would not cause an exceedance of NAAQS and would maintain each county's attainment status. Greenhouse gas emissions from decommissioning activities would likely be similar to the annual construction emissions from on-road and off-road vehicles.

Paleontology

During construction, direct impacts to paleontological resources would result from damage or destruction of fossils through crushing, breaking, exposing, or otherwise disturbing fossils. Indirect impacts include erosion of fossil beds due to slope re-grading and vegetation clearing, or the unauthorized collection of scientifically important fossils by construction workers or the public due to increased access to fossils in the paleontology analysis area. Environmental protection measures (EPMs) would be implemented to minimize impacts, including the development of a Paleontological Discovery Plan with a provision for stopping construction work should paleontological resources be discovered. During operations and maintenance, impacts to paleontological resources would be the same as construction-related impacts. However, overall activity during operations and maintenance would be localized, less intensive, and shorter in duration (up to several days in any one location). Additionally, most areas of operations and maintenance would have already been disturbed during Project construction, and the Paleontological Discovery Plan would have been implemented at that time. Impacts to paleontology and soil resources from activities to remove Project facilities would likely be similar to impacts during construction.

Soils

Construction would require cutting or removing vegetation, resulting in increased potential for wind and water erosion, and alteration of soil moisture. Temporary disturbance activities would require grading on up to approximately 4,162 acres. Project construction would create temporary disturbance on 1,428 acres of compaction-prone soil, including habitat conversion disturbance. An additional 85 acres of compaction-prone soil would be permanently impacted by Project facilities. The Project would cause approximately 4,751 acres of temporary disturbance (including 1,025 acres of habitat conversion) and 210 acres of permanent loss of prime farmland or farmland of statewide importance. Following Project construction and restoration, agricultural activities would generally be expected to resume on prime farmland areas. The indirect loss of prime farmland would occur underneath the transmission line structures where farm equipment could no longer access the land for agricultural use. This area would account for 0.013–0.097

acres per structure that occurs within prime farmland, depending on the type of tower and agricultural equipment in use. Permanent losses of farmland would primarily result from converter station site development. The Applicant would implement EPMs and develop a Stormwater Pollution Prevention Plan (SWPPP) to meet construction general stormwater permit requirements in each state and reduce impacts to soil resources. Potential impacts to soil could result from localized, temporary activities, such as inspections, vegetation management, and repair or replacement of damaged Project facilities occurring over several days. The primary impact from these activities would be compaction from construction equipment. Implementation of EPMs would reduce impacts to soil resources. The disturbance footprint for decommissioning would likely be similar to the footprint during construction, resulting in a similar extent of soil impacts. Following decommissioning, demolition of aboveground Project facilities and removal of the foundations would disencumber up to 210 acres of prime farmland that were inaccessible during Project operation.

Water Resources

Water consumption during construction is expected to total approximately 144 million gallons, including 5.31 million gallons for concrete mixing, 138.24 million gallons for controlling dust emissions from temporary workspaces and access routes, and 1.28 million gallons for controlling dust emissions for the converter stations. Impacts from consumptive water use would likely be greatest in central Kansas, where available water supplies are smaller and the demand for dust control water could be higher compared to the rest of the Project due to the drier climate. Local water supplies could also be impacted if private water wells near the Project are accidentally damaged during construction. Potential impacts would be mitigated by identifying private wells in advance and taking measures to prevent damage.

The Project area crosses 26 hydrologic subbasins and includes approximately 7,554 acres of estimated permanent and temporary surface disturbance. Over half of this surface disturbance would occur in 7 of the 26 subbasins crossed by the Project. The Applicant would manage the potential for water quality impacts through implementation of EPMs, including developing and implementing an SWPPP.

Approximately 193 acres of Forest and Woodland Vegetation would be removed, and 530 acres of Forest and Woodland Vegetation would be converted to Shrub and Herb Vegetation. Streams within these areas could be susceptible to temperature increases. Surface water quality could be impacted if any chemicals are spilled during construction or refueling and flow into an adjacent waterbody. Impacts to groundwater quality could also be possible if a spill or release goes undetected and infiltrates the uppermost aquifer. The Applicant would manage potential water quality impacts from spills through application of the EPMs, including developing and implementing a Spill Prevention and Response Plan.

The Project would disturb approximately 633 acres of 100-year floodplains. Most of this surface disturbance would be temporary (388 acres) or habitat conversion (243 acres) and would originate from access routes, temporary workspaces around transmission structures, and other temporary workspaces (e.g., pull or tension sites). Permanent disturbance would occur from 115 transmission structures and one optical regeneration facility and driveway located in floodplains. The Project would impact approximately 2 acres of floodplain from new permanent transmission line structures. No permanent disturbance in floodplains would occur within the HVDC converter station parcels. Flood-related impacts in temporary surface disturbance areas are expected to be minimal. Most of the permanent surface disturbance to the floodplain (approximately 42 acres) would occur from construction of the HVDC converter station in Ford County, Kansas. The presence of permanent structures (i.e., optical regeneration facilities) could locally obstruct flood flows and decrease the flood zone’s capacity for retaining flood waters, potentially causing an increase in base-flood levels. This could also result in expansion of the flood zone into non-zone areas and thus increase the likelihood for flooding in areas previously not susceptible. Flooding may also prevent or delay access for repairs, causing power outages during extreme weather events that could lead to significant public safety concerns. However, the Project infrastructure located in flood zones is limited to temporary disturbance and transmission line structures; this footprint is relatively small in comparison to the local flood zone and any displacement of water during a flood event is expected to be minimal. Approximately 104 acres of the potential floodplain impacts would occur from temporary disturbance and habitat conversion at the HVDC converter station in Ford County, Kansas. The parcel size is approximately 308 acres, of which 185 acres would be subject to temporary disturbance during construction, and 123 acres would be permanently developed for the converter station. Site development designs are in progress which would avoid permanent development and minimize temporary development in a floodplain. Once designs have been developed, LPO would complete a review in accordance with 10 CFR 1022, as needed, and any required local permits, including associated hydrological analysis, would be obtained and conducted for permanent impacts to floodplains. Any required local permits and associated hydrological analysis, would be obtained and conducted for permanent impacts to floodplains. No impacts to lives or property are expected.

Approximately 35.3 acres of wetlands inside the Project area would be temporarily disturbed. There are 122.4 acres of wetlands within the Project area that would be permanently converted and maintained as emergent wetlands, including 2.4 acres of palustrine scrub-shrub wetlands and 55.3 acres of palustrine forested wetlands. The Project area has less than one acre of wetlands that would be permanently impacted by the location of permanent project facilities. The Project would temporarily disturb 0.9 acres of playa wetlands. Approximately 0.3 acres of permanent disturbance is proposed in playas. All playas that overlap disturbance are currently farmed and are not considered healthy. The Project area would temporarily disturb 43,825 linear feet of waterbodies and permanently impact 2 linear feet. The U.S. Army Corps of Engineers (USACE) will decide whether to authorize the Project under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act.

Small amounts of water use would be required for operation of the HVDC converter stations, and no water use is anticipated for operations and maintenance of the HVDC Line. The limited water use for these operations and maintenance activities would have no discernible impact to available supplies near the HVDC converter stations. The HVDC converter stations would require specific EPMs, and design would minimize impervious surface where possible.

Over time, minimal surface disturbance from off-road access activities could contribute additional sediment loading if the work is concentrated near surface waterbodies. These types of water quality impacts, while typically small, would persist intermittently for the life of operations and maintenance activities. Wetlands and waterbodies within the Project right-of-way (ROW) would be subject to vegetation maintenance activities to prevent establishment of incompatible vegetation. Such maintenance clearing may require authorization by USACE, Kansas Department of Health and Environment (KDHE), and Missouri Department of Natural Resources (MDNR), and would be subject to USACE nationwide permit (NWP) conditions for restoration of any jurisdictional wetland impact, whether temporary or permanent.

Impacts to water resources from activities to remove project facilities would likely be similar to impacts during construction.

Vegetation

Impacts to general vegetation would result from approximately 212 acres of permanent disturbance from transmission line structures, optical regeneration facilities and associated access driveways, and HVDC converter stations. Impacts to general vegetation would result from approximately 5,745 acres of temporary disturbance from access routes, pull or tension sites, multi-use yards, concrete batch plants, helipads, fly yards, and workspaces in the vegetation analysis area. Most impacts resulting from disturbance would be in Agricultural and Developed Vegetation. This vegetation type has already been modified from native vegetation and could be converted back to agricultural and developed lands in temporarily impacted areas following construction.

Habitat conversion of approximately 1,596 acres would result in a permanent impact to vegetation composition and ecological function, where trees throughout the Project ROW would be replaced by shrubs and/or herbaceous vegetation, and shrubs in the wire zone would be replaced by herbaceous vegetation for the life of the Project.

During construction, the increase in vehicles and equipment in vegetated areas could increase the short-term potential for ignitions in the Project area. Other activities, such as hot work, welding, or smoking; accidental ignition of flammable liquids; implosive splicing; and mechanical malfunction could also increase the potential for ignitions during construction. These potential ignition sources would be minimized through the application of EPMs.

Direct surface disturbance during construction would impact 619 acres of vegetation in the Kansas Smoky Hills Ecological Focus Area and would be limited to small local areas with temporary impacts from construction activities. Impacts to the Smoky Hills Ecological Focus Area Shrub and Herb Vegetation could result in removal of Hancin's dewberry, a Kansas Species of Greatest Conservation Need (SGCN). Within the combined Missouri Conservation Opportunity Areas, construction impacts would permanently impact less than 1 acre of vegetation. There would be 13 acres of temporary disturbance in the Weston-latan Conservation Opportunity Area, 95 acres of temporary disturbance in the Lower Grand River and Missouri-Grand Confluence Conservation Opportunity Areas, and 18 acres of temporary disturbance in the Duck Lake Conservation Opportunity Area. There would additionally be 10 acres of habitat conversion in the Weston-latan Conservation Opportunity Area, 24 acres of temporary disturbance in the Lower Grand River and Missouri-Grand Confluence Conservation Opportunity Areas, and 11 acres of temporary disturbance in the Duck Lake Conservation Opportunity Area.

Spread of noxious weeds is possible anywhere in the vegetation analysis area. Agricultural areas, which constitute 71 percent of the vegetation analysis area, are routinely treated for noxious weeds by chemical and mechanical means. However, areas with native or naturalized vegetation, approximately 26 percent of the vegetation analysis area, are not typically treated for noxious weeds and are susceptible to spread of noxious weeds after disturbance. The Applicant would ensure that restoration occurs in a timely manner following the completion of construction. Spread of noxious weeds becomes less likely after planted areas mature and cover previously exposed soil.

Edges would be created during construction primarily along the planned Project ROW, and edge effects can be long-term impacts extending into operations and maintenance. Edge effects would be greatest in areas of Forest and Woodland Vegetation, where the vegetation adjacent to the Project area would be exposed to higher solar radiation and wind, resulting in hotter, drier conditions on the forest floor and an increased risk of windthrow. Project operations and maintenance activities would temporarily impact vegetation in areas where periodic inspections and maintenance activities occur, and plants may be crushed or uprooted, or soils compacted by vehicles. Incompatible vegetation within the planned Project ROW would be cut or trimmed to comply with the North American Electric Reliability Corporation Transmission Vegetation Management Standard. Overall, the impacts from operations and maintenance activities would be periodic and minor.

Impacts to vegetation resources from activities to remove Project facilities would likely be similar to impacts during construction, with the exception that tree removal would not likely be necessary. Forest and Woodland Vegetation would likely be allowed to recolonize areas within the Project ROW that were maintained as Shrub and Herb Vegetation through the operations and maintenance phase of the Project.

Cultural Resources and Native American Traditional Resources and Values

Impacts to archaeological resources from construction include destruction or disturbance by vertical and horizontal displacement of soil containing archaeological materials; damage to or destruction of artifacts and features; and loss of archaeological data due to surface-disturbing activities, such as clearing, grading, excavation, erosion, and compaction, and using temporary multi-use yards for storing equipment and supplies. Increases in the use of vehicles and equipment, as well as human access to previously inaccessible areas, could expose archaeological sites to increased looting, vandalism, and trampling, depending on their accessibility and visibility. To minimize these potential impacts, Project personnel would be instructed on the federal, state, and tribal laws that protect historic properties, including prohibition of collection and removal of cultural material, as noted in the EPMs.

To avoid or minimize potential impacts to inadvertent discoveries, the Applicant would develop and implement the Inadvertent Discovery Plan. Currently, there are 16 previously documented archaeological sites within or up to 250 feet from the planned Project ROW. The archaeological field studies conducted at the two HVDC converter stations resulted in the identification of nine archaeological sites, six in Ford County, Kansas, and three in Monroe County, Missouri. Any archaeological sites encountered during the ongoing archaeological field investigations would be assessed for National Register of Historic Places eligibility and included in the National Historic Preservation Act Section 106 consultation process.

The Fort Larned NHL is approximately 1.7 miles from the planned Project ROW and areas where construction activities would occur. No physical effects from Project construction on Fort Larned NHL are anticipated, as surface disturbance associated with construction would be located within agricultural fields more than a mile from the NHL boundary. During construction, the temporary presence of construction equipment, laydown yards, and other construction-related activities would modify the visual environment within the viewshed of historic properties and could temporarily introduce an inconsistent and contrasting element into the landscape. Temporary effects (those associated with construction activities) to landscape character would occur primarily as a result of the presence of construction equipment, materials, and activities that could temporarily modify the visual landscape by introducing inconsistent and contrasting elements to the existing visual environment during construction of the Project. Upon completion of construction, vehicles and equipment would depart, and disturbed portions of the site would be restored.

Due to the distance (over a mile) and intervening vegetation between the Project ROW and the Fort Larned NHL that screens outward views, temporary visual impacts from construction are anticipated to be minor. Temporary visual impacts would last only the duration of construction activities in the localized area along the planned Project ROW, which is anticipated to be approximately four weeks. Noise and atmospheric impacts are not anticipated due to the distance of the Project from the NHL.

Project construction activities could also impact other historic built environment resources, including direct physical alteration of the built resource (for example a building or bridge), as well as surface disturbance to landscape features that contribute to the significance and integrity that qualifies a resource for inclusion in the NRHP. These impacts could occur from the installation of towers, the introduction of multi-use yards, and constructing or improving access routes located within the boundary of a historic property, as well as visual impacts from adding contrast through visual clutter and alterations to the landscape composition, such that the viewer’s experience may be temporarily affected. In addition, construction activities could have a temporary indirect impact to historic built environment resources, such as noise impacts from construction activities.

The Applicant would not conduct construction-related activities, including surveys, in Osage Nation-provided Areas of Avoidance. As a result, there would be no impact ton tribal resources within these

Areas of Avoidance. Cultural resource surveys are ongoing in the Areas of Interest to the extent they intersect the analysis area.

The nature and types of effects from operations and maintenance activities are similar to those described for construction. There would be no ongoing adverse effects on historic properties, and there would be reduced or no direct effects on historic built environment resources.

The nature and type of direct effects on cultural resources resulting from decommissioning activities would likely be similar to operations and maintenance impacts, as activities would most likely occur in previously disturbed areas, though the visual impacts of the decommissioning activities would be similar to the visual impacts during construction. Once decommissioning is complete, the visual impacts associated with the presence of Project facilities would be eliminated or reduced with the removal of the aboveground infrastructure.

Wildlife

Construction of the Project would result in permanent and temporary habitat loss and conversion of habitat used by wildlife. Permanent habitat loss would occur through clearing of vegetation and construction and operation of permanent project features with permanent impervious surfaces. Temporary disturbance to habitats would occur due to clearing and grading of temporary access routes and multi-use yards that would later be regraded and reseeded with herbaceous species. Revegetation of temporarily disturbed areas would be conducted in compliance with the EPMs.

Project construction activities would have the potential to result in injury and mortality to wildlife species. Some species could potentially be crushed by vehicles along access routes, during vegetation clearing, or from crushing of occupied dens during construction. Species that are prone to injury and mortality on routes include small-bodied or slow-moving species such as reptiles and amphibians, and some fast-moving species such as mammals and birds. To minimize the risk of collisions and mortality, EPMs would be implemented.

The highest construction noise level arising from the use of heavy equipment and machinery at the closest human noise-sensitive receptor (165 feet; L_{eq}) is estimated to range from 62 to 71 A-weighted decibels (dBA), depending on the type of construction activity. Areas located closer to the construction sites where active construction is occurring would experience higher noise levels that would likely result in disturbance and displacement of wildlife from these areas. Noise due to Project construction would be temporary and primarily limited to daytime hours. Night work would be avoided where possible but may occur for the following activities: security activities, material transportation/deliveries, major railroad/highway crossings, equipment repair/maintenance, major concrete pours, and commissioning activities. Artificial light may disturb or disorient wildlife, particularly nocturnal species. Construction activities would generally be limited to daylight hours to the extent practicable.

Construction would result in 689 acres of disturbance to Forest and Woodland Vegetation, which may be used by gray bat, Indiana bat, northern long-eared bat, and tricolored bat for roosting or foraging. Additionally, 6,603 acres of Shrub and Herb Vegetation and Agricultural and Developed Vegetation that may be used by foraging gray bats and tricolored bats and 92 acres of Wetland and Riparian Vegetation that may be used by foraging gray bats and Indiana bats would be disturbed. Construction activities associated with noise, visual changes, and physical presence of construction equipment, vehicles, and personnel could impact bat species, potentially causing temporary avoidance or reduced use of active construction areas. Bats would potentially avoid roosting near active construction and may alter their foraging behavior near active construction sites.

The eastern spotted skunk has a high potential to occupy forest habitats in the wildlife analysis area; therefore, the disturbance of Forest and Woodland Vegetation could affect this species. There would be less than 1 acre of permanent habitat removal, approximately 4 acres of permanent habitat conversion from woodland to grassland, and approximately 146 acres of temporary impacts to grassland that would be restored to preconstruction conditions of Kansas state-designated critical eastern spotted skunk habitat. Impacts from construction resulting in injury or mortality would be similar to those described for general wildlife. The eastern spotted skunk would likely move away from construction disturbance but could be impacted through noise and general disturbance of construction by having to relocate to less preferred habitat.

The Aransas-Wood Buffalo whooping crane population migrates through the wildlife analysis area each spring and fall. While no suitable wetland stopover habitat within the wildlife analysis area would be physically removed by construction activities, avoidance by whooping cranes could make 132 acres of previously suitable wetland stopover habitat fully or partially unavailable for whooping crane use during spring and fall migration. Although the Project could shift the area where whooping cranes stop over during migration, it would not likely have a measurable impact to individual cranes or the population. Impacts to whooping cranes resulting from functional habitat loss would be considered permanent and would continue from construction through operation and maintenance of the Project (primarily along the planned Project ROW). Whooping cranes would potentially experience noise and visual disruption in the Project area during construction.

Project construction would result in 44 acres of surface disturbance to the estimated occupied range of the lesser prairie-chicken. Construction would also result in functional habitat loss of 2,070 acres of the estimated occupied range through avoidance of transmission lines and newly constructed gravel roads. However, functional habitat loss may already have occurred in some portions of the wildlife analysis area because of an existing high-voltage transmission line and existing roads and other infrastructure; therefore, a total of 729 acres of suitable habitat may be functionally lost as a result of the construction of the Project. Of the 729 acres of suitable habitat, 163 acres are known to be or are likely occupied, and 566 acres are likely unoccupied. Impacts to lesser prairie-chicken habitat resulting from potential habitat loss, including avoidance, would be considered permanent beginning during construction and continuing through operations and maintenance of the Project (primarily along the planned Project ROW).

Two special-status raptor species regularly occur in the wildlife analysis area: northern harrier and bald eagle. The Project would impact 1,200 acres of Shrub and Herb Vegetation potentially utilized by the northern harrier. The Project would disturb approximately 698 acres of Forest and Woodland Vegetation that may be utilized by nesting and foraging bald eagles. One known bald eagle nest occurs within 660 feet of Project disturbance. The Applicant would avoid disturbance within 660 feet of all known and discovered bald eagle nests during the nesting season. Impacts to golden eagles are not anticipated because they are uncommon and not known to nest in the wildlife analysis area.

For special-status aquatic species, no permanent impacts from habitat loss, modification, injury, or mortality are anticipated because no permanent facilities would be placed within streams or rivers, aquatic sites would be spanned, and construction equipment would be kept out of flowing stream channels and active drainages to the extent possible to avoid directly impacting special-status aquatic species and their habitats. Transmission structures and other permanent Project components would be sited outside the 100-year floodplain of State-designated critical habitat streams, and no surface-disturbing activities would be conducted within the ordinary high watermark of critical habitat streams.

Construction of the Project would disturb 1,404 acres of Shrub and Herb Vegetation that could potentially be suitable for the monarch butterfly (i.e., areas that could support milkweeds and nectar-producing plants). Additionally, 606 acres of Forest and Woodland Vegetation would be converted to Shrub and

Herb Vegetation, which could support monarch butterflies after that conversion. There may be impacts to monarch butterflies if they are flushed or otherwise disturbed by construction activities while nectaring, mating, or breeding. Injury and mortality of adult monarchs may occur from vehicle collisions and during vegetation clearing. Butterfly eggs, caterpillars, and chrysalis may be crushed during construction activities that involve machinery, vehicles, or foot traffic in areas where milkweed is present.

Construction of the Project would disturb 1,404 acres of Shrub and Herb Vegetation that could potentially be suitable for the regal fritillary. Additionally, 525 acres of Forest and Woodland Vegetation would be converted to Shrub and Herb Vegetation that could support regal fritillary. Impacts would be similar to those described above for monarch butterflies.

During operations and maintenance, a Vegetation Management Program would ensure vegetation is managed for safety and reliability, retaining vegetation compatible with electric transmission clearance requirements in NESC and FAC-003-5. The conversion of forested areas to shrub or grassland habitat would result in modifications to the use of and species mix found in the modified habitat.

The project would be built following Avian Power Line Interaction Committee guidance, which outlines design features and measures to minimize risks of avian collision and electrocution. There is the potential for wildlife species collisions with equipment and vehicles transiting existing access roads and from vegetation management activities. There is also a potential for injury and mortality during vegetation management if dens, burrows, or young are encountered and crushed or killed. However, EPMs would be implemented to reduce the potential for avian mortality.

Noise impacts from helicopter inspections would be similar to those described for construction; EPMs would be implemented to minimize the scope and magnitude of these effects. Additional potential impacts that could occur during operations and maintenance include the spread of nonnative invasive plant species, increased potential for wildland fire, changes in microclimate and sun exposure, and risk of windthrow.

Impacts to special status species during operations and maintenance would be similar to those discussed above for general wildlife species. Impacts are anticipated to occur over a short time span and infrequently, primarily during routine vegetation trimming, transmission line inspections, and repair activities, and may result in special status species avoiding areas adjacent to the Project while these maintenance activities occur.

Impacts to wildlife resources from activities to remove Project facilities would likely be similar to impacts during construction, though are expected to be less extensive, in part due to continued vegetation management during operations and maintenance. Following decommissioning, disturbed areas would be revegetated to preconstruction conditions to the extent practical.

Transportation

In total, there would be approximately 186 daily vehicle trips for HVDC Line, Tiger Connector, and Ford County Interconnect construction at any one segment. Construction vehicle increases to the annual average daily traffic (AADT) volumes would be expected to occur along roadways in the transportation analysis area. The impacts would be greatest for roadways that have the smallest volume of daily traffic and smallest AADT count. Prior to construction, road-use agreements would be established with counties where construction activities would occur.

Delivery of heavy loads and overhead stringing may require temporary traffic controls that modify existing traffic patterns or necessitate limited roadway closures, which could restrict public access to certain roadways. The Applicant plans to repair existing private roadways before and after construction, with paving limited to approach aprons at intersections with existing paved roadways and all-weather access routes to converter stations, unless otherwise required by jurisdictional authorities.

The Project would require 19 overhead crossings of rail lines, including some rail lines that would be crossed more than once. An additional four rail lines occur within the transportation analysis area and would not be crossed by the HVDC Line, Tiger Connector, or Ford County Interconnect. Utility crossing license agreements would be obtained from affected rail line owners, and conductor stringing would be implemented in compliance with utility crossing licenses. Helicopter use during construction could introduce additional numbers of low-flying and hovering helicopters to the existing airspace. Issues related to airports or airspace would require Federal Aviation Administration review and coordination with specific facilities or entities.

Construction activities related to conductor stringing, bird flight diverter installation, and/or structure placement may require temporary restriction of transportation on the Missouri River for a short period of time (a few days to a few weeks). The Applicant would coordinate with maritime operations agencies, such as the U.S. Coast Guard or other local regulatory governing bodies, to ensure safety and limited disruptions to commercial, recreational, or other transport and shipping vessels. Impacts from the construction of Missouri River and levee crossing would be evaluated through the Section 408 process, which would be submitted as a separate application to USACE.

Approximately two personnel would be commuting daily to the converter stations, which would not noticeably increase AADTs in the transportation analysis area. Where practical, inspections and repairs would be conducted by helicopter or drone. This short-term and intermittent use of helicopters would not change or alter the use of airports and airspace. Typically, equipment repair or replacement would be conducted by a four-person crew with two or three 4x4 trucks, a boom or line truck, an aerial truck, and an assist truck. The duration would occur in a limited timeframe, ranging from hours to a few days. Due to the small number of vehicles needed and the short-term nature of the activities, operations and maintenance vehicle use would not noticeably increase AADTs in the transportation analysis area.

Impacts to transportation resources from activities to remove Project facilities would likely be similar to impacts during construction but likely with fewer passenger vehicles and equipment vehicles due to a reduced workforce.

Land Use

The Project would impact land use during construction. Cultivated crops (4,354 acres), grassland/herbaceous (1,189 acres), and pasture/hay (1,016 acres) land cover classes would be most impacted by temporary and permanent disturbance and habitat conversion. Temporary impacts to agricultural lands in the land use analysis area would result from vegetation-clearing activities; temporary access routes and laydown yards; and construction of transmission structures, converter stations, and access driveways. After construction and reclamation are complete, agricultural activities could generally resume within the planned Project ROW. The planned Project ROW would not cross incorporated municipalities and would not include lands that contain schools, cemeteries, places of worship, or residences, including those in the Amish community of Keytesville, Missouri.

Approximately 1,596 acres of previously wooded areas would be permanently impacted due to the need to maintain short vegetation (i.e., grasses) for safety throughout operations and maintenance. Through the life of the Project, land uses compatible with reliability and safety requirements for the Project would be permitted in the ROW. Limitations on land uses would be described in the easement agreements; these limitations could be modified in the easement based on site-specific conditions and/or coordination with landowners.

While only 212 acres within the land use analysis area would have a permanent conversion to utility use (of which 201 acres, or approximately 95 percent, are agricultural land), some long-term impacts may extend to areas beyond the foundations of the transmission structures. Large farming equipment (combines, sprayers, tractors, etc.) requires certain horizontal and vertical clearance from structures to avoid damaging the structure or machine and to make turns in a field; the placement of transmission structures may impact the routes taken by such equipment. Up to 0.1 acre may be impacted for each structure in a way that makes navigating around it difficult or impossible, or that blocks irrigation equipment. Additionally, permanent loss of agricultural land would also occur underneath the transmission line structures where farm equipment could no longer access the land for agricultural use. This area would account for 0.013-0.112 acres per structure that occurs within agricultural land depending on the type of tower. Agricultural production would be allowed and expected to continue under the transmission lines; any restrictions on land use related to agricultural production within the ROW would be determined based on the site-specific conditions and/or in coordination with landowners. Grazing and pasturage would be allowed under the transmission lines after construction is complete; no impacts from the presence of Project facilities are expected to livestock. Existing irrigation systems would also be unaffected by the HVDC Line and Tiger Connector.

Maintenance activities for vegetation management and facility repair could impact land use similar to construction, including erosion, rutting, and compaction from equipment; water quality impacts from stormwater runoff, erosion, and hazardous materials spills; introduction of invasive weeds and other pests from construction equipment; and temporary loss of use of lands. Impacts would be reduced through the implementation of EPMs.

Impacts to land use resources from activities during decommissioning would likely be similar to those that would occur during construction. Following decommissioning, it is assumed that land use could revert to pre-Project conditions for a majority of the impacted areas.

Recreation

Noise or dust from, or visual presence of, Project construction activities within the recreation analysis area would cause a temporary change to the recreation setting and the experience of visitors participating in recreation opportunities at Fort Larned NHL. Noise, dust, and visual impacts from construction activities would be noticeable at certain areas of the Salisbury Municipal Golf Course and would temporarily impact the quality of recreation experiences.

Along the Missouri River, construction of the transmission structures would impact recreational users of the river through temporary closures or delays of nearby roads that access the water trail. During Project construction activities at the Missouri River crossing, helicopters may be used for conductor stringing, bird flight diverter installation, and/or structure placement. Noise and visual presence of Project construction activities near the Jentell Brees Access site and the Missouri River may temporarily impact the quality of visitor experiences at this site, particularly for bird watchers, anglers, and boaters that desire a quiet, natural setting.

The temporary potential displacement of game species from the Project area during hunting seasons would reduce the quality of hunting experiences at Glen Elder Wildlife Area, Cheyenne Bottoms, Wilson Lake, Bluffwoods Conservation Area – Goodell Memorial Annex, Belcher Branch Lake Conservation Area, and Sterling Price Community Lake, where hunting is allowed. Impacts would only be expected to occur if construction activities near these locations coincide with the hunting season, and conditions would return to existing conditions after construction is completed.

The permanent presence of the Project would result in changes to the recreation setting at Fort Larned NHL and the crossings of the Lewis and Clark NHT Auto Route. The permanent presence of the Project would alter the recreation setting at the Jentell Brees Access site and the Missouri River, where the transmission structures would rise above the shoreline vegetation into the open skyline, with the conductors visible between the structures across the river.

Trees are located between the planned Project ROW and the southern edge of the Salisbury Municipal Golf Course; some of these trees may be removed to comply with regulatory requirements regarding vegetation in the ROW. Golfers could have a foreground view of the Project at the southern section of the golf course, depending on final vegetation requirements for this area.

In publicly accessed hunting areas and Walk-In Hunting Areas, the permanent presence of transmission structures and vegetation clearing may reduce suitable habitat for some game species. Maintenance activities would lead to the temporary displacement of game in the recreation analysis area for a short time (approximately 4 weeks) due to noise and human presence.

Activities during decommissioning would likely be similar to those during construction, and therefore, impacts to recreational resources from noise, dust, and visual presence of decommissioning activities would be similar to impacts during construction.

Visual Resources

Temporary impacts to landscape character would occur primarily as a result of the presence of construction equipment, materials, and activities that would be introduced to the existing visual environment during construction of the Project. Much of the Project would be in areas that are sparsely populated, and the changes in landscape character during construction would be observed to a lesser degree in those areas. The temporary presence of construction equipment, multi-use yards, and other construction-related activities would modify the visual environment within the viewshed of historic properties and could temporarily introduce an inconsistent and contrasting element into the landscape.

Visual impacts to public lands and recreational resource areas from construction could result from adding contrast through visual clutter and alterations to the landscape composition, such that the viewer's experience may be temporarily impacted. Impacts would be most apparent in locations where scenic resources contribute to the recreation experience. Environmental protection measures would be implemented. Potential impacts would be most apparent at the Missouri River (including the Missouri River Water Trail), Jentell Brees Access, Ronald and Maude Hartell Conservation Area, Salisbury Municipal Golf Course, and Sterling Price Community Lake, and from portions of the Lewis and Clark NHT Auto Tour Route due to the open viewsheds provided by the Missouri River channel.

Project construction activities, including increased traffic and night lighting, would have a temporary visual impact to views from transportation corridors, towns, and rural residences, lasting only the duration of construction activities in the localized area (a few days to a few weeks).

The presence of overhead transmission lines, supporting structures, ancillary facilities, and vegetation clearing would introduce a new source of potential increased visual contrast over the life of the Project. At the Missouri River crossing, FAA-required marking and lighting systems would be designed to minimize visual impacts through the use of red lights and non-lighted marker balls crossing the river. At permanent Project facilities requiring security lighting (e.g., converter stations, optical regeneration stations), full cut-off lighting fixtures that project light in a downward direction and emit no upward component of light would be installed. This would minimize impacts outside of areas requiring illumination and reduce glare into the night sky.

Operations and maintenance activities would result in slightly noticeable to clearly apparent changes in views from public lands and recreational resources, with a potentially substantial change to views at the Jentell Brees River Missouri River Access given the introduction of new contrasting and dominant features. From rural residences, impacts would be highly dependent on viewing direction and distance from the residence and could range from indiscernible to substantial changes to the landscape and views.

Impacts to visual resources from activities to remove Project facilities would likely be similar to impacts during construction. Following decommissioning, no project facilities would be visible from KOPs in the visual resources analysis area.

Noise

The highest predicted construction noise level at the nearest noise-sensitive receptor to the Project (165 feet away) is 71 dBA L_{eq}. The highest predicted construction noise level at the nearest noise-sensitive location to the HVDC converter stations (2,500 feet away) is 44 dBA L_{eq}. Project construction noise levels would impact other noise-sensitive receptors within the noise analysis area but would decrease with distance from the Project; therefore, the Project would not exceed the FTA guidance construction noise limit of 90 dBA L_{eq} at any noise-sensitive receptor during the daytime period for ground-based construction activities. Noise due to Project construction would be temporary and would only occur during construction activities.

Light-duty helicopters typically result in noise of 72–81 dBA at 250 feet from the helicopter. Heavy-lift helicopters typically result in noise of 90–96 dBA at 250 feet from the helicopter. Noise from helicopters would be more transient and shorter in duration than ground-based construction activities. Helipad locations would be located no closer than 0.5-mile from the nearest noise sensitive land uses.

Implosive splicing would result in momentary (seconds) loud booms of about 150 dB, resulting in noise impacts to noise sensitive receptors. Implosive splicing would not be utilized within 0.5-mile of the nearest noise sensitive receptor (e.g., occupied dwellings, school, and cemeteries). In areas where implosive splicing would be utilized, coordination with local emergency services and notification to landowners would be required.

Typical noise effects associated with maintenance activities at the transmission lines and/or HVDC converter stations would likely include noise generated by drones, pickup trucks, boom trucks, mowers, and chainsaws. At the closest noise-sensitive receptor distance of 165 feet from the HVDC Line, Tiger Connector, and Ford County Interconnect, hourly noise levels from a boom truck would generate approximately 61 dBA L_{eq}. At the closest noise-sensitive receptors to the HVDC converter stations (2,500 feet or greater distance), these noise levels would attenuate to 37 dBA, L_{eq} or less. The maximum potential noise from corona discharges at noise-sensitive receptors near the Tiger Connector and Ford County Interconnect was calculated to be 29 dBA L_{dn} at the closest analysis distance of 165 feet during fair weather conditions, which is roughly the sound level of leaves rustling. Operational noise from the HVDC converter stations at the closest noise-sensitive receptors is predicted to range from 46 to 49 dBA, L_{dn}. Summed with the existing noise environment, future operation of the HVDC converter stations would result in an overall noise exposure increase of 4–6 dBA at noise-sensitive receptors.

Impacts to noise resources from activities to remove Project facilities would likely be similar to impacts during construction.

Social, Economic, and Community Resources

Construction of each HVDC Line segment is expected to involve an average of 115 workers, with a peak of approximately 160 workers employed at one time. Construction of the Tiger Connector would involve respective average and peak workforces of 85 and 110 workers. Peak workforce for the converter station sites would require approximately 330 workers. Viewed as a share of the existing population, peak converter station employment (330 workers) would be equivalent to 1.0 percent and 3.8 percent of the existing populations in Ford and Monroe counties, respectively.

The existing supply of temporary housing that is normally vacant and available for rent should be sufficient to accommodate Project-related demand. The temporary in-migration of non-local construction workers could potentially result in increased demand for local public services, such as emergency services and law enforcement.

Project construction would result in temporary disturbance to an estimated 4,418 acres of agricultural land and developed vegetation, which represents approximately 0.05 percent of the total farmland acreage (8.4 million acres) in the socioeconomic analysis area counties in Kansas and Missouri. As a result, Project construction is expected to result in little to no economic impact to the Kansas and Missouri agricultural sectors.

Over the 36-month construction duration, the total property taxes paid to counties in the Kansas socioeconomic analysis area would total $20.1 million. The total property taxes paid to counties within the Missouri socioeconomic analysis area during the 36-month construction duration would total $8.4 million. The employment supported by Project construction (direct, indirect, and induced) is estimated to total 14,375 full-time equivalent positions over the 36-month construction duration. Project construction is also estimated to support $609 million and $351 million in direct earnings in Kansas and Missouri, respectively.

An average of two workers at each of the converter stations would be on site daily. Project operations and maintenance is, therefore, not expected to have a measurable impact to the population in any single county. Local housing resources would be more than sufficient to handle any overnight stays required for maintenance work in a single location.

The average annual property taxes paid over the first 20 years of the Project’s life would represent an approximately 0.8 percent increase in local revenues, which would represent a small but measurable benefit to the economies of the Kansas and Missouri socioeconomic analysis areas. Project operations and maintenance (direct, indirect, and induced) is estimated to support a total of 100 full-time equivalent positions in Kansas and 105 full-time equivalent positions in Missouri. Operations and maintenance would also support an estimated $9.1 million in Kansas and $8.2 million in Missouri in total (direct, indirect, and induced) earnings.

Impacts to population, housing, and public services, land use and property values, and taxes and government would likely be similar to the impacts from construction activities. Following decommissioning, the employment provided from operations and maintenance would no longer occur, and the related beneficial and adverse socioeconomic impacts would cease.

Environmental Justice

No disproportionate and adverse effects on environmental justice communities are anticipated.

Public Health and Safety

Construction of transmission facilities includes the use of hazardous materials such as fuels, oils, lubricants, coolants, cleaners, paints, and paint thinners. These materials would be stored in multi-use yards following Occupational Safety and Health Administration and EPA guidelines. Project construction activities could result in leaks and accidental spills of these hazardous materials. A Spill Prevention and Response Plan would be developed. Where work in the vicinity of energized transmission lines or other energized equipment is planned, safety measures specific to the immediate work area would be developed. It is possible that a wildfire could occur during Project construction, and it would be responded to per established safety and emergency response plans.

Hazardous chemicals or materials used for routine maintenance activities may be stored at the converter stations where accidental releases could result in worker exposure. The EPMs would mitigate the potential impacts of releases of hazardous materials.

The Project would introduce a new source of direct current electric and magnetic fields (EMFs) from the HVDC Line and converter stations and a new source of AC EMFs from the Ford County Interconnect and Tiger Connector. The magnetic field created by the HVDC Line is approximately 1,000 milliGauss (mG) beneath the conductors and approximately 300 mG at the edge of the ROW. The HVDC facilities are not expected to adversely affect people, livestock, or equipment with potential EMF issues or exposure. The specific design limits for the AC conductor have a magnetic field of 200 mG at the edge of the planned Project ROW; exposures related to the Project are expected to be well below the International Commission on Non-Ionizing Radiation Protection guidelines for AC fields. The newly generated EMFs associated with the Tiger Connector and the Ford County Interconnect would have the potential to interact with conductive objects located near the public health and safety EMF analysis area. As the Applicant would control the space within the planned Project ROW, the primary concern is the potential for conductive objects located just outside the ROW.

The operations and maintenance of an active electric transmission line presents an inherent fire risk from both AC and direct current transmission line facilities. The greatest potential would result from either uncontrolled growth of vegetation within the planned Project ROW under live wires, or vegetation outside of the planned Project ROW that could fall into energized lines.

Impacts to public health and safety resources from activities to remove Project facilities would likely be similar to impacts during construction, specifically with respect to electric and magnetic fields, wildfire, accidents and intentional destructive acts, and worker safety.

Network Upgrades

Activities associated with network upgrades would consist of the following: upgrades at existing substations; upgrades of existing transmission lines, which in some cases may include the expansion of existing ROWs; and construction of new transmission lines and ROWs. Details of the construction, including exact locations in some cases (e.g., the locations of new transmission lines to be constructed, potential expansion of existing ROWs, or other additional disturbance that may be required), operations and maintenance, and decommissioning activities associated with the network upgrades are not fully known.

<u>Air Quality, Greenhouse Gas Emissions, and Climate Change:</u> Impacts to air quality, including GHG emissions, would occur during construction from the following activities, if required: helicopter use, operation of heavy-duty construction equipment, light-duty construction vehicles commuting to and from the work site, fugitive dust from driving across and working in unpaved areas, operation of concrete batch plants, on-site cut and fill work, and vegetation clearing. It is anticipated that the emissions associated with each individual network upgrade would be lower than the pollutant *de minimis* levels and would not cause an exceedance of NAAQS. Projects that are predicted to exceed *de minimis* levels or are predicted to cause an exceedance of NAAQS would be subject to mitigation as determined by the appropriate permitting agency. In some cases, surface disturbance could add to the GHG impact by eliminating existing vegetation and disturbing soil organic matter that acts as a carbon sink for atmospheric CO_2.

Operations and maintenance activities that would generate pollutant emissions include off-road vehicle use, helicopter use, and operation of on-road construction vehicles for routine inspections, repair activities, and vegetation management, if required. Greenhouse gas emissions would occur from the combustion of vehicle fuel during operations and maintenance activities, which include worker commutes, inspections of the transmission line, routine and emergency repairs, vegetation management, and helicopter use. At existing infrastructure locations, there would likely be no changes to pollutant or GHG emissions from existing conditions. Construction of the network upgrades would also help reduce overall GHG emissions by allowing new renewable energy projects additional access to the electrical grid. Activities during decommissioning would likely be similar to those during construction, and therefore, impacts would likely be similar to impacts during construction.

<u>Paleontology and Soils:</u> Construction could result in damage to or destruction of fossils or loss of valuable scientific information during surface-disturbing activities such as clearing, grading, excavation, or off-road travel. Erosion of fossil beds due to slope re-grading and vegetation clearing, or the unauthorized collection of scientifically important fossils could also occur. Network upgrades that do not require additional surface disturbance, such as some substation upgrades, would result in no impacts to paleontological resources. Construction that requires vegetation clearing, grading, or use of heavy equipment would result in impacts as described for the Proposed Action. Network upgrades that do not require additional surface disturbance, would result in no impacts to soil resources. Any impacts to hydric soils, prime farmland, and terraced soils would vary depending on the individual network upgrade and the level of surface disturbance associated with that upgrade. Potential operations and maintenance-related impacts to paleontological and soils resources would be similar to construction-related impacts (e.g., disturbance or loss of fossils, compaction or erosion of soils). Impacts to paleontology and soil resources from activities to remove facilities would likely be similar to impacts during construction. Following decommissioning, removal of structure foundations would disencumber soil resources, including areas of prime farmland that were inaccessible during network upgrade operations.

<u>Water Resources:</u> Construction could result in wetland and waterbody degradation, altered hydrology, groundwater contamination, and/or sedimentation during surface-disturbing activities such as clearing, grading, excavation, or off-road travel. An increase in consumptive water use for dust control or dewatering would also impact groundwater resources. Potential operations and maintenance-related impacts to water resources would be similar to construction-related impacts. However, overall activity during operations and maintenance would be localized, less intensive, and shorter in duration (up to several days in any location). At existing infrastructure locations, there would likely be no changes in impacts to water resources. Project decommissioning could affect water resources in localized areas due to temporary surface disturbance and consumptive water use for dust control.

<u>Vegetation:</u> Vegetation resources could be impacted through clearing and grading, crushing, soil compaction from vehicular traffic and construction equipment, herbicide treatment to control noxious weeds and incompatible vegetation, mowing, growth of opportunistic and early successional species, and the potential dilution of topsoil with subsoil when grading. The increase in vehicles, equipment, and people in vegetated areas could also increase the potential for spread of noxious weeds and wildfire ignitions. Vegetation may be permanently converted from Forest and Woodland Vegetation to Shrub and Herb Vegetation, resulting in the loss of that specific vegetation type. Network upgrades that do not require additional surface disturbance would result in no permanent impacts to vegetation resources. Potential operations and maintenance-related impacts to vegetation resources would be similar to construction-related impacts. Maintenance to limit incompatible trees and shrubs within the new or expanded ROWs would result in a permanent impact to vegetation. At existing infrastructure locations, there would likely be no changes in impacts to vegetation resources. Impacts to vegetation resources from activities to remove network upgrades would likely be similar to impacts during construction.

Cultural Resources and Native American Traditional Resources and Values: Ground-disturbing activities associated with construction, including access routes and staging areas, could result in permanent physical impacts to resources, such as destruction or alteration of archaeological sites, tribal resources, and the historic built environment. Increased human access to sensitive areas during construction of new transmission lines could result in vandalism, looting, and trampling of some resources. Construction activities could result in temporary visual and atmospheric impacts to some resources that require integrity of setting or feeling to convey their significance, such as some historic buildings and NHTs. The physical presence of new infrastructure could result in permanent visual impacts to some cultural resources located in the vicinity of the network upgrades. Upgrades to existing infrastructure with no new ground disturbing activities and no major visual changes to the built environment would result in minor or no permanent adverse impacts due to the presence of existing similar infrastructure on the landscape. Operations and maintenance activities could result in temporary noise, dust, and visual impacts similar to those described for Project construction. At existing infrastructure locations there would likely be no changes from existing conditions. Visual and atmospheric impacts to cultural resources from operations and maintenance activities would decrease with distance from the network upgrade activities. During decommissioning, impacts to cultural resources could include permanent physical impacts from ground-disturbing activities, as well as temporary visual and atmospheric impacts to the setting of some resources.

Wildlife: Construction impacts from the network upgrades on wildlife habitat and general wildlife would be similar to those described above for the Project. Construction would result in permanent habitat loss where new permanent facilities are installed. Construction could also result in functional habitat loss as species avoid construction areas due to noise, vibration, and visual disruption. Furthermore, species may be directly injured or killed by construction equipment.

New facilities could create a range of potential impacts to general wildlife and habitat, including the risk of collision, creation of edge effects, and functional habitat loss. Rebuilt and reconductored transmission lines and upgraded substations would result in limited to no permanent impacts during operations and maintenance, beyond existing conditions, due to the presence of existing infrastructure.

Impacts to aquatic species during construction of the network upgrades could include direct disturbance (e.g., clearing of habitat for road crossings or culvert installation) and a reduction in habitat quality (e.g., temporary increase in erosion, sedimentation, and turbidity following soil disturbance, exposure to hazardous materials). Operations and maintenance activities would be unlikely to cause recurring permanent impacts to aquatic species.

The network upgrades would likely introduce new habitat disturbance adjacent to or within suitable habitat for special status bat species. Bats may roost in proximity to the network upgrades and could experience impacts similar to construction noise or human activity impacts described for the Project. Vegetation clearing could cause the permanent removal of suitable summer habitat for bats. Impacts to special status bats are anticipated to be similar to those described for the Project.

The plains spotted skunk has a high potential to occupy prairies, brush areas, and cultivated land in the network upgrades analysis area; therefore, the disturbance of Shrub and Herb Vegetation and Agricultural and Developed Vegetation from new construction and expanded ROWs could affect this species. Other impacts to the plains spotted skunk, such as direct injury or mortality, are anticipated to be similar to those described for eastern spotted skunk for the Project.

Mississippi green watersnakes, western chicken turtles, prairie massasauga, and alligator snapping turtles would experience impacts similar to those described for general wildlife. The construction of the network upgrades may have impacts to habitat if temporary infrastructure such as access routes or laydown yards were located in Mississippi green watersnake, western chicken turtle, prairie massasauga, or alligator snapping turtle habitat. No permanent impacts during operations and maintenance beyond existing conditions are anticipated at existing lines.

Construction and operations and maintenance impacts of the network upgrades on special status birds (American bittern, Bachman's sparrow, greater prairie-chicken, eastern black rail, rufa red knot, and piping plover) would be similar to those described for wildlife habitat and general wildlife. Additionally, an increase in the functional loss of greater prairie-chicken habitat could occur if new or taller transmission line structures are built for the network upgrades in proximity to occupied prairie-chicken habitat.

Construction of network upgrades is likely to cause at least temporary loss of monarch butterfly suitable habitat and potentially loss to western regal fritillary habitat. Some butterfly eggs or larvae could be killed. Vegetation conversion could also provide localized benefits to monarch butterflies by creating suitable habitat.

Construction of network upgrades may impact foraging and breeding eagles if forested habitat is removed or converted to open habitats or if nests are removed. Additionally, if construction occurs in proximity to nests during the breeding season, bald eagles could abandon eggs or young due to noise or the presence of humans. During operations and maintenance, eagles could collide with new transmission lines, resulting in injury or mortality. Rebuilt and reconductored transmission lines would result in limited to no permanent impacts during operations and maintenance, beyond existing conditions, due to the presence of existing infrastructure.

Impacts to wildlife resources from activities to remove network upgrades would likely be similar to impacts during construction.

<u>Transportation:</u> During construction, workers commuting to worksites, and the delivery of materials, supplies, and equipment would generate traffic on existing roadways within the network upgrades analysis area. The impacts from additional traffic would be greatest for roadways that have the smallest volume of daily traffic. Traffic delays, road closure, rail line, and air transportation impacts would be similar to those described for the Project and would depend on the total number of crossings required for each network upgrade project. The majority of the network upgrades would occur at existing facilities, and therefore, would not result in impacts to transportation during operations and maintenance beyond existing conditions. Impacts to transportation resources from activities to remove network upgrades would likely be similar to impacts during construction.

<u>Land Use</u>: Impacts to agricultural operations during construction could consist of short-term interference with movement of machinery, equipment, and irrigation implements; introduction of weeds and other pests; and livestock relocation. Impacts to community and residential developments and conservation easements are expected to be minimal. New transmission lines would likely be sited to avoid schools, cemeteries, places of worship, residences, and conservation easements, thus avoiding potential impacts. Current land use pertaining to community or residential development, such as use of gates, outbuildings, or other structures, could be disrupted during construction activities. Impacts from operations may include limited restrictions on land use and interference with farming activities. Maintenance activities may have the same types of impacts to land uses as those discussed for construction. Impacts to land use resources from activities during decommissioning would likely be similar to those that would occur during construction. There would be disruption of use of land as workspaces and interference with the movement of machinery. The impacts would be roughly the same duration as construction impacts. Following decommissioning, it is assumed that land use could revert to pre-development conditions for a majority of the impacted areas.

Recreation: Recreation sites located in the vicinity of the network upgrade construction activities would experience temporary impacts from noise or dust, or visual presence of construction activities. Increased construction-related traffic would impact visitors, and temporary road or lane closures for the network upgrade construction activities, if required, would result in the temporary displacement or disruption of visitors. Recreation sites located in the vicinity of the network upgrades would experience permanent visual impacts due to the physical presence of new infrastructure. Rebuilt and reconductored transmission lines and upgraded substations would result in minor or no permanent visual impacts. Operations and maintenance activities would result in temporary noise, dust, and visual impacts similar to those described for construction. At existing infrastructure locations there would likely be no changes to recreation from existing conditions. Activities during decommissioning would likely be similar to those during construction. Some temporary displacement of recreational activities may occur due to impacts to the setting or access.

Visual Resources: During construction, temporary impacts to landscape character, properties of historic significance, designated scenic resources, public lands and recreational resources, and transportation corridors, towns, and rural residences would be the same as described for the Project. Impacts would occur as a result of new physical features that would be introduced to the visual environment. New facilities would create a range of potential visual impacts, depending on the proximity of the various network upgrades to sensitive views and viewers. Rebuilt and reconductored transmission lines and upgraded substations would result in minor or no permanent impacts. Impacts to visual resources from activities to remove network upgrades would likely be similar to impacts during construction.

Noise: Use of ground-based heavy construction equipment and machinery, such as graders, dozers, drill rigs, and cranes would impact nearby noise-sensitive receptors. Noise levels would vary throughout construction, depending on the number and locations of operating equipment, distance to the noise-sensitive receptor from the equipment, time of day, atmospheric conditions, and intervening topography or barriers. If helicopters are proposed, they would cause additional noise impacts to noise-sensitive receptors from warm-up, take-off, and landing. Maintenance activities would result in short-term impacts to noise-sensitive receptors from noise generated by vehicles and equipment. At existing infrastructure locations, there would likely be no changes in impacts from noise as a result of continued operations and maintenance. Noise impacts from activities to remove network upgrades would likely be similar to impacts during construction.

Social, Economic, and Community Resources: During construction, potential impacts could occur to the supply of temporary housing and public services resulting from increased demand from an influx of non-local workers into the areas planned for these transmission and infrastructure upgrades. However, significant increases in construction workers are not anticipated to cause increases in demand for housing and public services beyond short-term minimal impacts during construction periods in a given location. Potential operations and maintenance-related impacts would be unlikely due to the limited amount of maintenance workers and associated staff for the planned network upgrades. Additionally, potential impacts to land use and property values as well as impacts to taxes and government revenues could occur; however, significant impacts to these taxes and revenues are not anticipated. At existing infrastructure locations, operations and maintenance activities are already occurring, and there would likely be no changes in impacts to socioeconomic resources as a result of continued operations and maintenance. Impacts to socioeconomic resources from activities to remove network upgrades would likely be similar to impacts during construction.

Environmental Justice: Construction-related potential adverse impacts to minority and low-income communities include air quality, greenhouse gas emissions, and climate change, transportation, cultural, noise, and social, economic, and community resources. Construction would be spread across the entirety of the network upgrades analysis area and would likely impact environmental justice communities the same as non-environmental justice communities. Long-term operations and maintenance-related impacts that could have adverse impacts to minority and low-income communities include air quality, greenhouse gas emissions, and climate change, transportation, and noise. Operations and maintenance activities would be spread across the entirety of the network upgrades analysis area and would be localized and short in duration. At existing infrastructure locations, there would likely be no changes in impacts to minority and low-income communities as a result of continued operations and maintenance. Operations and maintenance of the network upgrades would likely impact environmental justice communities the same as non-environmental justice communities. Activities during decommissioning would likely have similar impacts to environmental justice as those during construction. Impacts to environmental justice communities would likely be the same as non-environmental justice communities.

<u>Public Health and Safety:</u> Surface disturbance, including grading activities, during construction could disrupt contaminated soil, creating potential health hazards for workers and the public in the immediate vicinity of the construction activities. Reconductored transmission lines and upgraded substations that have no associated new surface disturbance would result in no impacts to public health and safety from contaminated soils. New transmission lines would introduce a new source of AC EMFs, and impacts would be similar to those described for the Ford County Interconnect and Tiger Connector. Other impacts from new transmission lines to public health and safety from contaminated soils, hazardous materials, wildfires, accidents and intentional destructive acts, and worker health and safety during construction and operations and maintenance of the network upgrades would be similar to those described for the Project. Impacts to public health and safety resources from activities to remove network upgrade facilities would likely be similar to impacts during construction, specifically with respect to EMFs, wildfire, accidents and intentional destructive acts, and worker safety. Surface disturbance during decommissioning would likely result in new adverse impacts related to contaminated soils, and hazardous materials would not be expected to occur.

Kansas AC Collector System

The Meade-Dodge City and Bucklin-Dodge City routes for the Kansas AC Collector System were approved by the KCC on September 26, 2024. Details of the construction, including the location of temporary and permanent disturbance, locations of construction workspaces, operations and maintenance, and decommissioning activities for the Kansas AC Collector System are under development and the design is not final. Activities associated with the Kansas AC Collector System would likely be similar to those described for the Project, and would be conducted in accordance with local, state, and federal laws and regulations.

<u>Air Quality, Greenhouse Gas Emissions, and Climate Change:</u> Impacts to air quality, including GHG emissions, during construction could occur from the following activities, if required: helicopter use, operation of heavy-duty construction equipment, light-duty construction vehicles commuting to and from the work site, fugitive dust from driving across and working in unpaved areas, operation of concrete batch plants, on-site cut and fill work, and vegetation clearing. If air emissions for the Kansas AC Collector System are lower than the pollutant *de minimis* levels and would not cause an exceedance of NAAQS and would maintain each county's attainment status, minimal air quality impacts from construction would be expected. Surface disturbance could also add to the GHG impact by eliminating existing vegetation and disturbing soil organic matter that acts as a carbon sink for atmospheric CO_2.

Operations and maintenance activities that would generate pollutant emissions include fugitive dust from off-road vehicles, helicopter use, and operation of on-road construction vehicles for routine inspections, repair activities, and vegetation management, if required. Greenhouse gas emissions would occur from the combustion of vehicle fuel during operations and maintenance activities, which include worker commutes, inspections of the transmission line, routine and emergency repairs, vegetation management, and helicopter use. In the long term, construction would help reduce GHG emissions by the addition of renewable energy to the electric grid, providing additional power to growing markets and/or replacing existing fossil-fuel power generation. Activities during decommissioning would likely be similar to those during construction, and therefore, impacts would likely be similar to impacts during construction.

Paleontology and Soils: Construction could result in damage or destruction of fossils or loss of valuable scientific information during surface-disturbing activities such as clearing, grading, excavation, or off-road travel. Erosion of fossil beds due to slope re-grading and vegetation clearing or the unauthorized collection of scientifically important fossils could also occur. Construction that requires vegetation clearing, grading, or use of heavy equipment would result in soil impacts as described for the Project. Any impacts to hydric soils, prime farmland, and terraced soils would vary depending on the final route selected and final project design. Impacts to paleontology and soil resources from activities to remove facilities would likely be similar to impacts during construction. Following decommissioning, removal of structure foundations would disencumber soil resources that were inaccessible during network upgrade operations.

Water Resources: Construction could result in wetland and waterbody degradation, altered hydrology, groundwater contamination, and/or sedimentation during surface-disturbing activities such as clearing, grading, excavation, or off-road travel. An increase in consumptive water use for dust control or dewatering would also impact groundwater resources. Potential operations and maintenance-related impacts to water resources would be similar to construction-related impacts. However, overall activity during operations and maintenance would be localized, less intensive, and shorter in duration (up to several days in any location). Project decommissioning could affect water quality in localized areas due to temporary surface disturbance.

Vegetation: During construction, temporary and permanent impacts to vegetation resources would be the same as described in for the Project. Due to the overall lack of Forest and Woodland Vegetation underlying the planned transmission routes, the Kansas AC Collector System would be unlikely to require a significant amount of tree clearing. During operations and maintenance, potential impacts to vegetation would be the same as those described for the Project. Impacts to vegetation resources from activities to remove the Kansas AC Collector System would likely be similar to impacts during construction.

Cultural Resources and Native American Traditional Resources and Values: Construction of the Kansas AC Collector System could result in impacts like those described for the Project**.** Ground-disturbing activities associated with construction of the collector system, including access routes and staging areas, could result in permanent physical impacts to resources such as destruction or alteration of archaeological sites, tribal resources, and the historic built environment. Increased human access to sensitive areas during construction of new transmission lines could result in vandalism, looting, and trampling of some resources. Construction activities could result in temporary visual and atmospheric impacts to some resources where setting is important to conveying a resource's significance, such as some historic buildings and NHTs. Cultural resources that require historical integrity of their setting to convey their significance, such as some historic built environment resources, could experience permanent visual impacts from the physical presence of new infrastructure. Operations and maintenance activities would result in temporary noise, dust, and visual impacts similar to those described for construction. During decommissioning, impacts to cultural resources could include permanent physical impacts from ground-disturbing activities as well as temporary visual and atmospheric impacts to the setting of some resources.

Wildlife: Construction impacts to wildlife habitat and general wildlife would be similar to those described for the Project. Construction would result in permanent habitat loss where new permanent facilities are installed and functional habitat loss as species avoid construction areas due to noise, vibration, and visual disruption. Furthermore, species may be directly injured or killed by construction equipment. New facilities could create a range of potential impacts to general wildlife and habitat, including the risk of collision, and the creation of edge effects.

Construction and operations and maintenance impacts to New Mexico threadsnakes would be similar to those described for wildlife habitat and general wildlife.

If the Kansas AC Collector System overlaps areas where lesser prairie-chickens are known or likely to occur, the construction and operation and maintenance of the Kansas AC Collector System could result in loss and degradation of lesser prairie-chicken habitat in such areas. These effects could lead to complete or partial avoidance of the area by lesser prairie-chickens. In areas of overlap with the estimated occupied range, the proposed routes generally parallel existing disturbance, which would minimize functional habitat loss.

Impacts to whooping crane from construction noise and the physical presence of the Kansas AC Collector System are anticipated to be minimal.

The Kansas AC Collector System overlaps designated critical habitat for the plains minnow in Crooked Creek in Meade County, Kansas. Construction of the Kansas AC Collector System could impact the minnow by introducing sediment or other pollutants into Crooked Creek. Operations and maintenance activities would be unlikely to cause recurring permanent impacts to this species.

Because fewer acres would be subject to disturbance, The impacts to monarch butterflies would be much smaller in magnitude but similar in type to those described for the Project. Construction of the Kansas AC Collector System may impact foraging golden eagles if open habitats are converted to permanent disturbance. Breeding golden eagles could be impacted if native grasslands are converted to permanent disturbance. Additionally, if construction occurs in proximity to nests during the breeding season, eagles could abandon eggs or young due to noise or the presence of humans. During operations and maintenance, eagles could collide with new transmission lines, resulting in injury or mortality.

Impacts to wildlife resources from decommissioning would likely be similar to impacts during construction.

<u>Transportation:</u> During construction, workers commuting to worksites, and the delivery of materials, supplies, and equipment would generate traffic on existing roadways. The impacts from additional traffic would be greatest for roadways that have the smallest volume of daily traffic, such as state routes and local roads. Traffic delays, road closure, rail line, and air transportation impacts would be similar to those described for the Project. No water crossings are proposed; therefore, no impacts to water transportation are anticipated. Impacts during operations and maintenance as a result of traffic, delays and road closures, rail lines, and air transportation would be similar to those described for the Project. Impacts to transportation resources from activities to remove the Kansas AC Collector System would likely be similar to impacts during construction, but likely with fewer passenger vehicles and equipment vehicles.

<u>Land Use:</u> During construction, impacts to agricultural operations could consist of short-term interference with movement of machinery, equipment, and irrigation implements; introduction of weeds and other pests; and relocation of livestock. After construction is complete, agricultural activities could generally resume. The Kansas AC Collector System would be sited to avoid schools, cemeteries, places of worship, residences, and known conservation easements, thus avoiding potential impacts. Current land use pertaining to community or residential development such as use of gates, outbuildings, or other structures could be disrupted during construction activities, and the duration and intensity of disruption would be variable. Impacts from operations may include limited restrictions on land use and interference

with farming activities. Impacts to land use resources from activities during decommissioning would likely be similar to those that would occur during construction.

Recreation: No recreation sites are located within the Kansas AC Collector System analysis area and no impacts are anticipated.

Visual Resources: During construction, temporary impacts to landscape character, properties of historic significance, and transportations corridors, towns, and rural residences would be the same as described for the Project. When operational, potential impacts to visual resources would occur as a result of the physical features that would be introduced to the visual environment. New facilities would have a range of potential visual impacts, depending on their proximity to sensitive viewers. Impacts to visual resources from activities to remove the Kansas AC Collector System would likely be similar to impacts during construction.

Noise: During construction, short-term impacts from noise would occur similar to those described for the Project. Use of ground-based heavy construction equipment and machinery, such as graders, dozers, drill rigs, and cranes would impact nearby noise-sensitive receptors. Noise levels would vary throughout construction depending on the number and locations of operating equipment, distance to the noise-sensitive receptor from the equipment, time of day, atmospheric conditions, and intervening topography or barriers. If helicopters are proposed, they would cause additional noise impacts to noise-sensitive receptors from warm-up, take-off, and landing. Activities during operations and maintenance would result in short-term impacts to noise-sensitive receptors from noise generated by vehicles and equipment. Noise impacts from activities to remove the Kansas AC Collector System would likely be similar to impacts during construction.

Social, Economic, and Community Resources: It is anticipated that most construction workers temporarily relocating to the area would seek temporary accommodation in Dodge City and the surrounding area. It is anticipated that there would be adequate temporary housing resources available to accommodate potential demand from incoming construction workers. Although workforce estimates are not available for the Kansas AC Collector System construction, the incoming workforce is likely to represent a relatively small share of the existing populations and would not be expected to substantially increase demand for local public services. Construction would also support jobs, income, and economic activity elsewhere in the local economy, as well as generate additional tax revenues for the affected local governments. Workforce requirements for operations and maintenance would not be anticipated to impact population, housing, or public services. Impacts to property values and local governments through property taxes would be unlikely due to the rural setting of the Kansas AC Collector System. Impacts to socioeconomic resources from activities to remove the Kansas AC Collector System would likely be similar to impacts during construction.

Environmental Justice: No disadvantaged communities are in the Kansas AC Collector System analysis area; therefore, no environmental justice impacts are anticipated.

Public Health and Safety: During construction of the Kansas AC Collector System, surface disturbance, including grading activities, could disrupt contaminated soil, creating potential health hazards. The new transmission lines would introduce a new source of AC EMFs, and impacts would be similar to those described for the Ford County Interconnect and Tiger Connector. Other impacts to public health and safety from contaminated soils, hazardous materials, wildfires, accidents and intentional destructive acts, and worker health and safety during construction and operations and maintenance of the Kansas AC Collector System would be similar to those described in for the Proposed Action. Impacts to public health and safety resources from activities to remove the Kansas AC Collector System would likely be similar to impacts during construction, specifically with respect to EMFs, wildfire, accidents and intentional destructive acts, and worker safety. Surface disturbance during decommissioning would likely occur in areas that had been disturbed during construction, and, therefore, new adverse impacts related to contaminated soils and hazardous materials would not be expected to occur.

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1. INTRODUCTION AND PURPOSE AND NEED

1.1 Introduction

Grain Belt Express LLC,[1] (the Applicant), applied for federal financial assistance via a loan guarantee from the United States (U.S.) Department of Energy (DOE) Loan Programs Office (LPO) under Title XVII of the Energy Policy Act of 2005 (EPAct) (42 U.S. Code [U.S.C.] 16513), as amended. Section 1703 of Title XVII (the Clean Energy Financing Program) defines eligible projects as those that, “avoid, reduce, or sequester air pollutants or anthropogenic emissions of greenhouse gases [GHGs]; and employ new or significantly improved technologies as compared to commercial technologies in service in the United States at the time the guarantee is issued” (Public Law [P.L.] 109-58, Section 1703(a)).

DOE LPO determined that the Phase 1 Grain Belt Express Transmission Project (the Project), as proposed by the Applicant, is eligible for a loan guarantee to support the development, construction, and startup of the Project. This Draft Environmental Impact Statement (EIS) for the Project was prepared in accordance with the National Environmental Policy Act (NEPA) (42 U.S.C. 4321 et seq.), the Council on Environmental Quality (CEQ) NEPA implementing regulations (40 Code of Federal Regulations [CFR] Parts 1500-1508)[2], and the DOE NEPA implementing regulations (10 CFR Part 1021).

1.2 DOE LPO’s Purpose and Need

The purpose and need of the proposed action is implementation of DOE LPO’s Section 1703 authority to provide federal financial assistance via a loan guarantee for projects that avoid, reduce, or sequester air pollutants or anthropogenic emissions of GHGs.

DOE LPO is using the NEPA process to assist in determining whether to provide federal financial assistance via a loan guarantee to the Applicant to support the Project. DOE LPO is not responsible for the design, engineering, construction, startup, commissioning, and shakedown of eligible projects under EPAct. Rather, DOE LPO performs comprehensive due diligence on such elements including the environmental impacts in accordance with NEPA, as well as a review of relevant supply and offtake agreements, and makes a recommendation of the Project’s reasonable prospect of repayment to the Secretary of Energy, who ultimately decides on providing a loan guarantee. Therefore, the decision before DOE is to either issue a loan guarantee for the Project as proposed by the Applicant (Proposed Federal Action), or not issue a loan guarantee for the Project (No Action Alternative).

The alternatives reviewed in this EIS are the Proposed Federal Action (providing federal financing via a loan guarantee for the Project as proposed by the Applicant) and the No Action Alternative (not providing the loan guarantee).

Assessment of alternatives for the Project’s siting and route selection were conducted as part of the regulatory approval process for transmission line facilities in each State, specifically, the Kansas Corporation Commission (KCC) and Missouri Public Service Commission (MPSC). The Project received

[1] The Project was initiated by Grain Belt Express Clean Line LLC, a wholly owned subsidiary of Grain Belt Express Holding LLC, which was a wholly owned subsidiary of Clean Line Energy Partners LLC. In 2020, Invenergy Transmission LLC acquired Grain Belt Express Clean Line LLC from Grain Belt Express Holding LLC, and the Applicant’s name was changed from Grain Belt Express Clean Line LLC to Grain Belt Express LLC.

[2] DOE LPO is aware of the November 12, 2024, opinion in *Marin Audubon Society v. Federal Aviation Administration*, No. 23-1067 (D.C. Cir. Nov. 12, 2024). To the extent that the CEQ NEPA implementing regulations are not judicially enforceable or binding on this agency action, DOE has nonetheless elected to follow those regulations, in addition to DOE’s own NEPA implementing regulations, to meet the agency’s obligations under NEPA.

State regulatory approval via the Certificate of Public Convenience and Necessity (CPCN) and Siting Permit from the KCC and the Certificate of Convenience and Necessity (CCN) approval from MPSC prior to the Applicant's application to DOE LPO for federal financing of the Project. Details of the project review, agency coordination, and public engagement for the State approval processes are discussed in **Section 1.5.1** and **Section 5.1.1**).

1.3 Project Overview

The federal financing provided by DOE LPO will apply to eligible project costs that include the design, engineering, financing, construction, startup, commissioning, and shakedown of the Project (**Figure 1.1** and **1.2**), which includes the following elements:

- A 542-mile, overhead 600-kilovolt (kV) high-voltage direct current (HVDC) transmission line that would extend between Ford County in southwestern Kansas and Monroe County in northeastern Missouri (HVDC Line);
- The Tiger Connector, an approximately 36-mile, overhead 345-kV alternating current (AC) transmission line that would extend from the HVDC converter station in Monroe County, Missouri, to the existing McCredie Substation, owned and operated by Associated Electric Cooperative Incorporated (AECI), and the existing Burns Substation, owned and operated by Ameren, in Callaway County, Missouri;
- The Ford County Interconnect, an approximately 0.2-mile, overhead 345-kV AC transmission line located in Ford County, Kansas that would extend from the HVDC converter station to the existing Saddle Substation, owned and operated by ITC Great Plains;
- Two HVDC converter stations and associated infrastructure, one located in Ford County, Kansas and one located in Monroe County, Missouri; and
- Optical regeneration facilities in support of the HVDC Line and associated driveways;
- Temporary workspaces needed for construction, including temporary access routes, workspaces around transmission structures, pull or tension sites, multi-use construction yards, concrete batch plants, and fly yards and helipads.

In addition to the Project elements above, the KCC CPCN included approval to construct and operate an AC Collector System, which consists of AC gathering lines that link power generators in western Kansas to the Project (Kansas AC Collector System). Additionally, regional power generators (Ameren and AECI) identified network upgrades (e.g., substation upgrades, reconductoring, rebuilds, and new transmission lines) needed to support the injection of power from the Project.

Financing from the DOE LPO loan guarantee will not be used to support the design, development, or construction of the Kansas AC Collector System or the network upgrades; therefore, these components are related non-federal actions that are reviewed in this Draft EIS as indirect effects (see **Section 3.17**). The relationship between the Project and the Kansas AC Collector System and the network upgrades are further described in **Section 2.2**.

As part of LPO's due diligence process related to the reasonable prospect of repayment for the loan guarantee, DOE LPO reviewed the current status of the Applicant's supply and offtake agreements. The following provides a summary of the network upgrades to support the injection of the power transmitted by the Project, followed by a summary of the interconnection agreement process for the supply of the power transmitted by the Project.

The Applicant has executed a Transmission Connection Agreement (TCA) with Midcontinent Independent System Operator (MISO) and Ameren, as well as a Generator Interconnection Agreement (GIA) with AECI. Each of these agreements identifies a list of upgrades (e.g. network upgrades and connection facilities) to support the injection of the power transmitted via the Project and identifies options for limited operations if upgrades are delayed. The timeline for completion of the network upgrades outlined in the TCA is December 1, 2030, and the timeline for completion of network upgrades outlined in the GIA is July 1, 2027. Completion of the network upgrades will proceed concurrent with the permitting and construction of the Project. The Applicant is in the process of negotiating Multi-Party Facilities Construction Agreements (MPFCAs) with MISO, Ameren, and other generators, which are anticipated to include and establish cost-sharing obligations among the parties for the implementation of the network upgrades.

The Applicant is completing a Power System Analysis and a Facility Study associated with interconnection requests to the Project. This review process is expected to be completed in the first half of 2025, followed by negotiation and execution of interconnection agreements between the Applicant and generation projects in the second half of 2025. An interconnection agreement does not guarantee that any given generation project would ultimately be constructed, completed, or interconnected to the Project. It is anticipated that approximately 3,000 megawatts (MW) of generation projects would need to both execute interconnection agreements and secure offtake to fully use the Phase 1 Project capacity and meet the requirement to deliver 2,500 MW to the points of interconnection in Missouri.

Federal Energy Regulatory Commission (FERC) authority to regulate electric transmission service and wholesale electricity sales pursuant to the Federal Power Act applies to approving transmission interconnection agreements filed by the relevant regional transmission organizations. FERC reviews the rate terms and conditions of transmission and generator interconnection service on the line, which will be memorialized in the project's Open Access Transmission Tariff. While FERC has authority over the interconnection agreements, it has no authority over the siting, permitting, or construction of the Project.

1.4 Applicant's Goals and Objectives

The Project will facilitate the delivery of affordable, reliable, domestically produced renewable energy between the Southwest Power Pool (SPP) and MISO and AECI territories in the Midwest, powering millions of homes and businesses, while creating economic opportunity and energy security. The Applicant's goal for the Project is to address the unique regional needs of transmission capacity and reliability. The objectives for the Project are:

1) **Domestic Energy:** address rapidly growing U.S. energy demand—as the U.S. competes for global leadership in energy-intensive manufacturing and artificial intelligence industries--by opening access to domestic energy resources and delivering systemwide energy.

2) **Increased Reliability:** enhance the reliability and resilience of the electric grid by improving national transmission infrastructure and establishing multiple new interregional transmission connections.

3) **National Security:** strengthen national security by providing greater energy assurance for critical infrastructure and supporting U.S. leadership in energy technology innovation and deployment.

4) **Economic Strength:** support American jobs, manufacturing, and local economic development (the Project is expected to create at least 1,110 direct jobs through the onsite prime construction workforce, as well as numerous additional jobs in construction management, engineering, procurement, commissioning, logistics, and other scopes.

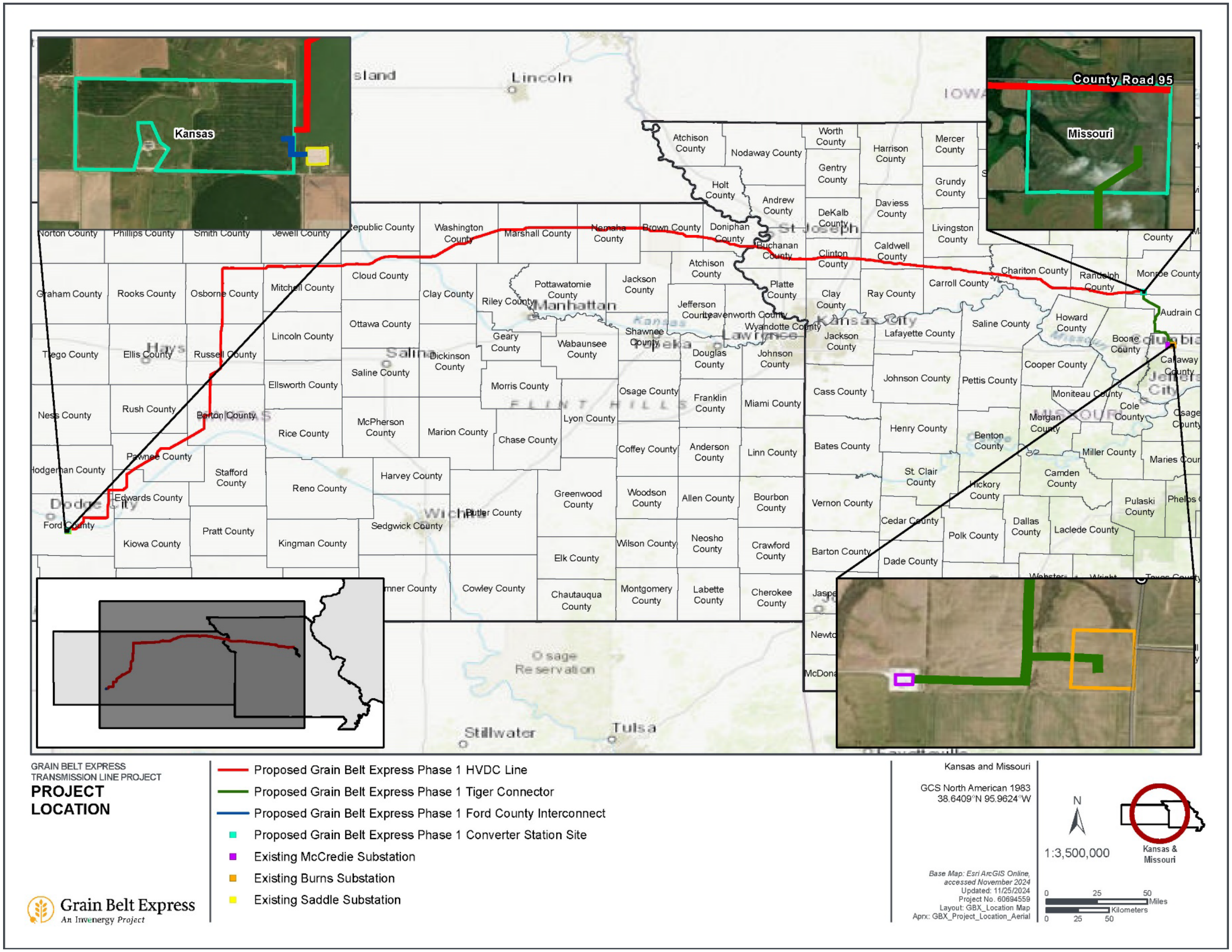

Figure 1-1. Project Location

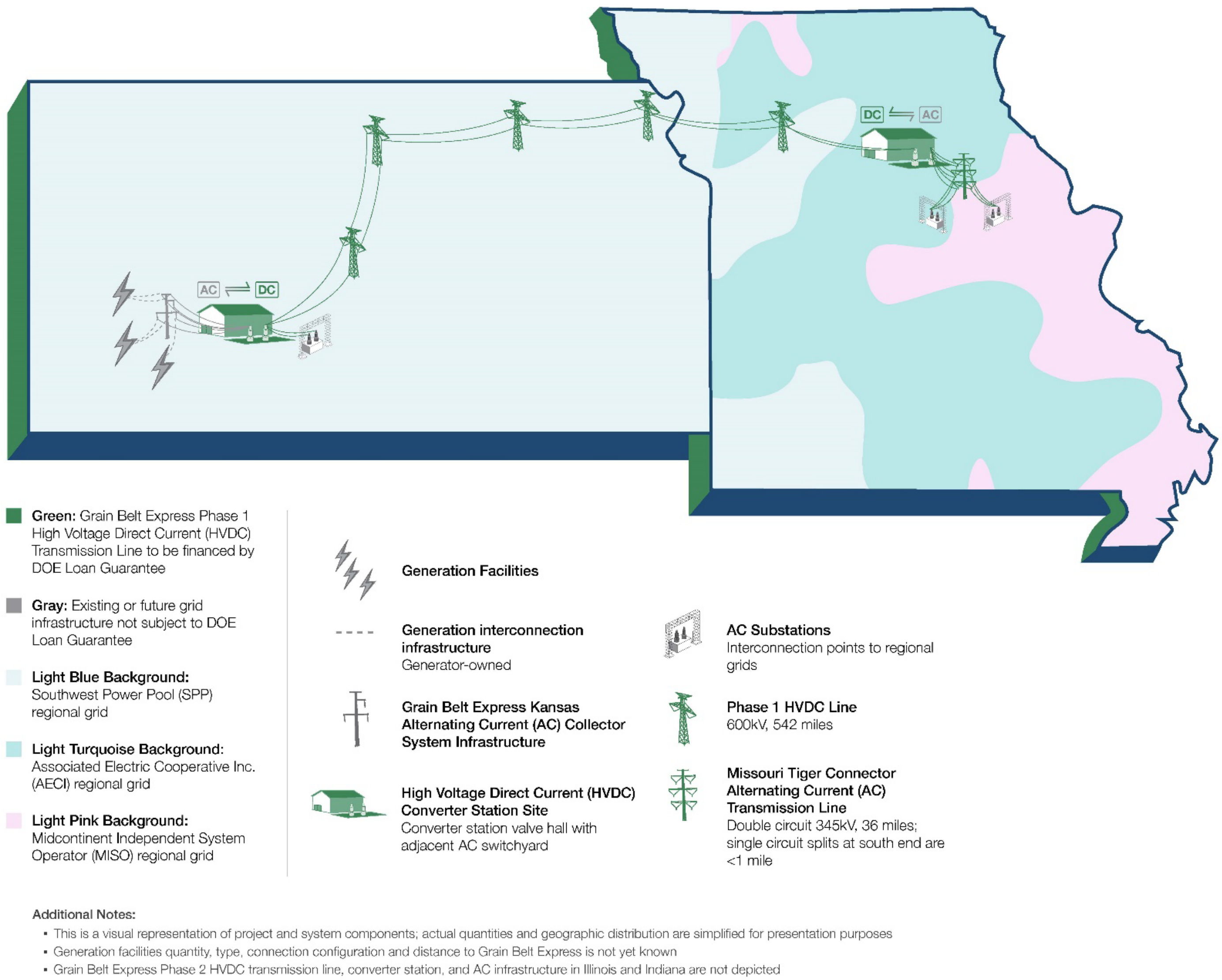

Figure 1-2. Grain Belt Express Phase 1 Project Schematic

High-voltage grid backbone projects using innovative HVDC technology are critical for American prosperity and national security. The U.S. is rebuilding its domestic manufacturing and industrial base and competing in the global artificial intelligence race. The demands of an increasingly energy-intensive economy requires enhanced grid reliability based on growing domestic energy sources. The Project's implementation of HVDC technology to build a modern, efficient, reliable U.S. power grid improves the transmission and delivery of American energy production.

The North American Electric Reliability Corporation (NERC), a not-for-profit regulatory authority, responsible for ensuring the reliability of the U.S. bulk power system, annually prepares the Long-Term Reliability Assessment (LTRA), which projects electricity supply and demand and discusses key issues and trends that could affect electric system reliability. The Project addresses several recommendations identified in the LTRA as high priority. The Project will improve reliability within both major power pools interconnected by the Project, each of which are at-risk of severe weather reliability events - MISO was categorized as a "High Risk Area," and SPP was categorized as a "Elevated Risk Area" (NERC 2023). Additionally, the Project meets NERC's recommendation to expand the transmission network to deliver supplies from new resources and locations to serve changing loads (NERC 2023).

With 2,500 MW of delivery capacity, the Project will create a path to market for new domestic energy supply produced in southwest Kansas to serve residential and industrial consumers throughout the central U.S. As a 600-kV line, the Project will be the highest voltage HVDC project in the U.S., enabling high-volume, high-efficiency power transfer over longer distances and with precise control to effectively route electricity across the grid to meet growing industrial demand. The Project will increase reliability insurance to areas susceptible to severe weather events, serving as an interregional link between MISO, SPP region, and AECI. The Project will expand capacity for available surplus generation in SPP, MISO and AECI to be routed to areas of grid strain across regional boundaries. This is valuable both for avoiding or mitigating acute events like power outages as well as minimizing consumer price spikes associated with these events.

The states of Kansas and Missouri have approved the Project based in part on the economic development benefits the project will bring to both states, including construction job creation, additional tax revenues for state and local governments, and payments to landowners. As a merchant line, the Project will contract with customers through voluntary agreements. In Missouri, 39 municipal utilities across the state have already contracted for transmission service on the Project.

1.5 Project Development

1.5.1 Regulatory Approvals

The Grain Belt Express Transmission Project was initiated in 2010 by a subsidiary of Clean Line Energy Partners LLC. It was originally conceived as an approximately 800-mile, 4,000-MW HVDC transmission line that would generally extend between Ford County, Kansas, and Clark County, Illinois, transitioning to a 345-kV AC transmission line that would interconnect to the existing power grid in Sullivan County, Indiana.

The siting, route selection, and development approvals for the Grain Belt Express Transmission Project are governed by the respective state agencies with regulatory authority over transmission line facilities in each state. The project proponent initiated outreach to landowners and federal, state, and local agencies to support regulatory approvals within each state, including detailed studies to evaluate reasonable routing and design options. The goal in selecting suitable transmission line routes was to minimize impacts on the natural, cultural, and human environment, while avoiding inefficient or circuitous routes, extreme costs, and non-standard design requirements.

For the Project under review in this DEIS, specifically Phase 1 of the Grain Belt Express Transmission Project, approvals from the KCC and MPSC were required. After conducting agency and public review processes (see **Section 5.1.1**), the Project received its CPCN from the KCC on December 7, 2011, and its Siting Permit approval from the KCC on November 7, 2013. The KCC Siting Permit approval considered the necessity and reasonableness of the location of the Project, including the benefit to consumers in and outside of Kansas, as well as economic development benefits within Kansas. The KCC approval documented the direct benefit to Kansas including short-term and long-term economic development benefits. The KCC also documented the need to build a transmission facility to move wind energy from southwest Kansas to the market in eastern Kansas and beyond. The KCC found the proposed route to be reasonable and in the public interest.

The Project received a CCN from the MPSC on March 20, 2019. The MPSC CCN documented that the proposed Project route represents the best route to minimize effects on the natural and human environment, while avoiding unreasonable and circuitous routes, unreasonable costs, and special design requirements. Additionally, the MPSC CCN found the Project would have a substantial and favorable effect on the reliability and cost of electric service in Missouri.

In January 2020, Invenergy Transmission LLC acquired the project. The proponent's name was changed to Grain Belt Express, LLC on May 1, 2020.

In 2020, the Applicant held community meetings to discuss the Project with interested stakeholders. As a result of community feedback, the Applicant updated the design and sequencing of the Project to include the addition of the Tiger Connector (**Figure 2-5**), which enabled the phasing of the Grain Belt Express Transmission Project and expanded interconnection to MISO from the Project. Phasing the project resulted in two segments – Phase 1 from Ford County, Kansas to the HVDC converter station in Monroe County, Missouri, and south to Callaway County, Missouri (the Project subject to the review is this EIS), and Phase 2 from the HVDC converter station in Monroe County Missouri to Sullivan County, Indiana. Only Phase 1 was included in the Applicant's request for federal financing via the loan guarantee; therefore, only Phase 1 is reviewed in this Draft EIS.

The Applicant requested amended regulatory approvals from the MPSC in August 2022 and from the KCC in March 2023 for the phased development of the Grain Belt Express Transmission Project. The KCC granted the Applicant's Motion to Amend the Unanimous Settlement Agreement on June 13, 2023.[3] The MPSC issued an amendment to the CCN on October 12, 2023, finding that the Project remains economically feasible and reiterating that the Project has a substantial and favorable effect on the reliability of electric service in Missouri. Details of the public engagement regarding the routing of the Tiger Connector is included in **Section 5.1.1**.

1.5.2 Routing Studies and Route Selection

An assessment of alternatives for the Project's route selection were conducted as part of KCC and MPSC's regulatory approval process. The KCC initially approved the Project on November 7, 2013, in a Notice Granting Siting Permit, and approved the Project's updated design with two phases on June 13, 2023 (KCC 2023), The MPSC initially approved the Project in on March 20, 2019, and approved the

[3] Past state regulatory approvals and amendment requests are available on the Applicant's website at https://grainbeltexpress.com/resources-news/#RegulatoryandConstructionUpdates.

Project's updated design with two phases on October 12, 2023 (MPSC 2023). A brief overview of the alternatives selected is below; more detail including additional resource considerations, can be found in **Appendix 2.2** and Louis Berger Group 2013, 2014, 2016, and WSP USA Inc. 2022.

In Kansas, route alternatives were divided into three distinct geographic segments that had common beginning and end points: West (Alternative Routes A-H), Central (Alternative Routes I-K), and East (Alternative Routes L-O). The selected route was a combination of Alternative Route H, Alternative Route I, and Alternative Route M (Louis Berger Group 2013).

- Alternative Route H included a combination of section/parcel boundary-based alignments and alignments adjacent to existing transmission lines. Near the western converter station, existing infrastructure limited the suitability of alignments parallel to existing transmission lines. Additionally, public comments to avoid potential impacts on farming operations near Spearville supported a more complex route. Alternative Route H limited the Project to two crossings of the Santa Fe National Historic Trail.
- Alternative Route I parallels existing transmission line ROWs for the majority of its length (79 percent). While Alternative Route I was longer than other options, it paralleled existing transmission lines through sensitive grassland habitat, avoided more residences, maximized the distance from several towns and culturally sensitive areas, maximized the distance from major whooping crane stopover habitat and designated critical habitat, and minimized diagonal crossings of farmland.
- Alternative Route M was the shortest alternative that also maximized parallel alignments of existing transmission lines and gas lines. Alternative Route M directly paralleled existing ROWs for over half of its length, reducing the impact on visual, recreational, and historic resources, and crossed the Missouri River at a point where an existing utility corridor crosses the river.

In Missouri, route alternatives were divided into two distinct geographic segments that had common beginning and end points: Segment 1 (Alternative Routes A through C) and Segment 2 (Alternative Routes D through I). The selected route was a combination of Alternative Route B and Alternative Route D (Louis Berger Group 2014, 2016).

- Alternative Route B paralleled a combination of pipelines, an existing transmission line, and parcel boundaries. This route had no residences located within 250 feet of the route centerline, avoided residential congestion located farther east along the pipeline corridor, and avoided crossing through the town of Agency. Alternative Route B had the least impact on forested areas, thereby reducing fragmentation of potential habitat for the Indiana bat and northern long-eared bat.
- Alternative Route D followed existing infrastructure and parcel boundaries for approximately 57 percent of its total length. This route had the least number of residences within 250 feet of the centerline and was the furthest from the Swan Lake National Wildlife Refuge, which is an important area for migratory birds. Alternative Route D also had the fewest acres of forested habitat within the ROW, minimizing potential impacts to protected bat species habitat.

For the Tiger Connector in Missouri, three alternative routes were considered: Alternatives A, B, and C (WSP USA Inc. 2022). Alternative B was selected because this alternative had an more resilient path (fewer severe angles), fewest residences within 500 feet of the centerline, no center-pivot irrigation crossings, fewest small parcels (less than 10 acres) crossed, fewest total parcels crossed, greatest length parallel to parcel boundaries, fewest streams crossed, least wetlands within the ROW, least acreage within Federal Emergency Management Agency (FEMA) floodplains, and least acreage of tree clearing within the ROW.

1.5.3 Project Development Timeline

Title 41 of the Fixing America's Surface Transportation Act (FAST-41) established coordination and oversight procedures for infrastructure projects under review by multiple federal agencies with the aim of increasing transparency and accountability. Phase 1 of the Project was enrolled in the FAST-41 program in February 2024, and a project-specific permitting timetable was developed and published online.[4] The permitting timetable includes milestones for completing the EIS, National Historic Preservation Act (NHPA) Section 106 review, Endangered Species Act (ESA) Section 7 consultation, Rivers and Harbors Act Section 408 permission, and Clean Water Act (CWA) Section 404/Rivers and Harbors Act Section 10 permitting.

A general Phase 1 Project timeline is presented in **Table 1-1**.

Table 1-1. General Phase 1 Project Timeline

Event	Timeline
Project initiated by Clean Line Energy Partners LLC	2010
CPCN issued by KCC	December 7, 2011
Siting Permit issued by KCC	November 7, 2013
CCN issued by MPSC	March 20, 2019
Project acquired by Invenergy Transmission LLC	January 2020
Project redesign (addition of Tiger Connector)	2020 - 2022
Notice of Intent to Prepare an EIS published in the Federal Register	December 16, 2022
Public scoping meetings	January – February 2023
Motion to Amend the Unanimous Settlement Agreement approved by KCC	June 13, 2023
Amendment to the existing Certificate of Convenience and Necessity approved by MPSC	October 12, 2023
Project enrolled in FAST-41	February 20, 2024
Draft EIS publication	January 17, 2025
Draft EIS public comment period	January 17 – March 2025
Final EIS publication	July 25, 2025
Record of Decision (ROD) and closing of loan	November 3, 2025
Anticipated start of construction	2026
Beginning of commercial operations	2029

1.6 Permits and Authorizations Required

DOE LPO has prepared this Draft EIS in accordance with NEPA, CEQ implementing regulations, and the DOE implementing regulations. **Appendix 1.2** contains a comprehensive list of the federal, state, and local permits and authorizations anticipated for the Project.

1.7 Agency Consultation

Per CEQ's NEPA regulations (40 CFR 1501.8), DOE LPO consulted with relevant federal, state, and local agencies with jurisdiction by law and/or special expertise with respect to environmental issues associated with the Project. This included outreach to U.S. Army Corps of Engineers (USACE), Bureau of Reclamation, National Park Service (NPS), U.S. Fish and Wildlife Service (USFWS), U.S. Environmental

[4] https://www.permits.performance.gov/permitting-project/fast-41-covered-projects/grain-belt-express-transmission-phase-1

Protection Agency (EPA), Kansas Department of Wildlife and Parks (KDWP), Missouri Department of Conservation (MDC), Kansas State Historic Preservation Office (Kansas SHPO), and Missouri State Historic Preservation Office (Missouri SHPO). As the lead federal agency, DOE LPO is leading consultations under Section 7 of the ESA and Section 106 of the NHPA, concurrent with the development of the EIS (Chapter 5). Through these consultation efforts, USACE, NPS, and EPA are cooperating agencies on the preparation of this EIS.

USACE is a cooperating agency and has jurisdiction pursuant to Section 10 and Section 14 (also referred to as Section 408 due to where it is codified in the U.S.C.) of the Rivers and Harbors Act and Section 404 of the Clean Water Act. The construction of the Project would cross over three USACE civil works projects: Wilson Lake flowage easements in Russell County, Kansas, the Missouri River Bank Stabilization and Navigation Project, and federal levee R443-448 at the Missouri River crossing site in Doniphan County, Kansas and Buchanan County, Missouri. The Project will result in the discharge of fill material, including structures, into Waters of the U.S., regulated by USACE. The Applicant has submitted requests to various USACE Divisions (Kansas City Civil Works District and the Kansas City Regulatory District for Section 408 permitting and the Kansas City and St. Louis Regulatory Districts for Section 404 permitting) for review as required, and Section 404 and 408 permitting is ongoing. The Section 404 and 408 permits will be submitted to USACE consistent with the FAST-41 coordinated project plan. (**Appendix 1.2**).

NPS is a cooperating agency and has jurisdiction under NHPA Section 106. NPS has expertise in cultural resource preservation, assessing and analyzing impacts to National Historic Landmarks (NHLs) and responsibilities for managing NHLs under the NHPA Section 110(f) (54 U.S.C. 306101 *et seq.*), administering National Historic Trails (NHTs) and their associated resources as defined by and outlined in the National Trails System Act (P.L. 90-543, as amended through P.L. 116-9, March 12, 2019), and other land and resource management responsibilities for units within the National Park System. Specifically, NPS expertise for these areas relates to managing viewsheds, cultural landscapes, and visitor experiences and uses.

EPA is a cooperating agency and has jurisdiction over protection of the environment and human health and has expertise in air quality and water quality issues.

1.8 Tribal Consultation

On December 28, 2022, DOE LPO issued consultation letters to 34 federally recognized Tribes notifying them of the Project and providing the opportunity to participate in the NEPA process and NHPA Section 106 consultation process, as well as to engage with DOE LPO in formal government-to-government consultation. The following eight federally recognized Tribes accepted DOE LPO's invitation to consult: Delaware Nation, Oklahoma; Iowa Tribe of Kansas and Nebraska; Northern Arapaho Tribe of the Wind River Reservation, Wyoming; Northern Cheyenne Tribe of the Northern Cheyenne Indian Reservation, Montana; Pawnee Nation of Oklahoma; Ponca Tribe of Indians of Oklahoma; The Osage Nation; and Wichita and Affiliated Tribes (Wichita, Keechi, Waco & Tawakonie), Oklahoma. See **Chapter 5** of this EIS for additional information on tribal consultation.

1.9 Public Involvement

1.9.1 Pre-NEPA Public Involvement

Prior to the initiation of NEPA, the Applicant was engaged in public outreach as part of the siting, route selection, and development approvals for the Project that were obtained from the KCC and MPSC (KCC 2011, 2013, 2023, MPSC 2019, 2023). A summary of the public involvement is as follows:

- Agency Coordination: The Applicant coordinated with federal and state agencies and local officials in Kansas and Missouri to gather critical information for route planning. Initial efforts focused on Project introductions, data collection, and permitting and consultation requirements. These discussions helped identify routing constraints and informed the development of initial routing guidelines. Agencies were also asked to review potential river crossing locations and provide insights to help in selecting a preferred crossing.
- Community Leader Roundtables: Roundtables were held across 19 counties with over 300 leaders from 50 counties in Kansas and across 24 counties with over 250 local leaders in Missouri. Local officials and business leaders reviewed Project maps, identified sensitive areas, and proposed routes. These insights were digitized to guide routing adjustments. The roundtables aimed to foster collaboration with leaders, including local and county officials, municipal leaders, government planners, business and economic development experts, local utilities, and federal and state agency representatives.
- Public Open Houses: From January to March 2013, open houses were held in 14 locations, attracting over 2,300 attendees in Kansas. Outreach efforts included mailed notifications to 11,200 people, newspaper advertisements, and website updates. Feedback from attendees helped create alternative routes, ultimately guiding the selection of a proposed route for submission to the KCC. In July, August, and December 2013, open houses were held across 13 locations in Missouri. These events attracted over 1,200 attendees. Outreach included 11,500 mailed invitations and resulted in over 300 public comments.
- Local Business Meetings: Five meetings explored potential partnerships with Missouri businesses for project development and maintenance.
- Public Feedback: After the open houses, the Applicant reviewed the gathered input, revised the potential route network as needed, and compiled a series of fifteen alternative routes for further analysis and comparison.

The Applicant conducted similar outreach in 2022 for the routing of the Tiger Connector, including holding four public meetings in Audrain and Callaway counties. Over 275 people attended the in-person meetings, with an additional virtual meeting hosted on the Project website to expand access to materials and input opportunities. Community members identified specific property constraints and opportunities, including locations of residences, barns, irrigation facilities, existing utilities, other infrastructure, and landscape features that could influence routing or structure placement. They also provided information on current land uses, such as agricultural areas, pastureland, and recreational zones. Similar feedback was gathered through the virtual meeting platform, resulting in a total of 93 public comments submitted to the Applicant.

1.9.2 NEPA Scoping

DOE LPO has conducted agency consultation and public engagement throughout the NEPA process to ensure that the public, agencies, tribes, and other government entities with an interest in the Project can view information and share input. The goal of sustained public engagement is to inform the public of potential impacts associated with the Project and provide opportunities to comment on those impacts.

DOE LPO published a Notice of Intent (NOI) to prepare an EIS in the *Federal Register* on December 16, 2022. The NOI was followed by written notification to approximately 3,000 property owners; local, regional, and state elected officials; and identified interest/advocacy groups. Virtual and in-person scoping meetings were held in Kansas and Missouri in early 2023.

During the scoping meetings, DOE LPO requested comments from the public and provided an overview of the process for submitting comments in the scoping outreach materials. DOE LPO received approximately 150 individual comment letters during the scoping period (DOE LPO 2023, available online at https://eis-grainbeltexpress.com/scoping-meeting-materials/). Commenters expressed concern for a wide range of environmental issues, including but not limited to land use, wildlife, vegetation, socioeconomics, geology, safety, air quality, and visual resources. Several comments focused on the range of alternatives and the purpose and need for the Project. Those comments were considered in the development of this Draft EIS.

2. PROPOSED ACTION AND ALTERNATIVES

Phase 1 of the Grain Belt Express Transmission Project (the Project), as proposed by the Applicant, is eligible for a loan guarantee pursuant to Section 1703, Title XVII (the Clean Energy Financing Program) of the EPAct. Under the Proposed Action, the loan guarantee would be used to support the development, construction, and startup of the Project (see **Section 1.1**).

The alternatives reviewed in this EIS that meet the purpose and need and are technically and economically feasible are the Proposed Federal Action (providing federal financing via a loan guarantee for the Project as proposed by the Applicant) and the No Action Alternative (not providing the loan guarantee) (see **Section 1.2**).

2.1 No Action Alternative

The No Action Alternative assumes that without federal financial assistance via a loan guarantee, the Project would not be constructed, resulting in no increase in the capacity to move energy developed from renewable sources in southwestern Kansas to points of interconnection in Missouri; the associated network upgrades and Kansas AC Collector would not be constructed; and the Applicant's goals of improving national transmission infrastructure and grid reliability would not be realized. Furthermore, the Project's potential effects on the natural and human environment, both adverse and beneficial, would not occur.

2.2 Alternatives Considered but Eliminated from Detailed Analysis

DOE LPO's decision pursuant to EPAct 2005 is whether or not to provide federal financial assistance via a loan guarantee for the Project, as proposed by the Applicant. Therefore, there are no other alternatives available to DOE LPO for agency action that are considered reasonable.

LPO notes that an assessment of alternatives for the Project's route selection and design considerations were conducted as part of KCC and MPSC's regulatory review and approval processes. A brief overview of the route alternatives and design considerations is presented in **Section 1.5.2** and discussed below; more detail can be found in **Appendix 2.2** and Louis Berger Group 2013, 2014, and 2016, and WSP USA Inc. 2022.

2.2.1 Route Alternatives

Separate routing studies were conducted for the HVDC Line in Kansas (Louis Berger Group, 2013) and Missouri (Louis Berger Group, Inc. 2014; Louis Berger Group 2016) and for the AC transmission line Tiger Connector in Missouri (WSP USA Inc. 2022). For each of these routing studies, numerous alternative routes were assessed and compared with respect to their potential impacts to natural resources (water resources, wildlife and habitats, special-status species, and geology and soils) and human uses (agricultural use, populated areas and community facilities, recreational and aesthetic resources, and cultural resources), and any identified engineering or construction challenges (transportation, existing utility corridors, and other existing infrastructure).

In consideration of public input obtained through the state approval processes, final proposed routes were identified that met the overall goal of minimizing impacts to the natural and human environment along the route, while utilizing existing linear rights-of-way (ROWs) and avoiding non-standard design requirements to the extent practical. The factors considered in routing included avoiding and minimizing impacts to the natural, cultural, and human environment, while avoiding circuitous routes, extreme costs, and non-standard design requirements.

2.2.2 Alternative Project Design

The KCC and MPSC approved the Project as described in **Section 1.5**, which includes the use of overhead transmission lines. The KCC and MPSC processes included the identification and consideration of transmission facility design options and alternatives, including the analysis of the feasibility of undergrounding all or portions of the Project's transmission lines. This included the evaluation of technical, economic, and environmental factors for undergrounding the HVDC Line, Ford County Interconnect, and Tiger Connector. The results of the HVDC Line routing study found that an underground alternative was not considered viable for the Project's proposed HVDC Line because suitable technology is not commercially ready or available for 600-kV transmission lines. Therefore, this alternative is not technically feasible for the Project. The time, surface and subsurface conditions, materials, various construction processes, spare cables for reliability, and the use of specialized labor to construct Tiger Connector and Ford County Interconnect underground would be cost prohibitive, with an up to 8-fold cost increase. Therefore, this alternative is not economically feasible for the Project. Additional information regarding alternative Project design is included in **Appendix 2.2**.

2.3 Proposed Federal Action

The federal financing provided by DOE LPO will apply to eligible costs that include the design, engineering, financing, construction, startup, commissioning, and shakedown of the Project. The Project components are listed below and discussed in more detail in the following sections:

- A 542-mile, overhead 600-kV HVDC Line that would extend between Ford County in southwestern Kansas and Monroe County in northeastern Missouri;
- The Tiger Connector, an approximately 36-mile, overhead 345-kV AC transmission line located in that would extend from the HVDC converter station in Monroe County, Missouri, to the existing McCredie Substation, owned and operated by AECI, and the existing Burns Substation, owned and operated by Ameren, in Callaway County, Missouri;
- The Ford County Interconnect, an approximately 0.2-mile, overhead 345-kV AC transmission line located in Ford County, Kansas that would extend from the HVDC converter station to the existing Saddle Substation, owned and operated by ITC Great Plains;
- Two HVDC converter stations and associated infrastructure: one located in Ford County, Kansas and one located in Monroe County, Missouri;
- Optical regeneration facilities in support of the HVDC Line and associated driveways; and
- Temporary workspaces needed for construction, including temporary access routes, workspaces around transmission structures, pull or tension sites, multi-use construction yards, concrete batch plants, and fly yards and helipads.

Should DOE decide to provide a loan guarantee to the Applicant, a loan guarantee agreement would be established and executed between DOE LPO and the Applicant. DOE LPO actively monitors all loan guarantees pursuant to the conditions of the loan guarantee agreement, which will incorporate any requirements identified as part of the environmental review process and/or included a ROD. The duration of monitoring activities is based on the duration of the loan guarantee, up to 30 years. LPO's project monitoring is initiated upon closing and execution of the loan guarantee agreement and incorporates unique requirements based on the phase of the Project (e.g. during construction and operation). During construction, monitoring includes periodic review of all material invoices for work completed and/or billed on the construction contract(s). The borrower will represent and warrant among other things that:

- The work was completed and the invoices are the expenses incurred in completing the work;
- There is sufficient funding available to complete the construction;
- The Project is expected to be completed by the agreed completion date under the loan guarantee agreement; and
- All environmental requirements, monitoring, reporting, and measures are current and in compliance with relevant agreements and approvals.

Project information provided during monitoring will be reviewed by the LPO Portfolio Management Division, the LPO Technical and Environmental Division, and an independent engineer. Once approved, the portion of the costs to be covered by the loan will be disbursed in accordance with the loan guarantee agreement. Funding is directed only to pay for eligible costs, as agreed to in the loan guarantee.

2.4 Review of Potentially Connected Actions

Several actions – the Kansas AC Collector System, the network upgrades, the new renewable energy generation projects, and Phase 2 of the Grain Belt Express Transmission Project (Phase 2) – were reviewed to determine if they met the definition of a connected action (40 CFR 1501.3(b)) (**Table 2-1**). Connected actions are closely related federal activities or decisions that should be considered in the same NEPA review because these actions:

1. Automatically trigger other actions that may require NEPA review;
2. Cannot or will not proceed unless other actions are taken previously or simultaneously; or
3. Are interdependent parts of a larger action and depend on the larger action for their justification.

None of these actions are connected actions because they will not be funded by DOE LPO's loan guarantee and are not known to have a federal nexus (no federal activities or decisions) that require federal environmental review and authorization.

The Kansas AC Collector System and the network upgrades were determined to be related non-federal actions to the Project and are assessed in this Draft EIS as indirect effects (see **Section 3.17**).

The new renewable energy generation projects and Phase 2 were determined to be independent (non-related non-federal actions) from the Project and are assessed in this Draft EIS as cumulative effects (see **Chapter 4**).

Table 2-1. Review of Potentially Connected Actions

Action	Purpose	Responsible Entity	Schedule	Funded by DOE LPO's loan guarantee?	Connected Action?
Kansas AC Collector System	Additional locations for renewable energy generation projects to interconnect to the Project	Grain Belt Express LLC	Construction is anticipated in late 2028	No	No. Impacts are assessed as indirect effects (**Section 3.17**)
Network Upgrades	Support the influx of power from the Project to the existing grid	Applicable grid operators (Ameren and AECI)	Construction is ongoing through 2030	No	No. Impacts are assessed as indirect effects (**Section 3.17**)

Action	Purpose	Responsible Entity	Schedule	Funded by DOE LPO's loan guarantee?	Connected Action?
New renewable energy generation projects	Provide energy capacity to the grid	Various	Unknown	No	No. Impacts are assessed as cumulative effects (**Chapter 4**).
Phase 2 of the Grain Belt Express Transmission Project	Provide additional capacity to the PJM power market	Grain Belt Express LLC	Ongoing	No	No. Impacts are assessed as cumulative effects (**Chapter 4**).

2.4.1 Network Upgrades

Ameren, the applicable grid operator within MISO, and AECI determined that network upgrades will be required to support the influx of power from the Project to the existing electric grid. Network upgrades include transmission line rebuilds and reconductoring, new transmission lines, and upgrades at existing substations (**Appendix 2.1**). The transmission line upgrades include approximately 164 miles of transmission line rebuilds, approximately 52 miles of line reconductoring, and approximately 99 miles of new transmission lines. Substation upgrades include new line positions, new breakers, bus upgrades, and transformer upgrades.

The upgrades will be constructed through 2030. The network upgrades are being planned and constructed by the applicable grid operators; the Applicant will not be responsible for or involved in the planning, routing, design, or construction of the network upgrades, and funds from the federal financial assistance via a loan guarantee from DOE LPO would not be used to subsidize or reimburse transmission owners for the network upgrades. The network upgrades are considered as related non-federal actions to the Project and their effects are discussed in **Section 3.17.**

2.4.2 Kansas AC Collector System

As part of the CPCN, the KCC granted the Applicant the authority to construct and operate an AC Collector System comprised of AC gathering transmission lines that could connect generators in western Kansas to the Project (**Appendix 2.1**). The Applicant conducted two routing studies for the Kansas AC Collector System and filed a transmission line siting permit application with the KCC for the Meade-Dodge City AC Line and the Bucklin-Dodge City AC Line on May 31, 2024; the transmission line siting permit application was approved on September 26, 2024. The Meade-Dodge City AC Line is an approximately 46-mile-long, overhead 345-kV transmission line from a potential future substation or switchyard in Meade County to the HVDC converter station in Ford County, and the Bucklin-Dodge City AC Line is an approximately 20-mile-long, overhead 345-kV transmission line from a potential future substation or switchyard in Ford County to the HVDC converter station in Ford County.

The Applicant is responsible for and involved in the routing, design, and construction of the Kansas AC Collector System. However, the location of the Kansas AC Collector System components and the timing and duration associated with construction, are unknown or not finalized at this time. The Kansas AC Collector System is not included in the application for the DOE LPO loan guarantee, and federal funds will not be used to subsidize or reimburse responsible parties for the AC Collector System. The Kansas AC Collector System is considered a related non-federal action to the Project, and its effects are discussed in **Section 3.17.**

2.4.3 New Renewable Energy Generation Projects

The Project will provide new capacity and facilitate efficient transmission for renewable energy facilities and power users by transmitting power from southwest Kansas to the existing electric grid. Several entities have submitted requests to interconnect with the Project, each of which is under review by the Applicant. Renewable energy generation projects have other options for connecting to the grid even if the Project is not constructed under the No Action Alternative.

Federal funds backed by the loan guarantee will not be used to subsidize or reimburse responsible parties (i.e. entities developing new renewable generation projects). New renewable energy generation projects that are considered “reasonably foreseeable future actions” (as identified and defined in **Section 4.2.2**) and that contribute to cumulative effects are reviewed and analyzed in **Chapter 4**.

2.4.4 Phase 2 of the Grain Belt Express Transmission Project

Phase 2 of the Grain Belt Express Transmission Project is an approximately 280-mile-long HVDC transmission line extending from the HVDC converter station in Monroe County, Missouri (constructed as part of the Project) to a new HVDC converter station site in Clark County, Illinois, with a potential 345-kV AC transmission line from the HVDC converter station site in Clark County, Illinois, to the existing Sullivan Substation in Sullivan County, Indiana.

The Indiana Utility Regulatory Commission granted the Applicant a CPCN on May 22, 2013. The Illinois Commerce Commission granted the CPCN for the phased project in March 2023, which was appealed and is now pending at the Illinois Supreme Court, with a decision expected by early 2026. The CPCN remains valid and in effect pending the final decision on the appeal. The Applicant has not completed detailed design for Phase 2, and federal funds backed by the loan guarantee will not be used to subsidize or reimburse responsible parties for Phase 2. Because Phase 2 has received state regulatory approval, Phase 2 is a reasonably foreseeable future action; therefore, the portions of Phase 2 that contribute to cumulative effects are reviewed and analyzed in **Chapter 4**.

2.5 Design of the Proposed Project

All components of the Project would be sited entirely on private land and would cross 21 counties in Kansas and Missouri as follows (listed from west to east) (**Figure 1-1)**:

- **Kansas:** Ford, Hodgeman, Edwards, Pawnee, Barton, Russell, Osborne, Mitchell, Cloud, Washington, Marshall, Nemaha, Brown, and Doniphan
- **Missouri:** Buchanan, Clinton, Caldwell, Carroll, Chariton, Randolph, Monroe, Audrain, and Callaway.

Engineering design of the Project is ongoing, and **Table 2-2** outlines the key design milestones for each component of the Project.

Table 2-2. Project Component Engineering Design Schedule

Project Component		10 Percent Design [a]	30 Percent Design [b]	60 / 70 Percent Design [c]
Ford County HVDC Converter Station	Switchyard	March 2025	TBD	TBD
	Valve Hall	March 2025	June 2025	TBD
Ford County Interconnect		March 2025	TBD	TBD
HVDC Line		Complete	Complete	Complete
Monroe County HVDC Converter Station	Switchyard	March 2025	TBD	TBD
	Valve Hall	March 2025	June 2025	TBD

Project Component	10 Percent Design [a]	30 Percent Design [b]	60 / 70 Percent Design [c]
Tiger Connector	Complete	Complete	2026

Note: Updated October 15, 2024

[a] Engineering submittals that define the design criteria for subsequent design packages.

[b] Engineering submittals that facilitate contractor bids. For transmission lines, this defines structure quantities, types, locations, and sizes, preliminary bill of material, and proposed foundation types. For the HVDC converter stations, this package includes a general site layout, building envelopes for the valve halls and control buildings, preliminary plan and section drawings of outdoor areas, and a preliminary bill of material.

[c] Drawing set used to support procurement and develop detailed construction plans for review.

2.5.1 Project Component Design

The HVDC Line includes the ROW easements pursuant to KCC and MPSC regulatory approvals, planned structure locations, transmission line design, and tower designs. The Applicant has secured more than 90 percent of easements needed for the HVDC Line and is coordinating with counterparties on the finalization of crossing agreements as needed.

The converter station site in Ford County would be constructed within an Applicant-owned 310-acre parcel and the converter station site in Monroe County would be constructed within an Applicant-owned 159-acre parcel. The Applicant has entered into a contract for further design of the converter station site components and the development of the converter station facilities would adhere to the environmental protection measures (EPMs) presented in **Appendix 2.4**.

The Tiger Connector transmission line is in the preliminary design phase. The centerline, as approved by the MPSC, and preliminary structure locations are identified. Ongoing activities in the preliminary design phase include micrositing structure locations, transmission line structure development, landowner engagement, and initial utility crossing engagements.

The Ford County Interconnect transmission line is in the conceptual design phase. Based on the interconnection bay, or tie-in location, at the Saddle Substation, it is anticipated that four two-pole structures would be needed between the Project HVDC converter station site and the adjacent Saddle Substation. The Applicant has obtained all easements needed for the Ford County Interconnect transmission line between the HVDC converter station site and the Saddle Substation.

2.5.2 Disturbance Model

The surface disturbance acreages associated with construction and maintenance of the Project is conservatively estimated (an over-estimation of acreage) based on current Project design and reasonable assumptions for construction using a disturbance model (**Table 2-2**). The KCC and MPSC regulatory approvals allow the Applicant flexibility in micro-siting the HVDC Line and Tiger Connector based on site-specific conditions, including some landowner requests, as part of the final design (see **Appendix 2.2**). Because over 90 percent of the easements for the HVDC Line have been acquired, changes to the Project design that would result in substantive changes to the disturbance model are not expected. Design modifications from micrositing may result from ongoing studies, such as the cultural surveys, geotechnical investigation, and Federal Aviation Administration (FAA) determinations for the HVDC Line. The land acquisition efforts along the Tiger Connector are still in the early stage; however, any changes along the Tiger Connector would be within the bounds established by the CCN issued by the MSPC.

For the purposes of the disturbance model analysis, the “Project Area” is defined to include the following: the ROW for the HVDC Line, the HVDC converter station footprint and associated driveway access, the Ford County Interconnect and Tiger Connector ROWs, the optical regeneration facilities and associated driveways, and temporary workspaces needed for construction, such as temporary access routes, pull or tension sites, multi-use construction yards, concrete batch plants, and fly yards and helipads. The location of the temporary and permanent facilities presented below, were sited to avoid special status species habitat and other sensitive environmental resource areas (e.g. wetlands/water, forests, cultural resource sites, recreational resources, etc.) to the extent practicable. Operations and maintenance activities will occur within the established ROW.

The following design assumptions and estimates for were used to develop the disturbance model:

Transmission Line Structures

- HVDC Line structure permanent disturbance associated with the tower foundations is approximately 0.0026 acres per structure. The area under the tower base is approximately 0.03 acres per structure. There would be approximately 2,147 transmission structures.
- Tiger Connector and Ford County Interconnect structures permanent disturbance is approximately 0.001115 acres per structure.
- Temporary disturbance associated with structure erection is estimated to be approximately 1 acre per structure surrounding the structure base.

Optical Regeneration Facilities and Driveways

- Permanent sites would occur approximately every 50 miles, and it is estimated that these sites would measure 100 feet by 100 feet (approximately 0.23 acres per site). Driveways are estimated to have a 20-foot-wide permanent corridor.

HVDC Converter Station Sites

- A portion of each Applicant-owned HVDC converter station parcel would be permanently disturbed, and a portion would be temporarily disturbed.

Vegetation Clearing

- Vegetation clearing would occur where non-compatible vegetation overlaps the Project ROW.

Access Routes

- Temporary access routes are estimated to have a 40-foot-wide corridor. There would be approximately 2,311 temporary access routes.

Puller or Tension Sites

- Temporary sites would occur every 3 to 5 miles, and it is estimated that these sites would measure 150 feet wide by 450 feet long (approximately 1.55 acres). There would be paired sites at each location for an estimated 384 individual puller-tensioner sites at 192 locations.

Multi-Use Yards and Concrete Batch Plants

- Large temporary multi-use yards would occur every 250 miles, and it is estimated that these yards would measure approximately 50 acres. There would be a total of three large temporary multi-use yards.
- Small temporary multi-use yards would occur every 30 to 40 miles, and it is estimated these yards would measure approximately 20 to 30 acres. There would be a total of 13 small temporary multi-use yards.

- Concrete batch plants, where needed, would be constructed within a large or small multi-use yard.

Fly Yards and Helipads

- Fly yards and helipads would be co-located with multi-use yards to the greatest extent possible. There would be approximately 53 fly yard and helipad sites.[1]
- Fly yards and helipads would occur as needed to access areas with limited overground access, and it is estimated that these sites would measure 250 feet wide by 1,400 feet long (approximately 8.34 acres).

Table 2-3. Estimated Project-Related Surface Disturbance

Project Component	HVDC Line (acres)	Ford County Interconnect (acres)	Tiger Connector (acres)	Total (acres)
Disturbance Acreage for Permanent Project Components				
Transmission Line Structures	2.7	<0.01	0.2	2.9
Optical Regeneration Facilities	2.1	N/A	N/A	2.1
Optical Regeneration Facilities Driveways	0.3	N/A	N/A	0.3
HVDC Converter Station[2]	N/A	123	83	207
Total:	*5*	*123*	*84*	*212*
Disturbance Acreage for Habitat Conversion[1]				
Vegetation Clearing[2]	1,505	N/A	92	1,597
Total:	*1,505*	*N/A*	*92*	*1,597*
Disturbance Acreage for Temporary Project Components				
Access Routes	1,941	N/A	160	2,100
Pull or Tension Sites	444	2	63	509
Multi-Use Yards and Concrete Batch Plants	427	N/A	N/A	427
Helipads and Fly Yards	376	N/A	14	391
Workspace around Transmission Structures	1,980	1	81	2,062
HVDC Converter Station[2]	N/A	185	73	257
Total:	*5,168*	*187*	*390*	*5,488*
Grand Total Disturbance Acres:	**6,678**	**311**	**566**	**7,554**

[1]Vegetation clearing constitutes a temporary surface disturbance. However, trees and other woody vegetation cleared within the ROW would not be allowed to reestablish, as their height is incompatible with the North American Electric Safety Code (NESC) vegetation clearance requirements. In these locations, there would be a permanent conversion from forested vegetation cover to grasses and forbs.

[2] 332.9 acres of habitat conversion overlaps temporary disturbance within the ROW.

[3]The HVDC converter station site in Ford County would be constructed within an Applicant-owned 310-acre parcel, and the converter station site in Monroe County would be constructed within an Applicant-owned 159-acre parcel. For the purposes of analysis, it is conservatively assumed that some of the area within these parcels would be permanently disturbed and that the remainder of the parcels not permanently disturbed would be subject to temporary disturbance during construction. Totals do not add up due to overlapping disturbance.

NA = not applicable

2.5.3 Environmental Protection Measures

The Project would be constructed and operated by the Applicant consistent with the requirements of the approvals described in **Section 1.6** and detailed in **Appendix 1.2**.

[1] While the disturbance model conservatively estimates the number of fly yards and helipads to be used during construction, helicopters are currently only anticipated to be used at the Missouri River Crossing.

The Applicant has developed EPMs as part of the Project design to further avoid or minimize effects to environmental resources during construction, operations and maintenance, and/or decommissioning of the Project. The EPMs are in addition to applicable federal, state, and local permit and consultation requirements and measures that may result from those permits and consultations and are listed in **Appendix 2.4**. After construction is complete, the EPMs for operations and maintenance would be applicable to the Project, regardless of whether the Project is transmitting energy. **Appendix 1.2** contains both the requirements and measures associated with applicable federal, state, local permitting and consultations and the Applicant-developed EPMs. The Applicant would adhere to the EPMs in addition to all measures resulting from required federal, state, and local permits and consultations, and both are taken into account when evaluating the environmental impacts of the Proposed Federal Action in this EIS. Additional EPMs may be added throughout Project development and into construction.

In addition to the EPMs, the Applicant would develop a Construction Environmental Plan to outline the standards and requirements for environmental compliance during construction. The objectives of the Construction Environmental Plan would be to (1) outline how contractors are to achieve environmental compliance; (2) clarify the process for communication among the Applicant, contractors, and other parties; and (3) ensure consistency in the Applicant's approach to environmental compliance across different parties. The Construction Environmental Plan would address the following:

- Communication and documentation
- Training
- Erosion and sediment control
- Protection of environmental resources, including, but not limited to:
    - Water resources
    - Wildlife and habitat
    - Cultural resources
    - Vegetation
- Management of hazardous materials

The Applicant's construction contractor would be required to assign an Environmental Manager for the Project, whose primary responsibility would be the implementation and management of environmental compliance efforts. Duties would include, but would not be limited to:

- Ensuring Stormwater Pollution Prevention Plan (SWPPP) management, including implementation of best management practices, required inspections, and recordkeeping;
- Ensuring Spill Prevention, Control, and Countermeasure (SPCC) Plan implementation and required inspections;
- Ensuring on-site personnel receive Project-specific environmental compliance training;
- Verifying that flagging and signage for sensitive environmental areas are adequate to prevent unapproved work in those areas;
- Providing updates on environmental compliance topics during Project meetings; and
- Being available to meet with the third-party environmental compliance auditor or the Applicant's environmental representative during scheduled site visits.

- Ensuring periodic environmental compliance reporting is provided to LPO in accordance with the loan guarantee agreement.

The Applicant would hire third-party environmental compliance monitors to be on site during construction to ensure that the construction contractor is complying with environmental permits and plans. The third-party environmental compliance monitors would be responsible for monitoring the construction contractors, preparing for construction activities (e.g., training preparation, ensuring flagging/signing of sensitive environmental areas is maintained, etc.), and conducting other necessary environmental surveys/monitoring outside the scope of the construction contractor. The third-party environmental compliance monitors would provide regular compliance reports to DOE LPO in accordance with the loan guarantee.

2.6 Project Components

2.6.1 HVDC Line

HVDC Line facilities include ROW easements, transmission line structures, electrical conductor (transmission wires), optical ground wires, and optical regeneration facilities and associated driveways.

Table 2-4 identifies the approximate dimensions of the HVDC transmission facilities based on preliminary Project design. These dimensions do not include temporary workspaces needed for construction, which are described in **Section 2.6.4.7**. A typical schematic of the HVDC Line is included in **Figure 1** in **Appendix 2.3**.

Although, the HVDC technology has bidirectional capability, power can only move along the line in one direction at a time, and capacity on the line is finite. It is expected that under normal operating conditions, power would flow eastward. Power would flow westward only under emergency operating conditions.

Table 2-4. Approximate Dimensions of HVDC Line Facilities

Description of Design Features	Approximate Dimensions
Total HVDC Line length	542 miles
Voltage	600-kV
Average span between transmission structures (exclusive of Missouri River crossing)	1,500 feet
Height of transmission structures (aboveground) (exclusive of Missouri River crossing)	115–220 feet
Average transmission structure height (exclusive of Missouri River crossing)	150 feet
Missouri River crossing transmission structure height (two structures total)	275–315 feet
Missouri River crossing span between transmission structures	3,700 feet
Typical width of transmission structure base	24–50 feet[a]
Number of transmission structures	2,141
Conductor size (outer diameter)	1.8 inches
Minimum conductor-to-ground clearance to agricultural lands, rural roads, and paved highways at the conductor’s maximum operating temperature[b]	34 feet
Minimum conductor-to-ground clearance to railroads at the conductor’s maximum operating temperature	42 feet
Minimum conductor-to-ground clearance to the Missouri River at the conductor’s maximum operating temperature	52 feet

*[a]Represents typical width of transmission structure bases. Other tower types may have larger base widths (as shown in **Table 2-3**).*

[b]The HVDC Line would be designed to maintain a minimum 34-foot conductor-to-ground clearance to provide for public safety, including safe operations of vehicles and equipment. A minimum 34-foot conductor-to-ground clearance exceeds NESC requirements for ground clearance and would also apply to landscape features outside of these areas.

2.6.1.1 Right-of-Way

The HVDC Line would require a ROW with a typical width of 150 to 200 feet. The width of the ROW is established based on the required clearance distances for the conductors, which are dictated by the NESC. The required conductor clearance distances are directly related to the transmission tower (structure) height, length between structures (span length), and terrain. The width of the ROW would be wider than typical where tall structures, longer spans, or the terrain requires greater horizontal distances to maintain safe clearances. To date, the Applicant has identified one location, the Missouri River Crossing, as requiring a significantly wider ROW (350 feet) than the typical 150 to 200 feet. This section of ROW is approximately 0.7 miles long. **Section 2.6.5** describes the post-construction activities permitted to occur within the ROW.

2.6.1.2 Transmission Line Structures

All transmission line structures would be sited within the ROW. The structures used to support the electrical conductor for the HVDC Line would generally consist of a series of steel lattice structures standing on four legs. Structures would be supported by pile foundations. Pile foundations would consist of individual piles or pile groups for the tower legs.

The Applicant would use eight different lattice structure types for the HVDC Line, ranging from 115 feet to 220 feet tall, and an additional type at the Missouri River crossing, for a total of nine different lattice structure types across the HVDC Line (**Table 2-5**). Preliminary design indicates that most structures would be less than 200 feet tall, though taller structures may be used in circumstances where additional clearances and/or longer spans are required. The typical lattice structure employed for the Project would be the basic suspension structure, as shown on **Figure 2** in **Appendix 2.3**. **Appendix 2.5** includes additional detail of each proposed tower structure.

Table 2-5. HVDC Transmission Line Structure Types and Dimensions

Tower Type	Approximate Number of Towers	Tower Height (feet)	Foundation Diameter (feet)[1]	Tower Base Width (feet)	Tower Base Area (acres)	Permanent Surface Disturbance per Structure (acres)
Basic Suspension	1,386	120–190	4	24–41	0.013-0.039	0.00115
Heavy Suspension	407	130–215	4	25–46	0.014-0.049	0.00115
Small Running Angle	108	125–210	4	26–48	0.016-0.053	0.00115
Medium Running Angle	88	135–220	4	29–50	0.019-0.057	0.00115
Small Angle Dead-End Tower	33	115–200	6	30–60	0.021-0.083	0.0026
Medium Angle Dead-End Tower	93	117–202	6	32–65	0.024-0.097	0.0026
Large Angle Dead-End Tower	28	117–202	6	34–70	0.027-0.112	0.0026
River Crossing Dead-End	2	130–170	10	40–56	0.037-0.072	0.00721
River Crossing Tangent	2	275–315	12	52–60	0.062-0.083	0.01039

[1]*Four foundations per tower.*

The Applicant will design structure heights, span lengths, and vertical clearance in accordance with the NESC, technical design requirements, terrain and land use accommodations, and all applicable standards and laws. Structure types other than steel lattice (e.g., single steel poles) may be specified in final design to address and optimize engineering and safety constraints. Marking and/or lighting would be added to structures as determined by the FAA (14 CFR Part 77).

The HVDC Line would cross the Missouri River at the border of Kansas and Missouri in Doniphan County, Kansas, and Buchanan County, Missouri. There would be two river crossing suspension structures with a typical height of 275 to 315 feet and a span of approximately 3,700 feet between the transmission structures (**Table 2-5**). It is estimated that the river crossing suspension structures would have approximately 12-foot diameter foundations; however, the exact dimensions of the foundations would not be known until closer to Project construction. **Figure 3** in **Appendix 2.3** is an image of a heavy suspension tower, similar to what would be used to cross the Missouri River, and **Figure 4** in **Appendix 2.3** shows a profile view of the proposed Missouri River crossing.

2.6.1.3 Electric Conductor (Transmission Wires)

Four electric conductors would be installed, two on each side of the transmission tower structure. The HVDC Line would include a positive and negative 600-kV bipolar configuration capable of delivering approximately 5,000 MW of power.[2] The bipolar transmission line has two circuits, one with positive polarity and the other with negative polarity. The bipolar transmission line operates by electric current flowing down one circuit and returning via the opposite circuit in balanced operation. When one circuit is not available due to the electrical failure of that circuit, maintenance, or an imbalanced current between the two circuits, the current must have a return path for the line to remain in service. This is accomplished using dedicated metallic return conductors, sufficiently sized to carry the return current during any outage of one circuit and also to accommodate any imbalance in current during normal operation. There would be one metallic return conductor on each side of the structure, located above each 600-kV circuit, each consisting of a 2,156-kcmil Aluminum-Conductor Steel-Reinforced Bluebird conductor (wire) suspended by an I-string insulator assembly (**Figure 1** in **Appendix 2.3**).

For the basic suspension structure (see **Figure 2** in **Appendix 2.3**), each 600-kV circuit would comprise three 1.8-inch diameter conductors in a triangular bundle arrangement. One bundle would be installed on each side of the structure. Each bundle would be suspended by a V-string insulator assembly to minimize the conductor movement caused by wind. The minimum conductor to ground clearances for the HVDC Line are listed in **Table 2-5**.

The electric conductors at the Missouri River crossing would be similar to the rest of the HVDC Line, except that the transmission structures would utilize specialty conductors to accommodate long spans and specific clearance requirements, and therefore, may differ in size and quantity from the rest of the HVDC Line (see **Table 2-5**). The conductors at the Missouri River crossing would be an Aluminum-Conductor Composite-Reinforced conductor.

Design of the HVDC line crossing of the Missouri River would provide for a minimum clearance height of 52 feet from the 2 percent flow line elevation, plus an additional clearance of 35 feet, as required for aerial

[2] The Grain Belt Transmission Line Project is designed to deliver approximately 5,000 MW of power; Phase 1 (the Project) is intended to provide approximately 2,500 MW of power because that is the extent of Phase I injection rights into MISO and AECI. An anticipated future Phase 2 would support the delivery of an additional approximately 2,500 MW of power to the PJM Interconnection. The permanent disturbance associated with infrastructure to support Phase 2 would be entirely within the fenced area planned for Phase 1. Therefore, potential disturbance associated with Phase 2 at the converter station sites in Ford County, Kansas, and Monroe County, Missouri, is accounted for in the analysis of the Project in **Chapter 3**.

power transmission lines crossing navigable waters of the U.S. specific to the HVDC Line's voltage class (33 CFR 322.5(i)(2)).

Marking and/or lighting would be added to wires as determined by FAA regulations (14 CFR Part 77). Preliminary marking plans include unlit marker balls on the optical ground wire and lighted marker balls on the dedicated metallic return conductors everywhere the wires are 200 feet or more above the existing ground elevation. Final marking and/or lighting methods to be employed would be subject to necessary FAA approvals. In addition, the most current Avian Power Line Interaction Committee (APLIC) suggested practices would be implemented to ensure that overhead transmission lines are designed and constructed in a manner to minimize bird collision and electrocution risk (APLIC 2006, APLIC 2012).

2.6.1.4 Optical Ground Wires

The HVDC Line would include two optical ground wires that would serve to provide grounding and lightning protection for the line (**Figure 1** in **Appendix 2.3**). These optical ground wires, approximately 0.5 to 0.75 inch in diameter, would be installed at the top of the transmission structures. The ground wires and structures would transfer current from lightning strikes into the ground. The optical portion of the cable would be used to transport communication signals for the control and protection of the transmission line and stations.

2.6.1.5 Optical Regeneration Facilities

The HVDC Line would include optical regeneration facilities (also known as amplifier repeaters). These would be used to extend the reach of optical communication links between converter stations. The exact locations of the optical regeneration facility sites and associated driveways would be determined during the detailed design process. Because the signals within the optical fibers are subject to attenuation over long distances, optical regeneration facilities would be located approximately every 50 miles along the HVDC Line, outside and adjacent to the HVDC Line's ROW. Based on preliminary design, approximately 10 optical regeneration facilities and associated driveways would be needed.

Figure 5 in **Appendix 2.3** shows images of typical optical regeneration facilities. Regeneration equipment would be enclosed within a small control building made of either metal or concrete. Each of the regeneration facilities would require a power supply. It is anticipated that the power supply would be sourced from the local power service provider by connecting to its existing electric distribution lines near the optical regeneration sites. The voltage of the power supply line would be approximately 34.5 kV or lower. An emergency generator with fuel storage would also be installed at the optical regeneration facility sites, inside the fenced area. Additionally, the two optical ground wires would be spliced on the structures and trenched underground between the HVDC Line and the control building.

Each optical regeneration facility would include a fenced area approximately 75 feet by 75 feet (approximately 0.13 acre) in size. The fenced area plus an additional 5 to 10 feet past the fence line would have a gravel finish. Each optical regeneration facility site would require a permanent driveway. Sites would be selected to utilize existing infrastructure (e.g., distribution lines and roads) to the extent practicable. Permanent driveways would have a typical width of 20 feet. Together with the graveled area, the total disturbance footprint for the optical regeneration facilities and access is conservatively estimated to be 0.23 acre each, approximately 2.3 acres total for the 10 anticipated sites.

2.6.2 HVDC Converter Stations

HVDC converter stations convert direct current (DC) to AC for transmission and use in the power grid. The Project would include HVDC converter station sites at each end of the HVDC Line; one in Ford

County, Kansas, at the western end of the HVDC Line, and one in Monroe County, Missouri, at the eastern end of the HVDC Line.

Each converter station site would include:

- Valve halls that contain the power electronics for converting AC to DC and vice versa, and converter modules
- Six main power transformers and one spare power transformer
- Converter water cooling and outdoor coolers for cooling system
- DC high speed switches
- DC and AC disconnector and grounding switches
- DC and AC filter capacitors, reactors, and resistors
- Ancillary building(s) containing control and protection equipment, communications equipment, etc.
- AC voltage and current, interface, and auxiliary transformers
- Battery or diesel generator back-up systems
- AC circuit breaker
- AC switchyard
- Driveways
- Fencing
- Security systems
- Spare parts building or yard

The HVDC converter station site in Ford County would be constructed within an Applicant-owned 310-acre parcel (**Figure 2-1** and **2-4**), and the converter station site in Monroe County would be constructed within an Applicant-owned 159-acre parcel (**Figure 2-3** and **2-6**). A typical converter station site requires 45–70 acres of land. The AC switchyard would occupy approximately one-third of the area within the converter station site. There would be two buildings, referred to as valve halls, that house the power electronic equipment used in AC/DC conversion, each approximately 170 by 220 feet. Valve halls protect the converter equipment from ambient conditions and impede the audible noise generated by the equipment. The valve halls would be 60–85 feet tall. Additionally, smaller buildings would house the control room, control and protection equipment, auxiliaries, and cooling equipment. Other electrical equipment may be required within the AC switchyard. Transformers would be located adjacent to the valve halls and surrounded on two sides with concrete fire walls. In addition to preventing a fire in one transformer from spreading to adjacent ones, the walls would also serve to impede audible noise generated by the transformers. A spare parts building would be used for dry storage. A spare parts yard would house larger material, such as partially erected structures, spare conductors, and other outdoor equipment.

Within the HVDC converter station site, switchyards and other buildings or outdoor equipment would be fenced with a typical 8-foot-tall, galvanized steel chain link fence with a top guard such as barbed wire. Additionally, the converter stations themselves may have unique fencing specifications due to site-specific needs such as noise barriers and storm water retention. Additional security measures around converter station sites may be implemented for heightened physical security, including, but not limited to, the use of fabric screens, berms, or perimeter security gates.

Within the fenced area, the ground surface of the converter stations would consist of a combination of crushed rock and paved driveways. Security lighting would be installed, typically 30 feet above grade with an 80 degree down tilt. The exact locations, heights, and down tilt would be established during detailed design of the converter stations. At the converter stations, underground communication, power cables, and other utilities, such as water and gas, would be installed. **Figure 6** in **Appendix 2.3** shows a rendering of a typical HVDC converter station.

Permanent driveways would be installed to access the two converter station sites. Converter station site driveways would have a typical surface width of 40 feet to safely accommodate the turning radius for vehicles and construction equipment. Preliminary estimates indicate that the two converter station site driveways would each be approximately 2,500 feet in length. These driveways would be gated and paved.

2.6.3 Ford County Interconnect and Tiger Connector

At each HVDC converter station site, the Project would connect to the existing power grids in Kansas and Missouri that are managed by SPP, MISO, and AECI.

- From the HVDC converter station site in Ford County, Kansas, one double-circuit 345kV transmission line would be constructed, approximately 1,000 feet in length, and connect into the existing Saddle Substation within the SPP, which is owned and operated by ITC Great Plains. The transmission line and the interconnection facilities noted below are referred to as the Ford County Interconnect (**Figures 2-1** and **2-4**).
- From the HVDC converter station site in Monroe County, Missouri, the Tiger Connector, approximately 36 miles in length, would be constructed and connect into two substations in Callaway County: the existing McCredie Substation within the AECI, owned and operated by AECI, and the Burns Substation within the MISO, owned and operated by Ameren (**Figures 2-2** and **2-5**).

The interconnection facilities common to both the Ford County Interconnect and Tiger Connector would include ROW easements, transmission line structures, electrical conductors (transmission wires), and optical ground wires

Table 2-6 identifies the dimensions of the Ford County Interconnect and Tiger Connector features based on preliminary Project design. These dimensions do not include additional area needed for construction, which is described in **Section 2.6.4.7**.

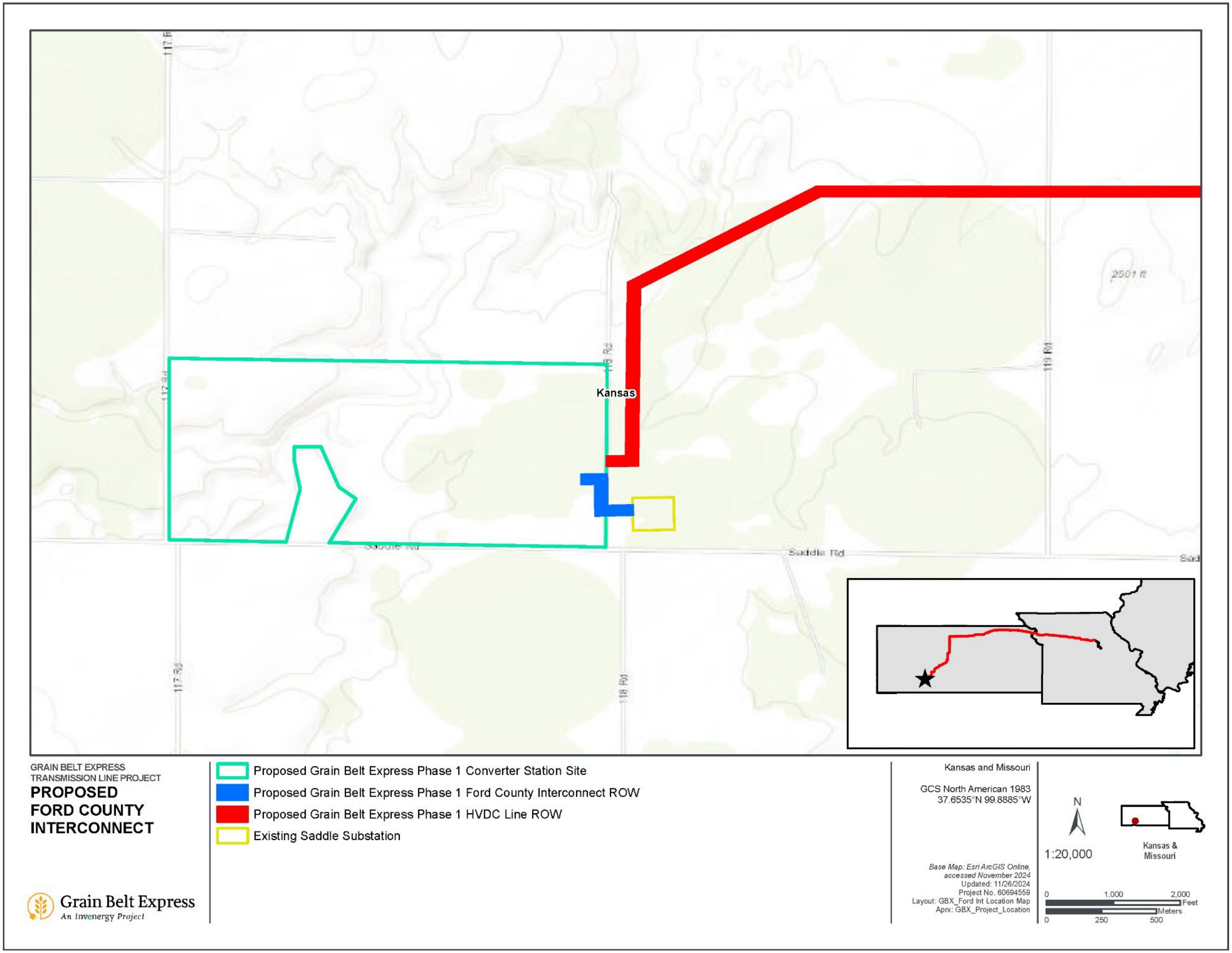

Figure 2-1. Proposed Ford County Interconnect and Ford County HVDC Converter Station

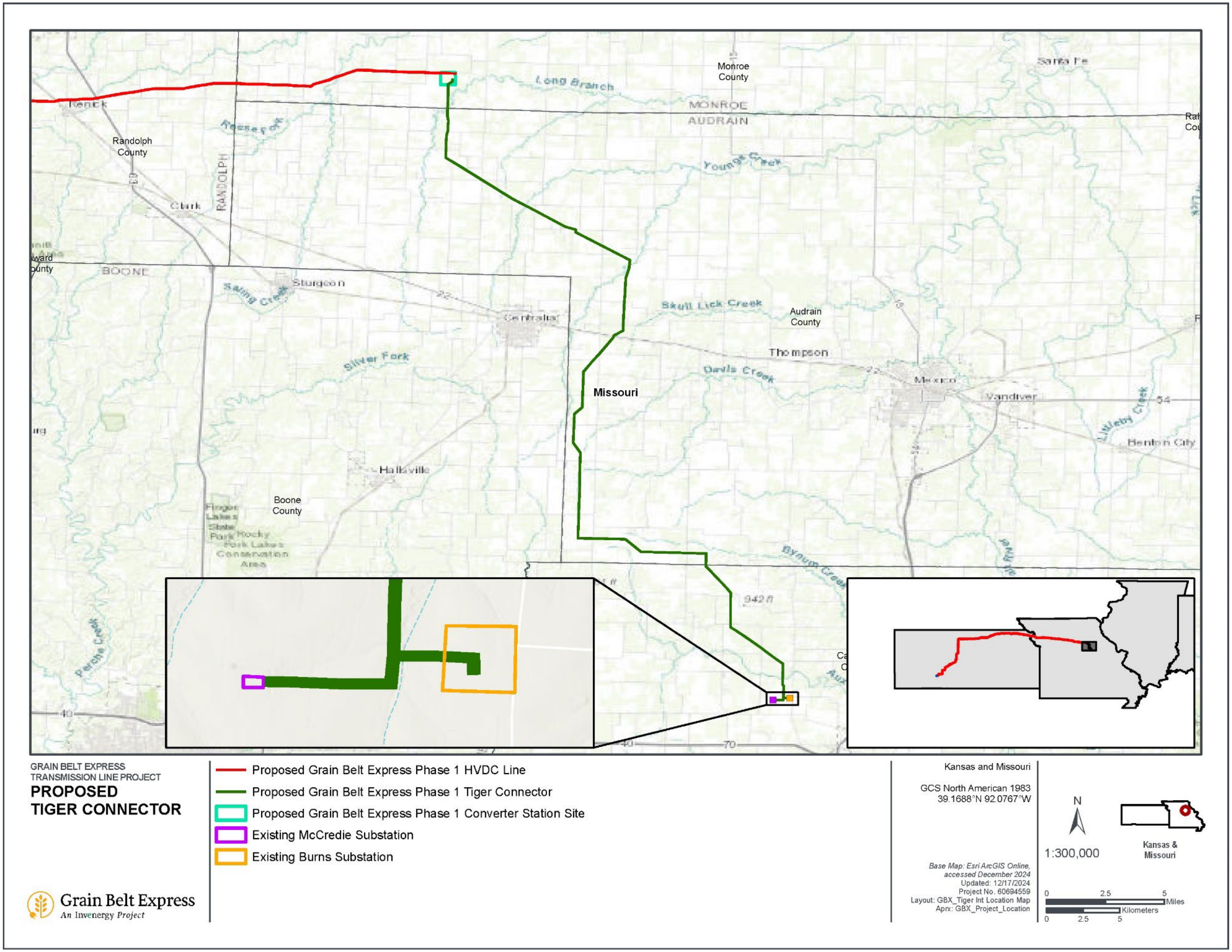

Figure 2-2. Proposed Tiger Connector

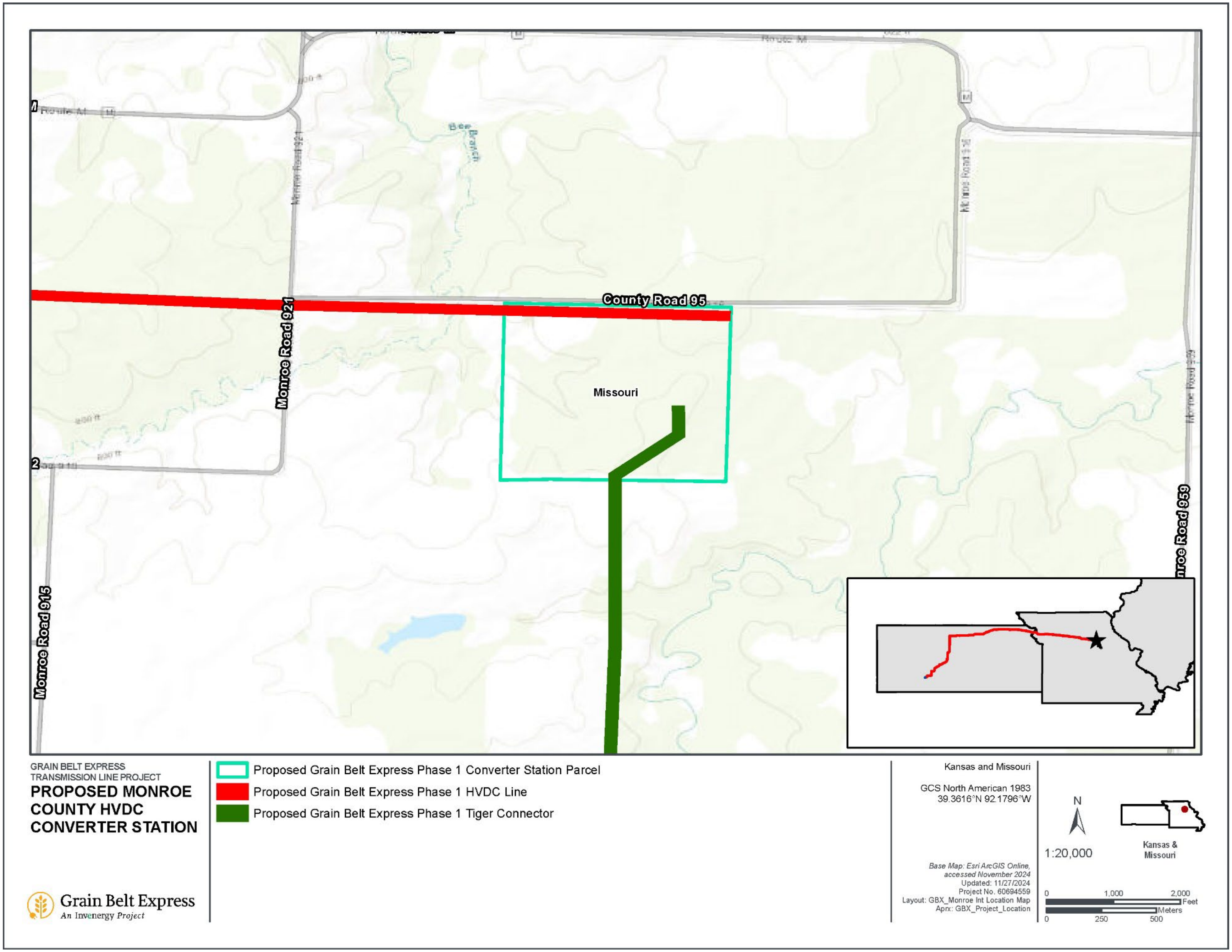

Figure 2-3. Proposed Monroe County HVDC Converter Station

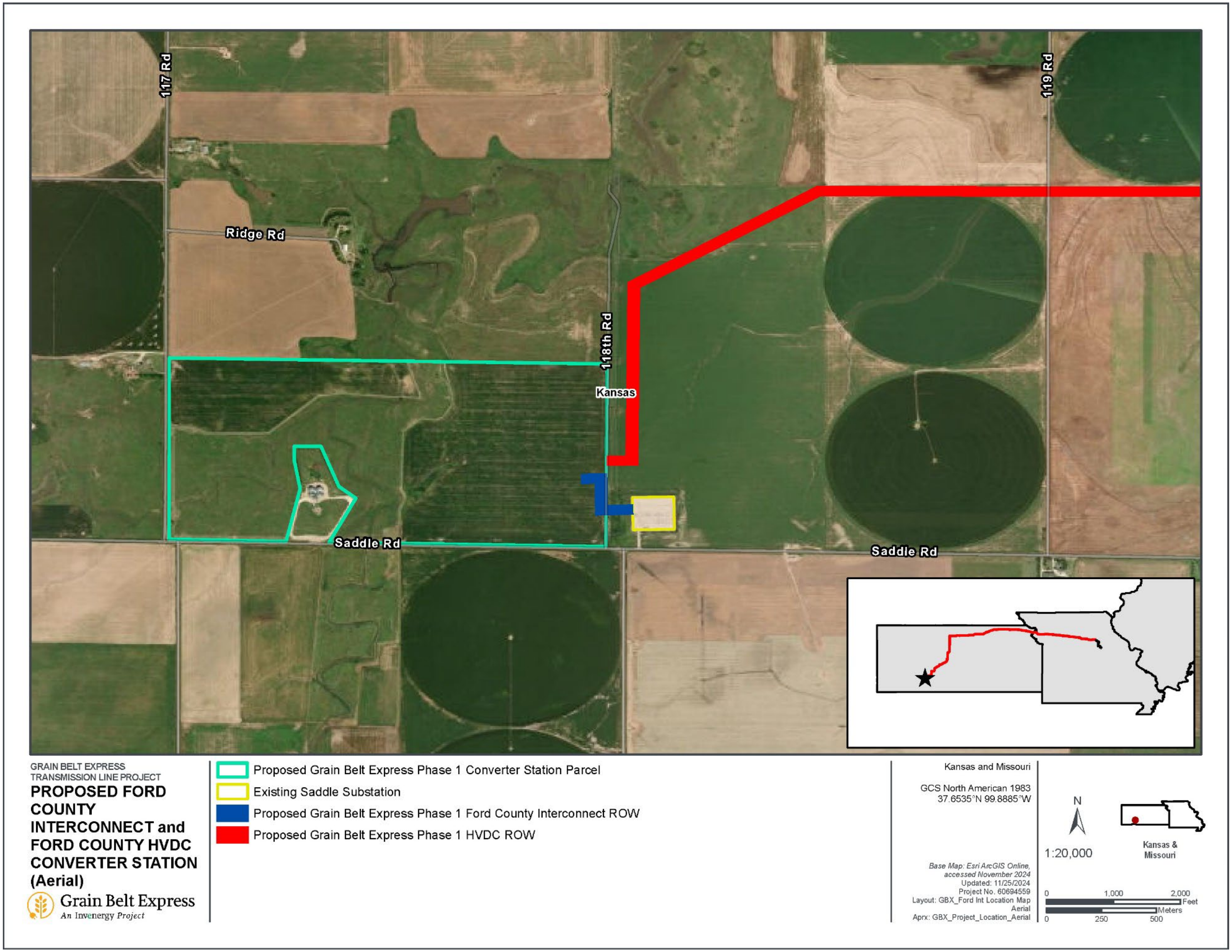

Figure 2-4. Proposed Ford County Interconnect and Ford County HVDC Converter Station (Aerial)

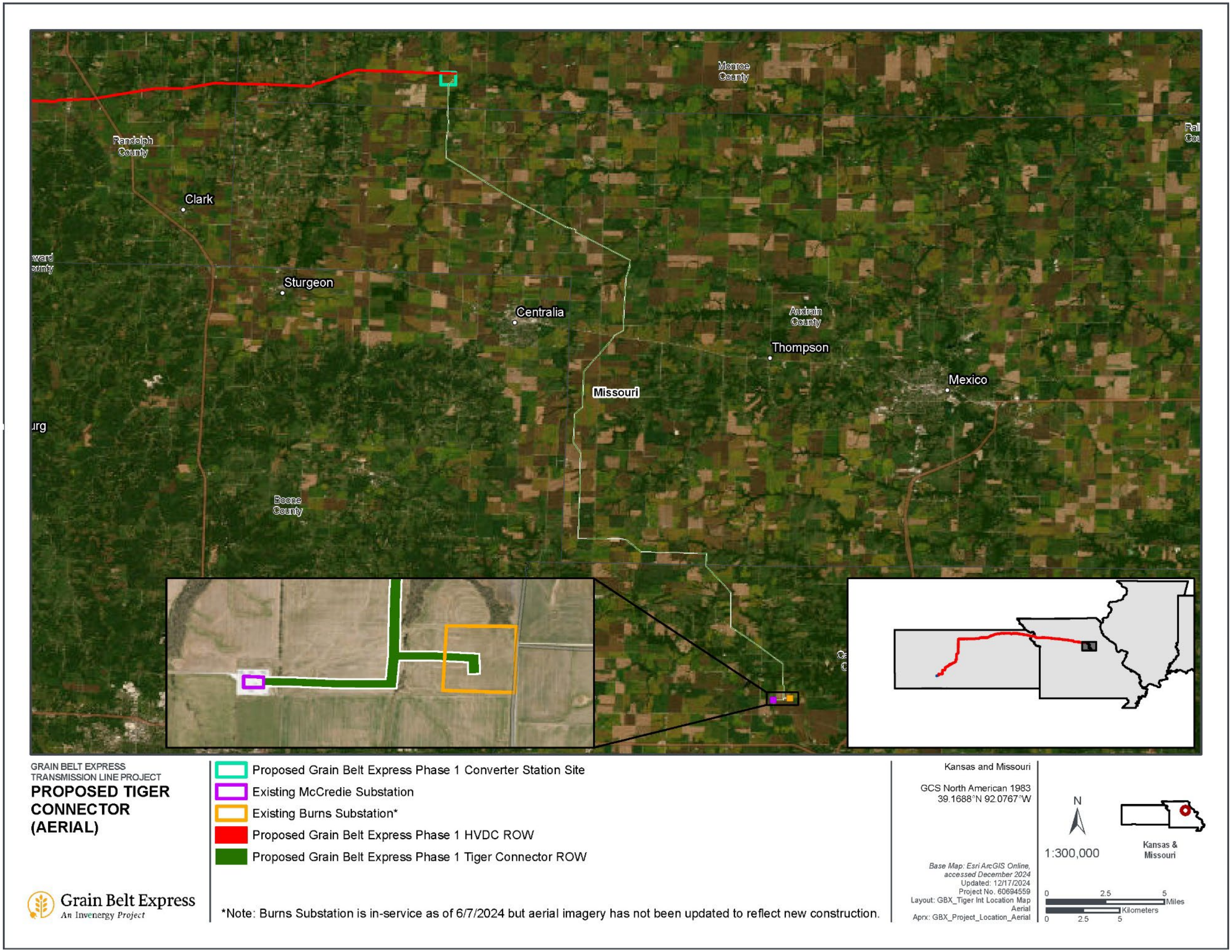

Figure 2-5. Proposed Tiger Connector (Aerial)

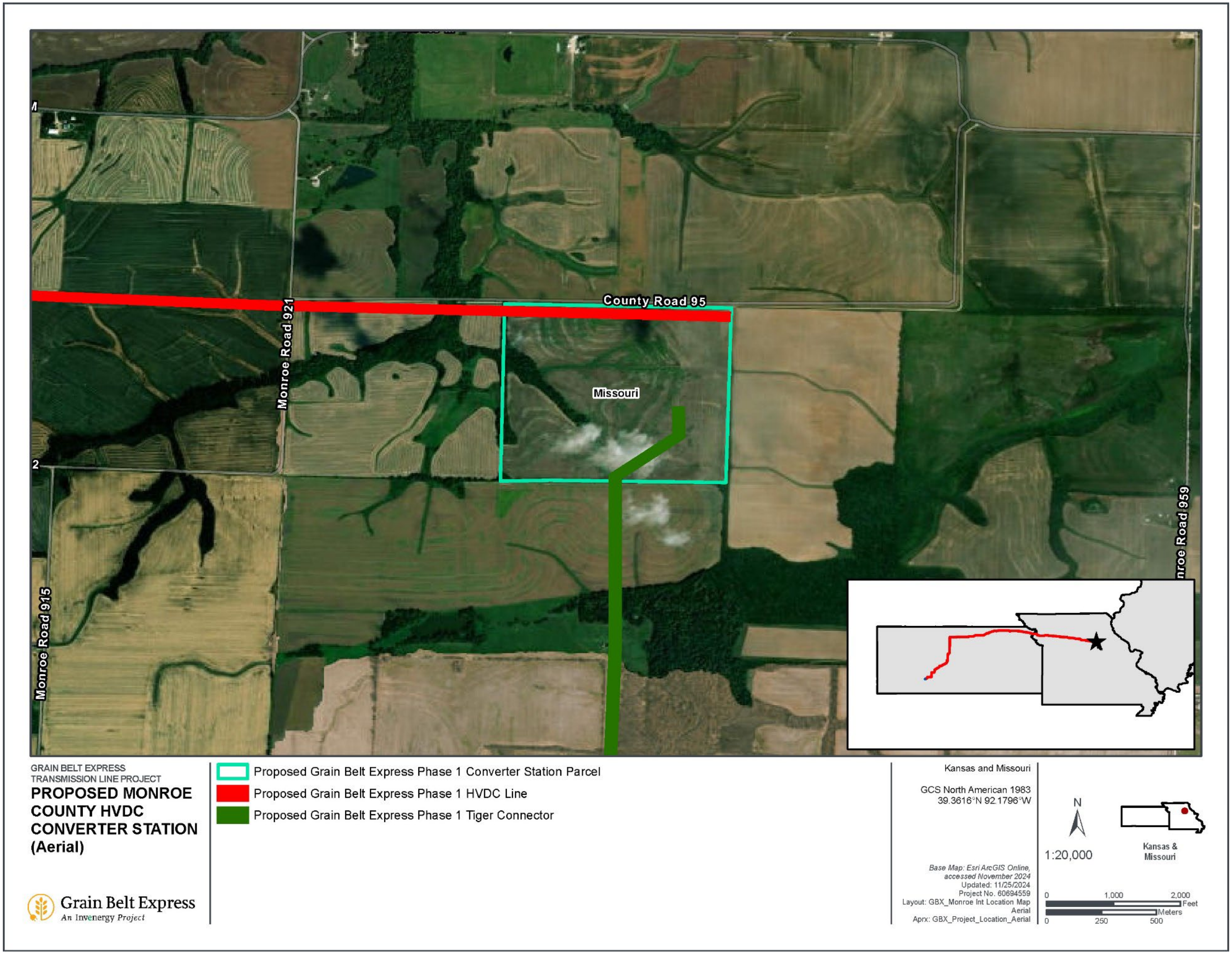

Figure 2-6. Proposed Monroe County HVDC Converter Station (Aerial)

Table 2-6. Approximate Dimensions of Ford County Interconnect and Tiger Connector Components

Description of Design Features	Ford County Interconnect	Tiger Connector
Transmission line length	0.2 miles	36 miles
Voltage	345 kV	345 kV
Connection point	Ford County converter station	Monroe County converter station
AC connection substation	Existing Saddle Substation	Existing McCredie and Burns Substations
Average span between transmission structures	362 feet	1,087 feet
Height of transmission structures (aboveground)	100–200 feet	130–180 feet
Average transmission structure height	140 feet	150 feet
Typical diameter of transmission structure base	6–8 feet	6–8 feet
Number of transmission structures	4 two-pole structures[a]	Up to 200 structures[b]
Conductor size (outer diameter)	1.6 inches	1.6 inches
Minimum conductor-to-ground clearance to agricultural lands, rural roads, and paved highways at the conductor's maximum operating temperature[c]	25 feet	25 feet
Minimum conductor-to-ground clearance to railroads at the conductor's maximum operating temperature	33 feet	33 feet

Notes

[a] *The Ford County Interconnect would consist of two-pole structures due to the number of angles anticipated.*

[b] *The Tiger Connector would consist primarily of single steel pole structures, except at angles and dead ends, which would consist of two-pole structures.*

[c] *The Ford County Interconnect and Tiger Connector would be designed to maintain a minimum 25-foot conductor-to-ground clearance to provide for public safety, including safe operations of vehicles and equipment. A minimum 25-foot conductor-to-ground clearance exceeds requirements for ground clearance of the NESC and would also apply to landscape features outside of these areas.*

2.6.3.1 Right-of-Way

The Ford County Interconnect and Tiger Connector would require a ROW with a typical width of 150 to 200 feet. The width of the ROW is related to the required clearance distances for the conductors, dictated by the NESC. The required conductor clearance distances are directly related to the transmission tower (structure) height, length between structures (span length), and terrain. The width of the ROW would be wider than typical where tall structures, longer spans, or terrain demands greater horizontal distances to maintain safe clearances. **Section 2.6.5.4** describes post-construction activities permitted to occur within the ROW.

2.6.3.2 Transmission Line Structures

Electrical conductors for the Ford County Interconnect would be supported by four galvanized steel two-pole structures, ranging in height from 100 to 200 feet tall.

Electrical conductors for the Tiger Connector would be supported by single galvanized steel pole structures, and two-pole structures would be used at angles along the route. Structures would range in height from 115 to 180 feet. **Figure 7** in **Appendix 2.3** shows a typical monopole structure.

The Applicant will design structure heights, span lengths, and vertical clearance in accordance with the NESC, the Applicant's design criteria, terrain and land use, and all applicable standards and laws. The Applicant may use taller structures in circumstances where additional clearances and/or longer spans are required based on engineering review.

Structures would be supported by pile foundations or be directly embedded. Pile foundations would consist of individual piles or pile groups for each pole of the structure. Estimated dimensions of the Ford County Interconnect and Tiger Connector components are included in **Table 2-4**.

2.6.3.3 Electric Conductor (Transmission Wires)

The Ford County Interconnect and Tiger Connector would include two wire types, electric conductors and optical ground wires. Two electric conductors would be installed with one on each side of the transmission tower structure. The optical ground wire would be installed along the top of the transmission tower structures.

The Ford County Interconnect and Tiger Connector would include two 345-kV AC circuits. Each 345-kV AC circuit would include three phases,[3] each phase consisting of two conductors up to 1.8 inches in diameter in a vertical bundle arrangement. One circuit would be installed on each side of the structure, and each bundle would be suspended by a V-string insulator assembly to minimize the conductor movement caused by wind. The minimum conductor to ground clearances for the Ford County Interconnect and Tiger Connector are listed in **Table 2-4**.

In addition, the most current APLIC suggested practices would be implemented to ensure that overhead transmission lines are designed and constructed in a manner to minimize bird collision and electrocution risk (APLIC 2006, APLIC 2012).

2.6.3.4 Optical Ground Wires

The Ford County Interconnect and Tiger Connector each include two optical ground wires that would serve to provide grounding and lightning protection for the line. These optical ground wires, approximately 0.5–0.75 inch in diameter, would be installed on the top of the transmission structures. Current from lightning strikes would be transferred through the ground wires and structures into the ground. The optical portion of the cable would be used to transport communication signals for control and protection of the transmission line and stations.

2.6.4 Construction

Typical Project construction activities include geotechnical investigations, soil resistivity testing, surveying and staking, clearing and grading, access route preparation, erosion and sediment control, siting and use of temporary workspaces, construction of the HVDC converter station sites and the HVDC Line, Ford County Interconnect, and Tiger Connector and associated facilities, as well as site cleanup and restoration. The Applicant would implement the EPMs listed in **Appendix 2.4** to avoid or minimize potential impacts from construction of the Project.

The actual quantity, size, and precise locations of access routes and temporary workspaces would depend on construction logistics and landowner negotiations. The quantities, footprints, and configurations provided in this description are approximate based on preliminary Project design.

With the exception of emergencies, the Applicant would provide 24-hour notice to affected landowners, or otherwise in accordance with the landowner's easement agreement, prior to accessing the property for construction activities.

[3] The magnitude of current and voltage of alternating current varies with time and is made up of three phases to achieve steady-state transmission of electricity.

2.6.4.1 Geotechnical Investigations

Geotechnical investigations would be conducted to complete detailed foundation design for the Project. These investigations involve core sampling from boreholes drilled to depths of approximately 40 to 60 feet to gather information on the physical properties of soil and rock around a site to properly design Project foundations unique to each location. The Applicant intends for one boring/probe to be taken at each structure location using all-terrain vehicle mounted rigs and truck-mounted rigs where the ground would support truck-mounted rigs with limited rutting or disturbance. The use of Cone Penetration Testing probes would be limited to locations where available data indicate that the probe can be completed to the minimum depth required without additional drilling with Standard Penetration Testing methods. Where hard till, shallow bedrock, or other conditions indicate that the probe penetration is in question, the boring would be completed using a drill rig and Standard Penetration Testing and/or rock core sampling methods.

Boreholes would be backfilled in compliance with local, state, and federal requirements. In the absence of laws and/or regulations for backfilling the borings, boreholes would be backfilled with cuttings from the boring. Boreholes located in paved surfaces would be patched with in-kind materials. Boreholes located in areas regularly occupied by people or livestock would be capped with compacted fill or controlled low-strength materials for the upper 5 feet of the borehole.

2.6.4.2 Soil Resistivity Testing

Resistivity testing would be conducted at the HVDC converter station sites and approximately every 2 miles along the HVDC Line, Ford County Interconnect, and Tiger Connector. Resistivity measurements indicate the relative ability of the soil to carry an electrical current, and data are used as design inputs for the tower grounding and system operations. Testing consists of driving small probes approximately 6 inches into the soil and injecting a small current between the probes. The minimal depth allows for the probes to be driven into soil by hand without heavy equipment. All locations would be selected to avoid existing underground infrastructure.

2.6.4.3 Surveying and Staking

The Applicant would locate and mark features, including but not limited to, the ROW, access routes, boundaries of environmentally sensitive areas, transmission structure foundations, property or section lines, and aboveground and underground utilities. Surveyors would access Project areas via existing roads and routes, where available, and/or via off-road travel. Surveys for underground utilities are to be conducted via the use of ground-penetrating radar, which is non-intrusive to the ground surface.

2.6.4.4 Clearing and Grading

Construction would begin with work crews removing vegetation from areas that would interfere with Project construction activities (e.g., access routes and temporary work areas), including trees, shrubs, and other tall or dense vegetation. For analysis in the Draft EIS, the Applicant is conservatively assuming that all areas requiring dense tree and brush clearing would result in surface disturbance and a permanent conversion of land cover. Vehicular travel for vegetation removal in the ROW to meet NESC requirements outside of temporary access routes would be necessary. It is assumed travel would be limited to one entrance and one exit to areas of vegetation removal with limited equipment. Unless otherwise specified by regulatory approvals or the landowner, trees and shrubs to be cleared would be either removed by hand-cutting, or mechanically felled and then limbed on-site, or cleared with a forestry mower. Stumps may be removed in some locations to accommodate construction vehicle access.

Equipment such as wheeled and tracked feller bunchers, mechanical side trimmers, forestry mowers, excavators, skid steers, chainsaws, lift trucks, and platform baskets may be used for vegetation clearing.

If required by regulatory approvals or landowners or for Project operations and maintenance purposes, tree stumps or brush would be removed or treated with an herbicide approved for that use by the EPA and in accordance with manufacturer’s instructions. The Applicant would take precautions to avoid spray or drift-spray contacting non-target vegetation.

Grading would be avoided wherever practicable. Where grading cannot be avoided, it would be limited to that needed for safe construction and/or to meet design requirements. Grading at the converter station sites would be required to ensure adequate drainage of the facilities. Equipment such as skid steers, wheel loaders, backhoes, dozers, excavators, farm tractors, harrows, dump trucks, scrapers, chippers, straw blowers, brush hogs, and stump grinders may be used for grading.

2.6.4.5 Access Route Preparation

Existing routes would be used where feasible. However, approximately 500 miles of temporary access routes would be required for Project construction for access to transmission structure locations and temporary workspaces. To accommodate construction vehicles and vehicular turning radii, temporary access routes would have a typical surface width between 16 and 24 feet with up to 40 feet along some portions. When necessary, equipment would be used to grade and compact a road base that would then be covered with geotextile fabric and crushed rock. In addition, improvements may be needed to public roads to facilitate the transportation of Project equipment for construction. These road improvements would be coordinated with the applicable jurisdictional entity. Examples include changes to road turning radius, overhead wire heights, aboveground telephone and electric distribution pole locations, rail sidings, and relocating telephone and electric distribution poles and signs. It is assumed that any road improvements would occur within the existing road or utility ROW and would not require new disturbance.

Where needed, the Applicant would utilize methods such as matting to cross wetlands, minimize disturbance, or ensure safe working conditions in areas with unstable soil. Matting is typically installed with equipment such as rubber-tired mat trucks, forwarders, forklifts, or skid loaders. Matting is typically 16 to 24 feet wide along access routes and, in some cases, would be left in place through all phases of construction. When necessary for crossing waterbodies, culverts would be installed to maintain the flow of water during construction of a temporary access route. The exact number and location of culverts is not known at this time. Erosion and sediment controls would be installed as necessary during construction of the access routes to prevent sediment from entering wetlands or waterbodies. After completion of Project construction, temporary access routes would be restored (see **Section 2.6.4.10**), including removal of culverts, matting, and erosion and sediment controls. Where applicable, the Applicant would comply with Nationwide Permit 57 conditions, which state that temporary access routes must be removed upon construction completion and the affected areas returned to preconstruction elevations. Areas affected by temporary fills would be revegetated, as appropriate. If received, the Applicant would consider landowner requests to convert temporary access routes to permanent routes.

The locations and specifications of access routes needed for Project construction are not precisely known at this time. However, **Table 2-2** summarizes anticipated surface disturbances associated with temporary disturbance from construction activities.

2.6.4.6 Erosion and Sediment Control

The Applicant would develop SWPPPs detailing specific steps for managing stormwater runoff during construction and preventing sediment and other pollutants from entering wetlands and waterbodies. The SWPPPs would be prepared in compliance with the Construction General Permit requirements for each state. As part of each SWPPP, an erosion and sediment control plan would be prepared showing the location and type of each erosion and sediment best management practice (BMP) to be utilized. The Applicant would implement appropriate parts of the SWPPP before clearing, grading, and excavating activities begin. The BMPs would include, but would not be limited to, the installation of storm drain inlet protection, construction entrances, sediment basins, filter logs, silt fences, straw bales, rolled erosion control products, and seeding (EPA 2007).

2.6.4.7 Temporary Workspaces

Temporary workspaces would be needed throughout Project construction to provide sufficient access and operating space for vehicles, equipment, machinery, and materials. Temporary workspaces include pull or tension sites, multi-use yards, concrete batch plants, and fly yards and helipads. The locations and specifications of temporary workspaces needed for Project construction are not precisely known at this time. **Table 2-3** summarizes anticipated surface disturbances associated with temporary workspaces from construction activities, based on the assumptions used in the disturbance model. After completion of Project construction, temporary workspaces would be restored to the extent feasible (see **Section 2.6.4.11**).

2.6.4.7.1 Pull or Tension Sites

Pull or tension sites are temporary construction areas located adjacent to or between certain transmission structures within the planned ROW. Pull or tension sites contain hydraulic pulling and tensioning machines and other parts and tools used to pull conductors through a series of structures or tension conductor such that the required conductor sag between structures is achieved. Pull or tension sites would be located along the Project centerline and at large turns in the centerline. Pull or tension sites would be located roughly every 3 to 5 miles (closer in areas along the centerline with more turns) and would measure approximately 150 feet wide by 450 feet long (1.55 acres in size).

Stringing operations also include midspan splice locations between pull or tension sites located approximately every 1.5 to 3 miles. Splicing is the physical joining of two conductor strings from separate conductor reels. Splicing operations typically occur on an insulated platform or on a metallic grounding mat. Implosive couplers may also be used for conductor splicing. This method utilizes an explosive device to tighten the fitting around the conductor. Implosive splicing has several benefits to conventional hydraulic joining, including a higher quality connection, easier splice installation, cost reduction, and quicker installation (Pasini 2006). Seasonal restrictions for sensitive wildlife species and restricted use in proximity to infrastructure and residential areas would be applied (see **Appendix 2.4**). At the time of the Draft EIS preparation, there are no identified locations for the use of implosive splicing.

Equipment used at the pull or tension sites may include hydraulic puller-tensioners, semi-trucks, cranes, and helicopters. Each pull or tension site would be active for approximately 5 days and would be restored after construction unless otherwise requested by the landowners.

2.6.4.7.2 Multi-Use Construction Yards

Multi-use construction yards are temporary work areas that are used for materials and equipment storage and staging for construction activities. The Project would require up to 16 multi-use yards: three large (approximately 50-acre) multi-use yards would be sited approximately 250 miles apart, and 13 small (20- to 30-acre) multi-use yards would be sited every 30 to 40 miles. Multi-use construction yards would be located near the planned ROW to the extent practicable. Considerations for siting multi-use yards are locations that are previously disturbed; are relatively flat and require minimal grading; are close to major highways or existing access points, existing power distribution, and rail yards; avoid wetlands and forested areas; avoid, to the extent possible, visual impacts to cultural and recreation sites; and do not require additional tree clearing. Multi-use construction yards would not be sited in areas that require additional tree clearing or in any sensitive environmental features such as wetlands or streams. Gravel or crushed rock may be placed in the multi-use yards to allow vehicles to maneuver. Multi-use construction yards would be fenced and equipped with security lighting. Specific multi-use construction yard locations are expected to be established approximately 6 months prior to the start of construction and would be active for approximately 16 months each.

In addition to construction equipment and materials, fuel would be stored in multi-use yards. All on-site fuel storage would have secondary containment. The Applicant would inspect fuel storage regularly and would remediate any containment failure promptly in accordance with the Project's SPCC Plan.

2.6.4.7.3 Concrete Batch Plants

The Project would require a substantial amount of concrete, transported by trucks. Concrete for Project construction would be sourced from concrete suppliers with existing, separate facilities, or concrete batch plants would be located within multi-use construction yards. Where used, concrete batch plants would serve as staging areas for dry constituents (e.g., sand, aggregate, cement) and water, both of which would be supplied from off-site sources and hauled to the Project multi-use construction yards. The mixing of these materials would also occur at these locations. Any excess concrete would be disposed of at a landfill. Each concrete batch plant would require a power supply. It is anticipated that the power supply would be sourced from portable generators or the local power service provider by connecting to its existing electric distribution lines near the concrete batch plant. Batch plants would be collocated within multi-use yards and would be active for approximately 16 months each.

2.6.4.7.4 Helipads and Fly Yards

Helicopters may be used during line-stringing activities, installation of conductor bird flight diverters, vegetation clearing, and transmission structure placement at certain sites. Activities involving helicopters would typically be limited to between the hours of 8:00 a.m. and 5:00 p.m., and helicopter use would be limited to fair-weather conditions. Helicopter use could also be increased to expedite construction, and the ultimate usage would be determined by the construction contractor.

Small helipads (approximately 170 feet by 250 feet [0.97 acre]) within larger fly yards (approximately 250 feet by 1,400 [8.03 acres]) would be used to support line-stringing activities and bird flight diverter installation. Fly yards would also be used to support transmission structure construction for the delivery, assembly, and staging of the material for construction activities supported by the use of helicopters. Helicopters would pick the assembled material from the yard and fly it to the designated locations for installation.

Fly yards are selected along the ROW to accommodate ideal operating ranges for heavy-lift helicopters where they would be needed to erect transmission towers. Limiting the travel distance minimizes the number of facilities over which suspended loads need to be carried. Fly yards would be located adjacent to the planned Project ROW. Considerations for siting fly yards are locations that are previously disturbed; are relatively flat and require minimal grading; have safe and easy access for crews, helicopters, and material delivery; are away from sensitive noise receptors (e.g., occupied dwellings, schools, recreation sites, and cemeteries); and do not require additional tree clearing. At the time of the Draft EIS preparation, helicopters are only planned to be used at the Missouri River Crossing for stringing purposes.

Fly yards would be temporary and would be restored after construction unless otherwise requested by the landowners. **Figure 8** in **Appendix 2.3** is a drawing of a typical helicopter fly yard. Fly yards would include staging areas for equipment, structure work areas, and helicopter landing and take-off zones. It is anticipated that helicopter activities would occur for no more than 1 month at locations where they are used.

2.6.4.8 HVDC Line, Ford County Interconnect, and Tiger Connector

Construction activities for the HVDC Line, Ford County Interconnect, and Tiger Connector would include foundation construction, transmission structure installation, conductor stringing, and grounding.

2.6.4.8.1 Foundation Construction

Foundations are designed based on structure loads and subsurface soil conditions specific to the sites. Based on preliminary designs, the HVDC transmission towers are expected to be supported by pile foundations individually or in groups for each leg of the structure. For the Ford County Interconnect and Tiger Connector, pile or pile group foundations would be constructed for each pole. Foundations are expected to be approximately 15–25 feet deep. The type of pile or pile groups would also depend on accessibility. Pile foundations such as driven piles, screw piles, cased piles, and concrete piles would be considered. Foundation construction would involve the use of heavy equipment such as concrete trucks and drill rigs.

2.6.4.8.2 Transmission Line Structure Installation

Steel lattice transmission line structures would be erected on each foundation for the HVDC Line by connecting a framework of steel angle irons, commonly referred to as “lattice members.” For the Ford County Interconnect and Tiger Connector, steel structures would be erected on each foundation by joining sections of tubular steel. Each transmission structure (HVDC Line, Ford County Interconnect, and Tiger Connector) would be erected in sections using cranes (it is not anticipated at this time that helicopters would be used for erecting transmission structures). Where cranes are used, the work area would require approximately 210 feet by 210 feet (approximately 1 acre per structure) around the structure location. These are separate areas from the temporary workspaces previously described and are included in **Table 2-3**. **Figure 9** in **Appendix 2.3** shows the typical construction activity during installation of transmission structures for the Project.

2.6.4.8.3 Conductor Stringing

Conductor stringing and installation would begin with the use of pilot lines that could be strung by helicopter or land-based construction equipment. These pilot lines are then attached to the conductors and pulled through by hydraulic pulling and tensioning machines. Stringing operations would then involve pulling a conductor through pullies at each conductor attachment point on each transmission structure, increasing tension of the conductor until it meets the specified tension, and finally replacing the pullies with a fixed attachment connecting the conductor to the insulators. Stringing would typically be done in 3-to-5-mile-long segments, with work limited to daylight hours. Each segment would take approximately 3 days to complete. All conductor stringing operations would be performed in accordance with Institute of

Electrical and Electronics Engineers (IEEE) Publication 524 (IEEE 2017), Guide for the Installation of Overhead Transmission Line Conductors, subject to the conductor manufacturer's concurrence.

If a segment being strung crosses over existing infrastructure such as roads, electric supply lines, or railroads, temporary guard structures would be used. The purpose of these structures is to prevent a conductor that is being strung from falling into these facilities in the event of equipment failure. Typically, one guard structure would be placed on either side of the facility, perpendicular to the conductor being strung. Guard structures must be wide enough to cover the entire area beneath the conductor and may be implemented as temporary wood H-frames, wood poles with rope nets, or a bucket truck with the arm extended. As necessary, traffic control personnel would be stationed at road crossings to address the general safety of the public. If rail line closures are necessary to accommodate wire stringing activities, the Applicant would coordinate with the subject railroad company to halt trains. Other safety measures in IEEE Publication 524 (IEEE 2017) would also be implemented.

2.6.4.8.4 Grounding

Transmission structures would require subsurface installation of copper ground rods and wire. Bare copper wire would be installed underground from the rods to the transmission structures. Based on the current Project design, grounding rods would be installed below grade 3–15 feet from the structure foundation. The grounding rods would be connected by copper wire at a depth of roughly 18 inches. Ground rods are installed by such methods as driving the rod into the ground with a hammer drill or boring a small-diameter hole and placing the rod into the ground then backfilling the hole with low-resistivity material (e.g., bentonite). The copper grounding rods and wire installation would occur within the permanent disturbance footprint for the transmission line structure.

2.6.4.9 HVDC Converter Station Sites

The Applicant would erect a temporary chain-link fence around the perimeter of the converter station site to prevent unauthorized personnel from accessing the construction and staging areas. The Applicant would compact the excavated and fill areas to the required densities to allow structural foundation installations for the main equipment, bus supports, and buildings. Following the foundation installation, underground electrical conduits or ducts and copper ground-grid installation would take place, followed by steel-structure and building erection, and installation of area lighting. This effort also would include the construction of all-weather access routes. The Applicant would then erect the control buildings, converter hall buildings, and install the outdoor above ground equipment, including bus supports, reactors, transformers, and circuit breakers. The Applicant would also install indoor equipment within the converter hall and control buildings, including converter modules, control and protection equipment, and communication systems. After the completion of construction activities, a permanent perimeter fence would be installed to prevent the public from accessing the converter station site.

2.6.4.10 Site Cleanup and Restoration

As soon as practical following construction, all areas of temporary disturbance would be restored (see **Table 2-3**). Restoration would include the removal of deep ruts in the soil and the disposal of foreign objects such as stumps, chunks of concrete, pile cut-offs, and similar materials. All trash, debris, and stockpiles would be removed and disposed of in accordance with federal and state requirements. The area would be graded to facilitate proper drainage.

Restoration would also include the decompaction of soils (if compacted), reestablishing preconstruction contours, and seeding to meet all applicable regulatory, landowner, and Project requirements.

Revegetation may be seasonally deferred, if necessary, to coincide with suitable growing conditions. In these cases, temporary seed mixes may be used until conditions allow for permanent mixes to be used.

2.6.4.11 Construction Schedule

Project construction is anticipated to begin in 2026 and expected to take approximately 3 years in total for all the components (HVDC Line, Ford County Interconnect, and Tiger Connector), including the time from initiation of clearing and grading through cleanup and restoration. The actual construction duration would depend on several factors, such as weather and availability of labor. Construction may be active on any or all segments at any given time and activities may occur in parallel with other segments or staggered. While exact construction sequencing is not known at this time, general assumptions for analysis are as follows:

- Construction activities would occur over approximately 36 months, including the time from initiation of clearing and grading through cleanup and restoration, across the entire Project area.
- Construction would be completed sequentially along the planned HVDC Line, Ford County Interconnect, and Tiger Connector ROWs and would not occur in all locations at any one time. Specific activities along the ROWs and primarily at or near structure locations would include the following actions:
    - Clearing and grading – up to 1 week
    - Excavating/compacting – approximately 2 days
    - Constructing the foundation – up to 1 week
    - Installing the transmission structure – approximately 3 days
    - Conductor stringing – approximately 5 days
    - Cleaning up and restoring the temporary disturbance areas – approximately 1 week
- Multi-use yards used for staging materials and equipment, established prior to the start of construction, would support construction activities. Each yard would be active for approximately 16 months.
- For the Ford County and Monroe County HVDC converter stations, construction activities would occur for approximately 36 months.

Construction working hours would typically be 7:00 a.m. to 7:00 p.m., and work outside these hours would be limited to the greatest extent possible. Exceptions to daylight construction may be necessary from time to time, such that construction activities may be required to proceed continuously until the work is completed. These conditions may extend for one or more 24-hour days of continuous work, depending on the site and weather conditions, public safety, permit requirements, schedule, crew availability, and other factors. Activities that could extend working hours include security activities; material transportation and delivery of heavy loads, which may require road closures and would better be performed during low-traffic nighttime hours; major railroad or highway crossings; equipment repair and maintenance; commissioning activities, and major concrete pours.

Work on the HVDC Line, Ford County Interconnect, and Tiger Connector would be divided into construction segments. The construction crews would complete each of the individual activities required for construction along each segment in assembly-line fashion. Construction would begin in Kansas and would consist of three crews working concurrently in approximately 127-mile segments. A “crew” is made up of personnel who would conduct clearing, access, foundation, structure setting, wire, and restoration activities. Each crew would work from the western point of each segment and move east. When work in Kansas is complete, one crew would shift to the Missouri River Crossing, and the two other crews would begin work along the two approximately 80-mile-long segments in Missouri. Each crew would work from the western point of each segment and move east.

Construction details have not been finalized at this time; however, it is anticipated that work at each segment of the route would last approximately 16 months, beginning with mobilization of equipment and concluding with site restoration. The peak activities would occur when the structure foundation activities begin, while several other activities would occur at the same time (e.g., structure placement, conductor pulling). The exact details of the construction schedule would be developed by the construction contractor prior to Project initiation and would be communicated to participating stakeholders in advance of the planned activities.

Commissioning activities would begin following the completion of construction activities and would occur through the Project's commercial operation date, which is anticipated to be 2029. Commissioning is a systematic process that verifies systems are designed, manufactured, installed, inspected, tested, operated, and managed as intended. Commissioning activities include the following phases:

- Pre-Commissioning: testing systems and components after installation;
- Cold Commissioning: testing systems and components without power or with temporary/auxiliary power;
- Hot Commissioning: testing systems and components with grid power; and
- Final Commissioning: testing the entire project with all systems and components.

2.6.4.12 Workforce

Construction workforce for the transmission lines (HVDC Line, Ford County Interconnect, and Tiger Connector) would reach a peak of approximately 750 workers, with an average workforce of approximately 480 people during the assumed 36-month construction period. The Applicant would stage construction on each segment of the HVDC Line, Ford County Interconnect, and the Tiger Connector from multi-use construction yards located at regular intervals along the route. The construction personnel peak in any HVDC segment would be approximately 160 workers, and the average over the construction duration of one HVDC segment would be approximately 115 workers. The construction personnel peak for the Tiger Connector would be approximately 110 workers, and the average over the construction duration of the Tiger Connector would be approximately 85 workers.

Construction of the HVDC converter stations in Ford County, Kansas, and Monroe County, Missouri, requires separate workforces from those along the transmission lines. While there would be separate crews for constructing the converter station and AC switchyard components, work on both would occur for the duration of the 36-month construction period. Peak workforce for the converter station sites would require approximately 330 workers, with an average workforce of approximately 190 people during an assumed 36-month construction duration.

2.6.5 Operations and Maintenance

The Applicant would oversee the operations and maintenance activities that would occur after completion of construction activities, once the Project is energized, and throughout the life of the Project. Operations and maintenance activities would occur at Project facilities (e.g., HVDC converter station sites) and within the established transmission line ROWs. With the exception of emergencies, the Applicant would provide

24-hour notice to affected landowners, or otherwise in accordance with the landowner's easement agreement, prior to accessing the property for operations and maintenance activities.

In connection with its current grant of authority by FERC to negotiate rates for transmission service, the Applicant has committed to turn over administrative operations of the Project, including scheduling, reliability coordination, and balancing responsibilities, to a regional transmission organization. These functions would be administered pursuant to a FERC-approved, non-discriminatory Open Access Transmission Tariff. The regional transmission organization for the Project could be SPP, MISO, or another capable regional transmission organization or independent system operator.

The Applicant would contract with one or more companies to provide a team to oversee the operations and maintenance activities associated with the Project. These companies would provide personnel to plan, manage, and schedule the required maintenance of the Project, and they would be required to have sufficient maintenance resources in place along the Project's route to ensure timely responses to any operational or service issues.

2.6.5.1 Inspections

Routine aerial inspections of the entire transmission line system are planned to be conducted annually by helicopter, drone, or other comparable technology. Ground-based inspections would be conducted on an as-needed basis. These inspections would typically use 4x4 trucks or 4x4 all-terrain vehicles. Where access is restricted, ground-based inspections would be conducted on foot or by other approved means. The inspector would assess the condition of the transmission line and hardware to determine whether any components need to be repaired or replaced or whether other conditions exist that require maintenance or modification activities. The inspector would also note any unauthorized encroachments or other unauthorized activities on the ROW that could constitute a safety hazard. Additional aerial or ground inspections would also take place on an as-needed basis (e.g., after severe weather or an event on the line).

2.6.5.2 Vegetation Management

Vegetation management in the active transmission line ROW and easement areas would comply with Project requirements and federal regulations. Reliability standard FAC-003, developed by NERC,[4] is in place to prevent vegetation-caused, cascading outages on the bulk power system. FAC-003 requires transmission owners to prepare and implement a Transmission Vegetation Management Program and to document compliance with the standard. The planned Project ROW would be maintained during operations and maintenance in accordance with a Transmission Vegetation Management Program and associated annual plans for the Project.

The expected Vegetation Management Program would remove and control incompatible vegetation, allowing compatible vegetation to dominate the ROW. Compatible vegetation is characterized by short-stature plant communities. These communities would typically be comprised of herbaceous plants and low-growing shrubs. Vegetation management activities maintain vegetation conditions for safety and reliability, while avoiding negative effects to farmland. It is anticipated that current agricultural practices would largely continue. In appropriate areas, herbicides would be applied in accordance with federal,

[4] NERC is the Electric Reliability Organization for North America, subject to oversight by FERC and governmental authorities in Canada. NERC's jurisdiction includes users, owners, and operators of the bulk power system. NERC develops and enforces Reliability Standards that define the reliability requirements for planning and operating the North American bulk power system.

state, and local regulations, in compliance with documented landowner agreements and obligations, and as a component of a Transmission Vegetation Management Program.

Vegetation would be managed using equipment such as chain saws, forestry mowers, off-road lift trucks, tree harvesters, boom mounted saws, and all-terrain vehicles, as well as manual work methods. Vegetation maintenance access, when needed, would include existing access routes, routes, and off-road travel. Methods, crewing, and duration of activities would depend on the volume and type of vegetation management.

Vegetation management on permanent Project facilities outside of the ROW, such as converter stations and optical regeneration facilities, would be conducted to conform to Project and local requirements and objectives and to maintain security, access, and operational safety and reliability. Vegetation management at these locations would consist of tree removal and trimming, ground cover maintenance by mowing and herbicide treatments, bare-ground herbicide treatment, and as required, landscape screening maintenance.

2.6.5.3 Equipment Repair

Operations and maintenance activities throughout the life of the Project would include repair or replacement of damaged or defective Project components due to normal wear and tear, natural disasters, and/or vandalism. Examples of electrical components that may require repair or replacement include conductors, insulators, optical ground wires, and fiber-optic equipment. Ground access to work sites would be via existing roads and routes to the extent practical but may involve off-road travel. This could require clearing to allow vehicle access. The size and type of equipment required for repair or replacement would vary depending on the location and extent of the work. After repairs are complete, areas of surface disturbance would be stabilized in accordance with regulatory requirements, landowner agreements, and the standard of care detailed throughout this document. The Applicant would correct or pay for any damage to property improvements, livestock, and/or crops as a result of repair activities in accordance with the landowner’s easement agreement.

2.6.5.4 Permitted Uses Within the Right-of-Way

Land uses compatible with reliability and safety requirements for HVDC Line, Ford County Interconnect, and Tiger Connector facilities would be permitted in and adjacent to the planned Project ROW. Existing land uses, such as agriculture, grazing and other compatible land uses, are generally permitted. Incompatible land uses within the ROW include construction and maintenance of inhabited dwellings and any use requiring changes in surface elevation that affect electrical clearances of existing or planned facilities.

Limitations on land uses would be described in the easement agreements; these limitations could be modified in the easement based on site-specific conditions and/or coordination with landowners. For example, limitations on uses within the ROW could include the following:

- A prohibition on placing a building or structure within the ROW.
- Restrictions on timber or the height of orchard trees within the ROW.
- Restrictions on grading and land recontouring within the ROW that would change the ground surface elevation within the ROW such that required electrical clearances are no longer maintained.

- Restrictions and/or required coordination for the construction of future facilities, such as fences and/or irrigation lines within the ROW.
- Restrictions on access for safety considerations where maintenance activities are being performed.

Restrictions on land use within the ROW would be determined based on site-specific conditions and/or in coordination with landowners. For example, the Applicant recognizes that agricultural areas are graded, contoured, and ditched as part of routine agricultural practices. These types of routine practices are compatible with the reliability of the HVDC Line, Ford County Interconnect, and Tiger Connector facilities and would not be restricted.

2.6.5.5 Safety and Reliability

Safety and reliability of the transmission system are primary concerns for the Project. The Project will be designed to meet or exceed applicable criteria and requirements outlined by organizations such as the FERC, NERC, NESC, SPP, MISO, American Society of Civil Engineers, and other applicable federal, state, or local requirements. Safety measures will meet or exceed applicable occupational safety and health standards. The transmission line would be protected with circuit-interruption equipment (circuit breakers, disconnects, etc.). If the conductor were to fail, power would be automatically removed from the line. Lightning protection would be provided by the optical ground wires. Electrical equipment and fencing at the converter stations and substations would be grounded. Vegetation management would minimize safety and reliability vegetation risks.

As stated above, the FERC approved plan is for the Applicant to turn over operational control of the Project to a regional transmission organization. For the Project, this could include SPP, MISO, or another capable regional transmission organization or independent system operator. Operational control of a facility means that the regional transmission organization ensures that service on the Applicant’s assets is administered transparently via a FERC-approved Open Access Transmission Tariff, and other operations-related functions like balancing and reliability coordination are properly administered. In addition, a NERC compliance program would be established and maintained either by the Applicant or by a third party to which the compliance requirements are delegated. Coordination agreements would be negotiated and executed with the relevant interconnection parties. The Applicant or a NERC-certified third party would be designated as the Transmission Operator, responsible for the requirements associated with that function.

2.6.6 Decommissioning

Overhead transmission lines have a typical life expectancy of approximately 80 years. Site decommissioning would be performed at the end of the service life of the Project several decades in the future by the owner of the Project. A Decommissioning Plan would be developed prior to the decommissioning and would follow applicable federal, state, and local laws, regulations, and requirements at that time, including requirements in the MPSC CCN.[5] Unless facilities are upgraded or otherwise kept in service, all Project components would be dismantled and removed. Aluminum and steel components and electrical equipment would be recycled, either through use at another station or sold for scrap. Tower foundations would be removed to a minimum depth of 3 feet, resulting in waste concrete and re-bar. Temporary access routes would be identified and used for the removal of the structures and lines; these would be reclaimed after the lines and structures have been removed.

[5] In Kansas, the Notice Granting Siting Permit from the KCC did not include any decommissioning requirements.

The MPSC CCN requires the Applicant to establish a decommissioning fund in an amount reasonably necessary to perform the Project close-out activities described below for portions of the Project that are constructed and installed in Missouri:

- Dismantling, demolishing, and removing all equipment, facilities, and structures;
- Legally terminating all transmission line easements;
- Securing, maintaining, and disposing of debris with respect to the Project facilities; and
- Performing activities necessary to comply with applicable laws, contractual obligations, or that are otherwise prudent to retire the Project facilities and restore any landowner property.

3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 Approach to Analysis

Each resource discussed below in **Chapter 3** is organized as follows: issues for analysis, analysis area, affected environment, and environmental consequences of the Proposed Federal Action. The environmental consequences of the No Action Alternative are discussed in **Section 3.2**. Environmental consequences of the related, non-Federal actions, the network upgrades and the Kansas AC Collector System, are presented in **Section 3.18**. The Proposed Federal Action would result in construction, operations and maintenance, and decommissioning of the Project, which may result in potential impacts to the existing environmental, social, and cultural resources within the Project area and the resource analysis areas.

The affected environment discussions describe the existing natural and human environments in the resource analysis areas that would be impacted by the Project, and encompass the conditions associated with the No Action Alternative. Descriptions of the affected environment are based on review of available literature, observations during fieldwork (where applicable), and other readily and publicly available data. The resources and issues presented in the analysis discussions in **Chapter 3** were identified during public and agency scoping. For each resource, a description of the resource-specific analysis area is provided, along with the rationale for why that specific analysis area was selected for each resource. The resource analysis areas include the Project area and may also include surrounding lands that may be directly or indirectly impacted by Project construction, operations and maintenance, and decommissioning activities.

The environmental impacts analyses are presented specific to the phase of the Project and include construction, operation and maintenance, and decommissioning. The terms “effect” and “impact” are synonymous under NEPA. Impacts can be direct or indirect. Direct impacts are defined as those caused by the action, and they occur at the same time and place. Indirect impacts are caused by the action and occur later in time or are farther removed in distance (40 CFR 1508.1(g)). Temporary impacts occur during construction or decommissioning, with the resource returning to preconstruction conditions once construction or decommissioning is complete. Permanent impacts would be expected to continue after construction of the Project. In the analysis of environmental consequences, quantitative impacts are provided where possible; otherwise, the impacts are characterized qualitatively.

3.1.1 Incomplete and Unavailable Information

The CEQ regulations at 40 CFR 1502.21 provide direction for addressing incomplete and unavailable information. They state, “when an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an environmental impact statement, and there is incomplete or unavailable information, the agency shall always make clear that such information is lacking.” Therefore, where information is not available, statements regarding that information are included in the applicable section of Chapter 3. In certain circumstances, assumptions are made for the purpose of the analysis.

3.1.2 Impact Summary Table

A summary of the potential impacts to each resource analyzed in this DEIS is provided below in **Table 3.1-1**. Additional details regarding the potential impacts of the Project are provided in **Chapter 3**.

3.1.3 No Action Alternative Impact Assessment

Under the No Action Alternative, DOE LPO would not provide federal financial support (a federal loan guarantee) to the Applicant for construction and interconnection of the Project. While this would not preclude the Applicant's Project from being constructed using non-federal funding, for the purposes of analysis, this EIS assumes that the Project would not be built.

Consequently, no impacts from the Project would occur to or be associated with the following resources: air quality, paleontology and soils, water resources, vegetation, cultural resources and Native American traditional resources and values, wildlife, special designations, transportation, land use, recreation, noise, visual resources, environmental justice, and public health and safety. Implementation of the No Action Alternative would result in the following impacts on greenhouse gas emissions and on social, economic, and community resources:

Under the No Action Alternative, the potential reduction or avoidance of between 2.8 to 3.1 million tons of GHG emissions annually (**see Section 3.2.4.3.2**) would not be realized and transmission line losses associated with equivalently sized AC transmission systems (up to 16 percent compared to HVDC transmission) would persist. Thus, the No Action Alternative would not support attainment of the U.S. government's established target to reduce GHG emissions by 50 to 52 percent from 2005 levels economy-wide by 2030 (The White House 2021).

Under the No Action Alternative, there would be no Project-related jobs created or Project-related changes to population, housing and public services, property values, or government revenues in the socioeconomic analysis area. However, energy transmission in the region as a result of the Project would not occur, nor would the Project be available to contribute to regional objectives.

Table 3.1-1. Impact Summary Table

Resource Type	Area of Analysis	Impact Summary	No Action Alternative
Air Quality and Greenhouse Gas Emissions	Air Quality: 14 counties in Kansas and 9 counties in Missouri where construction, operations and maintenance, and decommissioning activities would take place	**Construction**: County-wide emission increases due to the Project would be less than 3 percent across the air quality analysis area for all pollutants. Air emissions in the Project area are lower than the pollutant de minimis levels and National Ambient Air Quality Standards (NAAQS) thresholds (except for carbon monoxide [CO]), and small increase in county emissions from construction activities (including CO) would not cause an exceedance of NAAQS and would maintain each county's attainment status; minimal air quality impacts from construction are expected. **Operations and Maintenance**: The estimated annual operations and maintenance emissions would be less than the respective general conformity pollutant de minimis level of 100 tons per year. Therefore, Project operations and maintenance activities would not cause an exceedance of NAAQS, nor would they affect each county's attainment status throughout the life of the Project. **Decommissioning**: Pollutant emissions would be similar to or less than construction-related activities and would be lower than federal pollutant de minimis and NAAQS threshold levels, the small increase in emissions from decommissioning activities would not cause an exceedance of NAAQS and would maintain each county's attainment status.	No new air pollutants would be created by the Project.
	Greenhouse Gas Emissions: discussed in terms of state and national trends	**Construction**: Total GHG emissions would be approximately 45,190.82 metric tons (MT) of carbon dioxide equivalents (CO_2e), representing annual emissions of approximately 15,063.61 MT CO_2e. Greenhouse gas emissions would be less than the annual 25,000 MT CO_2e threshold for the Mandatory GHG Reporting Rule. **Operations and maintenance**: Total annual GHG emissions from operations and maintenance activities are estimated to be 761.52 MT CO_2e per year. The Project's estimated operations and maintenance GHG emissions would be less than the annual 25,000 MT CO_2e threshold for the Mandatory GHG Reporting Rule. The Project could also help reduce overall GHG emissions by allowing new renewable energy projects to access the electric grid, potentially leading to the replacement of existing fossil-fuel power plants, while providing additional power to expanding renewable energy markets. **Decommissioning**: Greenhouse gas emissions from decommissioning activities would likely be similar to the annual construction emissions from on-road and off-road vehicles.	No new GHG emissions would be created by the Project under the No Action Alternative.
Paleontology and Soils	Paleontology: 0.25-mile buffer on either side of the Project area (0.5 miles total). The total acreage for the paleontology analysis area is 221,724 acres	**Construction:** Direct impacts to paleontological resources would result from damage or destruction of fossils through crushing, breaking, exposing, or otherwise disturbing fossils or fossil remnants, or loss of valuable scientific information during surface-disturbing activities within the planned Project ROW or temporary access roads. Indirect impacts include erosion of fossil beds due to slope re-grading and vegetation clearing or the unauthorized collection of scientifically important fossils by construction workers or the public due to increased access to fossils in the paleontology analysis area. EPMs would be implemented to minimize impacts, including the development of a Paleontological Discovery Plan with a provision for stopping construction work should paleontological resources be discovered. **Operations and Maintenance:** Impacts to paleontological resources would be the same as construction-related impacts (e.g., possible crushing, breaking, or otherwise disturbing fossils). However, overall activity during operations and maintenance would be localized, less intensive, and shorter in duration (up to several days in any one location). Additionally, most areas of operations and maintenance would have already been disturbed during Project construction, when the Paleontological Discovery Plan would have been implemented for the Project. **Decommissioning:** Impacts to paleontology and soil resources from activities to remove Project facilities would likely be similar to impacts during construction. However, most areas disturbed by decommissioning would have already been disturbed during Project construction, when the Paleontological Discovery Plan was implemented.	Paleontological resources within the paleontology analysis area would be subject mainly to erosion from natural causes, artificial modifications already made to the environment, and disturbance from the continuation of existing land uses, such as farming.
	Soils: entire Project area (13,641 acres)	**Construction:** Temporary disturbance activities would require grading on up to approximately 4,162 acres. The Applicant would implement EPMs and develop a SWPPP to meet construction general stormwater permit requirements in each state. Soils with high compaction potential would be susceptible to compaction from construction vehicles and equipment. Impacts would be minimized by the EPMs. The Project would cause approximately 4,751 acres of temporary disturbance (including 1,025 acres of habitat conversion) and 210 acres of permanent loss of prime farmland or farmland of statewide importance. Following Project construction and restoration, agricultural activities would generally be able to resume on prime farmland areas with temporary disturbance. The permanent losses would primarily result from converter station site development. **Operations and Maintenance:** Potential impacts could result from localized, temporary activities such as inspections, vegetation management, and repair or replacement of damaged Project facilities occurring over several days. The primary impact from these activities would be compaction from construction equipment. Implementation of EPMs would reduce impacts to soil resources. **Decommissioning:** The disturbance footprint for decommissioning would likely be similar to the footprint during construction, resulting in a similar extent of soil impacts. Following decommissioning, demolition of aboveground Project facilities and removal of the foundations would disencumber up to 210 acres of prime farmland that were inaccessible during Project operation.	No impacts would occur to soils from construction, operations and maintenance, and decommissioning of the Project.
Water Resources	Water Resources Analysis Area: 0.25-mile buffer of the Project area. The total footprint of the water resources analysis area was 221,724 acres. Project area: entire Project area (13,641 acres)	**Construction:** Total water consumption for concrete mixing for the HVDC Line, the Tiger Connector, and the Ford County Interconnect is expected to exceed 5.3 million gallons. Controlling dust emissions from temporary workspaces and access roads is estimated to consume an additional 138 million gallons of water during construction duration. The total estimated dust control water volume for the converter stations is 1.28 million. Impacts from consumptive water use would likely be greatest in central Kansas, where available water supplies are smaller and the demand for dust control water could be higher compared to the rest of the Project	No impacts would occur on water resources as a result of the Project from construction, operations and maintenance, and decommissioning.

Resource Type	Area of Analysis	Impact Summary	No Action Alternative
		due to the drier climate. Local water supplies could also be impacted if private water wells near the Project are accidentally damaged during construction. Potential impacts would be mitigated by identifying private wells in the field and taking measures to prevent damage. The Project area crosses 26 hydrologic subbasins, with approximately 7,554 acres of estimated permanent and temporary surface disturbance for the Project. Over half of the permanent and temporary surface disturbance and habitat conversion would occur in 7 of the 26 subbasins crossed by the Project. The Applicant would manage the potential for water quality impacts through implementation of EPMs, including developing and implementing an SWPPP. Approximately 689 acres of Forested and Woodland Vegetation would be removed or converted to Shrub and Herb Vegetation. Streams within these areas could be susceptible to temperature increases. Surface water quality could be impacted if any chemicals are spilled during construction or refueling and flow into an adjacent waterbody. Impacts to groundwater quality could also be possible if a spill or release goes undetected and infiltrates the uppermost aquifer. The Applicant would manage potential water quality impacts from spills through application of the EPMs, including developing and implementing a Spill Prevention and Response Plan. The Project would disturb approximately 633 acres of 100-year floodplains. Most of this surface disturbance would be temporary (388 acres) or habitat conversion (243 acres). Flood-related impacts in temporary surface disturbance areas are expected to be minimal. Most of the permanent surface disturbance to the floodplain would occur from construction of the transmission structures and optical regeneration facilities. Any required local permits, including associated hydrological analysis, would be obtained and conducted for permanent impacts to floodplains. Approximately 35.3 acres of wetlands inside the Project area would be temporarily disturbed. There are 122.4 acres of wetlands within the Project area that would be permanently converted and maintained as emergent wetlands, including 2.4 acres of palustrine scrub-shrub wetlands and 55.3 acres of palustrine forested wetlands. The Project area has less than one acre of wetlands that would be permanently impacted by the location of permanent Project facilities. The Project would temporarily disturb 43,825 linear feet of waterbodies and permanently impact 2 linear fee Mitigation and/or avoidance measures would be implemented once field surveys are complete, and impacts are finalized. The USACE would decide whether to authorize the Project under Section 404 of the CWA and Section 10 of the RHA. **Operations and Maintenance:** Limited water use would be required for operation of the HVDC converter stations. The limited water use for these operations and maintenance activities would have no discernible impact on available supplies near the HVDC converter stations. The HVDC converter stations would require specific EPMs, and design would minimize increased impervious surface where possible. Over time, minimal surface disturbance from off-road access activities could contribute additional sediment loading if the work is concentrated near surface waterbodies. These types of water quality impacts, while typically small, would persist intermittently for the life of operations and maintenance activities. Wetlands and waterbodies within the Project ROW would be subject to vegetation maintenance activities to prevent establishment of incompatible vegetation. Such maintenance clearing may require authorization by USACE, KDHE, and MDNR and would be subject to USACE nationwide permit conditions for restoration of any jurisdictional wetland impact, whether temporary or permanent. **Decommissioning:** Impacts to water resources from activities to remove project facilities would likely be similar to impacts during construction.	
Vegetation	300-foot buffer of the Project area (64,884 acres)	**Construction:** Approximately 98 percent of the permanent disturbance to vegetation would be related to the construction of the HVDC converter stations, with the remaining permanent disturbance from transmission structures and optical regeneration facilities and associated access driveways. Temporary disturbance would also occur in areas within the planned Project ROW where Forest and Woodland Vegetation would be converted to Shrub and Herb Vegetation to meet NERC safety requirements. Impacts to general vegetation would result from approximately 212 acres of permanent disturbance from transmission line structures, optical regeneration facilities and associated access driveways, and HVDC converter stations. Impacts to general vegetation would result from approximately 5,745 acres of temporary disturbance from access routes, pull or tension sites, multi-use yards, concrete batch plants, helipads, fly yards, and workspaces. Most impacts resulting from disturbance would be in Agricultural and Developed Vegetation (4,664 acres of temporary disturbance, 331 acres of habitat conversion, and 204 acres of permanent disturbance). During construction, the increase in vehicles and equipment in vegetated areas could increase the short-term potential for ignitions in the vegetation analysis area. Other activities such as hot work, welding, or smoking; accidental ignition of flammable liquids; implosive splicing; and mechanical malfunction could also increase the potential for ignitions during construction. These potential ignition sources would be minimized through the application of EPMs. Spread of noxious weeds is possible anywhere in the vegetation analysis area. Agricultural areas, which constitute 71 percent of the vegetation analysis area, are routinely treated for noxious weeds by chemical and mechanical means. However, areas with native or naturalized vegetation, approximately 26 percent of the vegetation analysis area, are not typically treated for noxious weeds, and are susceptible to spread of noxious weeds after disturbance. The Applicant would ensure that restoration occurs in a timely manner following the completion of construction along each segment. Spread of noxious weeds becomes less likely after planted areas mature and cover previously exposed soil.	No impacts would occur on vegetation from construction, operations and maintenance, and decommissioning of the Project.

Resource Type	Area of Analysis	Impact Summary	No Action Alternative
		Edges would be created during construction primarily along the planned Project ROW, and edge effects can be long-term impacts extending into operations and maintenance. Compared with non-forest vegetation, edge effects would be greatest in areas of Forest and Woodland Vegetation, where the removal of vegetation would expose vegetation adjacent to the Project area to higher solar radiation and wind, resulting in hotter, drier conditions on the forest floor and an increased risk of windthrow. **Operations and Maintenance:** Project operations and maintenance activities would temporarily impact vegetation where periodic inspections and maintenance activities occur, and plants are crushed or uprooted, or soils are compacted by vehicles. Incompatible vegetation within the planned Project ROW would be cut or trimmed to comply with the NESC Transmission Vegetation Management Standard. Overall, the impacts from operations and maintenance activities would be periodic and small relative to construction activities. **Decommissioning:** Impacts to vegetation resources from activities to remove Project facilities would likely be similar to impacts during construction; however, tree removal would not likely be necessary. Forest and Woodland Vegetation would likely be allowed to recolonize areas within the Project ROW that were maintained as Shrub and Herb Vegetation through the operations and maintenance phase of the Project.	
Cultural Resources and Native American Traditional Resources and Values	Archaeological analysis area: the surface-disturbance areas, not including the areas within the planned Project ROW where surface disturbance is avoided. Historic built environment analysis area: the surface-disturbance areas plus a variable buffer between 0.5 and 2 miles of new aboveground infrastructure proposed for the Project (between 1 and 4 miles total). Native American traditional resources and values analysis area: the same area as the historic built environment analysis area, including the areas of interest (AOIs) and areas of avoidance (AOAs) expressed by tribes as part of ongoing consultation.	**Construction:** Impacts to archaeological resources from construction include destruction or disturbance by vertical and horizontal displacement of soil containing archaeological materials; damage to or destruction of artifacts and features; and loss of archaeological data due to surface-disturbing activities, such as clearing, grading, excavation, erosion, and compaction, and using temporary multi-use yards for storing equipment and supplies. Increases in the use of vehicles and equipment, as well as human access to previously inaccessible areas, could expose archaeological sites to increased looting, vandalism, and trampling, depending on their accessibility and visibility. To minimize these potential impacts, Project personnel would be instructed on the federal, state, and tribal laws that protect historic properties, including prohibition of collection and removal of cultural material, as noted in the EPMs. To avoid or minimize potential impacts to inadvertent discoveries, the Applicant would develop and implement the Inadvertent Discovery Plan. Currently, there are 16 previously documented archaeological sites within or up to 250 feet from the planned Project ROW. The archaeological field studies conducted at the two HVDC converter stations resulted in the identification of nine archaeological sites, six in Ford County, Kansas, and three in Monroe County, Missouri. Any archaeological sites encountered during the ongoing archaeological field investigations would be assessed for NRHP eligibility and included in the NHPA Section 106 consultation process. The potential for visual impacts resulting from construction activities is increased in open terrain, where the lack of topographic or vegetative screening allows the visual profile of the construction activities to be more pronounced, which could adversely affect a property's integrity of setting, feeling, design, and association. These visual impacts would be temporary and would be removed upon completion of the construction activities. There are three known NRHP-listed built environment historic properties and one Kansas state-inventoried resource within the historic built environment analysis area. Construction may have short-term impacts, such as visibility of construction equipment, construction noise, and exhaust fumes that may travel to the property location. As determined in consultation with the NPS, there would be no temporary or long-term physical or visual/atmospheric impacts to the NHTs from Project construction. The Applicant would not conduct construction-related activities, including surveys, in Osage Nation-provided AOAs. As a result, there would be no impact on tribal resources within these AOAs. Cultural resource surveys are ongoing in the AOIs to the extent they intersect the analysis area. **Operations and Maintenance:** The nature and types of effects from operations and maintenance activities are similar to those described for construction there would be no ongoing adverse effects on historic properties and there would be reduced or no direct effects on historic built environment resources. **Decommissioning:** The nature and type of direct effects on cultural resources resulting from decommissioning activities would likely be similar to operations and maintenance impacts, as activities would most likely occur in previously disturbed areas, though the visual impacts of the decommissioning activities would be similar to the visual impacts during construction. Once decommissioning is complete, the visual impacts associated with the presence of Project facilities would be eliminated or reduced with the removal of the aboveground infrastructure.	No effects on archaeological resources, historic properties, NHS and NHTs, and Native American traditional resources and values from construction, operation and maintenance, and decommissioning of the Project would occur. The documentation and inventory of cultural resources within the archaeological resources analysis area, historic built environment analysis area, and Native American traditional resources and values analysis area would be available to help further inform the known precontact and historic landscapes of the regions crossed by the Project area.
Wildlife	1.5-mile buffer surrounding the Project area (1,171,986 acres)	**Construction:** Construction of the Project would result in permanent and temporary habitat loss and conversion of habitat utilized by wildlife. Permanent habitat loss would occur through the clearing of vegetation for the construction and operation of permanent project features which would contain permanent impervious surfaces and would no longer function as suitable wildlife habitat following construction. Habitat conversion would also include the permanent conversion of one habitat type to another which would occur within portions of the planned Project ROW. Temporary disturbance to habitats would occur due to the clearing and grading of temporary access roads and multi-use yards that would later be regraded and reseeded with herbaceous species. Revegetation of temporarily disturbed areas would be conducted in compliance with the EPMs. Project construction activities would have the potential to result in injury and mortality to wildlife species. Some species could potentially be crushed by vehicles along access roads, during vegetation clearing, or from crushing of occupied dens during construction. Species that are prone to injury and mortality on roads include small-bodied or slow-moving species such as reptiles and amphibians, and some fast-moving species such as mammals and birds. To minimize the risk of collisions and mortality, EPMs would be implemented. The highest construction noise level arising from the use of heavy equipment and machinery at the closest human noise-sensitive receptor (165 feet; Leq) is estimated to range from 62 to 71 dBA, depending on the type of construction activity. Areas located closer to the construction sites where active construction is	No impacts would occur to wildlife resources from Project construction, operations and maintenance, and decommissioning.

Resource Type	Area of Analysis	Impact Summary	No Action Alternative
		occurring would experience higher noise levels that would likely result in disturbance and displacement of wildlife from these areas. Noise due to Project construction would be temporary and primarily limited to daytime hours. Night work would be avoided, where possible, but may occur for the following activities: security activities, material transportation/deliveries, major railroad/highway crossings, equipment repair/maintenance, major concrete pours, and commissioning activities. Artificial light may disturb or disorient wildlife, particularly nocturnal species. Construction activities would generally be limited to daylight hours to the extent practicable. In general, impacts to special status species would be similar to those discussed above for general wildlife species. Construction would result in approximately 689 acres of disturbance to Forest and Woodland Vegetation, which may be used by gray bat, Indiana bat, northern long-eared bat, and tricolored bat for roosting or foraging. Additionally, approximately 6,603 acres of Shrub and Herb Vegetation and Agricultural and Developed Vegetation that may be used by foraging gray bats and tricolored bats and approximately 92 acres of Wetland and Riparian Vegetation that may be used by foraging gray bats and Indiana bats would be disturbed. Construction activities associated with noise, visual changes, and physical presence of construction equipment, vehicles, and personnel could impact bat species, potentially causing temporary avoidance or reduced use of active construction areas. Bats would potentially avoid roosting near active construction and may alter their foraging behavior near active construction sites. Collisions with stationary Project structures are not expected. There would be less than 1 acre of permanent habitat removal, approximately 4 acres of permanent habitat conversion, and approximately 146 acres of temporary impacts to grassland of Kansas state-designated critical eastern spotted skunk habitat. Impacts from construction resulting in injury or mortality would be similar to those described for general wildlife. The eastern spotted skunk would likely move away from construction activities but could be impacted through noise and general disturbance of construction by having to relocate to less preferred habitat. The Aransas-Wood Buffalo whooping crane population migrates through the wildlife analysis area each spring and fall; however, no suitable wetland stopover habitat within the wildlife analysis area would be physically removed by construction activities. Avoidance by whooping cranes of areas could make 132 acres of previously suitable wetland stopover habitat fully or partially unavailable for whooping crane use during spring and fall migration. Although the Project could shift the distribution of where whooping cranes stop over during migration, it would not likely have a measurable impact on individual cranes or the population. Impacts to whooping cranes resulting from functional habitat loss would be considered permanent and continue from construction through operation and maintenance of the Project (primarily along the planned Project ROW). Whooping cranes would potentially experience noise and visual disruption in the Project area during construction. The implementation of EPMs would reduce these impacts. Injury or mortality from collisions during construction would not be expected. Project construction would result in 44 acres of surface disturbance to the estimated occupied range of the lesser prairie-chicken. Construction would also result in functional habitat loss of 2,070 acres of the estimated occupied range through avoidance of transmission lines and newly constructed gravel roads. However, functional habitat loss may already have occurred in some portions of the wildlife analysis area because of an existing high-voltage transmission line and existing roads and other infrastructure; therefore, a total of 729 acres of suitable habitat may be functionally lost as a result of the construction of the Project. Of the 729 acres of suitable habitat, 163 acres are known to be or likely occupied, and 566 acres are likely unoccupied. Impacts to lesser prairie-chicken habitat resulting from potential habitat loss, including avoidance, would be considered permanent beginning during construction and continuing through operations and maintenance of the Project (primarily along the planned Project ROW). Two special-status raptor species regularly occur in the wildlife analysis area: northern harrier and bald eagle. The Project would impact 1,200 acres of Shrub and Herb Vegetation potentially utilized by the northern harrier. The Project would disturb approximately 698 acres of Forest and Woodland Vegetation that may be utilized by nesting and foraging bald eagles. One known bald eagle nest occurs within 660 feet of Project disturbance. The Applicant would avoid disturbance within 660 feet of all known and discovered bald eagle nests during the nesting season. Impacts to golden eagles are not anticipated because they are uncommon and not known to nest in the wildlife analysis area. For special-status aquatic species, no permanent impacts from habitat loss, modification, injury, or mortality are anticipated because no permanent facilities would be placed within streams or rivers, aquatic sites would be spanned, and construction equipment would be kept out of flowing stream channels and active drainages to the extent possible to avoid directly impacting special-status aquatic species and their habitats. Transmission structures and other permanent Project components would be sited outside the 100-year floodplain of state-designated critical habitat streams, to the extent practicable and no surface-disturbing activities would be conducted within the ordinary high watermark of critical habitat streams from April 1 – August 31. Construction of the Project would temporarily disturb approximately 1,404 acres of Shrub and Herb Vegetation that could provide suitable habitat for the monarch butterfly (i.e., areas that could support milkweeds and nectar-producing plants). Additionally, 606 acres of Forest and Woodland Vegetation would be converted to Shrub and Herb Vegetation that could support monarch butterflies. There may be impacts to monarch butterflies if they are flushed or otherwise disturbed by construction activities while nectaring, mating, or breeding. Injury and mortality of adult monarchs may occur from vehicle collisions and during vegetation clearing. Butterfly eggs, caterpillars, and chrysalis may be crushed during construction activities that involve machinery, vehicles, or foot traffic in areas where milkweed is present. Construction of the Project would disturb 1,404 acres of Shrub and Herb Vegetation (823 acres of temporary disturbance, 580 acres of habitat conversion, and 2 acres of permanent disturbance) and 42 acres of Shrub and Herb Wetland and Riparian Vegetation that could potentially be suitable for the regal fritillary. Additionally, 525 acres of Forest and Woodland Vegetation would be converted to Shrub and Herb Vegetation that could support regal fritillary. Impacts would be similar to those described above for monarch butterflies.	

Resource Type	Area of Analysis	Impact Summary	No Action Alternative
		Operations and Maintenance: During operations and maintenance, a Vegetation Management Program would ensure vegetation is managed for safety and reliability, retaining vegetation compatible with electric transmission clearance requirements in NESC and FAC-003-5. The conversion of forested areas to shrub or grassland habitat would result in modifications to the use of and species composition found in the modified habitat. The project would be built following APLIC guidance, which outlines design features and measures to minimize risks of avian collision and electrocution. There is the potential for wildlife species collisions with equipment and vehicles transiting existing access roads and from vegetation management activities. There is also a potential for injury and mortality during vegetation management if dens, burrows, or young are encountered and crushed or killed. However, EPMs would be implemented to reduce the potential for avian mortality. Noise impacts from helicopter inspections would be similar to those described for construction. EPMs would be implemented to minimize the scope and magnitude of these effects. Additional potential impacts that could occur during operations and maintenance include the spread of nonnative invasive plant species, increased potential for wildland fire, changes in microclimate and sun exposure, and risk of windthrow. **Decommissioning:** Impacts to wildlife resources from activities to remove Project facilities would likely be similar to impacts during construction, though expected to be less extensive, in part due to continued vegetation management during operations and maintenance. Following decommissioning, disturbed areas would be revegetated to preconstruction condition to the extent practical.	
Transportation	5-mile buffer surrounding the planned Project ROW centerline (10 miles total)	**Construction:** In total, there would be approximately 186 daily vehicle trips for HVDC Line, Tiger Connector, and Ford County Interconnect construction at any one segment. Construction vehicles would increase the annual average daily traffic (AADT) volumes along roadways in the transportation analysis area. The impacts would be greatest for roadways that have the smallest volume of daily traffic and smallest AADT count. Prior to construction, road-use agreements would be established with counties where construction activities would occur. Delivery of heavy loads and overhead stringing may require temporary traffic controls that modify existing traffic patterns or necessitate limited roadway closures, which could restrict public access to certain roadways. The Applicant plans to repair existing private roadways before and after construction, with paving limited to approach aprons at intersections with existing paved roadways and all-weather access roadways to converter stations, unless otherwise required by jurisdictional authorities The Project would require 19 overhead crossings of rail lines including some rail lines that would be crossed more than once. Utility crossing license agreements would be obtained from affected rail line owners, and conductor stringing would be conducted in compliance with utility crossing licenses. Helicopter use during construction could introduce additional numbers of low-flying and hovering helicopters to the existing airspace. Issues related to airports or airspace would require FAA review and coordination with specific facilities or entities. Construction activities related to conductor stringing, bird flight diverter installation, and/or structure placement may require temporary restriction of transportation on the Missouri River for a short period of time (a few days to a few weeks). The Applicant would coordinate with maritime operations agencies, such as the U.S. Coast Guard or other local regulatory governing bodies, to ensure safety and limited disruptions to commercial, recreational, or other transport and shipping vessels. Impacts from the construction of Missouri River and levee crossing would be evaluated through the Section 408 process, which would be submitted as a separation application to USACE. **Operations and Maintenance:** Approximately two personnel would be commuting daily to the converter stations, which would not noticeably increase AADTs in the transportation analysis area. Where practical, inspections and repairs would be conducted by helicopter or drone. This short-term and intermittent use of helicopters would not change or alter the use of airports and airspace. Typically, equipment repair or replacement would be conducted by a four-person crew with two or three 4x4 trucks, a boom or line truck, an aerial truck, and an assist truck. The duration would occur in a limited timeframe, ranging from hours to a few days. Due to the small number of vehicles needed and the short-term nature of the activities, operations and maintenance vehicle use would not noticeably increase AADTs in the transportation analysis area. **Decommissioning:** Impacts to transportation resources from activities to remove Project facilities would likely be similar to impacts during construction but likely with fewer passenger vehicles and equipment vehicles due to a reduced workforce.	No impacts would occur on traffic, rail operations, or flight path/airspace use from Project construction, operations and maintenance, and decommissioning.
Land Use	1-mile buffer surrounding the HVDC Line and the Tiger Connector and Ford County Interconnect AC transmission lines (2 miles total) and a 1-mile buffer surrounding the HVDC converter station sites	**Construction:** Temporary impacts to agricultural lands in the land use analysis area would result from vegetation-clearing activities; temporary access roads and laydown yards; and construction of transmission structures, converter stations, and access driveways. After construction and reclamation are complete, agricultural activities could generally resume within the planned Project ROW. The planned Project ROW would not cross incorporated municipalities and would not include lands that contain schools, cemeteries, places of worship, or residences, including those in the Amish community of Keytesville, Missouri. No transmission structures would be located on lands subject to the identified conservation program easements. **Operations and Maintenance:** Approximately 1,596 acres of previously wooded areas would be permanently impacted due to the need to maintain short vegetation (i.e., grasses) for safety throughout operations and maintenance. Through the life of the Project, land uses compatible with reliability and safety requirements for the Project would be permitted in the ROW. Limitations on land uses would be described in the easement agreements; these limitations could be modified in the easement based on site-specific conditions and/or coordination with landowners.	No impacts would occur to agricultural land uses, community and residential uses, and natural and conservation areas from Project construction, operations and maintenance, and decommissioning.

Resource Type	Area of Analysis	Impact Summary	No Action Alternative
		While only 212 acres within the land use analysis area would have a permanent conversion to utility use (of which 201 acres, or approximately 95 percent, are agricultural land), some long-term impacts may extend to areas beyond the foundation of the transmission structures. Large farming equipment (combines, sprayers, tractors, etc.) requires certain horizontal and vertical clearance from structures to avoid damaging the structure or machine and to make turns in a field; the placement of transmission structures may impact the routes taken by such equipment. Up to 0.1 acre may be impacted for each structure in a way that makes navigating around it difficult or impossible, or that blocks irrigation equipment. Agricultural production would be allowed and expected to continue under the transmission lines; any restrictions on land use related to agricultural production within the ROW would be determined based on the site-specific conditions and/or in coordination with landowners. Grazing and pasturage would be allowed under the transmission lines after construction is complete; no impacts from the presence of Project facilities are expected to livestock. Existing irrigation systems would also be unaffected by the HVDC Line and Tiger Connector. Maintenance activities for vegetation management and facility repair could impact land use similar to construction, including erosion, rutting, and compaction from equipment; water quality impacts from stormwater runoff, erosion, and hazardous materials spills; introduction of invasive weeds and other pests from construction equipment; and temporary loss of use of lands. Impacts would be reduced through the implementation of EPMs. **Decommissioning:** Impacts to land use resources from activities during decommissioning would likely be similar to those that would occur during construction. Following decommissioning, it is assumed that land use could revert to pre-Project conditions for a majority of the impacted areas.	
Recreation	1-mile buffer (2 miles total) of the HVDC and AC transmission lines (i.e., 2-mile-wide corridor) and includes a 1-mile buffer of the HVDC converter station sites	**Construction:** Noise or dust from, or visual presence of, Project construction activities within the recreation analysis area would cause a temporary change to the recreation setting and the experience of visitors participating in recreation opportunities at Fort Larned NHL. Noise, dust, and visual presence of construction activities, in addition to access restrictions and potential increase in traffic due to construction, could result in a change in visitor experiences along the Lewis and Clark NHT Auto Route by temporarily altering the historic setting of the viewshed during construction activities. Noise, dust, and visual impacts from construction activities would be noticeable at certain areas of the Salisbury Municipal Golf Course and would temporarily impact the quality of recreation experiences. Along the Missouri River Water Trail, construction of the transmission structures would impact recreational users of the river through temporary closures or delays of nearby roads that access the water trail. During Project construction activities at the Missouri River crossing, helicopters may be used for conductor stringing, bird flight diverter installation, and/or structure placement. Noise and visual presence of Project construction activities near the Jentell Brees Access site and the Missouri River Water Trail may temporarily impact the quality of visitor experiences at this site, particularly for bird watchers, anglers, and boaters that desire a quiet, natural setting. The temporary potential displacement of game species from the Project area during hunting seasons would reduce the quality of hunting experiences at Glen Elder Wildlife Area, Cheyenne Bottoms, Wilson Lake, Bluffwoods Conservation Area – Goodell Memorial Annex, Belcher Branch Lake Conservation Area, and Sterling Price Community Lake, where hunting is allowed. Impacts would only be expected to occur if construction activities near these locations coincide with the hunting season, and conditions would return to existing conditions after construction is completed. **Operations and Maintenance:** The permanent presence of the Project would result in changes to the recreation setting at Fort Larned NHL. The permanent presence of the Project would result in changes to the recreation setting near the crossings of the Lewis and Clark NHT Auto Route. The permanent presence of the Project would alter the recreation setting at the Jentell Brees Access site and the Missouri River Water Trail, where the transmission structures would rise above the shoreline vegetation into the open skyline, with the conductors (wires) visible between the structures across the river. Trees are located between the planned Project ROW and the southern edge of the Salisbury Municipal Golf Course; some of these trees may be removed to comply with regulatory requirements regarding vegetation in the ROW. Golfers could have a foreground view of the Project at the southern section of the golf course, depending on final vegetation requirements for this area. In publicly accessed hunting areas and WIHA areas, the permanent presence of transmission structures and vegetation clearing may reduce suitable habitat for some game species. Maintenance activities would lead to the temporary displacement of game in the recreation analysis area for a short time (up to a few days) due to noise and human presence. **Decommissioning:** Activities during decommissioning would likely be similar to those during construction, and therefore, impacts to recreational resources from noise, dust, and visual presence of decommissioning activities would be similar to impacts during construction.	No impacts to recreational resources from Project construction, operations and maintenance, and decommissioning would occur.
Visual Resources	1.5-mile buffer of the HVDC Line, and Tiger Connector and Ford County Interconnect AC transmission lines center lines (3 miles total); 3-mile buffer of the HVDC Line, Tiger Connector, and Ford County Interconnect at intersections with NHTs) and near Fort Larned NHL (6 miles total); total acreage for the visual resources analysis area is 1,171,986 acres.	**Construction:** Temporary impacts to landscape character would occur primarily as a result of the presence of construction equipment, materials, and activities that would be introduced to the existing visual environment during construction of the Project. Much of the Project would be in areas that are sparsely populated, and the changes in landscape character during construction would be observed to a lesser degree in those areas. The temporary presence of construction equipment, multi-use yards, and other construction-related activities would modify the visual environment within the viewshed of historic properties and could temporarily introduce an inconsistent and contrasting element into the landscape. Visual impacts to public lands and recreational resource areas from construction could result from adding contrast through visual clutter and alterations to the landscape composition, such that the viewer's experience may be temporarily impacted. Impacts would be most apparent in locations where scenic resources contribute to the recreation experience. EPMs would be implemented. Potential impacts would be most apparent at the Missouri River (including the Missouri River	No new elements would be introduced into the existing visual environment, and no impacts to visual resources from Project construction, operations and maintenance, and decommissioning would occur.

Resource Type	Area of Analysis	Impact Summary	No Action Alternative
		Water Trail), Jentell Brees Access, Ronald and Maude Hartell Conservation Area, Salisbury Municipal Golf Course, and Sterling Price Community Lake, and from portions of the Lewis and Clark NHT Auto Tour Route due to the open viewsheds provided by the Missouri River channel. Project construction activities, including increased traffic and night lighting, would have a temporary visual impact on views from transportation corridors, towns, and rural residences, lasting only the duration of construction activities in the localized area (a few days to a few weeks). **Operations and Maintenance:** The presence of overhead transmission lines, supporting structures, ancillary facilities, and vegetation clearing would introduce a new source of potential increased visual contrast over the life of the Project. At the Missouri River crossing, FAA-required marking and lighting systems (14 CFR Part 77) would be designed to minimize visual impacts through the use of red lights and non-lighted marker balls crossing the river. At permanent Project facilities requiring security lighting (e.g., converter stations, optical regeneration stations), full cut-off lighting fixtures that project light in a downward direction and emit no upward component of light would be installed. This would minimize impacts outside of areas requiring illumination and reduce glare into the night sky. Operations and maintenance activities would result in slightly noticeable to clearly apparent changes in views from public lands and recreational resources, with a potentially substantial change to views at the Jentell Brees River Missouri River Access given the introduction of new contrasting and dominant features. Potential views of the Project from cities and towns would be intermittent and limited, as landscape, buildings, and infrastructure in general would aid in screening views toward the Project. From rural residences, impacts would be highly dependent on viewing direction and distance from the residence and could range from indiscernible to substantial changes to the landscape and views. **Decommissioning:** Impacts to visual resources from activities to remove Project facilities would likely be similar to impacts during construction. Following decommissioning, no project facilities would be visible from key observation points (KOPs) in the visual resources analysis area.	
Noise	4,695-foot buffer of the Project area (410,800 acres)	**Construction:** The highest predicted construction noise level at the nearest noise-sensitive receptor to the Project (165 feet away) is 71 A-weighted decibels (dBA) L_{eq}. The highest predicted construction noise level at the nearest noise-sensitive location to the HVDC converter stations (2,500 feet away) is 44 dBA L_{eq}. Project construction noise levels would impact other noise-sensitive receptors within the noise analysis area but would decrease with distance from the Project; therefore, the Project would not exceed the Federal Transit Administration (FTA) guidance construction noise limit of 90 dBA L_{eq} at any noise-sensitive receptor during the daytime period for ground-based construction activities. Noise due to Project construction would be temporary and would only occur during construction activities. Light-duty helicopters typically result in noise of 72 to 81 dBA at 250 feet from the helicopter. Heavy-lift helicopters typically result in noise of 90 to 96 dBA at 250 feet from the helicopter. Noise from helicopters would be more transient and shorter in duration than ground-based construction activities. Helipad locations would be located no closer than 0.5-mile from the nearest noise sensitive land uses. Implosive splicing would result in momentary (seconds) loud booms of about 150 dB, resulting in noise impacts to noise sensitive receptors. Implosive splicing would not be utilized within 0.5-mile of the nearest noise sensitive receptor (e.g., occupied dwellings, school, and cemeteries). In areas where implosive splicing would be utilized, coordination with local emergency services and notification to landowners would be required. **Operations and Maintenance:** Typical noise effects associated with maintenance activities at the transmission lines and/or HVDC converter stations would likely include noise generated by drones, pickup trucks, boom trucks, mowers, and chainsaws. At the closest noise-sensitive receptor distance of 165 feet from the HVDC Line, Tiger Connector, and Ford County Interconnect, hourly noise levels from a boom truck would generate approximately 61 dBA L_{eq}. At the closest noise-sensitive receptors to the HVDC converter stations (2,500 feet or greater distance), these noise levels would attenuate to 37 dBA, L_{eq} or less. The maximum potential noise from corona discharges at noise-sensitive receptors near the Tiger Connector and Ford County Interconnect was calculated to be 29 dBA L_{dn} at the closest analysis distance of 165 feet during fair weather conditions, which is roughly the sound level of leaves rustling. Operational noise from the HVDC converter stations at the closest noise-sensitive receptors is predicted to range from 46 to 49 dBA, L_{dn}. Summed with the existing noise environment, future operation of the HVDC converter stations would result in an overall noise exposure increase of 4 to 6 dBA at noise-sensitive receptors. **Decommissioning:** Impacts to noise resources from activities to remove Project facilities would likely be similar to impacts during construction.	No noise impacts to noise-sensitive receptors would occur from construction, operations and maintenance, and decommissioning of the Project.
Social, Economic, and Community Resources	14 counties in Kansas (Kansas socioeconomic analysis area) and the 9 counties in Missouri (Missouri socioeconomic analysis area) where construction, operations and maintenance, and decommissioning of the Project would take place	**Construction:** Construction of each HVDC Line segment is expected to involve an average of 115 workers, with a peak of approximately 160 workers employed at one time. Construction of the Tiger Connector would involve respective average and peak workforces of 85 and 110 workers. Peak workforce for the converter station sites would require approximately 330 workers. Viewed as a share of the existing population, peak converter station employment (330 workers) would be equivalent to 1.0 percent and 3.8 percent of the existing populations in Ford and Monroe counties, respectively. The existing supply of temporary housing that is normally vacant and available for rent should be sufficient to accommodate Project-related demand. The temporary in-migration of non-local construction workers could potentially result in increased demand for local public services, such as emergency services and law enforcement. Project construction would result in temporary disturbance to an estimated 4,418 acres of agricultural land and developed vegetation, which represents approximately 0.05 percent of the total farmland acreage (8.4 million acres) in the socioeconomic analysis area counties in Kansas and Missouri. As a result, Project construction is expected to result in little to no economic impact to the Kansas and Missouri agricultural sectors.	There would be no impacts from construction, operations and maintenance, and decommissioning of the Project. Energy transmission in the region as a result of the project would not occur and regional objectives would no longer be met.

Resource Type	Area of Analysis	Impact Summary	No Action Alternative
		Over the 36-month construction duration, the total property taxes paid to these Kansas counties would total $20.1 million. The employment supported by Project construction (direct, indirect, and induced) is estimated to total 14,375 full-time equivalent (FTE) positions over its 36-month construction duration. Project construction is also estimated to support $609 million and $351 million in direct earnings in Kansas and Missouri, respectively. **Operations and Maintenance:** An average of two workers at each of the converter stations would also be on site daily. Project operations and maintenance is, therefore, not expected to have a measurable impact on the population in any single county. Local housing resources would be more than sufficient to handle any overnight stays required for maintenance work in a single location. The average annual property taxes paid over the first 20 years of the Project's life would represent an approximately 0.8 percent increase in local revenues, which would represent a small but measurable benefit to the economies of the Kansas and Missouri socioeconomic analysis areas. Project operations and maintenance (direct, indirect, and induced) is estimated to support a total of 100 FTE positions in Kansas and 105 FTE positions in Missouri. Operations and maintenance would also support an estimated $9.1 million in Kansas and $8.2 million in Missouri in total (direct, indirect, and induced) earnings. **Decommissioning:** Impacts to population, housing, and public services, land use and property values, and taxes and government would likely be similar to the impacts from construction activities. Following decommissioning, the employment provided from operations and maintenance would no longer occur, and the related beneficial and adverse socioeconomic impacts would cease.	
Environmental Justice	87 census tracts, containing 136 census block groups, located within 3 miles of the HVDC Line, the Tiger Connector, and the Ford County Interconnect center lines (i.e., a 6-mile-wide corridor), and a 3-mile buffer of the HVDC converter station sites	**Construction:** No disproportionate and adverse effects on environmental justice communities are anticipated. **Operations and Maintenance:** No disproportionate and adverse effects on environmental justice communities are anticipated. **Decommissioning:** No disproportionate and adverse effects on environmental justice communities are anticipated.	No disproportionate and adverse effects would occur to low-income and minority populations or disadvantaged communities from activities related to construction, operations and maintenance, and decommissioning of the Project.
Public Health and Safety	150-foot buffer of the centerlines for the HVDC Line, Ford County Interconnect, and Tiger Connector (300 feet total) and within the fence line of the converter stations	**Construction**: Construction of transmission facilities includes the use of hazardous materials such as fuels, oils, lubricants, coolants, cleaners, paints, and paint thinners. These materials would be stored in multi-use yards following Occupational Safety and Health Administration (OSHA) and EPA guidelines. Project construction activities could result in leaks and accidental spills of these hazardous materials. A Spill Prevention and Response Plan would be developed. Where work in the vicinity of energized transmission lines or other energized equipment is planned, safety measures specific to the immediate work area would be developed. It is possible that a wildfire could occur during Project construction, and it would be responded to per established safety and emergency response plans. **Operations and Maintenance:** Hazardous chemicals or materials used for routine maintenance activities may be stored at the converter stations where accidental releases could result in worker exposure. The EPMs would mitigate the potential impacts of releases of hazardous materials. The Project would introduce a new source of DC electric and magnetic fields (EMFs) from the HVDC Line and converter stations and a new source of AC EMFs from the Ford County Interconnect and Tiger Connector. The magnetic field created by the HVDC Line is approximately 1,000 milligauss (mG) beneath the conductors and approximately 300 mG at the edge of the ROW. HVDC facilities are not expected to adversely affect people, livestock, or equipment with potential EMF issues or exposure. The specific design limits for the AC conductor have a magnetic field of 200 mG at the edge of the planned Project ROW; exposures related to the Project are expected to be well below the International Commission on Non-Ionizing Radiation Protection (ICNIRP) guidelines for AC fields. The newly generated EMFs associated with the Tiger Connector and the Ford County Interconnect would have the potential to interact with conductive objects located near the public health and safety EMF analysis area. As the Applicant would control the space within the planned Project ROW, the primary concern is the potential for conductive objects located just outside the ROW. The operations and maintenance of an active electric transmission line presents an inherent fire risk from both AC and DC transmission line facilities. The greatest potential would result from either uncontrolled growth of vegetation within the planned Project ROW under live wires or vegetation outside of the planned Project ROW that could fall into energized lines. **Decommissioning:** Impacts to public health and safety resources from activities to remove Project facilities would likely be similar to impacts during construction, specifically with respect to electric and magnetic fields, wildfire, accidents and intentional destructive acts, and worker safety.	There would be no impacts to public health and safety from activities related to construction, operations and maintenance, and decommissioning of the Project.

3.2 Air Quality, Greenhouse Gas Emissions, and Climate Change

3.2.1 Issues for Analysis

Based on NEPA statutory and CEQ/DOE regulatory requirements; input from federal, state, and local agencies and tribal governments; and comments received during scoping, the air quality, GHG emissions, and climate change analysis addresses the following:

- Emissions of criteria pollutants and GHGs;
- Loss of carbon sequestration capacity due to disturbance and removal of native vegetation and soil resources; and
- Potential for climate change impacts to Project facilities.

To address climate trends, where relevant, consideration is given to the future state of the affected environment in individual resource sections based on best available climate change reports (for example, refer to **Section 3.3**, **Section 3.5**, and **Section 3.6**).

Discussion of the No Action Alternative is presented in **Section 3.1**.

3.2.2 Analysis Area

The air quality analysis area comprises the 14 counties in Kansas and 9 counties in Missouri where construction, operations and maintenance, and decommissioning activities would take place. This area was selected because federal air quality attainment and nonattainment designations are tracked at the county level. **Figure 3.2-1** depicts the air quality analysis area and includes the Project facilities for reference.

Greenhouse gas emissions accumulate in the atmosphere and impact climate on a global scale over time. As a result, GHG emissions and climate change are discussed in terms of state and national trends.

3.2.3 Affected Environment

3.2.3.1 Air Quality

Ambient air quality in any location is defined by the concentration of various pollutants in the atmosphere, generally expressed in units of parts per million (ppm) or micrograms per cubic meter ($\mu g/m^3$); it can be affected by the type and amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and the prevailing meteorological conditions.

An emissions inventory is a detailed list of air pollutant emissions associated with various emission sources. Emissions inventories are useful for understanding the existing emission sources currently impacting ambient air quality in the air quality analysis area. Emissions inventories provide an overview of industries or practices in the area, as well as emissions levels. The EPA compiles the National Emissions Inventory (NEI) using data collected from state, tribal, and local air agencies (EPA 2017). The NEI includes estimates of emissions from several sources, including point sources (e.g., power plants, airports) and event sources (e.g., wildfires), which are located at a fixed point, as well as county-wide sources, which do not have a fixed point and are summed across a county. County-wide sources include non-point or area sources (e.g., asphalt paving, solvent use), on-road sources (e.g., vehicle emissions), non-road sources (e.g., construction equipment, trains, lawn mowers), and agricultural sources (e.g., animal grazing, windblown dust due to farming activities).

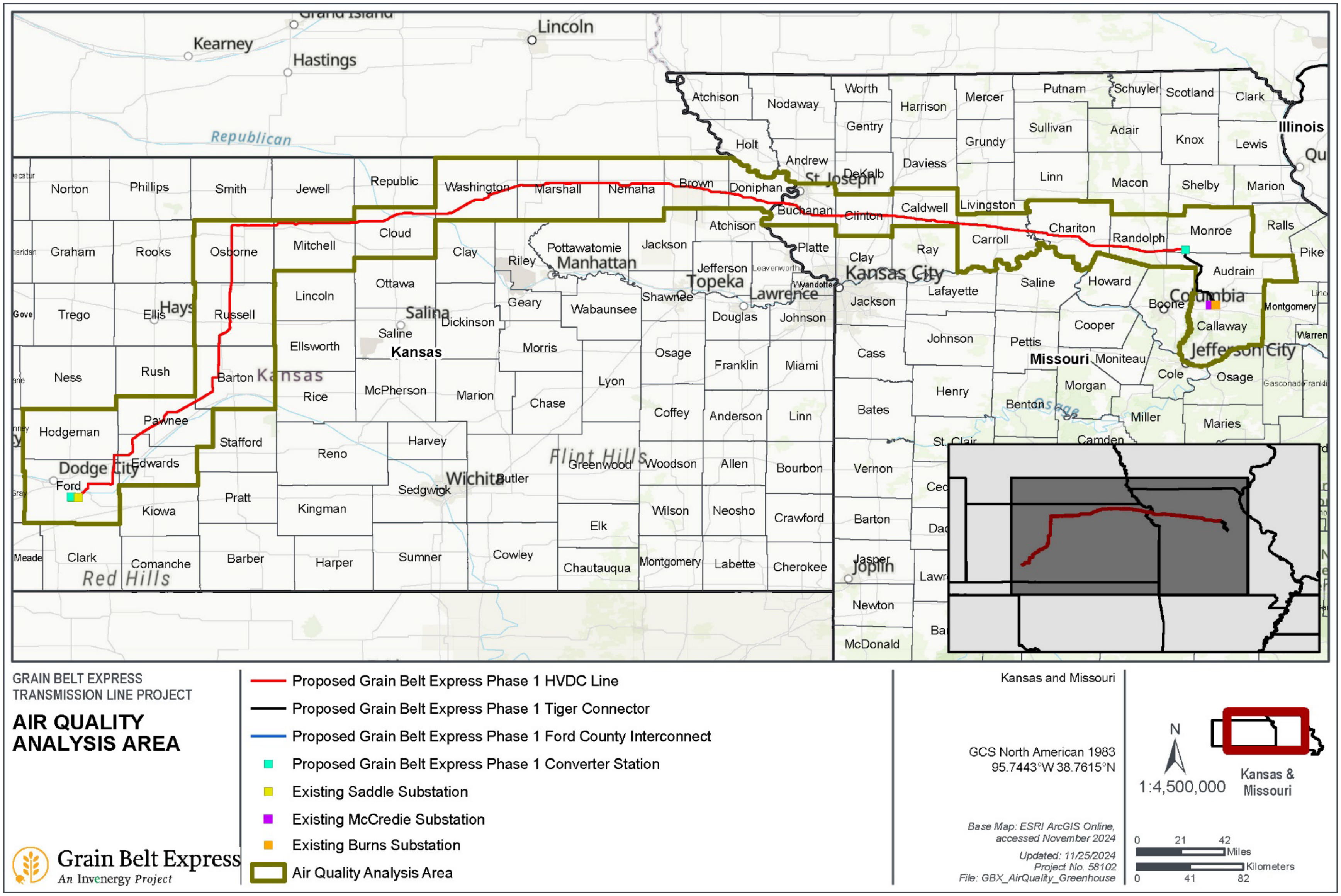

Figure 3.2-1. Air Quality Analysis Area

Figure 3.2-2 shows the EPA 2017 county-wide emission inventory for counties within the air quality analysis area (EPA 2022c). The figure illustrates higher pollutant emissions in urban areas and/or near industry sources, such as power plants. For example, the counties with the highest total emissions, Callaway and Randolph counties in Missouri, each contain power plants, which emit air pollutants. Across the air quality analysis area, mobile emissions are the biggest contributors to CO, oxides of nitrogen (NO_X) (which includes nitrogen dioxide [NO_2]), volatile organic compounds (VOCs), and hazardous air pollutants (HAPs). Particulate matter with an aerodynamic diameter of 10 microns or less (PM_{10}) is mostly due to dust emissions from driving on unpaved roads and windblown dust from unvegetated fields. Tilling agricultural fields contributes most to particulate matter with an aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$), and fuel combustion from vehicles and power plants contributes most to sulfur dioxide (SO_2) ambient air quality impacts. In some counties, naturally occurring sources and agriculture contribute more to emissions than other anthropogenic sources. On average, across the air quality analysis area, CO was emitted more than any other pollutant based on the 2017 county-wide emissions inventory.

The significance of a pollutant concentration is determined by comparing it to federal and/or state ambient air quality standards defined by the Clean Air Act (CAA). The CAA requires states to control air pollution emission sources so that NAAQS, established by the EPA and codified at 40 CFR 50, are met and maintained. The NAAQS establish maximum acceptable concentrations for NO_2, CO, SO_2, PM_{10}, $PM_{2.5}$, ozone, and lead;[1] these are known as criteria pollutants. Because ozone is not directly emitted into the atmosphere, ozone precursors (NO_x and VOCs) are the pollutants directly measured and assessed for impact analysis.

In addition to federal regulations, the CAA provides states with the authority to regulate air quality within their boundaries. Each state is required to comply with NAAQS and can enact additional and/or more stringent air quality standards. The Kansas and Missouri air quality standards for criteria air pollutants relevant to the Project are the same as the NAAQS. The collective ambient air quality standards that include Kansas, Missouri, and the NAAQS are shown in **Table 3.2-1**.

Areas that meet the NAAQS for a criteria pollutant are designated by the EPA as being in attainment. An area that does not meet the NAAQS is designated as a nonattainment area on a pollutant-by-pollutant basis. A maintenance area is an area that has recently been redesignated from a nonattainment area to an attainment area. During the maintenance period, most of the CAA rules for a nonattainment area are still applicable. In addition, EPA established the General Conformity rules that require federal agencies to work with state, tribal, and local governments in a nonattainment or maintenance area to ensure that federal actions conform to the air quality plans established in the applicable state or tribal implementation plan. EPA further established pollutant *de minimis* levels for various criteria pollutants that represent the minimum threshold for which a conformity determination must be performed. While these thresholds are specifically designed to assess project conformity in maintenance and nonattainment areas, they can be used to assess a project's impact in an attainment area.

[1] Fuel containing lead was banned under the CAA in 1996 and would not be a source of emissions from Project-related vehicle or equipment use. Fugitive dust created by Project-related activities would also not be a source of lead emissions. As the Project would not be a source of lead emissions, no further analysis of lead is warranted.

Source: EPA 2022c

Figure 3.2-2. 2017 County-wide Emission Inventory Data within the Air Quality Analysis Area

Table 3.2-1. National and State Ambient Air Quality Standards for Each Criteria Air Pollutant

Pollutant	Averaging Period	Air Quality Standard	Nearest Ambient Air Monitor	2017 Quality-Assured Monitor Data (Average)
PM_{10}	24-hour [a]	150 μg/m³	Wichita, KS (Monitor ID 20173_10)	71.0 μg/m³
$PM_{2.5}$	24-hour [b]	35 μg/m³	Wichita, KS (Monitor ID 20173_10)	32.8 μg/m³
	Annual [c]	9.0 μg/m³	Wichita, KS (Monitor ID 20173_10)	6.8 μg/m³
NO_2	1-hour [d]	100 ppb	Wichita, KS (Monitor ID 20173_10)	16.4 ppb
	Annual [e]	53 ppb	Wichita, KS (Monitor ID 20173_10)	6.9 ppb
SO_2	1-hour [f]	75 ppb	Wichita, KS (Monitor ID 20191_2)	5.4 ppb
	3-hour [g]	0.5 ppm	Wichita, KS (Monitor ID 20191_2)	0.001 ppm
CO	1-hour [g]	35 ppm	Kansas City (Monitor ID209_21)	2.1 ppm
	8-hour [g]	9 ppm	Kansas City (Monitor ID209_21)	1.5 ppm
Ozone	8-hour [h]	0.070 ppm	Wichita, KS (Monitor ID 20173_10)	0.063 ppm
Lead	3-month [i]	0.15 μg/m³	EPA AirData does not publish data	EPA AirData does not publish data

Source: EPA 2022a, 2023d; Kansas State Statutes 2023; Missouri Air Conservation Commission 2023

μg/m³: micrograms per cubic meter; CO: carbon monoxide; ID: Identification; NO_2: nitrogen dioxide; $PM_{2.5}$: particulate matter with an aerodynamic diameter of 2.5 microns or less; PM_{10}: particulate matter with an aerodynamic diameter of 10 microns or less; ppb: parts per billion; ppm: parts per million; SO_2: sulfur dioxide

[a] *Not to be exceeded more than once per year on average over 3 years.*

[b] *The 3-year average of the 98th percentile of the daily maximum 24-hour concentrations at each population-oriented monitor within an area must not exceed this standard.*

[c] *The 3-year average of the annual arithmetic mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed this standard.*

[d] *The 3-year average of the 98th percentile of the daily maximum 1-hour average must not exceed this standard.*

[e] *Annual mean.*

[f] *The 3-year average of the annual 99th percentile of the 1-hour daily maximum must not exceed this standard.*

[g] *Not to be exceeded more than once per year.*

[h] *Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years.*

[i] *Rolling 3-month average, not to be exceeded.*

For this assessment, the maintenance area *de minimis* threshold of 100 tons of the specific criteria pollutant is used. If Project pollutant annual emissions do not exceed the respective pollutant *de minimis* level, then Project emissions would not contribute to a significant contamination of air or exceed the NAAQS. Currently, there are no nonattainment or maintenance areas in the air quality analysis area (EPA 2023c). In addition, air quality data from Wichita and Kansas City monitors, which are proximate to the Project area, are listed in **Table 3.2-1**. The data from these monitors are below the NAAQS. It is likely that the Project area would have similar or better air quality given these monitors are located near urban areas and that most of the Project area is rural (EPA 2023d).

3.2.3.2 GHG Emissions

Climate change is a global issue that results from both natural and anthropogenic factors. Greenhouse gas emissions generated by human activity are the leading cause of the Earth's rapidly changing climate (EPA 2022a). Federal regulations at 40 CFR Part 98 Subpart A, Mandatory GHG Reporting General Provisions (Mandatory GHG Reporting Rule), establish requirements for GHG-related monitoring, recordkeeping, and reporting when 25,000 MT[2] of CO_2e or more per year are emitted in combined emissions from stationary fuel combustion sources (EPA 2009). While emissions for the Project's

[2] One metric ton is equivalent to 1.1 tons or 2,205 pounds.

construction, operations and maintenance, and decommissioning are expected to come solely from mobile sources, this rule is being used as a guideline for evaluating whether there would be significant GHG emissions from the Project.

Estimates of GHG emissions are typically reported in terms of MT CO_2e to account for the relative global warming potential (GWP), which represents a given pollutant's ability to trap heat compared to CO_2. The GWP is calculated over a specific time, typically 100 years. Methane (CH_4) has a GWP of 29.8, and nitrous oxide (N_2O) has a GWP of 273, meaning CH_4 and N_2O are 29.8 times and 273 times more effective at trapping heat than CO_2, respectively (Intergovernmental Panel on Climate Change [IPCC] 2023).

Approximately 106.9 million MT CO_2e were emitted in Kansas (1.8 percent of the national inventory), and 147.0 million MT CO_2e were emitted in Missouri (2.5 percent of the national inventory) in 2020 (EPA 2022b). In 2018, Missouri ranked 11 and Kansas ranked 25 of U.S. states in terms of GHG emissions (World Resources Institute 2021). The largest GHG emission sources in both Kansas and Missouri are agriculture, electricity and heat generation, transportation, and industrial processes. Neither Kansas nor Missouri has established statewide GHG reduction targets to which the Project's estimated GHG emissions can be compared; however, the U.S. government has established a target to reduce GHG emissions by 50 to 52 percent from 2005 levels economy-wide by 2030 (The White House 2021).

3.2.4 Environmental Consequences of Proposed Federal Action

3.2.4.1 Methods and Assumptions

The air quality analysis area is currently in attainment for all criteria pollutants, and therefore, general conformity regulations do not apply to the Project. Nevertheless, Project-related criteria pollutant emissions were compared to the respective general conformity pollutant *de minimis* level (100 tons per year for maintenance areas) to determine whether the Project's emissions could result in an exceedance of the NAAQS.

Air quality trends can also be assessed by comparing Project criteria pollutant emissions within the air quality analysis area to the existing emissions discussed in **Section 3.2.3.1**. Potential changes in local air quality were characterized using the estimated change in county-wide emissions due to the Project, which was assessed by calculating the percent increase to the existing emissions from the calculated maximum Project criteria pollutant emissions (refer to **Appendix 3.2** for detailed air pollutant assumptions and calculations for various Project air emissions sources). The analysis of impacts to air quality assumes that the EPMs listed in **Appendix 2.4** would be implemented to control emissions and potential for dust generation.

Greenhouse gas emissions were calculated and quantified to provide total CO_2e emissions (included in **Appendix 3.2**). Construction on-road and off-road emissions were calculated using emission factors from EPA's Motor Vehicle Emission Simulator (MOVES) model and total miles per year traveled (EPA 2023a). Helicopter emissions were calculated assuming a value of 21.5 pounds CO_2, 9.0×10^{-4} pounds CH_4, and 1.8×10^{-4} pounds N_2O emitted per gallon of fuel burned (U.S. Energy Information Administration [EIA] 2023; EPA 2014). For concrete batch plants, emissions from diesel generators were calculated using their horsepower and EPA AP-42 emission factors (EPA 1996). Results were then converted to metric tons and multiplied by their respective GWPs to provide emissions totals in MT CO_2e. On-road emissions during operation and maintenance were calculated using EPA MOVES emission factors and total miles per year traveled (EPA 2023a). Sulfur hexafluoride (SF_6) emissions for each converter station were calculated based on the total SF_6 content of the circuit breakers and application of a 0.1 percent leak rate (Institute of Electrical and Electronics Engineers [IEEE] 2019).

Calculated construction emissions totals for each GHG are presented in **Appendix 3.2** and also converted to metric tons and multiplied by their respective GWPs to provide emissions totals in MT CO_2e, which provides context to understand total expected GHG emissions (refer to **Section 3.2.3.2**). The GHG analysis compares the expected CO_2e emissions with thresholds described in the Mandatory GHG Reporting Rule (EPA 2009). Further context for the emissions is provided by comparing the annual emissions to the number of gas-powered vehicles driven and number of homes energized per year.

Additional details of the Project impact assessment methodology and emission calculations, including GHG and criteria pollutant calculations, are provided in **Appendix 3.2**.

3.2.4.2 Construction

3.2.4.2.1 Air Quality

Construction-related activities that would generate pollutant emissions include helicopter use, operation of heavy-duty construction equipment, light-duty construction vehicles commuting to and from the work site, fugitive dust from driving across and working in unpaved areas, operation of concrete batch plants, on-site cut and fill work, and vegetation clearing. **Table 3.2-2** presents the estimated total annual Project construction emissions for each year of construction duration. In **Table 3.2-2**, fugitive dust emissions are represented by the PM_{10} and $PM_{2.5}$ metrics.

Table 3.2-2. Estimated Annual Emissions of Criteria Pollutants from Project Construction Activities

	Construction Emissions (tons per year)					
Criteria Pollutant	**Off-Road Vehicle Emissions**	**On-Road Vehicle Emissions**	**Helicopter Use**	**Concrete Batch Plants**	**Fugitive Dust Off-Road Vehicle Emissions**	**Total**
CO	78.85	22.98	3.73	4.81	N/A	110.34
NO_x	23.35	4.98	30.74	22.34	N/A	81.41
SO_2	0.03	0.03	0.37	1.48	N/A	3.38
PM_{10}	1.16	0.18	0.52	10.19	56.69	68.75
$PM_{2.5}$	1.13	0.16	0.52	2.90	5.67	10.39
VOC	3.22	0.23	3.08	1.81	N/A	8.34
HAPs	1.26	0.02	0.33	0.03	N/A	1.64

Source: SWCA 2023

CO: carbon monoxide; HAP: hazardous air pollutant; N/A: not applicable; NOx: oxides of nitrogen: $PM_{2.5}$: particulate matter with an aerodynamic diameter of 2.5 microns or less; PM_{10}: particulate matter with an aerodynamic diameter of 10 microns or less; SO_2: sulfur dioxide; VOC: volatile organic compound

All criteria pollutant annual emissions, except CO, would be less than the respective general conformity pollutant *de minimis* level of 100 tons per year. Although annual CO emissions would be above the 100 ton per year *de minimis* threshold, (1) the Project is not located within a CO nonattainment or maintenance area, and therefore, the CO *de minimis* level is used as a threshold to assess impacts and represents a conservative approach; and (2) annual Project CO emissions of approximately 110 tons per year would vary from 0.6 percent to 3.6 percent of the 2017 county-wide CO emissions data as shown on **Figure 3.2-2**, above.

Based on the estimated construction emissions (**Appendix 3.2**), county-wide emission increases due to the Project would be less than 3 percent across the air quality analysis area for all pollutants, including fugitive dust. The emissions estimate includes considerations of EPMs (**Appendix 2.4**) to implement dust control measures to minimize fugitive dust (PM_{10}).

Given that air emissions in the Project area would be lower than the pollutant *de minimis* levels and NAAQS thresholds (except for CO), and that the small increase in county emissions from construction activities (including CO) would not cause an exceedance of NAAQS and would maintain each county's attainment status, minimal air quality impacts from construction are expected.

3.2.4.2.2 GHG Emissions

Equipment usage estimates for various source emissions categories during the expected construction duration were used to calculate GHG emissions. **Table 3.2-3** presents the estimated total (not annual) construction-related GHG emissions from off-road and on-road vehicles, helicopter use, and operation of concrete batch plants over the construction duration. Since construction activity would proceed along the planned Project ROW in a consistent sequence, total GHG emissions have been equally divided over the construction duration to derive annual emissions. Total GHG emissions would be approximately 45,190.82 MT CO_2e, which equates to annual emissions of approximately 15,063.61 MT CO_2e. Thus, annual GHG emissions would be less than the annual 25,000 MT CO_2e threshold for the Mandatory GHG Reporting Rule (EPA 2009). The Project's estimated annual GHG emissions during construction would be equivalent to the average annual emissions from driving 3,585 gasoline-powered passenger vehicles for 1 year or the annual energy use of 1,964 homes (EPA 2023b).

Table 3.2-3. Estimated Total Project Construction-Related GHG Emissions

GHG	Off-Road Vehicle Emissions	On-Road Vehicle Emissions	Helicopter Use	Concrete Batch Plants	Total
CO_2 (tons)	25,673.85	12,263.40	11,793.19	1,657.66	51,388.10
N_2O (tons)	<0.01	0.03	0.10	1.90	1.99
CH_4 (tons)	0.94	0.20	0.50	1.02	2.16
Total CO_2e (metric tons)	23,316.67	11,138.18	10,735.97	1,503.80	45,190.82
Total CO_2e per mile (metric tons)	40.34	19.27	18.57	2.60	78.18

Source: SWCA 2023

CH_4: methane; CO_2: carbon dioxide; CO_2e: carbon dioxide equivalents; GHG: greenhouse gas; N/A: not applicable; N_2O: nitrous oxide

Surface disturbance from the Project could add to the GHG impact by eliminating existing vegetation that acts as a carbon sink for atmospheric CO_2. The degree of GHG impacts from vegetation would depend on the types of vegetation present at individual converter stations and transmission structure installation sites, as well as regional information on sequestration potential for the different vegetation types. Soil organic matter also serves as a sink or buffer for atmospheric carbon. Therefore, a loss of soil organic matter due to permanent Project facilities would impact the ability of soils in the air quality analysis area to sequester CO_2 and would be expected to incrementally increase atmospheric carbon (Brevik 2013). Although it cannot be quantified, the incremental CO_2 increase due to lost sequestration capacity is expected to be small since the Project would create 212 acres of new permanent surface disturbance (**Chapter 2**). An incremental amount of sequestration capacity would also be lost across 1,597 acres of the planned Project ROW, where trees and woody vegetation would be permanently converted to grassland. More detail on the impact assessments for soil and vegetation are provided in **Section 3.3** and **Section 3.5**, respectively.

3.2.4.3 Operations and Maintenance

3.2.4.3.1 Air Quality

Project operations and maintenance activities that would generate pollutant emissions include fugitive dust from off-road vehicles, helicopter use, and operation of on-road construction vehicles for routine inspections, repair activities, and vegetation management. **Table 3.2-4** presents the estimated operations and maintenance emissions for the Project.

Table 3.2-4. Estimated Annual Emissions of Criteria Pollutants from Project Operations and Maintenance

Criteria Pollutant	Operations and Maintenance Emissions (tons per year)			
	Fugitive Dust Off-Road Vehicle Emissions	Helicopter Use	On-Road Vehicle Emissions from Commute/Deliveries	Total
CO	N/A	0.45	1.46	1.91
NO_x	N/A	0.56	0.07	0.63
SO_2	N/A	0.01	<0.01	0.07
PM_{10}	7.47	0.02	<0.01	7.49
$PM_{2.5}$	0.72	0.02	<0.01	0.74
VOC	N/A	0.36	<0.01	0.36
HAPs	N/A	0.04	<0.01	0.04

Source: SWCA 2023

CO: carbon monoxide; HAP: hazardous air pollutant; N/A: not applicable; NOx: oxides of nitrogen: $PM_{2.5}$: particulate matter with an aerodynamic diameter of 2.5 microns or less; PM_{10}: particulate matter with an aerodynamic diameter of 10 microns or less; SO_2: sulfur dioxide; VOC: volatile organic compound

The estimated annual operations and maintenance emissions would be less than the respective general conformity pollutant *de minimis* level of 100 tons per year. Therefore, Project operations and maintenance activities would not cause an exceedance of NAAQS, nor would they affect each county's attainment status throughout the life of the Project.

3.2.4.3.2 GHG Emissions

Table 3.2-5 presents the estimated annual GHG emissions from the combustion of vehicle fuel during Project operations and maintenance activities, which includes worker commutes, inspections of the transmission line, routine and emergency repairs, vegetation management, and helicopter use. Converter station circuit breakers would also cause GHG emissions from the release of SF_6. While circuit breakers are hermetically sealed, leaks do occur, and a leak rate of 0.1 percent was assumed. Emission calculations are provided in **Appendix 3.2**.

Table 3.2-5. Estimated Annual Project Operations and Maintenance GHG Emissions

Operation and Maintenance GHG Emissions	On-Road Vehicle Emissions from Commute/Deliveries	Emissions from Helicopter Use	Emissions from Circuit Breakers	Total
CO_2 (tons)	139.72	242.66	N/A	382.38
N_2O (tons)	<0.01	<0.01	N/A	<0.01
CH_4 (tons)	<0.01	<0.01	N/A	0.02
SF_6 (tons)	N/A	N/A	0.02	0.02
Total CO_2e (metric tons)	126.94	220.90	413.68	761.52

Source: SWCA 2023

CH_4: methane; CO_2: carbon dioxide; CO_2e: carbon dioxide equivalents; N/A: not applicable; N_2O: nitrous oxide; SF_6: sulfur hexafluoride

As shown in **Table 3.2-5**, annual GHG emissions from operations and maintenance activities are estimated to total 761.52 MT CO_2e per year, which is equivalent to the average annual emissions from driving 181 gasoline-powered passenger vehicles for 1 year (EPA 2023b). The Project's estimated operations and maintenance GHG emissions would be less than the annual 25,000 MT CO_2e threshold for the Mandatory GHG Reporting Rule (EPA 2009).

By facilitating access to the electric grid for new renewable energy projects, the Project, once operational, could also help reduce overall GHG emissions, potentially leading to the replacement of existing fossil-fuel power plants, while providing additional power to expanding renewable energy markets. As noted in **Chapter 2**, the Project has a transmission capacity of 2,500 MW, which, assuming an overbuild in generation capacity, equates to the development of approximately 3,000 MW of new renewable generation capacity (e.g. wind and solar energy generation). As the Project would adhere to FERC's open access rules and cannot discriminate between generation resource technologies (e.g. renewable, coal, natural gas) for the source of the power that would be transmitted by the Project, this analysis considered other potential generation technologies and noted the following:

- Kansas has a low penetration of coal generation facilities.
- The existing coal generation facilities are far enough removed from the point of injection for the Project (HVDC converter station and AC collectors) that there is a significant cost barrier for any new or existing coal generation projects to tie into the Project.
- There are existing natural gas generation and interstate natural gas pipeline facilities near the point of injection; however, there are no new natural gas generation projects currently planned to be built nearby.
- HVDC technology does not easily allow for connections at locations along the line without the need for intermediate converter stations, which requires significant modifications to the overall design as well as notable increased costs.
- As noted in **Chapter 2**, there are several new wind projects in the planning stages in proximity to the point of injection for the Project (HVDC converter station and AC collectors).

Based on the generation assets that could reasonably be assumed to tie into the point of injection, GHG emissions associated with wind and solar generation were compared to the GHG emissions associated with the U.S. Grid. The DOE National Renewable Energy Laboratory Wind Life Cycle Assessment Harmonization Project estimates that the cradle to grave GHG impact of the building and erecting turbines amortized over the lifespan of the equipment is 11kg CO_2e/MWh delivered, and that the cradle to grave GHG impact of the construction of solar amortized over the lifespan of the equipment is 50 kg CO_2e/MWh delivered. The US EPA eGRID Data Explorer reports that the GHG base case for the US grid is 403kg CO_2e/MWh (2019) (https://www.epa.gov/egrid/data-explorer; accessed August 21, 2021). Based on the Project transmission capacity of 2,500 MW (approximately 21.9 million MWh per year), operations at 60 percent capacity equals approximately 13.14 million MWh annually. Compared with the GHG emissions associated with the average US Grid generation emissions, the development and use of wind and/or solar generation assets for the Project represents a potential reduction or avoidance of up to 5.15 million tons of GHG emissions annually. In addition, the Project is expected reduce electrical line losses by at least 16 percent compared to an equivalently sized AC system, further increasing transmission efficiency of the electricity delivered by the Project.

3.2.4.4 Decommissioning

Site decommissioning would be performed at the end of the service life of the Project in accordance with a Decommissioning Plan. Impacts to air quality, GHG emissions, and climate trends during removal of Project facilities would likely be similar to impacts during construction, as described below.

3.2.4.4.1 Air Quality

It is anticipated that Project emissions for decommissioning activities would likely be similar to or less than construction-related activities. The equipment and structure removal process would include the operation of heavy-duty construction equipment, light-duty construction vehicles commuting to and from the work site, fugitive dust from driving across and working in unpaved areas, and helicopter use. Also, it is expected that emissions from equipment and vehicles would be lower in future years as older pieces of equipment and commuting vehicles are replaced with newer, cleaner, or alternatively fueled engines. As this would be a deconstructing phase, it is not expected that the concrete batch plants would be in use. Pollutant emissions would be similar to or less than construction-related activities and would be lower than federal pollutant *de minimis* and the current NAAQS threshold levels.

3.2.4.4.2 GHG Emissions

Greenhouse gas emissions from decommissioning activities would result from trucks and other mobile sources used to access the site and remove the equipment, structures, and transmission structure foundations. Greenhouse gas emissions would likely be similar to the annual construction emissions from on-road and off-road vehicles; however, if major technological advances occur for heavy duty on-road and off-road vehicles, the associated GHG emissions could be reduced or eliminated.

Although detailed decommissioning plans are not available, it is assumed the GHG emissions associated with helicopter use would also be similar to those calculated under the construction phase. It is assumed the GHG emissions associated with concrete batch plants during construction would not occur during decommissioning.

3.3 Paleontology and Soils

3.3.1 Issues for Analysis

Based on NEPA statutory and CEQ/DOE regulatory requirements; input from federal, state, and local agencies and tribal governments; and comments received during scoping, the paleontology and soils analysis addresses the following:

- Potential impacts to fossils and sensitive paleontological resources;
- Disturbance of soils leading to erosion, compaction, and increased runoff;
- Impacts to hydric soils;
- Loss of soil productivity or prime farmland soils; and
- Impacts to soils in terraced farm areas.

There were no scoping or agency comments related to geology, geologic hazards, or mineral resources. In general, geologic hazards are not a major concern in or near the Project area. Localized areas of karst terrain or landslide-prone topography that could affect individual transmission structures would be addressed by relocating the structure away from the hazard or by designing the structure to withstand the hazard. Additionally, the planned ROW would be relatively narrow and would not materially restrict access to mineral resources. For these reasons, impacts to geology, geologic hazards, and mineral resources are not considered further.

Discussion of the No Action Alternative is presented in **Section 3.1**.

3.3.2 Analysis Area

3.3.2.1 Paleontology

The paleontology analysis area includes a 0.25-mile buffer on either side of the Project area (0.5 mile total) to account for potential impacts from surface disturbance and facility access that would be created by the planned Project ROW and temporary access routes required for construction. Although increased fossil collection could occur along temporary access routes, based on previous observations and professional experience, individuals are not likely to walk farther than 0.25 mile from vehicle access points. For this reason, a 0.25-mile-wide buffer on either side of the Project area was used for analysis. The total acreage for the paleontology analysis area is 221,724 acres.

3.3.2.2 Soils

The soils analysis area is considered the entire Project area (13,641 acres). The Project area was chosen for the soils analysis area because it encompasses locations where soil impacts, such as compaction and erosion, could occur from Project construction, operations and maintenance, and decommissioning activities.

3.3.3 Affected Environment

3.3.3.1 Paleontology

This section discusses paleontological resources throughout the paleontology analysis area and focuses primarily on the uppermost strata of bedrock and fossils.

In Kansas and Missouri, Paleozoic dolomite, shale, mudstone, and sandstone bedrock overlay the Precambrian basement rock (Merriam 1963). These bedrock units were primarily formed when a shallow sea covered this region and contain echinoderms, corals, mollusks, arthropods, bryozoans, and the occasional fish or shark fossil. These bedrock units are exposed at the land surface in the central and eastern portions of the paleontology analysis area, including Washington, Marshall, Nemaha, Brown, and Doniphan counties, Kansas, and Buchanan, Clinton, Caldwell, Carroll, Charlton, Randolph, Monroe, Audrain, and Callaway counties, Missouri.

Shale, limestone, chalk, and sandstone from the early to late Cretaceous Period are exposed in the western and central portion of the paleontology analysis area, including parts of Ford, Pawnee, Barton, Russell, Osborne, Mitchell, Cloud, and Washington counties, Kansas. The Cretaceous environment was mostly cyclic, ranging from deeper marine to nearshore to terrestrial during periods of interior seaway transgressive and regressive cycles. Fossils from these deposits include marine reptiles, flying reptiles, dinosaurs, birds, fish, sharks, mollusks, crustaceans, and plants (Everhart 2017; Hattin 1977; Raymond et al. 1944).

Sediments and fossils from the latest Cretaceous and early Paleogene Period are not preserved in the paleontology analysis area. Deposition returned during the Miocene Epoch of the Neogene Period, when sediments eroding from the Rocky Mountains were carried by large river systems and deposited as thick sandstone and alluvial beds that contain a breadth of fossilized flora and fauna, such as grasses, hackberry (*Celtis occidentalis*), elm (*Ulmus americana*), fishes, tortoises, crocodilians, birds, rodents, horses, rhinoceros, camels, gomphotheres, and gastropods (Frye, Leonard, and Swineford 1956; Liggett 1997; Ludvigson et al. 2009; Wang, Tedford, and Taylor 1999). The Miocene strata are exposed in valleys in the northwestern portion of the paleontology analysis area.

Glaciers encroached into northeast Kansas and northern Missouri during the Pleistocene Epoch of the Quaternary Period and modified the underlying deposits (Frye and Leonard 1952). Much of the younger and recent surface sediments are tied to runoff from streams during or after glaciation and erosion and redeposition of these and underlying units by wind. Information on the changing environment is provided by the fossils in these deposits, which include mammoths, rodents, birds, ostracods, mollusks, grass and borage seeds, pollen, and wood. The occurrence of such fossils in these deposits is sporadic, often with limited areal distribution and restricted vertical range (Frye and Leonard 1952).

3.3.3.2 Soils

Soils within the Project area predominantly formed from loess (material transported and deposited by wind and predominantly consisting of silt-sized particles) and alluvium (sediments deposited by running water of streams and rivers) (Soil Science Society of America 2008). Soils within the Project area fall into a mesic temperature regime with average soil temperatures between 46.4 degrees Fahrenheit (°F) (8 degrees Celsius [°C]) and 59°F (15°C). Soil moisture regimes range from ustic (semiarid climate) to udic (humid or subhumid climate) from west to east, respectively. Predominant soil textures consist of sandy loam, loam, silt loam, silty clay loam, and clay loam (**Table 3.3-1**).

Table 3.3-1. Soil Units within the Project Area

Map Unit	Soil Unit	Acres	Percent of Project Area
2613	Harney silt loam, 1 to 3 percent slopes	1,242.9	9.1%
2612	Harney silt loam, 0 to 1 percent slopes	843.7	6.2%
7501	Pawnee clay loam, 4 to 8 percent slopes, eroded	448.5	3.3%
7681	Wymore silty clay loam, 1 to 3 percent slopes	430.6	3.2%
50059	Mexico silt loam, 1 to 4 percent slopes, eroded	404.5	3.0%
3800	Crete silt loam, 0 to 1 percent slopes, loess plains and breaks	383.5	2.8%
60022	Leonard silt loam, 1 to 6 percent slopes, eroded	308.2	2.3%
30120	Lagonda silty clay loam, 5 to 9 percent slopes, eroded	290.8	2.1%
3828	Crete silty clay loam, 1 to 3 percent slopes	281.2	2.1%
50058	Mexico silt loam, 0 to 2 percent slopes	237.2	1.7%
30085	Grundy silt loam, 2 to 5 percent slopes	217.9	1.6%
7500	Pawnee clay loam, 1 to 4 percent slopes	198.0	1.5%
7050	Kennebec silt loam, occasionally flooded	166.5	1.2%
3870	Hastings silty clay loam, 3 to 7 percent slopes, eroded	164.3	1.2%
2623	Harney-Mento complex, 3 to 7 percent slopes	155.0	1.1%
7683	Wymore silty clay loam, 3 to 6 percent slopes	148.1	1.1%
50030	Keswick silt loam, 9 to 20 percent slopes, eroded	145.4	1.1%
2625	Harney-Nuckolls complex, 3 to 7 percent slopes	144.8	1.1%
3755	Hord silt loam, rarely flooded	139.8	1.0%
7207	Aksarben silty clay loam, 6 to 11 percent slopes	135.6	1.0%
3830	Crete silty clay loam, 3 to 7 percent slopes	133.1	1.0%
2236	Roxbury silt loam, occasionally flooded	132.9	1.0%
2375	Roxbury silt loam, rarely flooded	127.3	0.9%
2817	Uly silt loam, 3 to 6 percent slopes	122.7	0.9%
50001	Armstrong loam, 5 to 9 percent slopes, eroded	121.4	0.9%
2718	Nibson silt loam, 3 to 30 percent slopes	120.2	0.9%
50012	Putnam silt loam, 0 to 1 percent slopes	119.0	0.9%
10021	Greenton silty clay loam, 5 to 9 percent slopes, eroded	117.8	0.9%
3261	Muir silt loam, very rarely flooded	117.4	0.9%
2614	Harney silt loam, 3 to 7 percent slopes	111.2	0.8%
2624	Harney-Mento silty clay loams, 3 to 7 percent slopes, eroded	100.1	0.7%
4725	Kipson-Sogn complex, 5 to 30 percent slopes	100.1	0.7%
30119	Lagonda silty clay loam, 2 to 5 percent slopes, eroded	98.1	0.7%

Map Unit	Soil Unit	Acres	Percent of Project Area
2953	Wakeen silt loam, 3 to 7 percent slopes	96.7	0.7%
2365	New Cambria silty clay loam, rarely flooded	95.3	0.7%
30087	Grundy silt loam, 5 to 9 percent slopes	93.6	0.7%
2524	Armo-Bogue complex, 7 to 20 percent slopes	86.5	0.6%
2766	Penden-Tobin complex, 0 to 15 percent slopes	84.5	0.6%
5986	Attica-Solvay complex, 0 to 3 percent slopes	83.1	0.6%
7970	Palermo silty clay loam, 18 to 30 percent slopes	80.8	0.6%
2660	Heizer-Brownell complex, 5 to 30 percent slopes	79.1	0.6%
13510	Colo silty clay loam, heavy till, 0 to 2 percent slopes, occasionally flooded	77.1	0.6%
30020	Armster silty clay loam, 5 to 9 percent slopes, eroded	75.9	0.6%
2616	Harney silty clay loam, 3 to 7 percent slopes	73.9	0.5%
30073	Gosport silty clay loam, 14 to 30 percent slopes	73.0	0.5%
66068	Carlow silty clay, 0 to 2 percent slopes, occasionally flooded	69.2	0.5%
10016	Contrary silt loam, 9 to 14 percent slopes	60.5	0.4%
7971	Palermo-Knox complex, 10 to 18 percent slopes	60.5	0.4%
50008	Keswick silt loam, 5 to 9 percent slopes, eroded	59.4	0.4%
34012	Shannondale silt loam, 0 to 2 percent slopes	58.5	0.4%
7436	Morrill loam, 7 to 12 percent slopes, eroded	58.2	0.4%
10056	Knox silt loam, 9 to 14 percent slopes, eroded	57.2	0.4%
66004	Dockery silt loam, 0 to 2 percent slopes, frequently flooded	56.9	0.4%
7415	Mayberry clay loam, 3 to 7 percent slopes	56.3	0.4%
3802	Crete silty clay loam, 3 to 7 percent slopes, eroded, loess plains and breaks	55.0	0.4%
3866	Hastings silt loam, 1 to 3 percent slopes	54.5	0.4%
30127	Lamoni and Adair soils, 5 to 9 percent slopes, eroded	52.3	0.4%
10094	Marshall silt loam, 5 to 9 percent slopes, eroded	52.0	0.4%
3775	Muir silt loam, rarely flooded	50.9	0.4%
	Soil units with less than 50 acres within Project area (315 soil units)	3,832.6	28.1%
	Total[1/]	**13,641.5**	**100.0%**

Source: Soil Survey Staff 2020a and 2020b
Note: Soils Analysis Area is the entire Project area.
[1/] Totals may not sum or exactly match the totals in **Chapter 2** due to rounding.

3.3.3.2.1 Soil Erosion

Erosion is the natural process that transports soil, typically by water and wind. The potential for soil to weather and be transported away is influenced by soil texture, structure, length and percent of slope, vegetative cover, and rainfall or wind intensity. Erosion is most likely to occur in areas with bare or sparse vegetative cover, non-cohesive soil particles with low infiltration rates, and moderate to steep slopes.

Based on soil survey data for the Project (Soil Survey Staff 2020a, 2020b), the existing potential for water erosion within the Project area is minimal for approximately 2 percent (333 acres) of the soil units and moderate to severe for 97 percent (13,284 acres) of the soil units. No water erosion rating has been assigned for approximately 25 acres of the units; these units include water and rivers (**Table 3.3-2** and **Appendix 3.3**).

Table 3.3-2. Water Erodibility K Factor of Soils within the Project Area

Water Erodibility K Factor	Acres	Percent of Project Area	Potential for Water Erosion
<0.25	332.6	2.4%	Minimal
0.25–0.4	5,707.1	41.8%	Moderate
>0.4	7,577.3	55.6%	Severe
Not Assigned	24.7	0.2%	–
Total[1/]	**13,641.5**	**100.0%**	–

Note: Soils Analysis Area is the entire Project area.
[1/] Totals may not sum or exactly match the totals in Chapter 2 due to rounding.

Terraced soil areas are not specifically linked to identified soil map units and have not been mapped for the Project. However, it is known that numerous agricultural fields in the Project area have been terraced to reduce erosion, trap sediment, and manage runoff. The terraces are typically associated with sloped agricultural terrain.

The potential for wind erosion also varies across the Project and is minimal (Wind Erodibility Groups 5 and 6) or not assigned for 86 percent (11,680 acres) of the Project area. Only 14 percent (1,961 acres) of the Project area is rated as having moderate (Wind Erodibility Groups 3, 4, and 4L) or severe wind erosion potential (Wind Erodibility Groups 1 and 2; **Table 3.3-3** and **Appendix 3.3**).

Table 3.3-3. Wind Erodibility of Soils within the Project area

Wind Erodibility Group[1/]	Acres	Percent of Project Area	Potential for Wind Erosion
1	1.2	<0.1%	Severe
2	63.9	<0.1%	Severe
3	261.9	1.9%	Moderate
4	421.7	3.1%	Moderate
4L	1207.5	8.9%	Moderate
5	1482.6	10.9%	Minimal
6	10172.7	74.6%	Minimal
Not Assigned	24.7	0.2%	–
Total[2/]	**13,641.5**	**100.0%**	**–**

Note: Soils Analysis Area is the entire Project area.
[1/] Wind Erodibility Group 4 has two designations (4 and 4L) that have the same weight percent of dry soil aggregates and the same wind erodibility index values. The distinguishing factor between the two designations is that loams are calcareous (4L) or noncalcareous (4).
[2/] Totals may not sum or exactly match the totals in Chapter 2 due to rounding.

3.3.3.2.2 Soil Compaction

Soil compaction occurs when soil bulk density is increased by compression. The risk for compaction is greatest when soil is wet. Therefore, fine-grained soils, such as clay, with poor drainage characteristics have the greatest propensity for compaction.

Soil compaction potential was evaluated by reviewing the drainage class and soil texture for soil map units within the Project area. Soil map units having fine textures in somewhat poor, poor, or very poor drainage classes were identified as being compaction prone (Al-Kaisi 2007). Approximately 25 percent of the soils (3,472 acres) within the Project area are susceptible to compaction. A majority of the soil units in the Project area (74 percent, or 10,145 acres) are not susceptible to compaction based on drainage class and texture (**Table 3.3-4** and **Appendix 3.3**). Less than 1 percent of the soils (24.3 acres) within the Project area are not rated in terms of soil compaction potential.

Table 3.3-4. Drainage Classes of Soils within the Project area

Drainage Class	Acres	Percent of Project Area	Potential for Compaction
Excessively drained	82.6	0.6%	Not susceptible
Somewhat excessively drained	324.2	2.4%	Not susceptible
Well drained	6471.2	47.4%	Not susceptible
Moderately well drained	3266.9	23.9%	Not susceptible
Somewhat poorly drained	1955.5	14.3%	Susceptible
Poorly drained	1502.8	11.0%	Susceptible
Very poorly drained	14.3	0.1%	Susceptible
Not Assigned/Subaqueous	24.3	0.2%	–
Total[1/]	**13,641.5**	**100.0%**	–

[1/] Totals may not sum or exactly match the totals in Chapter 2 due to rounding.
Note: Soils Analysis Area is the entire Project area.

3.3.3.2.3 Hydric Soils

Hydric soils are defined as “soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part” (Soil Science Society of America 2008). Approximately 11 percent of the soils (1,525 acres) in the Project area are classified as hydric or predominantly hydric, and less than 1 percent (14 acres) are classified as partially hydric. Most of the soils in the Project area (89 percent; 12,103 acres) are classified as either predominantly non-hydric or non-hydric, or are unclassified (Soil Survey Staff 2020a, 2020b; **Table 3.3-5** and **Appendix 3.3**).

Table 3.3-5. Hydric Classes of Soils within the Project area

Hydric Class	Acres	Percent of Project Area
Non-Hydric	4,340.8	31.8%
Predominately Non-Hydric	7,761.9	56.9%
Partially Hydric	14.2	0.1%
Predominately Hydric	1,095.7	8.0%
Hydric	429.1	3.1%
Total[1/]	**13,641.5**	**100.0%**

Note: Soils Analysis Area is the entire Project area.
[1/] Totals may not sum or exactly match the totals in Chapter 2 due to rounding.

3.3.3.2.4 Prime Farmland and Farmland of Statewide Importance

The Farmland Protection Policy Act (7 U.S.C. 4201-4209) requires federal programs to minimize the unnecessary and irreversible conversion of farmland to nonagricultural purposes. Lands considered prime farmland require additional scrutiny before a federal program is implemented to preserve farmlands from development and sprawl. The Natural Resources Conservation Service (NRCS) is responsible for maintaining a current inventory of prime farmland,[1] defined as "land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and without intolerable soil erosion, as determined by the Secretary [of Agriculture]. Prime farmland includes land that possesses the above characteristics but is being used currently to produce livestock and timber. It does not include land already in or committed to urban development or water storage" (7 U.S.C. 4201(c)). In general, prime farmland has an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, an acceptable level of acidity or alkalinity, an acceptable content of salt or sodium, and few or no rocks. Its soil is permeable to water and air. Prime farmland is not excessively eroded or saturated with water for long periods of time, and it either does not flood frequently during the growing season or is protected from flooding.

At the state level, NRCS also recognizes farmlands of statewide importance, which are classified as lands other than prime and unique farmland that are of statewide importance for production of food, feed, fiber, forage, and oil seed crops. Farmlands of statewide importance are nearly prime farmland and economically produce high yields of crops when treated and managed according to acceptable farming methods (7 CFR 657.5(c)).

Based on data from U.S. Department of Agriculture (USDA) (2023), Kansas has over 16.3 million acres of prime farmland, and Missouri has 9.5 million acres. Within the Project area, 53 percent (7,290 acres) of the soil units are classified as prime farmland or as prime farmland if drained (Soil Survey Staff 2020a, 2020b). Farmland of statewide importance comprises 25 percent (3,437 acres). Soil units that are classified as not prime farmland or where no rating is assigned amount to 20 percent (2,698 acres) of the Project area (**Table 3.3-6** and **Appendix 3.3**).

Table 3.3-6. Prime Farmland within the Project area

Farmland Classification	Acres	Percent of Project Area
All areas are prime farmland	6,351.5	46.6%
Prime farmland if drained	938.9	6.9%
Prime farmland if protected from flooding or not frequently flooded during the growing season	111.1	0.8%
Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season	105.4	0.8%
Farmland of statewide importance	3,436.5	25.2%
Not prime farmland	2,698.1	19.8%
Total[1/]	**13,641.5**	**100.0%**

Note: Soils Analysis Area is the entire Project area.
[1/] Totals may not sum or exactly match the totals in Chapter 2 due to rounding.

[1] The Farmland Protection Policy Act also identifies a category of farmland called unique farmland, and NRCS also maintains an inventory of that category. However, no farmland categorized as unique farmland is present in the Project area.

3.3.4 Environmental Consequences of Proposed Federal Action

3.3.4.1 Methods and Assumptions

3.3.4.1.1 Paleontology

Potential impacts to paleontological resources were analyzed based on the surface-disturbance and other activities that would occur in the paleontology analysis area. The analysis of impacts to paleontological resources assumes that the EPMs listed in **Appendix 2.4** would be implemented to minimize impacts, including the development of a Paleontological Discovery Plan prior to construction. If paleontological specimens are discovered in an active construction area, work would be stopped at the discovery location, the area would be flagged, and the process outlined in the Paleontological Discovery Plan would be followed. Work would resume according to requirements listed in the Paleontological Discovery Plan.

3.3.4.1.2 Soils

The methodology for evaluating impacts to soil resources involved analyzing soil survey data in relation to the surface disturbance areas. To determine acres of soils that would be disturbed by Project construction, the known locations of surface disturbances were overlain on the NRCS Gridded Soil Survey Geographic Database (gSSURGO) Order 3 Soil Survey layer (or General Soils Map data where gSSURGO data were unavailable) to determine the acreage of soils disturbed. Temporary disturbance and resulting impacts to soils are those that would be reclaimed and revegetated following disturbance; permanent disturbance resulting in long-term impacts to soils would include areas where structures, optical regeneration facilities and associated access driveways, or converter stations would be located for the duration of the Project or that would result in permanent alteration of the soil resource.

The analysis of the impacts to soil resources assumes that the EPMs listed in **Appendix 2.4** would be implemented and would limit soil resource impacts when implemented effectively. In compliance with the Kansas Department of Health and Environment's (KDHE's) National Pollutant Discharge Elimination System (NPDES) Construction Stormwater General Permit requirements[1] and Missouri Department of Natural Resources' (MDNR) General Permit requirements,[2] the Applicant would develop SWPPPs detailing specific steps for managing stormwater runoff during construction and preventing sediment and other pollutants from entering wetlands and waterbodies. As part of the SWPPPs, an erosion and sediment control plan would be prepared showing the location and type of each erosion and sediment BMPs to be utilized. Restoration would be conducted as soon as practical following surface disturbance.

3.3.4.2 Construction

3.3.4.2.1 Paleontology

Direct impacts to paleontological resources could result from damage or destruction of fossils through crushing, breaking, exposing, or otherwise disturbing fossils or fossil remnants, or loss of valuable scientific information during surface-disturbing activities such as clearing, grading, excavation, or off-road travel within the planned Project ROW or temporary access routes. These impacts would occur where fossils are at or near the ground surface in rock outcrops and/or areas of shallow bedrock. Potential impacts during construction could include erosion of fossil beds due to slope re-grading and vegetation

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[1] Pursuant to the provisions of Kansas Statutes Annotated 65-164 and 65-165; the Federal Water Pollution Control Act as amended (33 U.S.C. 1251 et seq.); and the Kansas Surface Water Quality Standards (Kansas Administrative Regulations. 28-16-28 et seq.).

[2] Pursuant to the provisions of the Missouri Clean Water Law (Chapter 644 Revised Statutes of Missouri); the Federal Water Pollution Control Act as amended (33 U.S.C. 1251 et seq.); and the Missouri Storm Water Regulations (10 Code of State Regulations 20-6.200).

clearing or the unauthorized collection of scientifically important fossils by construction workers or the public due to increased access to fossils in the paleontology analysis area. Grading activities would be limited to the minimum amount needed to create safe working surfaces, and excavations for foundation construction would typically be made using a drill rig (or auger) instead of open excavation, which would reduce the potential for impacts to paleontological resources. Access routes used during construction would be temporary and returned to baseline conditions following completion of construction activities, helping to limit future disturbance of paleontological resources in the restored areas. Temporary fences around the converter stations and yards would limit access to any paleontological resources unearthed during construction. EPMs listed in **Appendix 2.4** would be implemented to minimize impacts, including the development of a Paleontological Discovery Plan with a provision for stopping construction work should paleontological resources be discovered.

3.3.4.2.2 Soils

Project construction activities could cause soil erosion and compaction and disturb hydric soils, prime farmland, and terraced soil areas in areas where such activities are planned.

Soil Erosion

Construction would require cutting or removing vegetation. Vegetation removal increases potential for wind and water erosion, and tree cutting could alter soil moisture. Specific impacts to vegetation, including the amount of temporary vegetation clearing and permanent habitat conversion, are discussed in **Section 3.5**.

Grading associated with Project construction could also result in erosion (water and wind), exposure of subsoils, soil mixing (including reintroducing clay, rocks, and low-fertility soils from layers below the topsoil), temporary stockpiling of soils (which could create sterile conditions for soil microbes after extended periods of stockpiling), degraded soil aggregation and textures, and crushing soil fauna such as earthworms, nematodes, and protozoa. Most grading would be associated with temporary access routes and temporary workspaces around new transmission structures. These temporary disturbance activities would require grading on up to approximately 4,162 acres.

Where permanent structures would be located on terraced areas, they would be constructed to allow the terraced areas to continue to perform existing functions (reduce erosion, trap sediment, and manage runoff). Thus, no additional impacts to the functions of terraced soils are anticipated. To address soil impacts from vegetation removal and grading, the Applicant would develop a SWPPP to meet construction general stormwater permit requirements in each state. Other EPMs to reduce soil erosion impacts are listed in **Appendix 2.4**.

Soil Compaction

Soils with high compaction potential would be susceptible to compaction from construction vehicles and equipment. Compaction can alter the soil structure, reduce the porosity of the soil, and inhibit the development and action of plant roots. As a result, compacted soil has reduced moisture-holding capacity and may have reduced plant production and crop yield. Compaction also decreases infiltration, which can increase runoff and the potential for water erosion. Compaction impacts would be reversible in areas where the disturbance is temporary. Project construction would create temporary disturbance in 1,428 acres of compaction-prone soil, including habitat conversion disturbance. An additional 85 acres of compaction-prone soil would be permanently impacted by Project facilities. Some impact on compaction-prone soils could also occur from off-road travel within the planned Project ROW for tree and brush clearing. Vehicular travel in the ROW would be necessary where temporary access routes do not provide access to vegetation that would be cleared to comply with NESC requirements, but the extent of this impact cannot be quantified because the exact areas of off-road travel are not known at this time. Potential impacts related to soil compaction from off-road travel would be minimized by limiting vehicle travel to one entrance to and one exit from areas of vegetation clearing. Although compaction could reduce soil productivity, impacts would be minimized by the EPMs listed in **Appendix 2.4**, including use of temporary access routes and low-ground-pressure tire or tracked equipment during construction activities, when practicable, and discing compacted soils prior to revegetation using appropriate agronomic equipment.

Hydric Soils

Given the low percentage of the Project area classified as hydric or partially hydric (11 percent), and the proposed EPMs to avoid and minimize surface disturbance in wetlands (which typically include hydric soils) (see **Appendix 2.4**), impacts to hydric soils during construction activities would be limited. If traversing hydric soils cannot be avoided, impacts would be minimized using wetland matting when traveling across hydric soil areas and by avoiding construction activities when conditions are determined to be too wet for work to proceed.

Prime Farmland and Farmland of Statewide Importance

The Project would cause approximately 4,751 acres of temporary disturbance, 1,025 acres of habitat conversion, and 210 acres of permanent loss of prime farmland or farmland of statewide importance. After Project construction and site cleanup and restoration are completed, agricultural activities would generally be able to resume on prime farmland areas with temporary disturbance (**Section 2.3.3.10**). The indirect loss of prime farmland would occur underneath the transmission line structures where farm equipment could no longer access the land for agricultural use. This area would account for 0.013-0.097 acres per structure that occurs within prime farmland depending on the type of tower and agricultural equipment in use (see **Table 2-5**). Landowners would be compensated for these losses of farmland. Permanent losses would also result from converter station site development, including loss of 121.9 acres of prime farmland associated with the Ford County HVDC converter station and 14.7 acres of prime farmland, if drained, and 68.6 acres of farmland of statewide importance associated with the Monroe County converter station.

In compliance with the Farmland Protection Policy Act (7 U.S.C. 4201-4209) (**Appendix 1.2**), consultations with Kansas and Missouri NRCS offices are ongoing, and a Farmland Conversion Impact Rating form would be completed for the Project to evaluate the impact of prime farmland conversion. Results of those consultations would be included in the Final EIS if available.

3.3.4.3 Operations and Maintenance

3.3.4.3.1 Paleontology

Many of the potential operations- and maintenance-related impacts to paleontological resources would be the same as construction-related impacts (e.g., possible crushing, breaking, or otherwise disturbing fossils). However, overall activity during operations and maintenance would be localized, less intensive, and shorter in duration (up to several days in any one location). Permanent access driveways associated with the optical regeneration facilities would be maintained throughout the life of the Project leading to potential further disturbance of paleontological resources during regrading. If repeated maintenance proves necessary in the same area(s), the more frequent driving across these areas could remove vegetation and erode soils, potentially exposing previously covered paleontological resources, and subjecting the exposed resources to damage from vehicle tires and natural weathering processes.

However, most areas of operations and maintenance would have already been disturbed during Project construction, when the Paleontological Discovery Plan would have been implemented for the Project.

3.3.4.3.2 Soils

Operations and maintenance impacts to soil resources could result from localized, temporary activities such as inspections, vegetation management, and repair or replacement of damaged Project facilities occurring over several days. The primary impact from these activities would be compaction from construction equipment. Implementation of EPMs (**Appendix 2.4**) would reduce impacts to soil resources.

3.3.4.4 Decommissioning

Site decommissioning would be performed at the end of the service life of the Project in accordance with a Decommissioning Plan. Impacts to paleontology and soil resources from activities to remove Project facilities would likely be similar to impacts during construction. However, most areas disturbed by decommissioning would have already been disturbed during Project construction, when the Paleontological Discovery Plan was implemented.

During decommissioning, excavation, grading, and operation of heavy equipment could expose paleontological resources through surface disturbance and erosion, potentially leading to damage or unauthorized collection of fossil specimens. The footprint for transmission structure removal would likely approximate the temporary workspaces used during construction of transmission structures. Conducting decommissioning work in previously disturbed areas would help avoid impacts to paleontological resources, provided that no important fossils were identified in these areas during Project construction.

Temporary surface disturbance for decommissioning would cause soil erosion and compaction and could impact hydric or terraced soils in localized areas where these resources are present. Barring advances in construction technology, the disturbance footprint for decommissioning would likely be similar to the footprint during construction, resulting in a similar extent of soil impacts.

Following decommissioning, demolition of aboveground Project facilities and removal of the foundations would disencumber up to 210 acres of prime farmland that were inaccessible during Project operation. Reclamation could be necessary to restore soil productivity in these previously inaccessible areas.

3.4 Water Resources

3.4.1 Issues for Analysis

Based on NEPA statutory and CEQ/DOE regulatory requirements; input from federal, state, and local agencies and tribal governments; and comments received during scoping, the water resources analysis addresses the following:

1. Consumptive use of water and potential impacts to water supplies
2. Potential for impacts to water quality associated with:
3. Runoff, erosion, and mobilization of soil material
4. Chemical storage and herbicide application
5. Stream temperature changes from clearing vegetation
6. Disruption to waterways, floodplains, wetlands, and waterbodies

Two additional issues were identified during scoping and agency meetings: 1) impacts to sole-source aquifers and 2) the flow of groundwater springs. These have not been analyzed as there are no sole-source aquifers (EPA 2023a) or mapped springs within 0.25 mile of the Project area (USGS 2017; MDNR 2021).

Discussion of the No Action Alternative is presented in **Section 3.1**.

3.4.2 Analysis Areas

This section examines water resources in two geographically distinct analysis areas to evaluate the anticipated impacts to different water resources of the proposed Project. The first and broader area is referred to as the water resources analysis area, and the second area is the Project area.

The water resources analysis area was used to evaluate the affected environment and environmental consequences of a potential contaminant release at the surface with respect to groundwater and surface water impacts. The water resources analysis area consists of a 0.25-mile buffer of the Project area, which represents the distance where concentrated water quality impacts could occur in surface water before a contaminant became diluted or was deposited on the streambed. It is acknowledged that many factors, such as the type of contaminant, rate of streamflow, and other conditions would contribute to the required dilution distance. The total footprint of the water resources analysis area was 221,724 acres. The areal extent is depicted on **Figures 3.4-1** through **3.4-3**.

The Project area (13,641 acres) was used to evaluate impacts to wetlands, waterbodies, and floodplains, since impacts to these resources are mainly related to surface disturbance.

3.4.3 Affected Environment

Hydrologic conditions vary widely across the water resources analysis area. The affected environment description presented below focuses on broad, regional hydrologic trends.

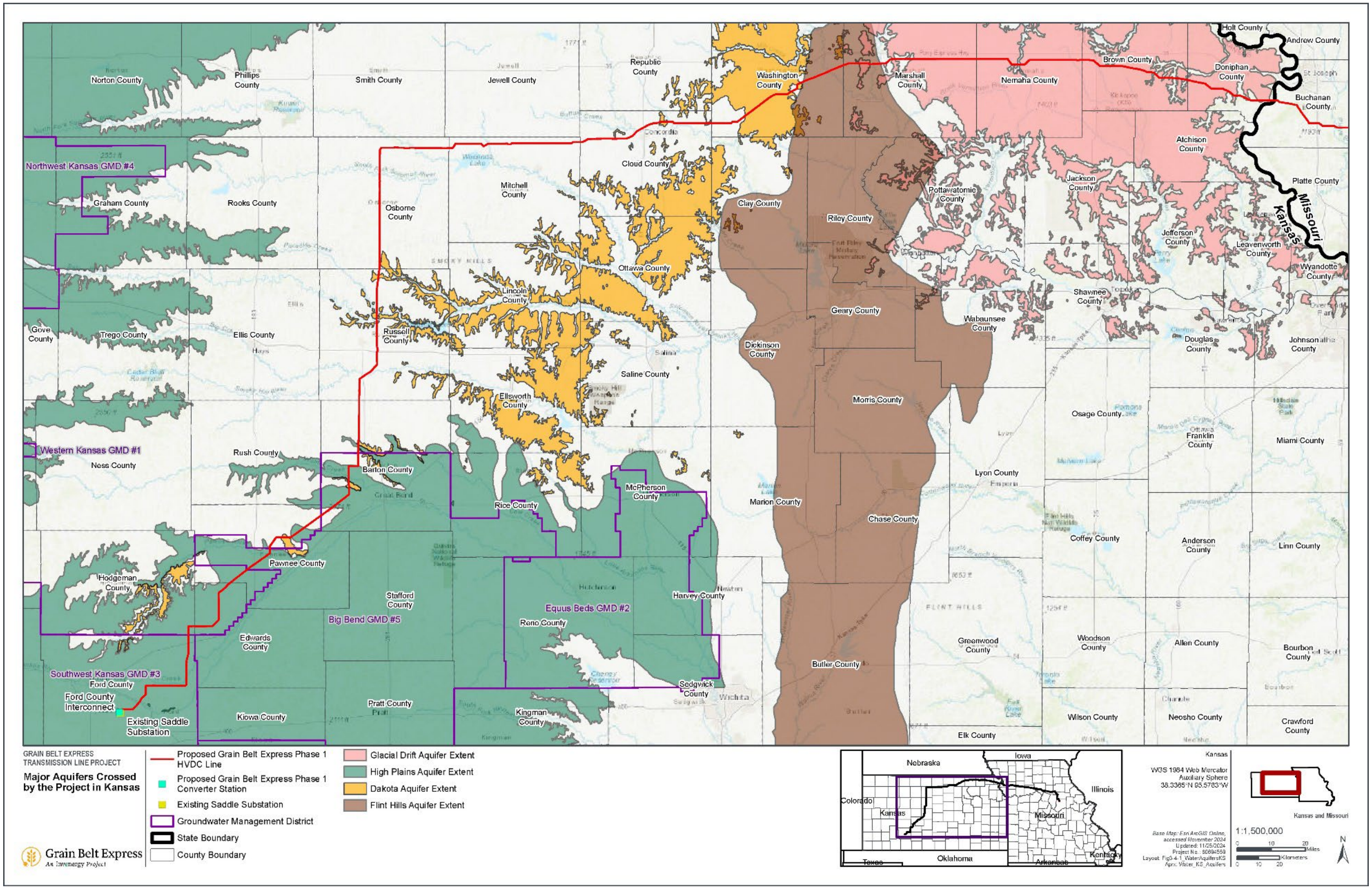


Figure 3.4-1. Major Aquifers Crossed by the Project in Kansas

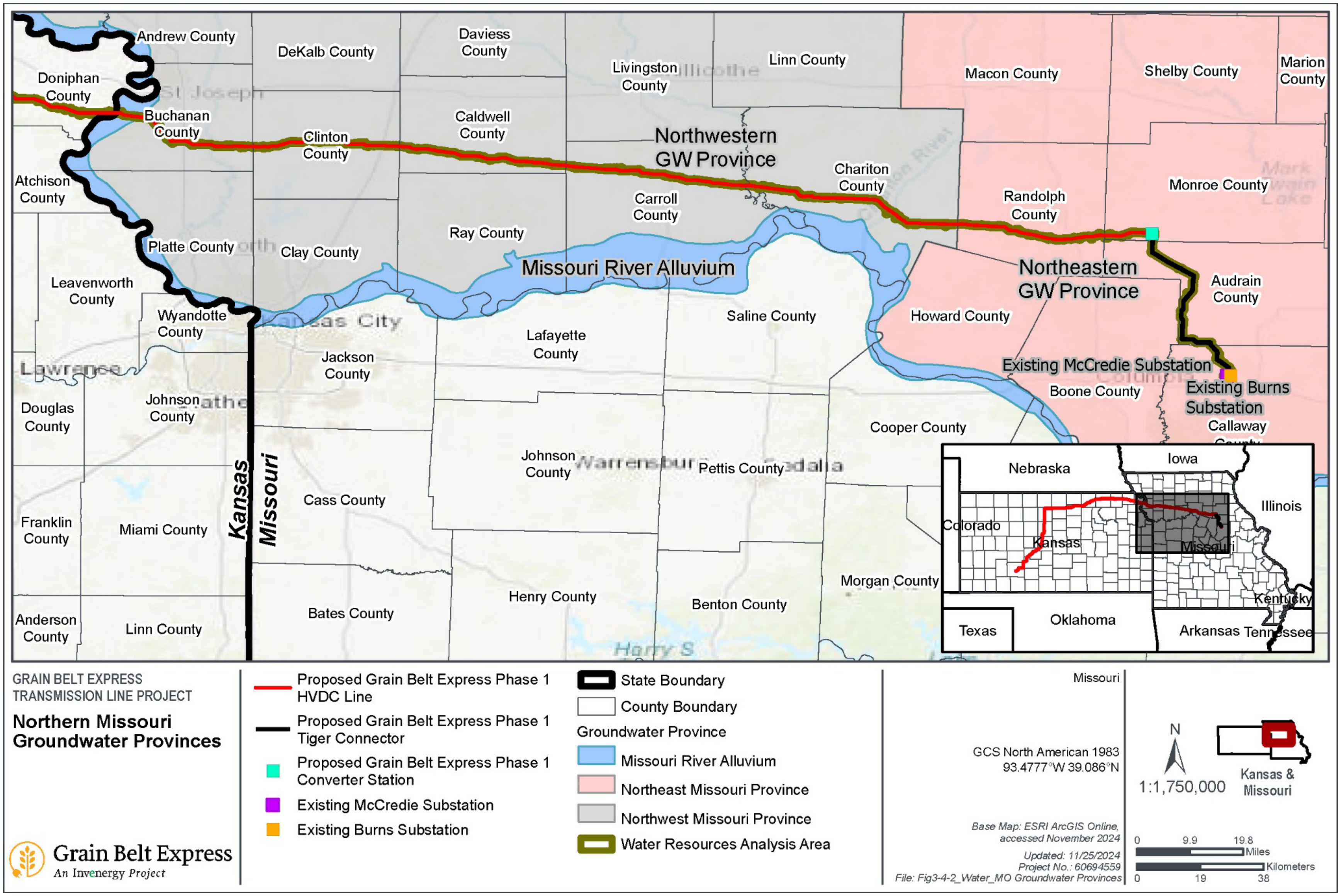


Figure 3.4-2. Northern Missouri Groundwater Provinces

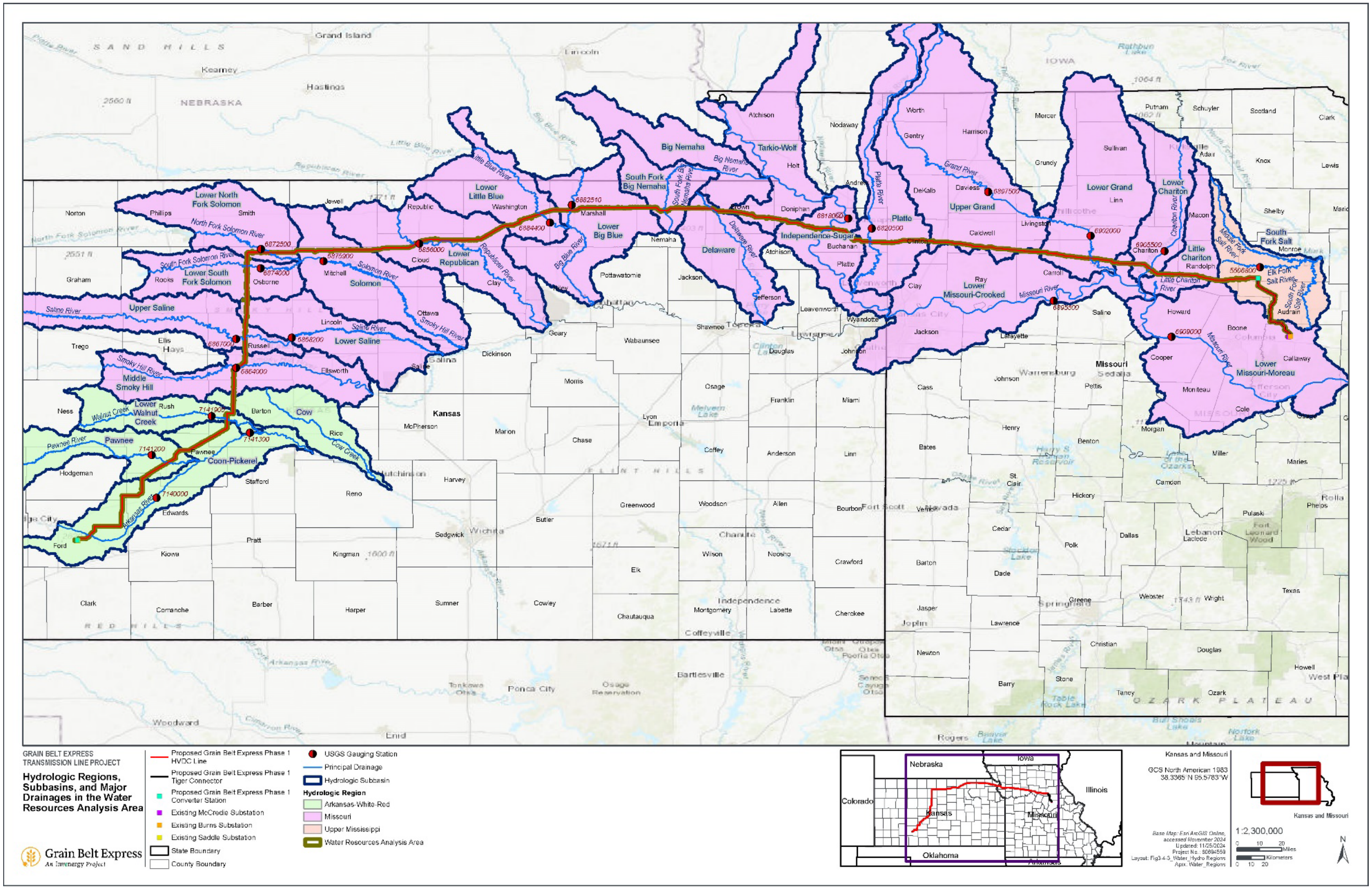


Figure 3.4-3. Hydrologic Regions, Subbasins, and Major Drainages in the Water Resources Analysis Area

3.4.3.1 Groundwater

Aquifers in the water resources analysis area range from Quaternary surficial deposits to limestones of Mississippian age. From west to east in Kansas, the water resources analysis area crosses the High Plains aquifer, the Great Bend Prairie aquifer, the Dakota aquifer, the Flint Hills aquifer, and the Glacial Drift aquifer (**Figure 3.4-1**). The High Plains aquifer is the principal source of groundwater in western Kansas. The aquifer is present throughout Ford County, Kansas, and beneath the Ford County Interconnect. Ford County is part of the Southwest Kansas Groundwater Management District No. 3, created to organize efforts and provide local input for the proper use, management, and conservation of groundwater resources. Macfarlane (2000) also recognized a subregion of the High Plains aquifer known as the “Great Bend Prairie” aquifer. Water use from the “Great Bend Prairie” aquifer is managed by the Big Bend Groundwater Management District Number 5, which encompasses portions of Edwards, Pawnee, and Barton counties in Kansas, along the HVDC Line planned ROW.

Russell, Osborne, and Mitchell counties in Kansas are mostly underlain by thick layers of Upper Cretaceous shale that do not produce significant quantities of water. Cloud and Washington counties in Kansas are near the eastern margin of the Dakota aquifer, where natural recharge flushes the formations, creating higher-quality, lower-total dissolved solids groundwater (Miller and Appel 1997). In this area, the Dakota aquifer is not part of a designated groundwater management district.

The Flint Hills aquifer occurs at the eastern terminus of the Dakota aquifer and spans portions of Washington and Marshall counties, Kansas. The limestone aquifers in these rock units are sources of water for many springs and for public water supply throughout the Flint Hills region. East of the Flint Hills, a pre-Illinoisian glaciation deposited glacial drift sediments across much of northeastern Kansas and northern Missouri, creating the glacial drift aquifer. Well yields from the glacial drift aquifer are highly variable and depend on the type of sediment encountered at a given well location. The HVDC Line would cross the glacial drift aquifer from central Marshall County to eastern Doniphan County, Kansas.

The Missouri River alluvial aquifer is present at the Kansas-Missouri state line. This aquifer underlies the Missouri River floodplain, reaching a maximum width of about 12 miles (MDNR 2020). East of the Missouri River, the water resources analysis area crosses the Northwestern Missouri Groundwater Province (**Figure 3.4-2**). The HVDC Line planned ROW spans the entire length of the Northwestern Missouri Groundwater Province from Buchanan County east of the Missouri River floodplain to Chariton County, Missouri.

The easternmost segment of the planned Project ROW and the Tiger Connector would fall within the Northeastern Missouri Groundwater Province. The Mississippian aquifer occurs near ground surface in portions of Monroe, Audrain, and Callaway counties, Missouri, near the Tiger Connector.

Groundwater well records provide a simple way to characterize groundwater depths and aquifer productivity. **Table 3.4-1** provides a summary of the average well depth, average depth to groundwater, and average well yield by county in the water resources analysis area. In general, the wells identified in **Table 3.4-1** are drilled deeper than average for the water resources analysis area in central Kansas (Ford, Edwards, Pawnee, Barton, and Russell counties) and in eastern Missouri (Randolph, Monroe, and Callaway counties). There is a strong correlation between average groundwater depth and average well depth across the water resources analysis area, meaning that wells have been drilled deeper in counties where the average depth to groundwater is greater. In Kansas, the deeper groundwater depths and deeper wells correspond to areas where the High Plains aquifer or the Dakota aquifer is the principal groundwater source. The highest average well yields in the water resources analysis area are found in the central Kansas counties utilizing the High Plains aquifer (Ford, Pawnee, and Barton counties). Deeper groundwater and deeper wells in Missouri correspond to the Northeastern Missouri Groundwater Province where water is available from the Mississippian aquifer. Between central Kansas and eastern Missouri, the surficial geology is dominated by alluvium and the glacial drift aquifer, which produce water from shallower depths.

Table 3.4-1. Depth and Yield Characteristics for Active Water Well Permits in the Water Resources Analysis Area

State	County	Number of Wells in Water Resources Analysis Area	Average Well Depth (feet)	Average Groundwater Depth (feet)	Average Well Yield (gallons per minute)
Kansas	Ford	31	190	65	222
Kansas	Hodgeman	1	120	44	No Data
Kansas	Edwards	8	149	66	45
Kansas	Pawnee	26	96	33	897
Kansas	Barton	54	101	46	157
Kansas	Russell	7	125	65	11
Kansas	Osborne	10	46	25	15
Kansas	Mitchell	1	45	19	No Data
Kansas	Cloud	42	71	31	138
Kansas	Washington	49	105	49	145
Kansas	Marshall	6	68	37	16
Kansas	Nemaha	10	105	36	19
Kansas	Brown	16	52	23	15
Kansas	Doniphan	3	48	27	8
Missouri	Buchanan	4	89	12	251
Missouri	Clinton	3	72	8	12
Missouri	Caldwell	11	53	0	4
Missouri	Carroll	5	25	0	3
Missouri	Chariton	7	89	0	85
Missouri	Randolph	2	198	15	13
Missouri	Monroe	1	626	0	60
Missouri	Audrain	5	118	0	4
Missouri	Callaway	4	138	0	5
	Total	**306**	**--**	**--**	**--**

Source: MDNR 2022a; Kansas Geological Survey 2023
Note: The table is organized from west to east along the water resources analysis area.

3.4.3.2 Surface Water

The water resources analysis area spans three major hydrologic regions (2-digit Hydrologic Unit Code) of the central United States: the Arkansas-White-Red Region in central Kansas, the Missouri Region in northern Kansas and northern Missouri, and the Upper Mississippi Region near the far eastern extent (**Figure 3.4-3**).

Within the Arkansas-White-Red Region, the water resources analysis area crosses the Coon-Pickerel, Pawnee, Lower Walnut Creek, and Cow Subbasins (8-digit Hydrologic Unit Code). Each of these subbasins includes or is a tributary to the Arkansas River. The water resources analysis area crosses the Arkansas River in Ford County, Kansas.

Within the Missouri Region, the water resources analysis area crosses 21 different subbasins (**Figure 3.4-3**), including the drainage areas of the Smoky Hill River, Saline River, Solomon River, Republican River, Big Blue River, Delaware River, Big Nemaha River, Platte River, Grand River, and Chariton River. The water resources analysis area crosses the Missouri River at the border between Doniphan County, Kansas, and Buchanan County, Missouri.

Within the Upper Mississippi Region, the water resources analysis area crosses the South Fork Salt Subbasin (**Figure 3.4-3**). This subbasin contains several forks of the Salt River; however, the water resources analysis area does not cross the Salt River or the Mississippi River.

3.4.3.2.1 Surface Water Quality

CWA regulates the discharges of pollutants into waters of the United States (WOTUS) and regulates the quality standards for surface waters. Both the EPA and the USACE have regulatory authority under the CWA. Section 404 of the CWA regulates the discharge of dredge or fill material into WOTUS and is under the jurisdiction of the USACE.

Section 401 of the CWA requires that an applicant for a federal permit who conducts any activity that may result in a discharge to WOTUS must provide the federal regulatory agency with a Section 401 certification from the state in which the discharge originates or will occur, which declares that the discharge would comply with applicable provisions of the act, including state water quality standards. Section 402 of the CWA authorizes the EPA to operate the NPDES permit program, which requires any person to obtain a permit from the EPA or qualified states for point source discharges. Non-point source discharges from routine construction activities are covered under the Construction General Permit for each state.

Section 303(d) of the CWA requires each state to establish, review, and revise water quality standards for surface waters and directs states to develop a list of impaired waters that do not meet water quality standards. The *Missouri Integrated Water Quality Report and Section 303(d) List* (MDNR 2020, 2022b) and the *Kansas Integrated Water Quality Assessment* (KDHE 2022) are prepared every 2 years to satisfy this requirement. Within these reports, the Section 303(d) list details regarding the extent to which surface water goals documented in state water quality standards are being met. A stream segment on the Section 303(d) list is considered impaired when one or more pollutants prevent the waterbody from meeting its designated uses.

The EPA guidelines for CWA integrated reporting and listing decisions (EPA 2006) define three categories of stream impairments:

1. **Category 3**: Water quality data are inadequate to make a use attainment decision for any of a stream's designated uses.
2. **Category 4**: State water quality criteria are not being met in the subject stream, but a total maximum daily load (TMDL) study is not required, either because an approved TMDL is already in place to address the impairment (4a), existing water pollution controls are expected to address the impairment in a reasonable period (4b), or a discrete pollutant or discrete property of the water is not causing the impairment.
3. **Category 5**: At least one discrete pollutant has caused non-attainment with water quality standards, and the waterbody does not meet the qualifications for listing under Category 4 (i.e., a TMDL is needed).

Table 3.4-2 lists the impaired segments and the Category 3, Category 4, and Category 5 impairments for streams in the water resources analysis area. The table is organized by hydrologic subbasin and tabulates data from west to east. Overall, the water resources analysis area intersects 34 impaired waters in Kansas and 6 impaired waters in Missouri. The most common impairments are related to agriculture and include the detection of *Escherichia coli* (*E. coli*, a bacterium derived from animal manure and septic systems); selenium and sulfate (components of some fertilizers); phosphorus (a fertilizer component and essential nutrient for plant growth); and atrazine (an herbicide).

Many of the constituents for which an impairment exists are considered Category 4 impairments, meaning state water quality criteria are not being met, but an approved TMDL is in place to control future pollution for that constituent and improve water quality. The water resources analysis area also intersects four waters in Kansas that are impaired for total suspended solids: the Pawnee River, Paradise Creek, West Fork Wolf Creek, and Big Blue River. The elevated total suspended solids concentrations in these streams are considered Category 5 impairments (at least one pollutant has caused non-attainment with standards and does not meet Category 4 qualifications) that are prioritized for achieving pollutant reductions in the future.

Table 3.4-2. Impaired Stream Segments by Subbasin in the Water Resources Analysis Area

Hydrologic Unit Code	Subbasin Name	Stream Name	Category 3 Impairment	Category 4 Impairment	Category 5 Impairment
11030004	Coon-Pickerel (Kansas)	Arkansas River near Ford	---	*E. coli*, Sulfate	Dissolved Oxygen, Fluoride, Gross Alpha, Selenium
11030005	Pawnee (Kansas)	Pawnee River near Burdett	---	Atrazine, Dissolved Oxygen, *E. coli*, Lead	Total Phosphorus, Total Suspended Solids
11030008	Lower Walnut Creek (Kansas)	Walnut Creek near Heizer	*E. coli*	Dissolved Oxygen, Selenium, Sulfate	Arsenic, Total Phosphorus
10260006	Middle Smoky Hill (Kansas)	Fossil Creek near Russell	Arsenic	Chloride, Sulfate	Atrazine, Selenium, Total Phosphorus
10260006	Middle Smoky Hill (Kansas)	Landon Creek near Russell	Lead	Chloride, Sulfate	Selenium
10260006	Middle Smoky Hill (Kansas)	Sellens Creek near Russell	Atrazine	---	Selenium
10260006	Middle Smoky Hill (Kansas)	Smoky Hill River near Russell	---	Chloride, Sulfate	Selenium, Total Phosphorus
10260006	Middle Smoky Hill (Kansas)	Smoky Hill River near Wilson	---	Chloride, Sulfate	Selenium
10260009	Upper Saline (Kansas)	Paradise Creek near Waldo	---	Chloride, Selenium, Sulfate	Arsenic, Dissolved Oxygen, Total Suspended Solids
10260009	Upper Saline (Kansas)	Saline River near Russell	---	Chloride, Selenium, Sulfate	---
10260010	Lower Saline (Kansas)	West Fork Wolf Creek	---	Chloride, Selenium, Sulfate	Total Suspended Solids
10260014	Lower South Fork Solomon (Kansas)	Covert Creek near Osborne	---	Selenium, Sulfate	---
10260014	Lower South Fork Solomon (Kansas)	Kill Creek near Bloomington	---	Selenium, Sulfate	---

Hydrologic Unit Code	Subbasin Name	Stream Name	Category 3 Impairment	Category 4 Impairment	Category 5 Impairment
10260014	Lower South Fork Solomon (Kansas)	South Fork Solomon River near Osborne	---	Biology, *E. coli*, Selenium, Sulfate	---
10260012	Lower North Fork Solomon (Kansas)	North Fork Solomon River at Portis	---	*E. coli*, Selenium, Sulfate	Arsenic, Biology, Total Phosphorus
10260012	Lower North Fork Solomon (Kansas)	Oak Creek near Cawker City	---	Selenium, Sulfate	Arsenic, Dissolved Oxygen
10260012	Lower North Fork Solomon (Kansas)	Twelve Mile Creek near Downs	---	Sulfate	Total Phosphorus
10260015	Solomon (Kansas)	Limestone Creek near Glen Elder	---	Dissolved oxygen, Selenium, Sulfate	Atrazine, Total Phosphorus
10250017	Lower Republican (Kansas)	Parsons Creek	Atrazine	---	---
10250017	Lower Republican (Kansas)	Peats Creek near Clifton	Atrazine	Total Phosphorus	Lead
10250017	Lower Republican (Kansas)	Republican River near Rice	---	Biology, *E. coli*, pH, Total Phosphorus	Lead
10250017	Lower Republican (Kansas)	Salt Creek near Hollis	---	Dissolved oxygen, *E. coli*, Total Phosphorus	Chloride
10250017	Lower Republican (Kansas)	Wolf Creek near Concordia	*E. coli*	Dissolved oxygen, Total Phosphorus	Arsenic
10270207	Lower Little Blue (Kansas)	Little Blue River near Waterville	---	Atrazine, *E. coli*, Total Phosphorus	Lead
10270205	Lower Big Blue (Kansas)	Big Blue River near Blue Rapids	---	Atrazine, *E. coli*, Total Phosphorus	Lead, Total Suspended Solids
10270205	Lower Big Blue (Kansas)	Black Vermillion River near Frankfort	---	Atrazine, *E. coli*, Total Phosphorus	Biology, Lead
10270205	Lower Big Blue (Kansas)	Robidoux Creek near Frankfort	---	Total Phosphorus	---
10270205	Lower Big Blue (Kansas)	Spring Creek	---	---	Biology
10240007	South Fork Big Nemaha (Kansas)	South Fork Nemaha River near Seneca	Atrazine	Selenium	*E. coli*
10270103	Delaware (Kansas)	Delaware River at Highway 36	---	---	Biology
10240008	Big Nemaha (Kansas)	Walnut Creek near Reserve	---	Fecal coli	Arsenic, Atrazine, Total Phosphorus
10240005	Tarkio-Wolf (Kansas)	Middle Fork Wolf River	---	Biology, *E. coli*	Atrazine
10240005	Tarkio-Wolf (Kansas)	South Fork Wolf River	---	Biology, *E. coli*	Atrazine
10240005	Tarkio-Wolf (Kansas)	Wolf River near Sparks	---	Biology, *E. coli*	Atrazine

Hydrologic Unit Code	Subbasin Name	Stream Name	Category 3 Impairment	Category 4 Impairment	Category 5 Impairment
10240011	Independence-Sugar (Missouri)	Missouri River	---	Chlordane, Polychlorinated biphenyls	*E. coli*
10240012	Platte (Missouri)	Platte River	---	---	*E. coli*
10280103	Lower Grand (Missouri)	Grand River	---	---	*E. coli*
10280103	Lower Grand (Missouri)	Salt Creek	---	---	Dissolved Oxygen
10280202	Lower Chariton (Missouri)	Chariton River	---	*E. coli*	---
10280202	Lower Chariton (Missouri)	Sterling Price Community Lake	---	---	Chlorophyll-a

Sources: MDNR 2022b; KDHE 2022
--- The listed stream does not have an impairment in this category
E. coli: Escherichia coli

3.4.3.3 Floodplains

Floodplains are the level or gently sloping land adjacent to a waterbody that experience periodic flooding. Floodplains typically absorb excess water during heavy rains or snowmelt, reducing the impact of floods on surrounding areas. The land area subject to a one-percent chance of flooding in any given year is normally called the 100-year floodplain. The land area subject to a 0.2-percent chance of flooding in any given year is normally called the 500-year floodplain. It is necessary to evaluate development in the floodplain to ensure that the Project is consistent with the requirements of Executive Order (EO) 11988 (Floodplain Management). EO 11988 directs federal agencies to (1) assert leadership in reducing flood losses and losses to environmental values served by floodplains; (2) avoid actions located in or adversely affecting floodplains unless there is no practicable alternative; and (3) take actions to mitigate floodplain losses if avoidance is not practicable. In response to EO 11988, DOE enacted 10 CFR 1022, which directs DOE to (1) determine whether a proposed action would be located in a floodplain and/or a defined wetland; and (2) prepare an assessment that discusses the positive and negative, direct and indirect, and long and short-term effects of the proposed action on the floodplain and/or wetland. A number of permanent transmission structures would be located within the floodplain; however, the transmission structures are considered repetitive actions in the 100-year floodplain and do not require a floodplain assessment under 10 CFR 1022. As the design and siting of other permanent features (e.g. converter stations and optical regeneration facilities) are finalized, LPO would review the features in accordance with 10 CFR 1022. Additionally, Kansas and Missouri state statutes and regulations require applicable agencies to administer a permit program for construction in floodplains (**Appendix 1-2**). If necessary, the Project would pursue a Floodplain Fill Permit from Kansas Department of Agriculture (KDA), Division of Water Resources and a Floodplain Development Permit from Missouri Department of Public Safety, State Emergency Management Agency.

The Project area encompasses 1,099 acres of mapped floodplains, including 1,080 acres in Zones A or AE and 19 acres in Zone B (see **Appendix 1.1**). Zone A or AE comprises the 100-year floodplain (base floodplain), where there is a 1 percent chance of flooding in any given year, and Zone B comprises the 500-year floodplain (critical action floodplain), where there is 0.2 percent chance of flooding in any given year (FEMA 2023). Approximately 87.6 acres within the Project area are considered Special Flood Hazard Areas with High Flood Risk.

FEMA has not delineated 100-year floodplains for some sparsely populated areas of Kansas, including the segments of Hodgeman County, Russell County, and Osborne County that would be crossed by the HVDC portion of the Project. These counties correspond to the Upper Saline, Lower Saline, Lower South Fork Solomon, and a small section of the Coon-Pickerel subbasin. The Project area may cross additional floodplains in these unmapped segments that are not accounted for in the acreage presented in the paragraph above.

3.4.3.4 Wetlands and Waterbodies

Wetlands are areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and in normal conditions do support, a prevalence of vegetation adapted for life in saturated soil conditions (COE 1987). Wetlands serve several functions, including but not limited to, water filtration, flood control, groundwater recharge, biodiversity, wildlife habitat, and climate regulation.

On August 29, 2023, the EPA and USACE issued a final rule amending the “Revised Definition of the ‘Waters of the United States’” rule that was first published in the Federal Register on January 18, 2023 (EPA 2023b). The final, amended rule, published in the Federal Register (FR) on September 8, 2023 (88 FR 61964), conforms the definition of “waters of the United States” to the U.S. Supreme Court’s May 25, 2023, decision in the case of *Sackett v. U.S. Environmental Protection Agency* (*“Sackett”*) (EPA 2023c). The *Sackett* decision removed the “significant nexus” test when identifying tributaries and other waters, including wetlands, as federally jurisdictional. The *Sackett* decision also resulted in the EPA and USACE revising the definition of the term “adjacent” (40 CFR 120.2(c)(2); 33 CFR 328.3(c)(2)), which is now defined as “having a continuous surface connection” (Revised Definition of ‘‘Waters of the United States’’; Conforming, 2023). Therefore, under the September 8, 2023, final rule, “waters of the United States” include (1) traditionally navigable waters, territorial seas, or interstate waters (“Jurisdictional Waters”); (2) impoundments of Jurisdictional Waters; (3) tributaries to Jurisdictional Waters or Jurisdictional Impoundments that are relatively permanent, standing, or continuously flowing bodies of water (“Jurisdictional Tributaries”); (4) wetlands that are adjacent to Jurisdictional Waters or are adjacent to Jurisdictional Impoundments or Jurisdictional Tributaries that are relatively permanent, standing, or continuously flowing; and (5) intrastate lakes and ponds not included in the previous categories that are relatively permanent, standing, or continuously flowing bodies of water with a continuous surface connection to Jurisdictional Waters, Jurisdictional Impoundments, or Jurisdictional Tributaries (EPA 2023c).

Due to ongoing litigation, within the states of Kansas and Missouri, the EPA and USACE are currently interpreting “waters of the United States” consistent with the “pre-2015” regulatory regime and the *Sackett* ruling (EPA 2023c). Under the pre-2015 regulatory regime, consistent with *Sackett*, the agencies will not assert jurisdiction based on the “significant nexus” standard, will not assert jurisdiction over interstate wetlands solely because they are interstate, will interpret “adjacent” to mean “having a continuous surface connection,” and will limit the scope of the "other waters” provision to only relatively permanent lakes and ponds that do not meet one of the other jurisdictional categories (USACE and EPA 2023).

The amount of potentially jurisdictional wetlands and streams within the Project area provides a baseline for understanding the scale of potential impacts and the regulatory review process under CWA Section 404. The primary data sources for wetlands include the National Wetlands Inventory (NWI) (USFWS 2023a), soil surveys (Soil Survey Staff 2020a, 2020b, 2022), the national hydrography dataset (USGS 2017), 2020 orthoimagery, LiDAR-generated contours, and aerial imagery available through Google Earth (Google Earth 2022).

By area, wetlands make up about 0.8 percent of Kansas and 1.4 percent of Missouri (USGS 1996, Corson 2023). As described in **Section 3.4.3.2.1**, the western portion of the Project area in Kansas is drier than the eastern portion. Thus, the western portion of the Project area contains more temporary wetlands (i.e., only wet for portions of the growing season, such as prairie potholes or vernal pools) and less frequent drainageways than the eastern portion of the Project area, where wetlands are more likely to have standing water year-round. The KDWP's Cheyenne Bottoms Wildlife Area and the USFWS Quivira National Wildlife Refuge are two important examples of internationally significant wetlands within 25 miles of the Project area.

Wetlands across the Project area were identified using the USFWS National Wetland Inventory (NWI) maps (USFWS 2023a), with selected locations in the Project area field surveyed in 2021, 2022, and 2023. Wetlands are classified into different types according to the USFWS's Cowardin classification system (Cowardin et al. 1979). An estimated acreage of wetlands is provided in **Table 3.4-3**. Map panels showing wetland types and streams along the planned Project ROW are included in **Appendix 3.4**. The NWI shows only an estimated representation of wetlands; therefore, wetlands at the site would be field surveyed as part of the permitting process.

Table 3.4-3. Summary of Wetland Types in the Project Area

Type (Code)	Description[1/]	Acres in Project Area	Percentage of Project Area[2/]
Palustrine Aquatic Bed (PAB)	Non-tidal wetlands dominated by plants that live on or below the surface of the water.	19.3	0.14 %
Palustrine Emergent (PEM)	Non-tidal wetlands less than 6.6 feet in depth. Persistent emergent vegetation cover across 30 percent or more of the area.	55.4	0.41%
Palustrine Forested (PFO)	Non-tidal wetlands less than 6.6 feet in depth. Persistent trees cover 30 percent or more of the area. Dominant species are 19.7 feet high or taller.	74.9	0.55%
Palustrine Scrub-Shrub (PSS)	Non-tidal wetlands less than 6.6 feet in depth. Persistent trees or shrubs cover 30 percent or more of the area. Dominant species are less than 19.7 feet tall.	4.5	0.03%
Palustrine 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.	26.0	0.19%
Palustrine Unconsolidated Shore (PUS)	Non-tidal wetlands having two characteristics: (1) unconsolidated substrates with less than 75 percent areal cover of stones, boulders or bedrock and (2) less than 30 percent areal cover of vegetation	1.9	0.01%
Riverine Unconsolidated Bottom (R2U) (R5U)	Non-tidal wetlands and deepwater habitats with at least 25% cover of particles smaller than stones (less than 6-7 cm) and a vegetative cover less than 30%.	40.4	0.30%
Riverine Streambed (R4S)	Includes all wetlands contained within the Intermittent Subsystem of the Riverine System and all channels of the Estuarine System or of the Tidal Subsystem of the Riverine System that are completely dewatered at low tide.	59.0	0.43%
Lacustrine Unconsolidated Bottom (L1U)	Includes all wetlands and deepwater habitats with at least 25% cover of particles smaller than stones (less than 6-7 cm) and a vegetative cover less than 30%.	1.1	0.01%
	TOTAL	**282.5**	**2.07%**

Source: Cowardin et al. 1979
[1/] All identified wetlands were included, regardless of jurisdictional status under the CWA.
[2/] Based on the total Project area acreage of 13,641 acres.

Playas are relatively small, shallow depressions found in the western Great Plains. These basins are lined with clay soil that hold water from rainfall and runoff and support temporary wetlands or waterbodies (PLJV 2024). There are 20 playas that overlap the water resources analysis area. All except one of the playas are farmed and not considered healthy (PLJV 2024).

In addition to wetlands, waterbodies may be jurisdictional under the CWA Section 404 authority and may also be subject to the Rivers and Harbors Act of 1899 (RHA), which pertains to activities in navigable WOTUS.[1] USACE regulates impacts to navigable waters pursuant to RHA Section 10 (33 U.S.C. Section 403).

Waterbodies that may occur within the Project area include perennial, intermittent, and ephemeral streams, including canal/ditches. Perennial streams are rivers and streams that have continuous surface water flow year-round. Except in cases of significant drought, they are fed by sufficient groundwater to maintain their flow. Intermittent streams are rivers and streams that flow continuously most of the time but may stop flowing for a short period every year or every few years. They may have less groundwater flow than a perennial river, but they are not wholly dependent on precipitation and runoff like ephemeral streams. Ephemeral streams rely solely on precipitation and runoff for their flow. However, this seasonal, or event flow is still important to the quality of aquatic habitat, life, chemistry, and physical properties of downstream flows. These types of waterbodies are important connections between upland and wetland, floodplain areas, and surface water and groundwater. Canals and ditches are classified as artificial open waterways constructed to transport water, to irrigate or drain land, to connect two or more bodies of water, or to serve as a waterway for watercraft.

Waterbodies across the Project area were identified using the U.S. Geological Survey (USGS) National Hydrography Dataset (NHD). The NHD represents the water drainage network with features such as rivers, streams, canals, lakes, and ponds. A summary of waterbody types in the Project area by linear foot of is provided in **Table 3.4-4**. Map panels showing waterbodies along the Project area are included in **Appendix 3.4** and **Appendix 1.1**. The NHD shows only an estimated representation of waterbodies; therefore, waterbodies would be field surveyed as part of the permitting process.

Table 3.4-4. Summary of Waterbody Types in the Project Area

Type	Linear Feet Crossed by Project Area
Perennial	27,587
Intermittent	217,710
Ephemeral	2,375
Canal/Ditch	1,265
Artificial Path[1/]	7,410
TOTAL	**256,347**

Source: USGS 2017
[1/] Artificial paths carry the name of the adjacent flowline feature and would be delineated with field surveys.

In Kansas, the water resources analysis area crosses 7 streams that the Kansas Department of Health and Environment has assigned special-status water quality designations: Blood Creek (**Appendix 3.4** Map 46 and 47), Saline River (**Appendix 3.4**, Map 64 and 65), Smoky Hill River (**Appendix 3.4**, Map 56 and 57), Republican River (**Appendix 3.4**, Maps 113, 117,and 118), South Fork Big Nemaha River

[1] Navigable waters for purposes of the RHA are defined at 33 CFR 329.4 as “are those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce.”

(**Appendix 3.4**, Map 151), Rock Creek (**Appendix 3.4**, Map 174) and Missouri River (**Appendix 3.4**, Map 177, **Table 3.4-5**). The special-status streams are classified as exceptional state waters, special aquatic life use waters, or both. Exceptional state waters are of remarkable quality or of significant recreational or ecological value and are afforded the highest level of water quality protection. Special aquatic life use waters contain combinations of habitat types and indigenous biota not found commonly in the state or contain populations of state and/or federally listed threatened or endangered species.

Table 3.4-5. Special Status Streams in Kansas Crossed by the Water Resources Analysis Area

County	Stream	Special Status Designation
Barton	Blood Creek	Exceptional, Special Aquatic Life Use
Russell	Saline River	Exceptional
Russell	Smoky Hill River	Exceptional, Special Aquatic Life Use
Cloud	Republican River	Special Aquatic Life Use
Nemaha	South Fork Big Nemaha River	Special Aquatic Life Use
Doniphan	Rock Creek	Special Aquatic Life Use
Doniphan	Missouri River	Special Aquatic Life Use

Source: KDHE 2007

In Missouri, the water resources analysis area crosses the watershed of four outstanding state resource waters as classified by MDNR (2022c): Shoal Creek, Log Creek, Brush Creek, and Crabapple Creek. The watershed crossings occur upstream of the protected segments, which are located in the Bonanza Conservation Area in Caldwell County, Missouri, approximately 3 miles north of the water resources analysis area.

3.4.4 Environmental Consequences of Proposed Federal Action

3.4.4.1 Methods and Assumptions

Impacts to groundwater and surface water are described in terms of changes to available water supplies and existing water quality. The analysis for water quality assumed that the Applicant would implement a SPCC Plan and a SWPPP under the Construction General Permit for each state to limit impacts to water quality. Impacts to floodplains, wetlands, and waterbodies were calculated by intersecting the features of interest with areas of permanent and temporary surface disturbance obtained from the Project representative disturbance model.

The analysis of impacts to water resources assumes that the EPMs listed in **Appendix 2.4** would be implemented to minimize impacts to water quality, water supply, floodplains, wetlands, and waterbodies.

3.4.4.2 Construction

3.4.4.2.1 Water Supply

Two major activities to consume the largest volume of water for the Project include mixing concrete for the transmission structure foundations and applying water to temporary workspaces and access routes for dust control. Concrete for the transmission structure foundations would generally require 30 gallons of water per cubic yard of concrete. Total water consumption for concrete mixing for the HVDC Line, the Tiger Connector, and the Ford County Interconnect is expected to exceed 5.3 million gallons. This total equates to approximately 13,000 gallons per day of consumptive water use during foundation construction (**Table 3.4-6**).

Controlling dust emissions from temporary workspaces and access routes is estimated to consume an additional 138 million gallons of water, or 192,000 gallons per day of use, during construction (**Table 3.4-6**). This estimate assumes that there would be six water trucks operating at any given time during construction, with each truck applying an average of 32,000 gallons per day for dust control. The daily application rate may fluctuate seasonally and geographically, with above average water use required during the summer months or in drier parts of the Project area, such as central Kansas.

Water for dust control would also be needed during initial site preparation and grading of the two HVDC converter station locations. The total estimated dust control water volume for the converter stations is 1.28 million gallons, or 64,000 gallons per day (**Table 3.4-6**), which is anticipated to require 20 working days per station.

Table 3.4-2. Estimated Consumptive Water Use During Project Construction

Construction Activity	Estimated Duration (days)	Daily Estimated Water Use (gallons)	Total Estimated Water Use (gallons)
Concrete mixing for transmission structure foundations	408	13,000	5,307,000
Dust control along transmission line planned ROW	720	192,000	138,240,000
Dust control for HVDC converter station preparation and grading	20	64,000	1,280,000
		Total	**144,827,000**

Source: Data provided by Invenergy

The water supply used to support Project construction would vary depending on location and could include purchasing treated groundwater or surface water from a municipal supplier. Where groundwater sources are used, the additional water pumped to meet construction needs would likely capture seasonal groundwater recharge or discharge or permanently remove water from aquifer storage. Effects of removing groundwater from aquifer storage would be most pronounced in areas where natural recharge is already limited, such as the High Plains aquifer in central Kansas. Where surface water sources are used to meet Project water supply needs, the additional use would have a greater proportional impact on streams in central Kansas because they tend to have lower average flow rates compared to the rest of the water resources analysis area.

In Kansas, water use is regulated under the Kansas Water Appropriation Act, which is designed to protect both the people’s right to water use and the state’s future supplies. Under the Water Appropriation Act, it is illegal to use water for purposes other than domestic supply without holding a water right. The law is administered by Kansas Division of Water Resources, which issues permits to appropriate water, regulates water use, and maintains records of all water rights in the state. There are no state laws, regulations, or policies in Missouri that specify the quantity of water that any diverter may use. Missouri does require registration for major water uses of 100,000 gallons per day (approximately 70 gallons per minute) for combined wells or surface water intakes. These major users are required to report the volume used. The Project would apply for all applicable Kansas and Missouri water rights permits and registrations (**Appendix 1.2**).

Impacts from consumptive water use would likely be greatest in central Kansas, where available water supplies are smaller and the demand for dust control water could be higher compared to the rest of the Project due to the drier climate. The magnitude of potential impact would decrease from west to east along the Project area as the climate becomes more humid and available water supplies more abundant.

Local water supplies could also be impacted if private water wells near the Project are accidentally damaged during construction. **Table 3.4-1** indicates that there are 306 total wells within the water resources analysis area. These wells could be damaged during construction through collisions with light-duty vehicles or heavy equipment. Potential impacts would be mitigated by identifying private wells in the field and taking measures to prevent damage.

Abandoned water wells may exist within the Project area and can pose a hazard to groundwater as they create direct pathways for contaminants to enter aquifers. If left unplugged, these wells can allow pollutants from surface activities, like pesticides, fertilizers, runoff, to seep directly into groundwater supplies without undergoing the natural filtration through the surface. Plugging of abandoned water wells typically falls under the responsibility of the landowner and/or respective state. If abandoned wells are identified in the field, the Applicant would take measures to prevent damage to the well, use applicable EPMs to prevent contaminants and runoff from entering the wells, and notify the landowner and state of the well location.

3.4.4.2.2 Water Quality

Permanent and temporary surface disturbance could increase the potential for wind and water erosion in some areas. Construction of transmission structures, optical regeneration facilities, and the HVDC converter stations would also cause soil compaction that may alter the timing and magnitude of water runoff. Areas where vegetation has been removed would be more prone to sheet flow and development of erosional channels. Such processes can wash away disturbed, loose soil, transporting the eroded sediment away from the construction site. Changes in runoff and erosion resulting from construction surface disturbance may cause water quality degradation by increasing turbidity and sediment loads in nearby streams. The degree of impact would depend on the distance, slope, and vegetation cover between the surface disturbance area and the nearest surface water feature. In areas of agricultural land use, surface disturbance of the uppermost soil layer could also mobilize applied chemicals, such as herbicides and nutrients from fertilizer. As shown in **Table 3.4-2,** several streams in the water resources analysis area are already impaired for these types of constituents.

The Project area crosses 26 hydrologic subbasins (**Figure 3.4-3**), with approximately 7,554 acres of estimated permanent and temporary surface disturbance and habitat conversion for the Project (**Table 3.4-7**). The total surface disturbance would be highest at either end of the HVDC line, located in the Coon-Pickerel and South Fork Salt Subbasins (1,655 acres of estimated disturbance), where the new HVDC converter stations and AC transmission lines for interconnection between the converter station and substation would be constructed. Over half of the permanent and temporary surface disturbance and habitat conversion would occur in 7 of the 26 subbasins crossed by the Project: Coon-Pickerel (1,060 acres, 14.1 percent of total Project surface disturbance), South Fork Salt (595 acres, 7.9 percent), Lower Republican (567 acres, 7.6 percent), Upper Grand (465 acres, 6.2 percent), Lower Big Blue (444 acres, 5.9 percent), Independence-Sugar (403 acres, 5.4 percent), Lower Grand (388 acres, 5.2 percent), and Platte (367 acres, 4.9 percent). Subbasins generally are between 250,000 acres and 448,000 acres. Total surface disturbance within the Coon-Pickerel subbasin, which would experience the highest percentage of the surface disturbance, would occur over less than 1 percent of the whole subbasin region. These areas would have a higher concentration of Project surface disturbance and are more likely to experience water quality impacts compared to the other subbasins where surface disturbance would be less concentrated. The Applicant would manage the potential for water quality impacts through implementation of EPMs as described in **Appendix 2.4**. Applicable EPMs include developing and implementing an SWPPP that details erosion and sedimentation control measures to be used before and during construction. It is noted that additional erosion controls may be required for segments impaired for total suspended solids where TMDLs are in place (**Table 3.4-2**).

Table 3.4-73. Permanent and Temporary Disturbance by Subbasin in the Water Resources Analysis Area

Hydrologic Unit Code	Subbasin Name	Permanent Disturbance (acres)	Habitat Conversion (acres)	Temporary Disturbance (acres)	Total Disturbance (acres)
11030004	Coon-Pickerel (Kansas)	123.6	74.4	861.7	1,059.7
07110006	South Fork Salt (Missouri)	83.5	128.9	382.7	595.1
10250017	Lower Republican (Kansas)	0.2	81.6	485.1	567.0
10280101	Upper Grand (Missouri)	0.4	171.0	293.9	465.3
10270205	Lower Big Blue (Kansas)	0.4	107.8	336.1	444.3
10240011	Independence-Sugar (Missouri)	0.4	108.9	293.5	402.8
10280103	Lower Grand (Missouri)	0.4	125.2	262.7	388.2
10240012	Platte (Missouri)	0.1	124.5	242.7	367.2
10260015	Solomon (Kansas)	0.4	20.6	255.8	276.7
10280203	Little Chariton (Missouri)	0.1	85.9	180.5	208.2
10240005	Tarkio-Wolf (Kansas)	0.1	80.7	178.6	259.4
10260006	Middle Smoky Hill (Kansas)	0.1	76.7	175.7	252.5
10270207	Lower Little Blue (Kansas)	0.4	39.4	202.7	242.4
10260012	Lower North Fork Solomon (Kansas)	0.1	20.5	215.1	235.7
10300102	Lower Missouri-Moreau (Missouri)	0.1	34.6	149.9	184.5
10260014	Lower South Fork Solomon (Kansas)	0.3	25.5	170.9	196.7
10300101	Lower Missouri-Crooked (Missouri)	0.1	70.9	124.6	195.5
11030005	Pawnee (Kansas)	0.4	14.7	172.3	187.4
10240007	South Fork Big Nemaha (Kansas)	0.1	49.9	112.1	162.0
10260010	Lower Saline (Kansas)	0.1	22.2	130.5	152.8
10260009	Upper Saline (Kansas)	0.1	33.3	128.6	161.9
10270103	Delaware (Kansas)	0.1	35.5	107.0	142.5
10280202	Lower Chariton (Missouri)	0.1	27.6	105.9	133.6
11030011	Cow (Kansas)	0.3	16.6	73.7	90.6
11030008	Lower Walnut Creek (Kansas)	0.0	14.5	63.2	77.8
10240008	Big Nemaha (Kansas)	0.0	5.5	39.7	45.2
	Total[1/]	**211.6**	**1,596.6**	**5,745.2**	**7,553.4**

Source: USGS 2017
[1/] Totals may not add up due to rounding.

Clearing vegetation can cause stream temperature increases if adjacent streams receive less shade after clearing (Johnson 2004; Kaushal et al. 2010). As shown in **Table 3.4-2**, no streams in the water resources analysis area have listed temperature impairments, suggesting that elevated water temperatures are currently not a widespread problem in this part of Kansas and Missouri. Due to the lack of forested vegetation in the prairie region, current conditions indicate there may be a larger allowable increase in temperature until a threshold is met. Approximately 689 acres of Forest and Woodland Vegetation (including Forest and Woodland Wetland and Riparian Vegetation) would be removed or converted to Shrub and Herb Vegetation (**Table 3.5-4** in **Section 3.5**) Streams within these areas are susceptible to temperature increases.

Chemicals planned for use during Project construction include diesel fuel, gasoline, ethylene glycol (a coolant), hydraulic fluids, and lubricants used for machinery. Surface water quality could be impacted if any of these chemicals are spilled during construction or refueling and flow into an adjacent waterbody. Impacts to groundwater quality could also be possible if a spill or release goes undetected and infiltrates the uppermost aquifer. The Applicant would manage potential water quality impacts from spills through application of the EPMs noted in **Appendix 2.4**, including developing and implementing a Spill Prevention and Response Plan that specifies requirements for chemical storage and spill containment. These measures would help prevent spills or ensure they are remediated promptly to prevent impacts to water quality.

Other potential impacts to water quality could arise from deep concrete pile foundations (typically 15 feet to 25 feet) required for the transmission structures. Deep concrete piles could affect water quality by increasing the groundwater pH where they encounter shallow groundwater. High groundwater pH causes a bitter taste, causes water pipes and water-using appliances to become encrusted with deposits, and depresses the effectiveness of the disinfection of chlorine, thereby causing the need for additional chlorine when pH is high. High pH corrodes or dissolve metals into water, increasing toxicity levels and therefore reducing the water quality. Impacts to groundwater pH are more likely to occur along the central and eastern portions of the water resources analysis area where average depths to groundwater are generally shallower. Such impacts are caused by groundwater contacting the concrete before it is fully cured. Due to the relatively slow groundwater flow rates present in most aquifers, and the relatively fast cure time for the concrete foundations, the amount of groundwater contacting the uncured foundations would typically be small, limiting groundwater pH changes to a localized area beneath the transmission structures.

Dewatering of shallow groundwater may also be needed to facilitate installation of deep foundations. The Applicant would obtain dewatering permit(s) from appropriate agencies, if required, and would manage potential impacts to water quality from dewatering through standard practices applied to prevent the discharge of contaminated or sediment-laden water from reaching nearby waterbodies (**Chapter 2**).

3.4.4.2.3 Floodplains

Under the Proposed Action, the Project would disturb approximately 633 acres of 100-year floodplains (**Table 3.4-8**). Most of this surface disturbance would be temporary (388 acres) or habitat conversion (243 acres) and would originate from access routes, temporary workspaces around transmission structures, and other temporary workspaces (e.g., pull or tension sites). Permanent disturbance would occur from 115 transmission structures and one optical regeneration facility and driveway located in floodplains. No permanent disturbance in floodplains would occur within the HVDC converter station parcels.

Consistent with EO 11988, access routes are considered to be repetitive actions in the 100-year floodplain that should result in only minor impacts. To minimize adverse impacts, any road improvements would be done in such a manner that upstream flood elevations would not be affected. Some tree clearing may occur within floodplains, causing a slight increase in flood storage capacity, which would result in a beneficial impact to floodplains. Consistent with EO 11988, the installation of transmission structures, access routes, culverts, and fencing are considered repetitive actions in the 100-year floodplain, which would result in minor impacts. Culvert installation within streams and floodplains may be necessary to provide access to the Project area during construction. EPMs would be implemented to prevent impacts at stream crossings, as described in **Appendix 2.4**.

The planned temporary surface disturbance areas in 100-year floodplains would not increase flooding damage unless a large flood occurred while a temporary surface disturbance area was occupied with construction materials or equipment or post construction while the temporary surface disturbance area was in the process of revegetating. Assuming Project construction would require 44 months, the chance of a 100-year flood affecting construction is 3.7 percent (National Weather Service 2023). The likelihood of impacts in any one floodplain area would be even lower given that only a portion of the Project would be under construction at a time. To prevent flood impacts, the Applicant would monitor weather forecasts and move construction equipment out of flood-prone areas if prolonged heavy rainfall is forecasted. As such, flood-related impacts in temporary surface disturbance areas are expected to be minimal.

Table 43.4-8. Permanent and Temporary Surface Disturbance in Floodplain Acreage by Subbasin in the Project Area

HUC8	Name	Permanent (Acres)	Temporary (Acres)	Habitat Conversion (Acres)[1/]
11030004	Coon-Pickerel	<0.1	88.1	15.6
11030005	Pawnee	<0.1	5.0	0.2
11030008	Lower Walnut Creek	<0.1	23.3	7.6
11030011	Cow	<0.1	4.8	2.9
10260006	Middle Smoky Hill	--	<0.1	0.4
10260012	Lower North Fork Solomon	<0.1	--	--
10260015	Solomon	<0.1	--	--
10250017	Lower Republican	<0.1	88.1	32.0
10270207	Lower Little Blue	<0.1	17.1	6.5
10270205	Lower Big Blue	<0.1	26.4	15.1
10240007	South Fork Big Nemaha	<0.1	9.8	14.0
10270103	Delaware	<0.1	1.4	4.9
10240008	Big Nemaha	--	--	0.5
10240005	Tarkio-Wolf	<0.1	1.4	15.7
10240011	Independence-Sugar	<0.1	--	18.1
10240012	Platte	--	3.5	13.6
10280101	Upper Grand	<0.1	6.9	12.7
10300101	Lower Missouri-Crooked	<0.1	1.8	4.0
10280103	Lower Grand	<0.1	49.5	23.6
10280202	Lower Chariton	<0.1	30.5	11.4
10280203	Little Chariton	<0.1	21.8	11.2
10300102	Lower Missouri-Moreau	<0.1	0.7	3.1
07110006	South Fork Salt	<0.1	8.0	29.4
	Total[2/]	**2.0**	**387.9**	**242.7**

Sources: FEMA 2023
HUC8: Hydrologic Unit Code 8
[1/] See Table 2-1 for details on the disturbance model and habitat conversion.
[2/] Column values may not exactly sum to the column total due to rounding.

The Project would impact approximately 2 acres of floodplain from new permanent transmission line structures. Consistent with EO 11988, overhead transmission lines and related support structures are considered repetitive actions in the 100-year floodplain that should result in minor impacts. The conducting wires of the transmission line would be located well above the 100-year flood elevation. The support structures for the transmission line would not be expected to result in any increase in flood hazard, either as a result of increased flood elevations or changes in flow-carrying capacity of the streams being crossed.

The presence of permanent structures, such as optical regeneration facilities, could locally obstruct flood flows and decrease the flood zone's capacity for retaining flood waters, potentially causing an increase in base-flood levels. This could also result in expansion of the flood zone into non-zone areas and thus increase the likelihood for flooding in areas previously not susceptible, Flooding may also prevent or delay access for repairs, causing power outages during extreme weather events that could lead to significant public safety concerns. However, the Project infrastructure located in flood zones is limited to temporary disturbance and transmission line structures; this footprint is relatively small in comparison to the local flood zone and any displacement of water during a flood event is expected to be minimal.

Approximately 104 acres of the potential floodplain impacts would occur from temporary disturbance and habitat conversion at the HVDC converter station in Ford County, Kansas. The parcel size is approximately 308 acres, of which 185 acres would be subject to temporary disturbance during construction, and 123 acres would be permanently developed for the converter station. Site development designs are under development which would avoid permanent development and minimize temporary development in a floodplain. Once designs have been developed, LPO would complete a review in accordance with 10 CFR 1022, as needed, and any required local permits, including associated hydrological analysis, would be obtained and conducted for permanent impacts to floodplains.

Authorization from the appropriate counties would be obtained as needed for the aforementioned improvements within the floodplain. By adhering to the appropriate EPMs during construction, the proposed transmission construction would have no permanent impact on floodplains and their natural and beneficial values. No impacts to lives or property are expected.

3.4.4.2.4 Wetlands and Waterbodies

The types of impacts that may occur in wetlands from Project construction include impacts to hydrology (alteration of natural flow patterns, increased flooding); water quality (higher sedimentation and pollution); and biology (habitat loss that could affect plant and animal species distribution and reduce biodiversity). These types of impacts include the following:

1. Temporary sedimentation by tracking adjacent soil material into the wetland during construction.
2. Temporary increase in turbidity from transporting vehicles and equipment through the wetland, often creating ruts and churning the wet soils. This can cause sediment to wash out of the wetland and potentially into other aquatic habitats.
3. Compaction of hydric soils, reducing the water-holding capacity of certain wetlands. While this is a ground disturbance, restoring the affected wetland would depend on successful decompaction of the hydric soil layer.
4. Loss of hydrologic integrity and alteration of hydrology, especially to wetlands that depend on a low-permeability bottom layer to hold water. This can occur when vehicle tires rip through the bottom layer of a wetland, allowing water to percolate into subsoils, potentially draining or drying the wetland. To minimize disturbance, vehicles, except those specified for wetland use with low ground pressure (e.g., utility terrain vehicles, tracked vehicles, or vehicles with low-pressure tires), would utilize wetland matting when traveling across wetland areas. Matting would not be used to access the ROW when conditions are determined to be too wet for construction or maintenance activities. Any matting used would be removed from the ROW at the conclusion of construction or maintenance activity.
5. Change of the wetland type from clearing the wetland. This most often occurs where forested wetlands must be cleared permanently and converted to emergent wetlands.
6. Temporary contamination of the wetland water quality through accidental spills.

7. Changes to the elevation of a wetland through grading, dredging, or adding fill, which can impact its long-term viability to remain a wetland, causing a gradual loss of wetland resources.
8. Changes to the hydrologic connectivity of wetlands due to culvert installation for temporary access routes.
9. Introduction of invasive species into the wetland by construction activities and equipment.

Project components, including temporary workspaces, were sited outside of a 50-foot buffer around wetlands and streams, when practicable. **Table 3.4-9** and **3.4-10** summarize the estimated wetlands and waterbodies, respectively, that would be impacted by construction in the Project area. Based on available data, 35.3 acres of wetlands inside the Project area would be temporarily disturbed. There are 122.4 acres of wetlands within the Project area that would be permanently converted and maintained as emergent wetlands, including 2.4 acres of palustrine scrub-shrub wetlands and 55.3 acres of palustrine forested wetlands. The Project area has less than one acre of wetlands that would be permanently impacted by the location of permanent Project facilities. All disturbance calculations are a conservative estimation of direct impacts and based on assumptions presented in the disturbance model (**Table 2-1**). These impact estimates would be refined and finalized once avoidance and/or mitigation measures are finalized during Section 404 consultation with the USACE.

The Project would temporarily disturb 0.9 acres of playa wetlands. Approximately 0.3 acres of permanent disturbance is proposed in playas. All playas that overlap disturbance are currently farmed and are not considered healthy (PLJV 2024).

The Project would temporarily disturb 43,825 linear feet of waterbodies and permanently impact 2 linear feet (**Table 3.4-10**). All disturbance calculations are likely a conservative estimate of direct impacts and based on assumptions presented in the disturbance model (**Table 2-1**). These impact estimates would be refined and finalized once avoidance and/or mitigation measures have been finalized during Section 404 consultation with the USACE. Ground-based stream crossings required for the Project would generally be bridged or culverted in accordance with the EPMs specified in **Appendix 2.4** to avoid vehicles or equipment physically driving through the stream channel, which could degrade the condition of the stream bed, causing erosion and potential water quality impacts. Additionally, vehicles, except those specified for wetland use with low ground pressure (e.g., utility terrain vehicles, tracked vehicles, or vehicles with low-pressure tires), would utilize wetland matting when traveling across wetland areas.

The Applicant is proposing to span all six streams that the KDHE has assigned special-status designations, which include Blood Creek, Saline River, Smoky Hill River, Republican River, South Fork Big Nemaha River, and Missouri River. The placement of transmission lines across the streams would be managed according to the EPMs to ensure that construction activities do not impact the streams. No impacts to these Kansas special-status streams are anticipated as a result of the Project.

Depending on the individual wetlands or streams being impacted, mitigation measures may be required. These measures, which could include restoration in place or securing wetland/stream bank credits, would be determined through the Section 404 of the CWA permitting process through coordination with USACE. **Table 1** in **Appendix 1.2** outlines permits and authorizations that may be required for Project construction. It is anticipated that Project activities requiring Section 404 authorization would fall under the existing USACE Nationwide Permit (NWP) #57: Electric Utility Line and Telecommunications Activities. The mitigation measures required, and the temporary nature of most impacts, would limit long-term impacts to wetlands and streams in the Project area.

The Missouri River is the only navigable water crossed by the Project where RHA Section 10 applies. The proposed crossing of the Missouri River is depicted in the map panels in **Appendix 3.4** and discussed in **Section 3.9**. The USACE would decide whether to authorize the Project under Section 404 of the CWA and Section 10 of the RHA.

Table 3.4-9. Wetlands Impacted by Project Construction

Area	Wetland Type Code	Temporary Disturbance in Project Area (acres)	Permanent Disturbance in Project Area (acres)	Acres of Wetland Type Conversion
HVDC Line	PAB	1.41	0.00	3.71
	PEM	8.02	<0.01	11.03
	PFO	3.98	0.00	55.29
	PSS	0.47	0.00	2.39
	PUB	2.17	<0.01	7.17
	PUS	0.20	0.00	0.14
	R2U/R5U	2.35	0.00	19.54
	R4S	9.58	<0.01	15.57
	L1U	0.00	0.00	0.09
Tiger Connector and HVDC Converter Station	PAB	0.00	0.00	0.00
	PEM	<0.01	0.00	0.02
	PFO	0.11	0.00	4.06
	PSS	0.00	0.00	0.00
	PUB	0.33	0.00	0.26
	PUS	0.00	0.00	0.00
	R2U/R5U	0.00	0.00	0.75
	R4S	1.48	0.00	2.32
	L1U	0.00	0.00	0.00
Ford County Interconnect and HVDC Converter Station	PAB	0.00	0.00	0.00
	PEM	4.57	0.00	0.00
	PFO	0.00	0.00	0.00
	PSS	0.00	0.00	0.00
	PUB	0.00	0.00	0.00
	PUS	0.46	0.00	0.00
	R2U/R5U	0.00	0.00	0.00
	R4S	0.21	0.00	0.00
	L1U	0.00	0.00	0.00
	Total	**35.33**	**0.01**	**122.35**

HVDC: high-voltage direct current
Note: Impacts presented in this table are preliminary and would be finalized once delineations are completed and impact calculations are determined.

Table 3.4-10. Summary of Waterbodies Impacted by Project Construction

Area	Stream Type	Temporary Disturbance in Project Area (Linear Feet)	Permanent Disturbance in Project Area (Linear Feet)
HVDC Line	Perennial	253	0
	Intermittent	28,307	2
	Ephemeral	0	0
	Canal/Ditch	799	0
	Artificial Path[1/]	148	0

Area	Stream Type	Temporary Disturbance in Project Area (Linear Feet)	Permanent Disturbance in Project Area (Linear Feet)
Tiger Connector and HVDC Converter Station	Perennial	1,241	0
	Intermittent	2,917	0
	Ephemeral	0	0
	Canal/Ditch	0	0
	Artificial Path [a]	0	0
Ford County Interconnect and HVDC Converter Station	Perennial	0	0
	Intermittent	10,159	0
	Ephemeral	0	0
	Canal/Ditch	0	0
	Artificial Path [a]	0	0
	Total	**43,825**	**2**

HVDC: high-voltage direct current
Note: Impacts presented in this table are preliminary and would be finalized once delineations are completed and impact calculations are determined.
[1/] Artificial Paths carry the name of the adjacent flowline feature and would be delineated with field surveys

3.4.4.3 Operations and Maintenance

3.4.4.3.1 Water Supply

Small amounts of water use would be required for operation of the HVDC converter stations. The water would be used to replenish the valve cooling systems and to provide potable water for workers at the ancillary buildings and facilities. The limited water use for these operations and maintenance activities would have no discernible impact on available supplies near the HVDC converter stations.

The Project would not substantially increase permanent impervious surfaces, because the transmission line and associated structures require minimal infrastructure to provide access. Construction and design of the HVDC converter stations would be conducted according to specific EPMs (**Appendix 2.4**) that include minimizing the conversion of land to impervious surface. Existing groundwater wells are located at least 300 feet from Project infrastructure and impacts to groundwater recharge areas and groundwater supplies are not expected.

3.4.4.3.2 Water Quality

Although most inspections of the transmission line would be performed by helicopter or drone, some ground-based work may be required to verify and mitigate the aerial inspection findings. Ground-based maintenance work in areas where there is no permanent access route to the transmission structures could damage vegetation and soils through off-road travel. Over time, minimal surface disturbance from off-road access activities could contribute additional sediment loading if the work is concentrated near surface waterbodies. These types of water quality impacts, while typically small, would persist intermittently for the life of operations and maintenance activities.

Operations and maintenance work would also require vegetation management to maintain the desired vegetation mix and to prevent incompatible vegetation from establishing in the planned Project ROW. Compatible vegetation would be characterized by regionally appropriate, short-stature plant communities composed of herbaceous plants and low-growing shrubs. Incompatible vegetation would generally be cut and removed with some vegetation debris left in place for soil stabilization. These practices would limit soil erosion while reducing wildfire risk from buildup of flammable debris, helping to maintain water quality in nearby streams by preserving compatible vegetation cover in the planned Project ROW. Other EPMs for vegetation management are discussed in **Appendix 2.4**.

In certain areas of the planned Project ROW, herbicides may be applied to prevent regrowth of incompatible vegetation. Common herbicides used for this purpose include aminopyralid, glyphosate, imazapyr, metsulfuron methyl, and triclopyr. Some of these chemicals are harmful to aquatic life and must be applied with a buffer distance from waterbodies and wetlands to avoid aquatic impacts as appropriate for each herbicide product. The Applicant has committed to performing herbicide applications following product labels, in accordance with applicable regulations, and in compliance with appropriate landowner requirements (**Appendix 2.4**). Herbicide applications would also be carried out and properly supervised by licensed and certified commercial applicators (**Chapter 2**).

3.4.4.3.3 Floodplains

Long-term operational impacts to floodplains would be primarily associated with the placement of structures in the floodplains and maintenance and repairs. Impacts from the placement of transmission line structures in floodplains is discussed in **Section 3.4.4.2.3**. Woody vegetation would be routinely cleared within the ROW to maintain clearance, which is needed for safe and efficient operations of a transmission line. Temporary matting, temporary access routes, temporary fly-in areas, and best management practices would be implemented during routine activities and would not further impact these resources. Such maintenance clearing may require authorization by the USACE, KDHE, MDNR, Missouri Department of Public Safety, State of Emergency Management Agency, and respective County. These activities would be subject to USACE nationwide permit conditions for restoration of any jurisdictional wetland impact.

3.4.4.3.4 Wetlands and Waterbodies

Wetlands and waterbodies within the Project ROW would be subject to vegetation maintenance activities to prevent establishment of incompatible vegetation. Specifically, vegetation management and maintenance clearing would be needed for previously forested wetlands that have been converted to emergent wetlands (122.4 acres in the planned Project area) (**Table 3.4-9**), as well as for emergent wetlands that begin to develop woody vegetation. The frequency of vegetation management is planned based on the site conditions; a typical cycle ranges from 3 to 5 years. The vegetation maintenance would normally be performed by mechanical means and would be scheduled during times that avoid damage to the wetland (e.g., during winter). It could also be performed using tracked vehicles to limit impacts, similar to EPMs listed in **Appendix 2.4**. Such maintenance clearing may require authorization by USACE, KDHE, and MDNR and would be subject to USACE nationwide permit conditions for restoration of any jurisdictional wetland impact, whether temporary or permanent.

3.4.4.4 Decommissioning

Site decommissioning would be performed at the end of the service life of the Project in accordance with a Decommissioning Plan. Impacts to water resources from activities to remove project facilities would likely be similar to impacts during construction. Project decommissioning could affect water quality in localized areas due to temporary surface disturbance. Barring advances in construction technology, the surface disturbance footprint for decommissioning would likely be similar to the footprint used during construction. The number of acres of surface disturbance to floodplains, wetlands, and waterbodies from decommissioning would also likely be similar to the footprint during construction.

Decommissioning would require consumptive water use for dust control. The amount of water necessary for dust control would likely be similar to or higher than the quantities shown in **Table 3.4-2,** particularly if summers become hotter and drier in the future as currently predicted for Kansas and Missouri.

3.5 Vegetation

3.5.1 Issues for Analysis

Based on NEPA statutory and CEQ/DOE regulatory requirements; input from federal, state, and local agencies and tribal governments; and comments received during scoping, the vegetation analysis addresses the following:

- Impacts to general vegetation, including timber, wooded areas, old-growth forest, savannah, grassland, and prairie habitats;
- Impacts to rare native plants;
- Impacts to landowner management of noxious weeds or introduction and spread of noxious weeds; and
- Impacts to vegetation, including crops, from herbicide and pesticide use.

Discussion of the No Action Alternative is presented in **Section 3.1**.

3.5.2 Analysis Area

The vegetation analysis area includes a 300-foot buffer of the Project area (i.e., the transmission line ROWs, the HVDC converter stations, the optical regeneration facilities and associated driveways, and all temporary workspaces; 64,884 acres; **Figure 3.5-1**). The vegetation analysis area accounts for where vegetation would be cleared or modified and potential edge effects related to microclimate and noxious weeds (Bentrup 2008). Edge effects result from creating or changing boundaries of two or more habitats, such as an herbaceous corridor located within a wooded habitat.

3.5.3 Affected Environment

The section presents the following categories within the vegetation analysis area: (1) general vegetation; (2) conservation and ecological areas associated with rare native plant species; (3) protected plants; and (4) noxious weeds. Data sources used to obtain information on the affected environment within the vegetation analysis area included current ecoregion data and descriptions (EPA 2022) and LANDFIRE (2020), as described below.

3.5.3.1 General Vegetation

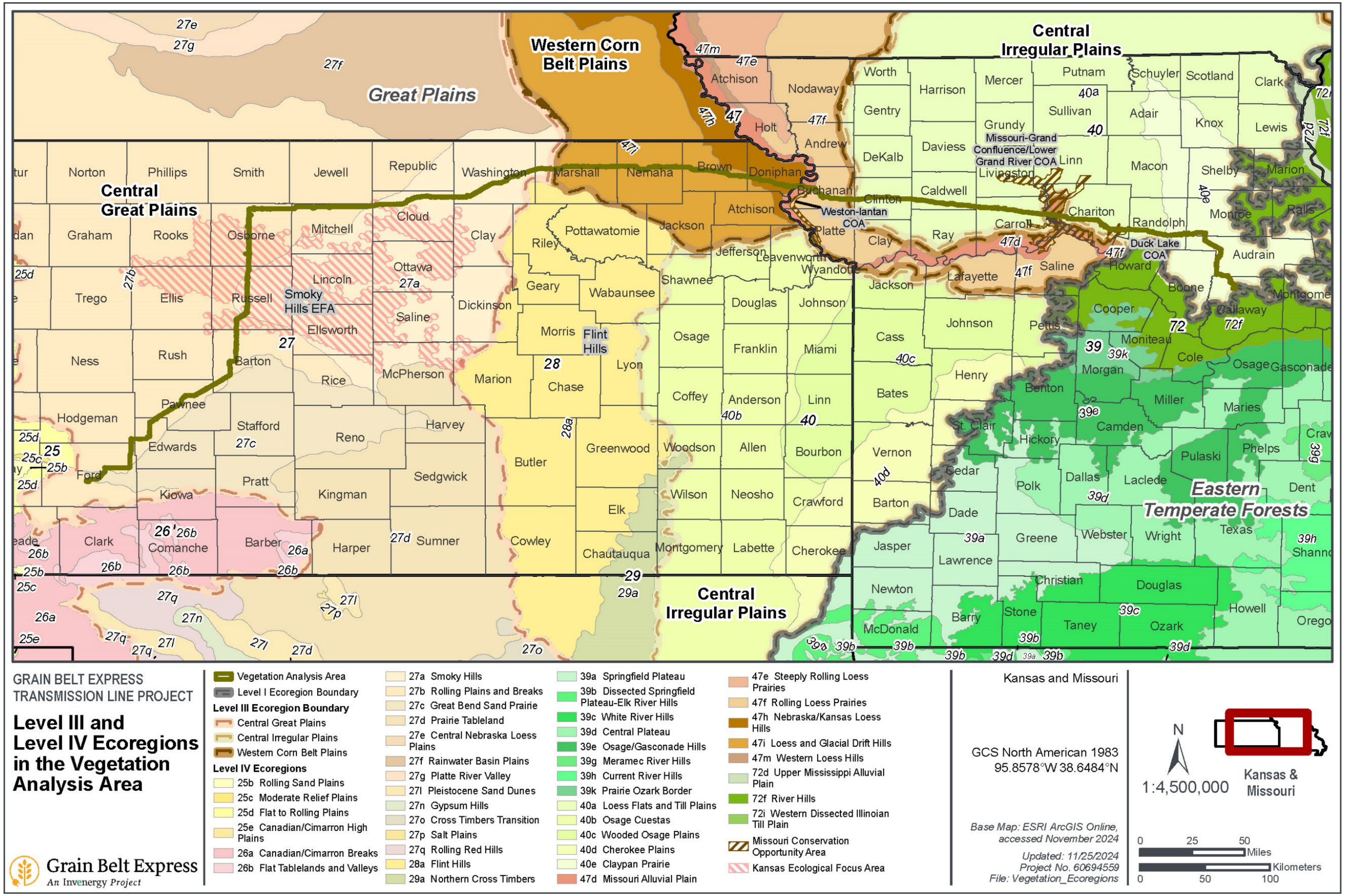
Ecoregions are broad areas of the landscape characterized by similar vegetation, topography, geology, and soils. Ecoregion data and descriptions (EPA 2022) are referenced to describe the spatial setting for general vegetation in the vegetation analysis area, while LANDFIRE data are used to describe and quantify vegetation (LANDFIRE 2020).

3.5.3.1.1 Ecoregions

The vegetation analysis area occurs within the Great Plains and a small portion of the Eastern Temperate Forest Level I ecoregions. The Great Plains Level I ecoregion is distinguished by lesser topographic relief, an abundance of grasslands, scarcity of forests, and (from west to east) a semiarid to subhumid climate (Commission for Environmental Cooperation 1997). The Eastern Temperate Forest Level I ecoregion is characterized by broadleaf and coniferous forests and warm, humid, and temperate climate.

Level I ecoregions are further divided into Level II, Level III, and Level IV ecoregions to describe the more refined ecosystem boundaries that are often nested within broader ecological hierarchies. The vegetation analysis area occurs in three Level II ecoregions (South Central Semi-Arid Prairies, Temperate Prairies, and Southeastern USA Plains) and three Level III ecoregions (Central Great Plains, Western Corn Belt Plains, and Central Irregular Plains) within which exist nine Level IV subregions (**Figure 3.5-1**). The unique types of vegetation in these Level IV subregions are described in **Table 3.5-1** according to the potential natural vegetation as determined by Chapman et al. (2001, 2002), along with the percentage of each Level IV subregion within the vegetation analysis area.

The term "potential natural vegetation," as used by Chapman et al. (2001, 2002), refers to the native vegetation historically typical to an area, absent most modern land uses and associated changes to vegetation. Prior to extensive development and agricultural conversion over the past 100 to 150 years, mixed-grass and tall grass prairies dominated the regional landscape, with woodlands and forests rare and restricted to riparian zones along river courses, floodplains, and some escarpments west of the Missouri River. East of the Missouri River these bottomland forests covered large areas, along with mixed hardwood woodland savannas intermixed with tall grass prairies. Most of the native vegetation within the vegetation analysis area has undergone conversion to cropland since settlement in the nineteenth century. Only regions that are unsuitable for farming, such as the Smoky Hills Level IV subregion, retain large areas of their potential natural vegetation.



Source: SWCA 2023

Figure 3.5-1. Level III and Level IV Ecoregions in the Vegetation Analysis Area

Table 3.5-1. Level III and Level IV Ecoregions and Potential Natural Vegetation in the Vegetation Analysis Area

Level III Region	Level IV Subregion, State	Percent of Vegetation Analysis Area	Potential Natural Vegetation
Central Great Plains	Rolling Plains and Breaks, Kansas	31%	Native mixed-grass prairie with big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), blue grama (*Bouteloua gracilis*), needle-and-thread (*Hesperostipa comata*), side-oats grama (*Bouteloua curtipendula*), and western wheatgrass (*Agropyron smithii*). Floodplain forests occur along major riparian corridors.
	Smoky Hills, Kansas	16%	Transitional from native mixed-grass prairie in the west to native tallgrass prairie in the east. Floodplain forests occur along riparian areas.
	Great Bend Sand Prairie, Kansas	1%	Native sand prairie bunchgrasses with sand bluestem (*Andropogon hallii*), sand dropseed (*Sporobolus cryptandrus*), and sand reedgrass (*Calamovilfa longifolia*).
Western Corn Belt Plains	Loess and Glacial Drift Hills, Kansas	13%	Native tallgrass prairie with eastern cottonwood dominated forests along floodplains and oak-hickory (*Quercus* spp. – *Carya* spp.) forests on bluffs.
	Nebraska/Kansas Loess Hills, Kansas	4%	Native tallgrass prairie with big bluestem, Indiangrass, switchgrass, and little bluestem. Scattered oak-hickory forests and some floodplain woodlands occur along rivers and streams with bur oak (*Quercus macrocarpa*), basswood (*Tilia americana*), black walnut (*Juglans nigra*), green ash (*Fraxinus pennsylvanica*), plains cottonwood (*P. deltoides* ssp. *monilifera*), and willow (*Salix* spp.).
	Rolling Loess Prairies, Missouri	3%	Mosaic of native big bluestem–Indiangrass tallgrass prairie and bur oak woodland.
	Missouri Alluvial Plain, Missouri	2%	Native northern floodplain forest, pin oak (*Quercus palustris*) forest, and prairie cordgrass (*Spartina pectinata*) wet prairie.
Central Irregular Plains	Loess Flats and Till Plains, Missouri	20%	Mosaic of native little bluestem–side-oats grama prairie, bur oak woodland, and chinkapin oak (*Quercus muehlenbergii*) woodland.
	Claypan Prairie, Missouri	10%	Native big bluestem–Indiangrass prairie, little bluestem–side-oats grama prairie, and white oak (*Quercus alba*) dry woodland.
	Total	100%	

Source: Chapman et al. 2001, 2002

3.5.3.1.2 LANDFIRE

LANDFIRE data (LANDFIRE 2020) were used to describe and analyze general vegetation within the vegetation analysis area grouped into general vegetation classes (**Table 3.5-2**; **Figure** 3.5-2 to **Figure** 3.5-5).

Table 3.5-2. Vegetation Classes in the Vegetation Analysis Area

Vegetation Class	Acres in Vegetation Analysis Area [b]	Percent of Acres in Vegetation Analysis Area [b]
Vegetated Land Cover Classes		
Forest and Woodland Vegetation	**4,086**	**6.3%**
Great Plains Oak Woodland	77	0.1%
North-Central Beech-Maple-Basswood Forest	<1	<0.1%
North-Central Oak Savanna and Barrens Tree	3	<0.1%
North-Central Oak-Hickory Forest and Woodland	2,250	3.5%
Northern and Central Great Plains Floodplain Forest	319	0.5%
Northern and Central Great Plains Mesic Woodland	8	<0.1%
Northern and Central Native Ruderal Forest	884	1.4%
Silver Maple-Green Ash-Sycamore Floodplain Forest	455	0.7%
South-Central Interior Oak Forest and Woodland	90	0.1%
Shrub and Herb Vegetation	**11,189**	**17.2%**
Central Great Plains Mixedgrass Prairie	5,038	7.8%
Central Great Plains Tallgrass Prairie	1,908	2.9%
Great Plains Sand Grassland	67	0.1%
Great Plains Sand Shrubland	8	<0.1%
Northern and Central Plains Ruderal and Planted Grassland	1,638	2.5%
Northern and Central Plains Ruderal and Planted Shrubland	81	0.1%
Northern and Central Ruderal Meadow	2,318	3.6%
Northern and Central Ruderal Shrubland	11	<0.1%
Silver Maple-Green Ash-Sycamore Floodplain Shrubland	<1	<0.1%
Southeastern Great Plains Floodplain Herbaceous	35	<0.1%
Southern Great Plains Tallgrass Prairie	83	0.1%
Great Plains Comanchian Ruderal Shrubland	1	<0.1%
Agricultural and Developed [a] Vegetation	**46,425**	**71.6%**
Eastern Cool Temperate Close Grown Crop	188	0.3%
Eastern Cool Temperate Developed Ruderal Grassland	75	0.1%
Eastern Cool Temperate Developed Ruderal Herbaceous Wetland	<1	<0.1%
Eastern Cool Temperate Developed Ruderal Mixed Forest	29	<0.1%
Eastern Cool Temperate Developed Ruderal Mixed Forested Wetland	<1	<0.1%
Eastern Cool Temperate Developed Ruderal Shrubland	2	<0.1%
Eastern Cool Temperate Fallow/Idle Cropland	<1	<0.1%
Eastern Cool Temperate Pasture and Hayland	6,048	9.3%
Eastern Cool Temperate Row Crop	11,555	17.8%
Eastern Cool Temperate Urban Deciduous Forest	30	<0.1%
Eastern Cool Temperate Urban Evergreen Forest	2	<0.1%
Eastern Cool Temperate Urban Herbaceous	303	0.5%
Eastern Cool Temperate Urban Mixed Forest	5	<0.1%
Eastern Cool Temperate Urban Shrubland	58	<0.1%
Eastern Cool Temperate Wheat	237	0.4%
Western Cool Temperate Close Grown Crop	712	1.1%
Western Cool Temperate Developed Ruderal Mixed Forest	4	<0.1%
Western Cool Temperate Developed Ruderal Shrubland	2	<0.1%
Western Cool Temperate Fallow/Idle Cropland	2,142	3.3%

Vegetation Class	Acres in Vegetation Analysis Area [b]	Percent of Acres in Vegetation Analysis Area [b]
Western Cool Temperate Pasture and Hayland	790	1.2%
Western Cool Temperate Row Crop	15,142	23.3%
Western Cool Temperate Row Crop-Close Grown Crop	<1	<0.1%
Western Cool Temperate Urban Deciduous Forest	22	<0.1%
Western Cool Temperate Urban Evergreen Forest	17	<0.1%
Western Cool Temperate Urban Herbaceous	474	0.7%
Western Cool Temperate Urban Mixed Forest	13	<0.1%
Western Cool Temperate Urban Shrubland	109	0.2%
Western Cool Temperate Wheat	8,467	13.0%
Forest and Woodland Wetland and Riparian Vegetation	**69**	**0.1%**
Northern and Central Native Ruderal Flooded and Swamp Forest	22	<0.1%
North-Central Flatwoods and Swamp Forest	47	<0.1%
Shrub and Herb Wetland and Riparian Vegetation	**984**	**1.5%**
Eastern North American Freshwater Marsh	1	<0.1%
Great Plains Depressional Saline and Brackish Wetland	13	<0.1%
Great Plains Herb Riparian	837	1.3%
Great Plains Shrub Riparian	19	<0.1%
Midwest Prairie Alkaline Fen Herbaceous	36	<0.1%
Midwest Wet Prairie and Wet Meadow Herbaceous	35	<0.1%
Northern and Central Ruderal Wet Meadow and Marsh	44	<0.1%
Northern and Central Shrub Swamp	0	<0.1%
Non-Vegetated Land Cover Classes		
Developed	**2**	**<0.1%**
Developed-High Intensity	12	<0.1%
Developed-Medium Intensity	194	0.3%
Developed-Low Intensity	1,687	2.6%
Developed-Roads	226	0.3%
Open Water	**3**	**<0.1%**
Open Rock	**3**	**<0.1%**
Great Plains Cliff Scree and Rock Vegetation	3	<0.1%
Quarries-Strip Mines-Gravel Pits-Energy Development	**3**	**<0.1%**
Recently Disturbed or Modified	**3**	**<0.1%**
Recently Burned-Herb and Grass Cover	<1	<0.1%
Recently Disturbed Other-Herb and Grass Cover	<1	<0.1%
Grand Total	**64,884**	**100.0%**

Source: LANDFIRE 2020
[a] Developed vegetation includes vegetation of developed lands typically in the form of lawns, parks, horticultural gardens, golf courses, and urban ponds in urban, suburban, and rural cities and villages.
[b] Totals may not sum due to rounding.

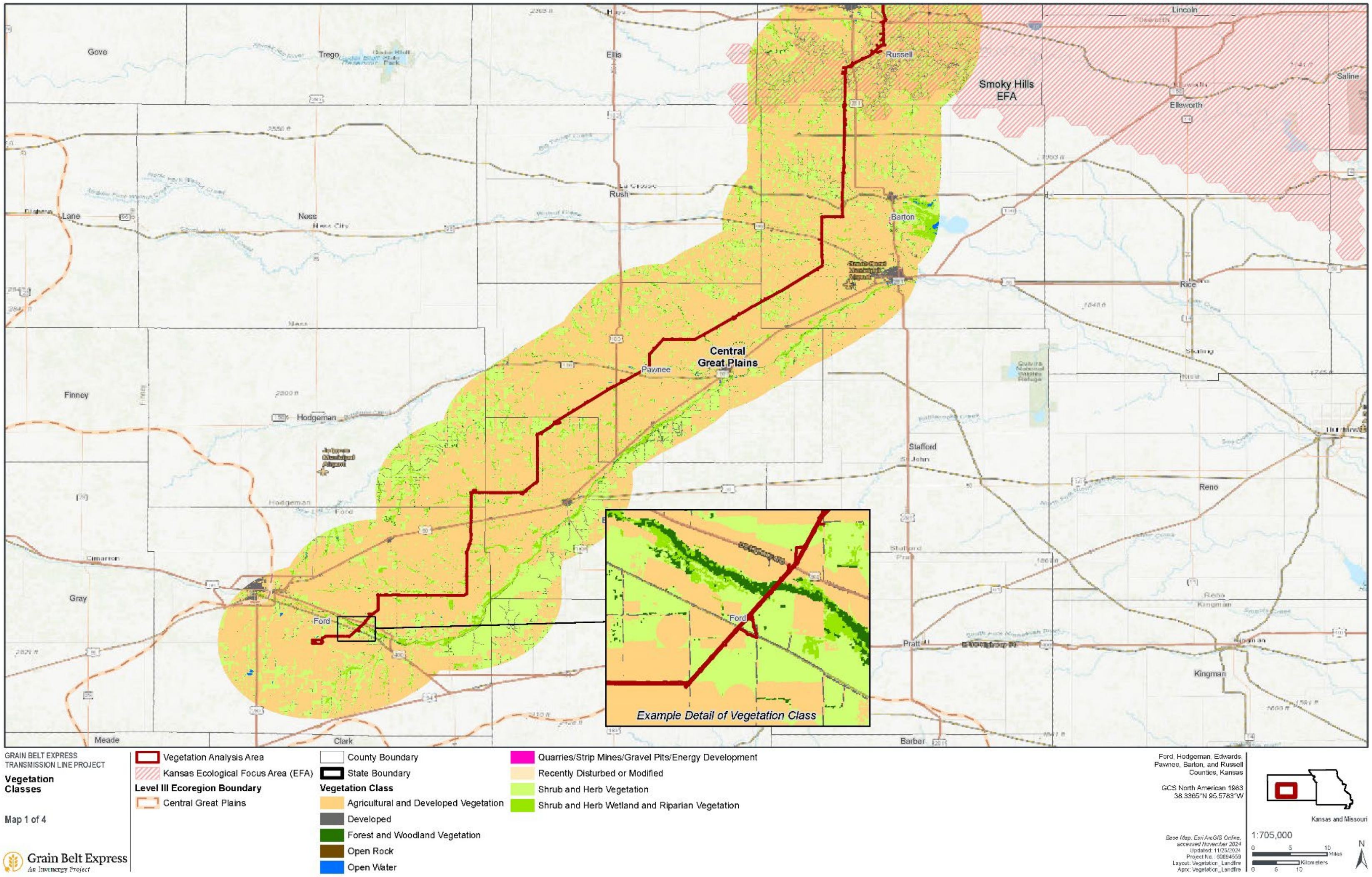


Figure 3.5-2. Vegetation Classes (Ford County, Kansas, to Russell County, Kansas)

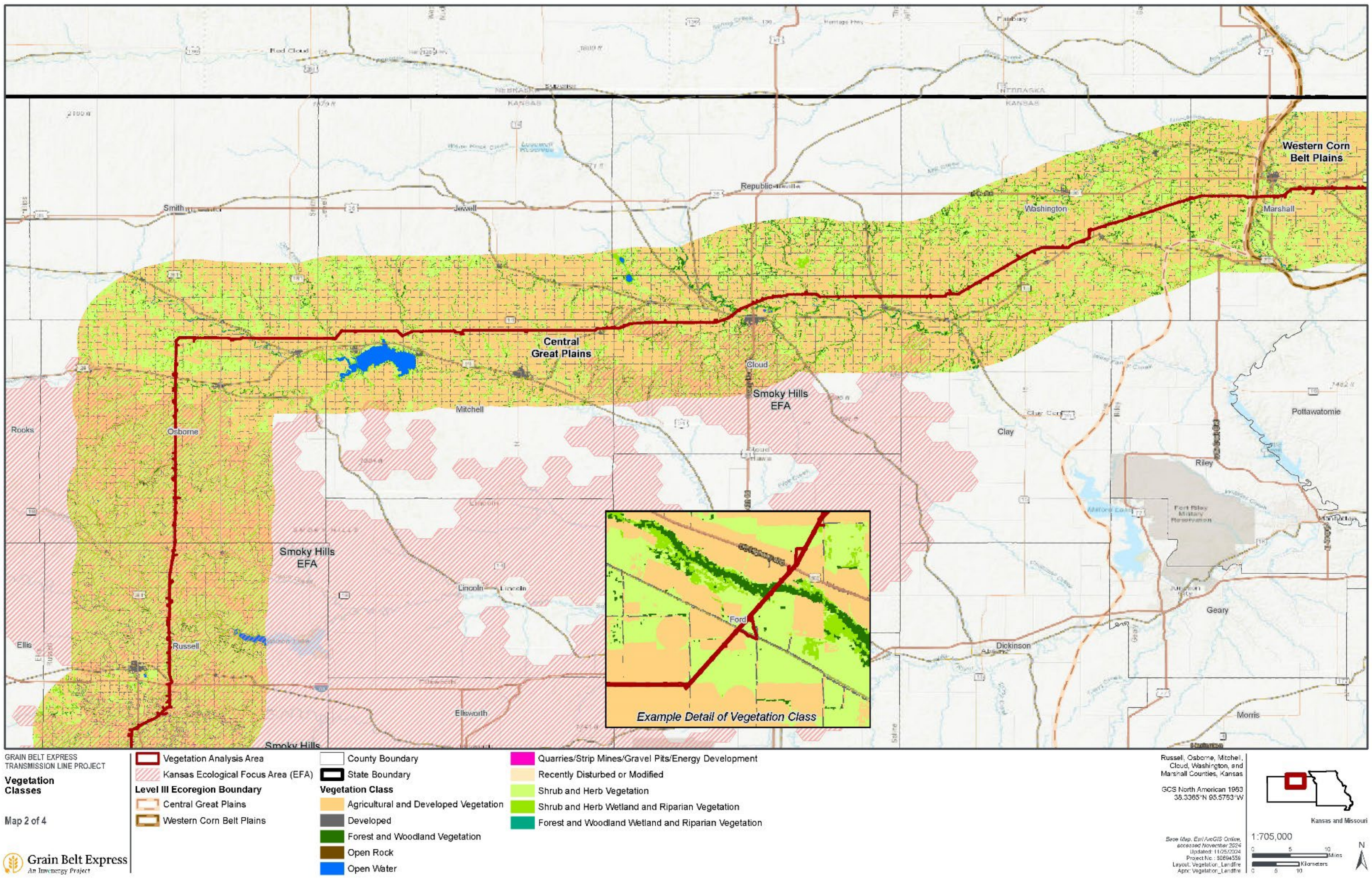


Figure 3.5-3. Vegetation Classes (Russell County, Kansas, to Marshall County, Kansas)

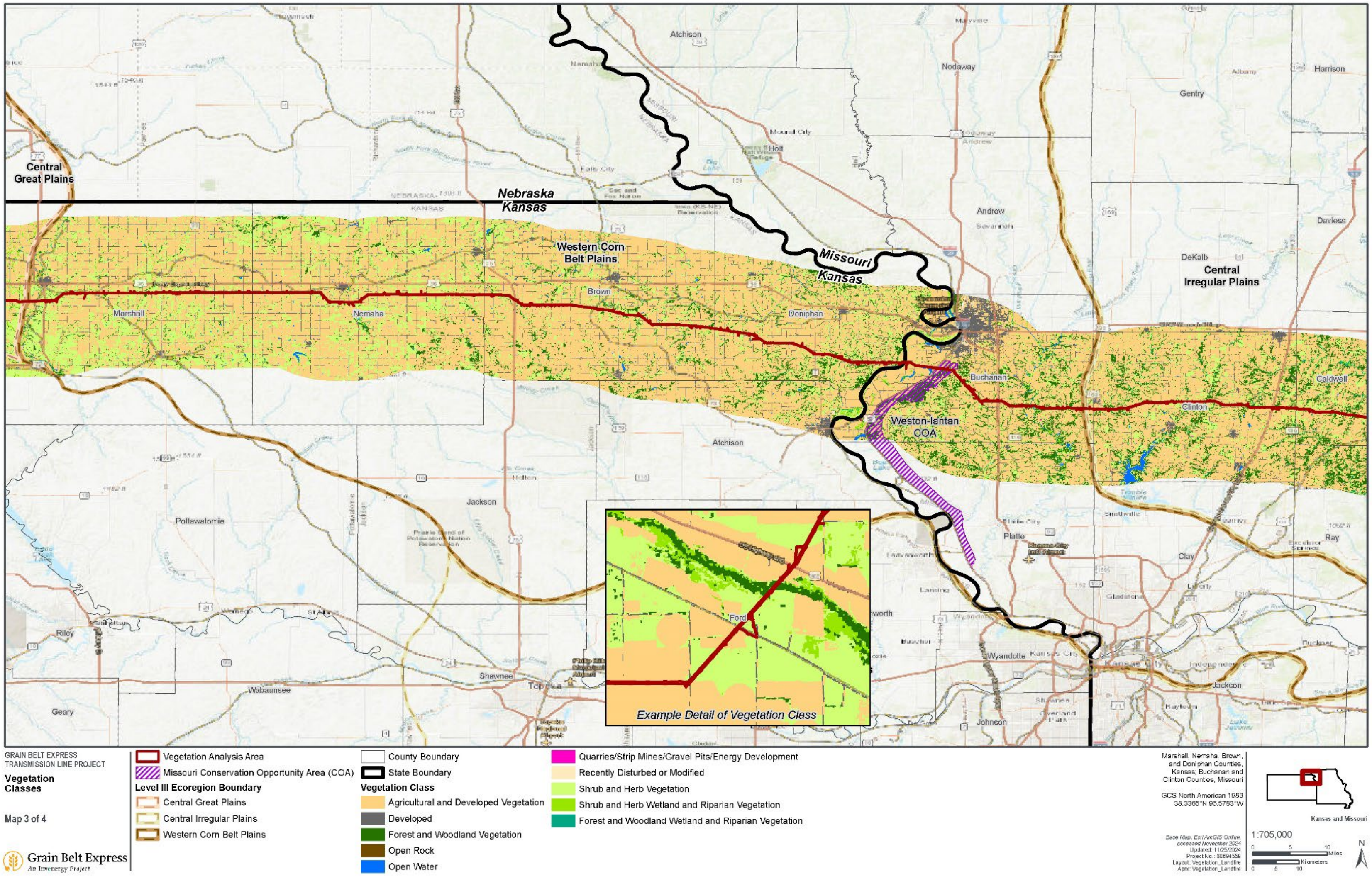


Figure 3.5-4. Vegetation Classes (Marshall County, Kansas, to Clinton County, Missouri)

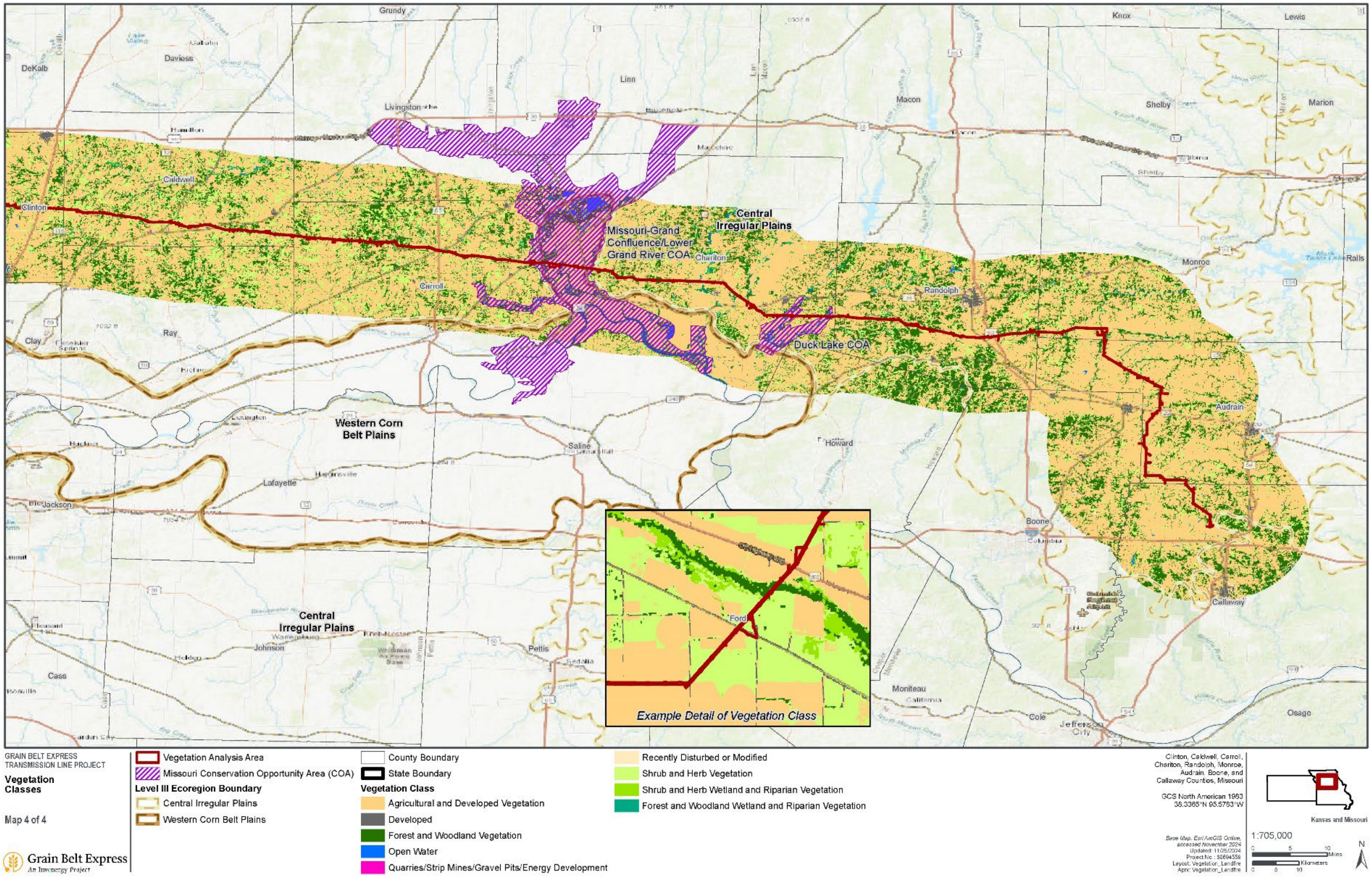


Figure 3.5-5. Vegetation Classes (Caldwell County, Missouri, to Callaway County, Missouri)

3.5.3.2 Conservation and Ecological Areas Associated with Rare Native Plant Species

State governments provide oversight for rare plants and natural communities that do not receive regulatory protections but are identified for improved management to prevent their future listing and are protected at a state or federal level. Rare plants and natural communities of conservation concern are tracked in the respective states through the Kansas Natural Heritage Inventory ([KNHI] 2022) and the Missouri Natural Heritage Program (MDC 2022). Rare native plants in need of state-led conservation are termed native plant Species of Greatest Conservation Need (Rohweder 2022; MDC 2015).

The Kansas and Missouri wildlife action plans define Ecological Focus Areas and Conservation Opportunity Areas as areas of the landscapes where conservation actions can be applied for maximum benefit by the states and their partners, as they contain plant communities important for wildlife habitat and Species of Greatest Conservation Need. This analysis uses Ecological Focus Areas and Conservation Opportunity Areas as a proxy for impacts, as the acreages of rare native plants in need of state-led conservation are not quantifiable within the vegetation analysis area due to imprecise distributions and unknown abundances of these species.

The vegetation analysis area intersects with the Smoky Hills Ecological Focus Area in Kansas (**Figure 3.5-1**, **Table 3.5-3**), which is a priority for conservation of native vegetation communities and native Species of Greatest Conservation Need (Rohweder 2022). The Smoky Hills Ecological Focus Area includes native mixed-grass prairie and tallgrass prairie and is a subregion within the larger Central Mixed Grass Prairie Conservation Region (**Figure** 3.5-2 and **Figure** 3.5-3). Approximately 10 percent of the vegetation analysis area occurs within the Smoky Hills Ecological Focus Area in Russell, Osborne, and Cloud Counties. Kansas identifies three native plant Species of Greatest Conservation Need (SGCN) associated with this Ecological Focus Area: Hancin's dewberry (*Rubus hancinianus*), Kansas arrowhead (*Sagittaria ambigua*), and Missouri mud-plantain (*Heteranthera missouriensis*) (Rohweder 2022).

Information on rare native species and native plant communities in Missouri is summarized from the *Missouri State Wildlife Action Plan* (MDC 2015). Plant communities of conservation priority occur in state-designated Conservation Opportunity Areas (MDC 2023a). The vegetation analysis area overlaps with three such areas in Missouri (**Figure 3.5-1**): the Weston-latan Conservation Opportunity Areas in Buchanan County, representing less than 1 percent of the vegetation analysis area; the Lower Grand River and Missouri-Grand Confluence Conservation Opportunity Areas in Carroll and Charlton Counties, representing just over 1 percent of the vegetation analysis area; and the Duck Lake Conservation Opportunity Areas in Carroll and Chariton Counties, representing less than 1 percent of the vegetation analysis area (**Table 3.5-3**, MDC 2015). The MDC recognizes six habitat systems across the Conservation Opportunity Areas: Grassland/Prairie/Savanna, Forest/Woodland, Glade, Cave/Karst, Wetland, and Rivers/Streams. The habitats systems form the basis for implementation of conservation efforts and are based on Nelson (2010). Missouri identifies 194 plant SGCN associated with four of the habitat systems: Forest/Woodland, Grassland/Prairie/Savanna, Wetland, or Rivers/Streams. Missouri does not provide lists of SGCN for individual Conservation Opportunity Areas and instead lists them by primary habitat system (MDC 2015).

Table 3.5-3. Conservation and Ecological Areas Associated with Rare Native Plant Species in the Vegetation Analysis Area

Conservation or Ecological Area	Total Acres within the States	Acres within the Vegetation Analysis Area	Percent of Vegetation Analysis Area	Important Plant Communities
Ecological Focus Areas				
Kansas, Smoky Hills Ecological Focus Area	2,985,282	6,237	9.6%	Mixed-grass and Tallgrass Prairies
Ecological Focus Area Totals	*2,985,282*	*6,237*	*9.6%*	
Conservation Opportunity Areas				
Missouri, Weston-latan Conservation Opportunity Areas	27,500	207	0.3%	Woodlands
Missouri, Lower Grand River and Missouri-Grand Confluence Conservation Opportunity Areas	236,484	885	1.4%	Tallgrass Prairie, Wetlands, and Hardwood Savannas
Missouri, Duck Lake Conservation Opportunity Areas	14,507	298	0.5%	Wetlands and Mesic Tallgrass Prairies
Conservation Opportunity Area Totals	*278,491*	*1,392*	*2.1%*	

3.5.3.3 Protected Plants

The USFWS Information for Planning and Conservation system database identified two native plant species federally listed as threatened under Endangered Species Act (ESA) Section 4 (16 U.S.C. 1533)] and known to occur in central and northern Kansas and eastern Missouri: Mead's milkweed (*Asclepias meadii*) and the eastern prairie fringed orchid (*Platanthera leucophaea*) (USFWS 2023b). These species are also listed as endangered by the state of Missouri (3 MO CSR 10-4.111). Based on distribution models in the Information for Planning and Conservation system database that include all known occurrences, the two species are not present in the vegetation analysis area.

The USFWS 2022 5-year status review for Mead's milkweed indicates that the closest known populations are more than 25 miles south of the vegetation analysis area in Kansas and more than 40 miles north of the vegetation analysis area in Missouri (USFWS 2022a). Due to the lack of known occurrences and the scarcity of native prairie in the vegetation analysis area, it is unlikely that Mead's milkweed occurs within the vegetation analysis area (USFWS 2022a). Therefore, Mead's milkweed is not included for further analysis.

Mapped historical distribution of eastern prairie fringed orchid includes counties that are crossed by the vegetation analysis area in Missouri (MDC 2023b, USFWS 2022b). However, McKenzie et al. (2012) indicate that the Missouri population now occurs only in two sites in Grundy County, both of which are more than 30 miles from the vegetation analysis area. Therefore, the eastern fringed prairie orchid is not included for further analysis.

No other state- or federally listed plants are known or likely to occur in the vegetation analysis area.

3.5.3.4 Noxious Weeds

Noxious weeds are plant species regulated by federal, state, or local laws to limit or prevent establishment or spread due to their ability to harm native ecosystems, crops, and livestock. Federal, state, and local laws and regulations specify which plant species are considered noxious weeds and how those species are managed within the state.

County-level noxious weed lists for Kansas and Missouri include 15 species that occur in counties crossed by the vegetation analysis area (KDA 2016; Missouri Department of Agriculture 2023a). Eight of the 15 noxious weed species are listed in both Kansas and Missouri, with 5 listed only in Kansas counties crossed by the vegetation analysis area and 2 listed only in Missouri counties. Abundance and distribution are unknown in the vegetation analysis area but are described by county occurrences for those counties crossed by the vegetation analysis area in **Table 3.5-4**.

Table 3.5-4. Noxious Weeds in the Vegetation Analysis Area

Common Name (Scientific Name)	County Occurrences in Analysis Area: Kansas	County Occurrences in Analysis Area: Missouri
Woollyleaf bur ragweed (*Ambrosia grayi*)	Ford, Edwards, Pawnee, and Barton	N/A
Marijuana, hemp (*Cannabis sativa*)	Pawnee, Barton, Osborne, Mitchell, Cloud, Washington, Marshall, Nemaha, Brown, and Doniphan	N/A
	N/A	Buchanan, Clinton, and Caldwell
Nodding plumeless thistle (*Carduus nutans*)	Barton, Russell, Osborne, Mitchell, Cloud, Washington, Marshall, Nemaha, Brown, Doniphan	N/A
Spotted knapweed (*Centaurea stoebe*)	Ford and Nemaha	N/A
Canada thistle (*Cirsium arvense*)	Osborne and Brown	Buchanan and Callaway
Field bindweed (*Convolvulus arvensis*)	All counties crossed by the vegetation analysis area	All except Carroll and Monroe
Fuller's teasel (*Dipsacus fullonum*)	Nemaha and Brown	Callaway
Cutleaf teasel (*Dipsacus laciniatus*)	N/A	Caldwell, Randolph, and Calloway
Quackgrass (*Elymus repens*)	Marshall, Nemaha, Brown, and Doniphan	Buchanan, Caldwell, Carroll, and Monroe
Leafy spurge, Russian leafy spurge (*Euphorbia virgata* [also *E. esula*])	Marshall, Nemaha, and Brown	N/A
Hoary cress, whitetop (*Lepidium draba* [also *Cadaria draba*])	Barton, Mitchell, Cloud, Washington, Marshall, Nemaha, Brown, and Doniphan	Buchanan and Clinton
Sericea lespedeza (*Lespedeza cuneata*)	N/A	Chariton and Randolph
Russian knapweed, hardheads (*Rhaponticum repens* [also *Acroptilon repens*])	Barton, Mitchell, Washington, and Nemaha	N/A
Multiflora rose (*Rosa multiflora*)	Barton and Brown	Randolph
Johnsongrass (*Sorghum halepense*)	All counties crossed by the vegetation analysis area	Buchanan, Carroll, and Chariton

N/A – not applicable

3.5.3.5 Edge Effects

Edge effects occur when one dominant vegetation class is bisected, often by a road or other linear feature (such as a transmission line), creating edges where the habitat was formerly intact. The U.S.

Forest Service (USFS) estimates that edge effects related to microclimate and invasive species arising from the creation of open corridors in woodlands or wooded corridors in grasslands could extend a maximum of approximately 775 feet, with most such impacts extending approximately 300 feet (Bentrup 2008). While vegetation conversions of the types reviewed by USFS in Bentrup (2008) would be uncommon for the Project, the 300-foot-wide approximation of indirect impact exposure is reasonable for the purposes of this assessment.

3.5.4 Environmental Consequences of Proposed Federal Action

3.5.4.1 Methods and Assumptions

The discussion of impacts considers the construction, operations and maintenance, and decommissioning of the Project. The analysis of general vegetation, rare native plant species, and noxious weeds assumes that during operations and maintenance, vegetation would be managed for safety and reliability, retaining vegetation compatible with electric transmission clearance requirements in NESC and FAC-003-05 (IEEE 2023, NERC 2024). Incompatible vegetation, which includes trees and shrub species that if not pruned can grow to heights that interfere with power lines, would be managed according to EPMs listed in **Appendix 2.4**.

Impacts to general vegetation are described in terms of permanent and temporary changes to vegetation, and permanent conversion of one vegetation to another (e.g., forest to non-forest in the planned Project ROW). LANDFIRE data are used to describe and calculate the site-specific Project impacts (LANDFIRE 2020). LANDFIRE data provide the local fine-scale information needed to analyze potential impacts that regional-level ecoregion data cannot.

The impact analysis for rare native plant species uses state conservation and ecological areas known to contain plant communities associated with rare species as a proxy for impacts to those species. Acreages of plant species identified as Species of Greatest Conservation Need are not quantifiable for the impact analysis due to imprecise distributions and unknown abundances of these species within the vegetation analysis area.

Ground disturbances that expose bare soil provide opportunities for the introduction and spread of noxious weeds. Construction equipment moving among sites can provide a dispersal vector for seeds of these undesirable species. Inadequate revegetation following construction or improper vegetation management during facility operation could fail to prevent the spread and growth of noxious weeds. The extent of construction-phase ground disturbances associated with the Project is assumed to represent areas at risk for the introduction or spread of noxious weeds by Project activities.

3.5.4.2 Construction

Permanent disturbance occurs where vegetation is converted to non-vegetation within the footprint of a Project structure or facility. Approximately 98 percent of the permanent disturbance to vegetation would be related to the construction of the HVDC converter stations, with the remaining permanent disturbance from transmission structures and optical regeneration facilities and associated driveways. Temporary disturbance would occur where vegetation is removed or modified during construction but subsequently revegetated. This includes areas of vegetation disturbed by temporary access routes, multi-use yards, and similar activities that would be limited to the duration of construction. Temporary disturbance would also occur in areas within the planned Project ROW where Forest and Woodland Vegetation would be converted to Shrub and Herb Vegetation to meet NERC safety requirements. Overall, this disturbance to vegetation would be temporary and herbaceous and shrub vegetation would be allowed to reestablish within the ROW; however, there would be a permanent impact to Forest and Woodland Vegetation due to the conversion to Shrub and Herb Vegetation in areas within the ROW where Forest and Woodland Vegetation are present. This conversion, or replacement, of vegetation type, which is a permanent impact, is distinct from permanent Project disturbance where vegetation is converted to non-vegetation, resulting in a complete loss of vegetation.

3.5.4.2.1 General Vegetation

Direct impacts to general vegetation during construction would result from removal of vegetation through clearing and grading, crushing vegetation herbicide treatment to control noxious weeds and incompatible vegetation, mowing, and growth of opportunistic and early successional species. Indirect impacts to general vegetation during construction would result from soil compaction from vehicular traffic and the potential dilution of topsoil with subsoil when grading.

Table 3.5-5 presents the anticipated construction impacts within the vegetation analysis area. Impacts to general vegetation would result from approximately 212 acres of permanent disturbance from transmission line structures, optical regeneration facilities and associated driveways, and HVDC converter stations. Impacts to general vegetation would result from approximately 5,745 acres of temporary disturbance from access routes, pull or tension sites, multi-use yards, concrete batch plants, helipads, fly yards, and workspaces (**Table 3.5-5**) in the vegetation analysis area. Most impacts resulting from disturbance would be in Agricultural and Developed Vegetation (**Table 3.5-5**). This vegetation type has already been modified from native vegetation and could be converted back to agricultural and developed lands in temporarily impacted areas following construction.

Habitat conversion of approximately 1,596 acres would result in a permanent impact to vegetation composition and ecological function, where trees throughout the Project ROW would be replaced by shrubs and/or herbaceous vegetation, and shrubs in the wire zone[1] would be replaced by herbaceous vegetation for the life of the Project. Changes in vegetation structure from forest to grassland may result in changes to wildlife habitat (see **Section 3.8**) (King and Byers 2002; Russo et al. 2021).

Table 3.5-5. Temporary and Permanent Disturbance in the Vegetation Analysis Area

Vegetation Class	Total in Vegetation Analysis Area (acres)	Temporary Disturbance (acres)	Habitat Conversion (acres)[a]	Permanent Disturbance (acres)	Total Disturbance (acres)
Forest and Woodland Vegetation	4,135	83	606	0	689
Shrub and Herb Vegetation	11,804	823	580	2	1,404
Agricultural and Developed Vegetation [b]	47,220	4,664	331	204	5,199
Forest and Woodland Wetland and Riparian Vegetation	66	3	7	0	9
Shrub and Herb Wetland and Riparian Vegetation	1,023	37	46	0	83
Vegetated Totals	*64,248*	*5,609*	*1,569*	*206*	7,385

[1] The wire zone is the area in the ROW that is directly under the outermost transmission wires or the transmission tower, whichever is wider.

Vegetation Class	Total in Vegetation Analysis Area (acres)	Temporary Disturbance (acres)	Habitat Conversion (acres)[a]	Permanent Disturbance (acres)	Total Disturbance (acres)
Non-Vegetated Cover Classes [c]	2,368	136	27	6	169
Non-Vegetated Totals	*2,368*	*136*	*27*	6	169
Total [d]	**66,616**	**5,745**	**1,596**	**212**	**7,553**

Source: LANDFIRE 2020

*[a] Inconsistencies with the LANDFIRE dataset occur as a result of the methods of determining where areas of habitat conversion would occur (see **Section 2.3.2.4**) and limitations of GIS data. Habitat conversion would only occur where trees and other woody vegetation cleared within the ROW would not be allowed to reestablish, as their height is incompatible with the NESC vegetation clearance requirements.*

[b] Vegetation group is routinely modified.

[c] Non-Vegetated Cover Classes includes developed or disturbed land, open water, open rock, quarries, strip mines, gravel pits, and energy development.

[d] Totals may not sum or exactly match the totals in Chapter 2 due to rounding.

Forest and Woodland Vegetation is the least impacted vegetation type in terms of total disturbance acres. However, Forest and Woodland Vegetation is less represented on the landscape than the other vegetation types, and thus, any loss of this vegetation type would have a disproportionate impact (see **Table 3.5-6**). In addition, the changes to this vegetation type classified as habitat conversion would last through operations and maintenance because the planned Project ROW would be restored and maintained during operations and maintenance (refer to **Section 3.5.4.3**) as non-forest to ensure that future vegetation is compatible with NERC and FAC-003-05 clearances and Project operations and maintenance (see **Table 3.5-6**). Shrub and Herb Vegetation, specifically grassland and prairie habitats, is compatible with Project operations and maintenance and would be maintained within the planned Project ROW. The conversion of Forest and Woodland Vegetation to Shrub and Herb Vegetation would increase the total amount of Shrub and Herb Vegetation in the vegetation analysis area once the planned Project ROW is restored and would be a permanent impact to vegetation, as shown in **Table 3.5-6**.

Table 3.5-6. LANDFIRE Vegetation Classes Pre-and Post-Construction (Estimated) in the Vegetation Analysis Area

National Vegetation Class	Acres in Vegetation Analysis Area		Percent Change
	Current Condition	Estimated Post-Construction [a]	
Forest and Woodland Vegetation	4,135	2,546	-38.4
Shrub and Herb Vegetation	11,804	13,391	13.4
Agricultural and Developed Vegetation	47,220	47,016	-0.4
Forest and Woodland Wetland and Riparian Vegetation	66	59	-10.6
Shrub and Herb Wetland and Riparian Vegetation	1,023	1,030	0.7
Non-Vegetated Cover Classes	2,368	2,574	8.7
Total	66,616	66,616	-

During construction, the increase in vehicles and equipment in vegetated areas could increase the short-term potential for ignitions in the Project area. Other activities such as hot work, welding, or smoking; accidental ignition of flammable liquids; implosive splicing; and mechanical malfunction could also increase the potential for ignitions during construction. These potential ignition sources would be minimized through the application of EPMs in **Appendix 2.4**. Additionally, construction would be sequenced, and thus the total area with increased fire risk would be reduced at any one time, thereby helping to reduce the risk and impacts from fires.

3.5.4.2.2 Conservation and Ecological Areas Associated with Rare Native Plant Species

Table 3.5-7 summarizes the permanent and temporary construction impacts within conservation and ecological areas containing plant communities associated with rare native species. In each Ecological Focus Area and Conservation Opportunity Area, the total impacts would be less than 1 percent of the vegetation analysis area, and no tree removal would be required in these areas.

Table 3.5-7. Construction Impacts to Communities Associated with Rare Native Species in the Vegetation Analysis Area

Ecological Area or Community	Total within Vegetation Analysis Area (acres)	Permanent Disturbance (acres)	Habitat Conversion Disturbance (acres)[a]	Temporary Disturbance (acres)	Total Disturbance (acres)
Ecological Focus Areas					
Kansas, Smoky Hills Ecological Focus Area	6,697	<1	125	494	619
Ecological Focus Area Totals [a]	*6,697*	*<1*	125	494	619
Conservation Opportunity Areas					
Missouri, Weston-latan Conservation Opportunity Areas	200	<1	10	13	24
Missouri, Lower Grand River and Missouri-Grand Confluence Opportunity Areas	846	<1	24	95	119
Duck Lake Conservation Opportunity Area	307	<1	11	18	29
Conservation Opportunity Area Totals [b]	1,353	<1	46	126	172

[a] *Habitat conversion would only occur where trees and other woody vegetation cleared within the ROW would not be allowed to reestablish, as their height is incompatible with the NERC vegetation clearance requirements.*
[b] *Totals may not sum or exactly match the totals in Chapter 2 due to rounding.*

Direct surface disturbance during construction would impact 619 acres of vegetation in the Kansas Smoky Hills Ecological Focus Area, with less than 1 acre of permanent vegetation loss, 494 acres of temporary and mostly short-term loss (i.e., during construction and through the next growing season), and 125 acres of habitat conversion (SWCA 2023). In the Smoky Hills Ecological Focus Area, most of the vegetation impacted would be Shrub and Herb Vegetation (326 acres; 53 percent), followed by Agricultural and Developed Vegetation (251 acres; 41 percent). Temporary impacts would be in the form of reduced native shrub and mixed grass prairie plant species cover. Total acres of habitat disturbance would impact less than 1 percent of the total area of the Smoky Hills Ecological Focus Area in Kansas and would be limited to small local areas with temporary impacts from construction activities. Impacts to the Smoky Hills Ecological Focus Area Shrub and Herb Vegetation could result in removal of Hancin's dewberry. The Kansas arrowhead and Missouri mud-plantain are both aquatic species and would be unlikely to be impacted by the Project. Revegetation and re-colonization of native species is anticipated to occur over approximately 5 years following construction.

Within the combined Missouri Conservation Opportunity Areas, construction impacts would permanently impact less than 1 acre of vegetation. There would be 13 acres of temporary disturbance in the Weston-

Iatan Conservation Opportunity Area, 95 acres of temporary disturbance in the Lower Grand River and Missouri-Grand Confluence Conservation Opportunity Areas, and 18 acres of temporary disturbance in the Duck Lake Conservation Opportunity Area. There would additionally be 10 acres of habitat conversion in the Weston-Iatan Conservation Opportunity Area, 24 acres of temporary disturbance in the Lower Grand River and Missouri-Grand Confluence Conservation Opportunity Areas, and 11 acres of temporary disturbance in the Duck Lake Conservation Opportunity Area. Total disturbance acres represent less than 1 percent of the extent of each Conservation Opportunity Area.

A majority of disturbance within the Conservation Opportunity Areas would occur within previously altered Agricultural and Developed Vegetation (117 acres; 68 percent), followed by Forest and Woodland Vegetation (39 acres; 23 percent). Removal or alteration of natural vegetation could result in impacts to plant SGCN that occur within the impacted Conservation Opportunity Areas.

3.5.4.2.3 Noxious Weeds

The spread of noxious weeds can occur through transfer of soil to construction equipment that is contaminated with seeds or plant parts that can establish new infestations or by surface disturbance that allows for exposure and germination of dormant noxious weed seeds. Impacts of the introduction or spread of noxious weeds include competition of noxious weeds with native and naturalized plants; forage availability of native plants for wildlife species, increased need for landowner management of noxious weeds; and impacts of herbicide use to control noxious weeds on native, naturalized, and crop plants.

Spread of noxious weeds is possible anywhere in the vegetation analysis area. Agricultural areas, which constitute 71 percent of the vegetation analysis area, are routinely treated for noxious weeds by chemical and mechanical means. However, areas with native or naturalized vegetation, approximately 26 percent of the vegetation analysis area, are not typically treated for noxious weeds and are susceptible to spread of noxious weeds after disturbance. Overall, native or naturalized vegetation types do not otherwise experience repeated surface disturbance, and the disturbances from construction would increase the potential to introduce or spread noxious weeds in areas that were not susceptible previously. Because noxious weeds are regulated by state law, the Applicant must control the spread of or eradicate these species on any land they own or supervise in accordance with the particular legal designation each species receives (KDA 2023; Missouri Department of Agriculture 2023b). Furthermore, control or eradication methods must follow those methods that are approved and adopted by the states, which can include biological, chemical, cultural, and mechanical methods of control and eradication (KDA 2023, Missouri Department of Agriculture 2023b).

The risk of spreading noxious weeds is greatest during active construction, when bare ground is present and construction equipment and vehicles may traverse those areas. However, as per the EPMs described in **Appendix 2.4**, the Applicant would ensure that restoration occurs in a timely manner following the completion of construction. Spread of noxious weeds becomes less likely after planted areas mature and cover previously exposed soil.

The use of herbicides during construction would have a positive impact to native and naturalized vegetation by controlling the growth and spread of noxious weeds, which compete with native and naturalized vegetation for resources (e.g., water, nutrients). The use of herbicides could also negatively impact populations of native and naturalized plants and crops located near noxious weed populations due to herbicide drift. However, these impacts are anticipated to be short term (i.e., one growing season) and localized, and the benefits of herbicide use in controlling noxious weeds should have a long-term benefit on native and naturalized plants. In addition, noxious weed control using herbicides as part of an integrated vegetation management plan would be done in accordance with manufacturer label recommendations and by licensed herbicide applicators, reducing the likelihood of impacts to native or naturalized vegetation and crops.

3.5.4.2.4 Edge Effects

Edges would be created during construction primarily along the planned Project ROW, and edge effects can be long-term impacts extending into operations and maintenance. One of the potential edge effects is a change in the structure or species composition of a vegetation community resulting from changes in microclimate and sun exposure along the exposed edge following vegetation removal in the Project area. Edge effects also include ongoing exposure to noxious weed establishment resulting from dispersal of seeds (from noxious weed populations) within the planned Project ROW. The impact of edges on wildlife is discussed in **Section 3.8**.

While Agricultural and Developed Vegetation make up most of the area subject to disturbance, edge effects are likely to be minimal in these areas, as agricultural areas are already converted from native or naturalized vegetation, are managed for high solar radiation to encourage crops, and are routinely treated for noxious weeds by chemical and mechanical means. Edge effects would also be minimal in Shrub and Herb Vegetation, since herbaceous vegetation is adapted to high solar radiation; dense shrub stems and canopies typically reduce the solar radiation that reaches the understory, even along the edges of these vegetation communities; and windthrow[2] is not an issue in non-forested communities. While Shrub and Herb Vegetation is susceptible to noxious weeds and wildfire, these edge effects can be minimized by following the noxious weed control measures and Project safety standards and practices for safe construction outlined as EPMs in **Appendix 2.4**.

Compared with non-forest vegetation, edge effects would be greatest in areas of Forest and Woodland Vegetation, where the removal of vegetation would expose vegetation adjacent to the Project area to higher solar radiation and wind, resulting in hotter, drier conditions on the forest floor and an increased risk of windthrow. However, it may take many years to detect a change if it occurs, and some potential impacts, such as windthrow, would be highly localized (SWCA 2023).

3.5.4.3 Operations and Maintenance

3.5.4.3.1 General Vegetation

Project operations and maintenance activities would temporarily impact vegetation where periodic inspections and maintenance activities occur, and plants are crushed or uprooted, or soils are compacted by vehicles. Incompatible vegetation within the planned Project ROW would be cut or trimmed to comply with the NERC Transmission Vegetation Management Standard (FAC-003-05) (NERC 2024). Some types of maintenance and repairs, such as repair of transmission structures, may also result in additional vegetation disturbance. These activities would occur in areas with previous disturbance and reclaimed vegetation, creating a new temporary disturbance in these areas. Operations and maintenance activities would occur in the planned Project ROW and follow relevant laws, regulations, easement rights, and EPMs. Short- or long-term impacts to vegetation would be limited to those strictly necessary.

Vegetation in the planned Project ROW would be maintained during operations and maintenance as sustainable vegetation compatible with conductor clearance and facility access requirements. Typically,

[2] Windthrow is when a tree falls over resulting from the forces of wind. Windthrow of trees typically increases along edges.

the wire zone is maintained in low-growing herbaceous species. Outside the wire zone, but still within the planned Project ROW, shrubs and short-stature tree species (up to 25 feet in height at maturity) may also be compatible and, if present, could be maintained along the edge of the planned Project ROW.

The frequency of extreme weather events could lead to drier fuels in the region. If extreme weather events become frequent, there would be a higher possibility of lightning-induced wildfire or high-wind events that increase spread rates. Considering these changing dynamics, the wildfire risk during operations and maintenance could increase if climate change scenarios progress along the current trends. Climate trends of wetter winters and hotter summers may alter plant cover, resulting in potential impact of greater wildfire risk because of increased fuel loads of drier vegetation.

3.5.4.3.2 Conservation and Ecological Areas Associated with Rare Native Species

The types of impacts to state Species of Greatest Conservation Need and related Ecological Focus Areas and Conservation Opportunity Areas during operations and maintenance activities would be the same as those described for general native vegetation communities. Overall, the impacts from operations and maintenance activities would be periodic and small relative to construction activities. If there are new impacts from operations and maintenance activities in Ecological Focus Areas and Conservation Opportunity Areas with a tree canopy, they would create a permanent impact, on the order of several decades, where trees are trimmed or removed. Herbaceous plant communities could have temporary impacts due to routine maintenance and inspection. For infrastructure replacement or repair, the disturbance would introduce the same impacts as described in **Section 3.5.4.2**, but on a smaller footprint and only at isolated locations needing replacement or repair.

3.5.4.3.3 Noxious Weeds

Periodic inspections and maintenance, including vegetation maintenance in the planned Project ROW, could create opportunities for noxious weeds to establish or proliferate. Vehicles that enter the vegetation analysis area could spread noxious weeds from elsewhere if seeds or propagules are picked up on vehicles prior to entering the vegetation analysis area. However, as compatible vegetation in the planned Project ROW is reestablished after construction, the likelihood of the establishment and spread of noxious weeds is reduced. Operations and maintenance activities to maintain compatible vegetation within the planned Project ROW would not be expected to create extensive new surface disturbance where noxious weeds could become widely established, and the anticipated long-term (i.e., through the life of the Project) impact of operations and maintenance activities on the introduction or spread of noxious weeds would be minimal.

If noxious weeds and other incompatible vegetation are controlled with herbicides during operations and maintenance, incidental contact with native or naturalized vegetation could cause unintended die-off of those plants. The impact would be localized and infrequent. The use of herbicides would also be subject to landowner agreements, and application would occur in accordance with manufacturer label recommendations by licensed herbicide applicators, which would reduce the likelihood of unintended impacts to vegetation.

3.5.4.4 Decommissioning

Site decommissioning would be performed at the end of the service life of the Project in accordance with a Decommissioning Plan. Impacts to vegetation resources from activities to remove Project facilities would likely be similar to impacts during construction; however, tree removal would not likely be necessary. Decommissioning would likely entail accessing and removing equipment and structures, including portions of transmission structure foundations. Changes to the general vegetation and conservation and ecological areas associated with rare native species during decommissioning would result from removal of vegetation through clearing during removal of transmission structure foundations, soil compaction from vehicular traffic, crushing vegetation, herbicide treatment to control noxious weeds, and incompatible vegetation, mowing, and growth of opportunistic and early successional species. Forest and Woodland Vegetation would likely be allowed to recolonize areas within the Project ROW that were maintained as Shrub and Herb Vegetation through the operations and maintenance phase of the Project. Like during construction, the risk of spreading noxious weeds would increase during decommissioning when bare ground is present and construction equipment and vehicles may traverse those areas.

3.6 Cultural Resources and Native American Traditional Resources and Values

3.6.1 Issues for Analysis

Based on NEPA/NHPA statutory and regulatory requirements; input from federal, state, and local agencies and tribal governments; and comments received during scoping, the cultural resources and Native American traditional resources and values analysis addresses the following:

- Direct and indirect effects[1] from surface-disturbing activities that could have an effect on historic properties per Section 106 of the NHPA;
- Direct and indirect effects, including visual, noise and atmospheric intrusions, from construction and operation and maintenance activities, that could have an adverse effect on historic properties per Section 106 of the NHPA;
- Direct and indirect effects that could have a negative impact on cemeteries and burial grounds;
- Direct and indirect effects that could have an effect on the Fort Larned NHL (also known as Fort Larned National Historic Site) or NHTs, including the Santa Fe NHT, the Oregon NHT, the California NHT, the Lewis and Clark NHT, and the Pony Express NHT; and
- Disturbances, both direct and indirect, to Native American traditional resources and values, including Traditional Cultural Places (TCPs), religious/sacred sites, burials and burial grounds, traditionally important natural and ecological areas, and other significant areas as determined by tribal entities.

"Cultural resources" include a broad range of resources showing evidence of past human activity. Cultural resources can be natural or built, purposeful or accidental, physical, or intangible. The term includes prehistoric or historic archaeological sites, landscapes, cemeteries and burial grounds, buildings, structures, objects, districts, TCPs, place names, natural areas with cultural significance, and sacred or religious sites. Cultural resources also include "historic properties" as defined in the NHPA[2] (36 CFR 800.16(i)). For this analysis, cultural resources are discussed as archaeological resources, historic built environment resources, and Native American traditional resources and values. These terms are defined as:

- **Archaeological resources**: Any prehistoric and historic sites, structures, objects, and districts where physical remnants of past human activity are present. Prehistoric archaeological resources can include prehistoric-era lithic and ceramic scatters, quarries, habitations sites, temporary camps, ceremonial sites, and abandoned trails. Historic archaeological resources can include

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[1] For clarification and distinction, the EIS is using "direct effect" and "indirect effect" per the NEPA definitions at 40 CFR 1508.1(i). The NHPA has more specific definitions for direct and indirect effects as the law is specific to the effects on historic properties from federal agency undertakings. "Effect" is defined at 36 CFR 800.16(i), and the Advisory Council on Historic Preservation (ACHP) has provided definitions for direct and indirect effects on page 41 in Attachment A: Definitions and Translations of the "NEPA and NHPA: A Handbook for Integrating NEPA and Section 106" (March 2013, https://www.achp.gov/sites/default/files/2017-02/NEPA_NHPA_Section_106_Handbook_Mar2013_0.pdf, last accessed 6/18/2024). In March 2019, the D.C. Circuit issued an opinion that clarified the meaning of the term "directly" specific to NHPA Section 110(f) as referring to the causality, not the physicality, of the effect on historic properties (see the ACHP update at https://www.achp.gov/news/court-rules-definitions-informs-agencies-determining-effects, last accessed 6/18/2024).

[2] 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. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria."

historic-era resources such as building foundations, wells, privies, corrals, historic artifact scatters, and trash dumps.

- **Historic built environment resources**: Any standing historic-era buildings and historic-era[3] structures such as roads, trails, bridges, irrigation ditches and cemeteries.
- **Native American traditional resources and values**: Any Native American-defined TCPs, ceremonial/religious or sacred sites, shrines, burial grounds, and ecological resources such as plant gathering areas, animals and animal habitat, springs, natural outcrops, dance grounds, clay sources, and other traditional use areas as determined by tribal entities.

3.6.1.1 National Historic Preservation Act of 1966 as amended (NHPA) 54 U.S.C. 300101-320101)

The NHPA of 1966, as amended, requires federal agencies to consider an undertaking's effects on historic properties. Historic properties are defined as cultural resources that are listed in, or eligible for listing in, the National Register of Historic Places (NRHP). Unevaluated cultural resources or those requiring additional data are treated as eligible for listing in the NRHP until final eligibility is determined. For the purposes of this EIS, the term "historic properties" will be consistent with historic preservation laws and regulations.

3.6.1.1.1 Section 106 of the NHPA (54 U.S.C. 306108)

Federal agencies must fulfill their NHPA responsibilities as detailed in Section 106 of the NHPA and its implementing regulations (36 CFR Part 800). Section 106 is a procedural law that establishes a process by which historic properties are given consideration during the development of federal undertakings. Section 106 review encourages but does not mandate preservation of historic properties. This process consists of the following:

- Establishing the undertaking, defining the Area(s) of Potential Effect (APE), and consulting with appropriate entities, referred to as consulting parties, which can include other federal agencies, SHPOs, Tribal Historic Preservation Officers (THPOs), the ACHP, Native American Indian Tribes (Tribes), local governments, interested parties, and the public.
- Identifying historic properties through inventory and evaluation of NRHP-eligibility under the NRHP criteria of significance found in 36 CFR Part 63, in consultation with cooperating agencies and consulting parties, including the Tribes.
- Determining effects to historic properties using the criteria of adverse effects found in 36 CFR 800.5, in consultation with cooperating agencies and consulting parties, including Native American Tribes.
- If the federal agency determines the project would result in adverse effects to historic properties, taking appropriate measures to avoid, minimize, or mitigate those effects, in consultation with cooperating agencies and consulting parties, including Native American Tribes.

[3] For the purposes of this analysis, the historic era was defined to include resources that meet the 50-year threshold for National Register of Historic Places eligibility based on the anticipated year of the start of construction for the Project (2026; see **Section 2.3.2.11** for additional information on construction schedule), plus an additional 5-year buffer that allows for unexpected delays in Project planning. Accordingly, the historic period was defined as any resource constructed in 1981 or earlier.

3.6.1.1.2 Section 106 Criteria for Evaluating Historic Properties

To be eligible for listing on the NRHP the property must be tangible; be at least 50 years old; meet at least one of the four criteria of significance (listed below) at the local, state, or national levels; and retain sufficient integrity of location, design, setting, materials, workmanship, feeling, and/or association to convey its significance (36 CFR 60.4). The NRHP criteria of significance include:

- Criterion A. Association with events that have made a significant contribution to the broad patterns of our history;
- Criterion B. Association with the lives of persons significant in our past;
- Criterion C. Embodying the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction;
- Criterion D. Resources that have yielded, or may be likely to yield, information important in prehistory or history.

Additionally, there are special considerations that allow for possible eligibility of resources typically deemed ineligible for listing in the NRHP. Properties that are typically deemed to be ineligible include cemeteries, birthplaces, or graves of historical figures, properties owned by religious institutions or used for religious purposes, structures that have been moved from their original locations, reconstructed historic buildings, properties primarily commemorative in nature, and properties that have achieved significance within the past 50 years (36 CFR 60.4).

3.6.1.1.3 Section 106 Programmatic Agreements

Regulations in 36 CFR 800.14 allow federal agencies to adopt program alternatives to 36 CFR Part 800 and to tailor the Section 106 process to better fit agency procedures or a specific project. The most common program alternative is the development of a Programmatic Agreement (PA), which is negotiated between the federal agency, cooperating agencies, applicable SHPOs and THPOs, consulting Tribes, and the ACHP (if it chooses to participate). A PA for a complex project lays out the steps that the lead federal agency, cooperating agencies, SHPOs, THPOs, Tribes, and other consulting parties agree to take to consider and resolve any adverse effects an undertaking might have on historic properties.

The DOE is currently preparing a PA for the undertaking with applicable cooperating agencies, including the Kansas SHPO, Missouri SHPO, the Osage Nation, USACE, ACHP, and the Applicant. The PA will provide the required framework for continued identification and evaluation of historic properties and establish the process for avoiding, minimizing, and/or mitigating adverse effects to historic properties from the undertaking. The Section 106 process concludes with the execution of the PA. This allows for the review procedures outlined in the PA to continue after DOE LPO signs a ROD. With an executed PA in place, the Section 106 review is concluded and DOE LPO can sign a ROD.

3.6.1.1.4 National Historic Landmarks Program (36 CFR Part 65)

In addition to establishing the NRHP, the NHPA provided for the development of the National Historic Landmarks Program, managed by the Department of the Interior, NPS. The purpose of the National Historic Landmarks Program is to identify and designate NHLs and encourage the long-range preservation of nationally significant properties that illustrate or commemorate the history and prehistory of the United States. The regulations at 36 CFR Part 65 detail criteria for evaluation of NHLs, as well as their designation, recognition, monitoring, boundary alteration, withdrawal of designation, and appeals process. An NHL can be a district, site, building, structure, or object, in public or private ownership, judged by the Secretary of the Interior to possess national significance in American history, archaeology, architecture, engineering, and culture. NHLs are historic properties that are listed in the NRHP but have greater status and protections due to their national significance. The NPS is responsible by law for monitoring the condition of NHLs.

3.6.1.1.5 Section 110(f) of the NHPA

NHPA Section 110(f) (54 U.S.C. 306107) stipulates that before commencing a federal undertaking that may "directly and adversely affect" an NHL, agencies "shall to the maximum extent possible undertake such planning and actions as may be necessary to minimize harm to the landmark."

3.6.2 Analysis Area

The analysis area is the geographic extent for identifying cultural resources and includes the areas where Project-related effects, both direct and indirect, may result. Section 106 of the NHPA requires federal agencies to take into account the effects an undertaking would have on historic properties present within a defined APE. The APE, as defined by the Section 106 implementing regulations, is "the geographic area or areas within which an undertaking may directly or indirectly cause alteration in the character or use of historic properties if such properties exist. 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)). The APE for a federal undertaking is defined by the federal lead agency. The APE for the Project has been defined through NHPA Section 106 consultation with agencies, tribes, and other consulting parties.

For this EIS, the cultural resources and Native American traditional resources and values analysis area is the APE, as described further below. As the potential for direct and indirect effects may be different for archaeological resources, historic built environment resources, and Native American traditional resources and values, the analysis area is subdivided and defined as follows:

- **Archaeological analysis area**: The area where archaeological investigations for this Project would occur, which encompasses the surface-disturbance areas but does not include the areas within the planned Project ROW where surface disturbance is avoided.
- **Historic built environment analysis area**: The area where historic resources investigations for this Project would occur, which encompasses the surface-disturbance areas plus a variable buffer between 0.5 and 2 miles of new aboveground infrastructure proposed for the Project (between 1 and 4 miles total). The variable buffer accounts for potential direct and indirect effects from the Project that could have an adverse effect on historic built environment resources (including NHLs, NHTs [discussed in **Section 3.7**], and NRHP-eligible properties). Where historic built environment concerns were identified, a viewshed analysis of Project components was conducted and the analysis area was expanded up to 2 miles based on the results.
- **Native American traditional resources and values analysis area**: The same area as the historic built environment analysis area, in consideration of the potential for direct and indirect effects on resources of potential significance to the Tribes that may be present within or outside the surface-disturbance areas. The AOIs and AOAs expressed by tribes as part of ongoing consultation are included within the Native American traditional resources and values analysis area. The Osage Nation, Pawnee Nation, and Wichita and Affiliated Tribes have provided geographical locations of their AOIs and/or AOAs.

3.6.3 Affected Environment

The affected environment describes the archaeological resources, historic built environment resources, and Native American traditional resources and values in the analysis areas. To identify resources and values within the analysis areas, record searches in state and federal agency databases, reviews of historic documents and maps, and reviews of historical archaeological field surveys were conducted, as well as consultation with Tribes for areas of interest and significant tribal values and resources. Primary source[4] research was conducted to identify land use practices that may indicate the potential for, or presence of, cultural resources. Primary sources reviewed included General Land Office plats and historical USGS quadrangles to identify place names and topographic features (e.g., knolls), which could indicate areas of potential tribal concern. Aerial imagery was reviewed to identify areas of stream crossings or areas adjacent to major natural water sources with increased archaeological/cultural potential, and soil data was reviewed to determine types of geologic deposits and depth to bedrock. Secondary literary sources were also reviewed, including available previous cultural resources reports that provide contextual information of the analysis areas. These previous inventories identified cultural resources, including historic properties, state-inventoried archaeological and historic resources, and cemeteries present within the analysis area. The following databases were searched to identify primary and secondary sources:

- NRHP Inventory of Properties (NPS 2023c)
- NHL and NHT Inventories (NPS 2023a, 2023b)
- Missouri SHPO Archaeology Viewer online database (Missouri SHPO 2023) and the Missouri Department of Natural Resources Historic Districts and Sites Map Viewer (MDNR 2023)
- Missouri State Parks National Register Historic Sites and Districts online database (Missouri State Parks 2016)
- Kansas Historical Society's Historic Resources Inventory and Archaeological Inventory (Kansas Historical Society 2023a, 2023b)

The affected environment as presented below is based on available information gathered through the above-noted literature and records reviews and contextual information of known and potential cultural resources.

Archaeological field inventories to identify previously unrecorded cultural resources have not been completed to date for most of the archaeological analysis area. These investigations for identification, eligibility evaluation, and effects assessment of archaeological resources would be completed under the terms and protocols defined within the PA currently under development by DOE LPO and other consulting parties.

During the ongoing consultation process, NPS identified KOPs associated with individual "high potential historic sites." Criteria for consideration as high potential sites include historic significance, presence of visible historic remnants, scenic quality, and relative freedom from intrusion" (16 U.S.C. 1251(1)). The

[4] Primary sources provide direct access, first-hand information and include maps, government documents, aerial photographs, personal accounts and histories, letters, and journal entries to name a few examples. Secondary sources are created by someone who did not experience first-hand or participate in the events or conditions being described, are one or more steps removed from the event, and interpret and analyzes primary source information. Examples of secondary sources include survey reports, research papers, journal articles, and books providing historical accounts.

KOPs were designated along NHTs (**See Section 3.7**) and at the Fort Larned NHL, discussed in detail in **Section 3.6.3.2.1**.

3.6.3.1 Archaeological Resources

Review of the Kansas SHPO and Missouri SHPO archaeological files identified 16 state-inventoried archaeological sites within or near the archaeological analysis area (Kansas Historical Society 2023a, Missouri SHPO 2023). These 16 sites include nine that contain exclusively precontact archaeological components, four with exclusively historic-era archaeological components, and three that contain both precontact and historic-era archaeological components. Only one of the 16 sites has been evaluated previously for NRHP eligibility (a precontact site in Carroll County, Missouri, assessed as not eligible), with the remaining 15 sites having “unknown” NRHP eligibility or a status of “not evaluated” for NRHP eligibility. Of these 16 sites, 12 appear to be partially or entirely within the archaeological analysis area and would be revisited during field investigations. The remaining four sites are outside of the archaeological analysis area but are near enough to warrant field survey within the archaeological analysis area to identify whether the limits of a site extend into surface disturbance areas planned for the Project. The 16 state-inventoried archaeological sites are listed in **Table 1** in **Appendix 3.6-1**.

Archaeological field reconnaissance studies conducted in late 2022 and early 2023 for the HVDC converter stations identified nine archaeological resources (six in Ford County, Kansas, and three in Monroe County, Missouri), all of which are recommended as not eligible for the NRHP, primarily due to the absence of subsurface contexts and/or evidence of intact cultural features or deposits. These nine resources are outlined in **Table 2** in **Appendix 3.6-1**.

Field investigations are continuing in the archaeological analysis area to identify the presence of archaeological resources not previously recorded and are expected to continue through the second quarter of 2025. These investigations for identification, eligibility evaluation, and effects assessment of archaeological resources would be completed under the terms and protocols defined within the PA currently under development by DOE LPO and other consulting parties.

3.6.3.2 Historic Built Environment Resources

Information on NRHP-listed properties of concern was identified through consultation with NPS. These properties include Fort Larned NHL, located in Pawnee County, Kansas, and five NHTs, the historic routes of which extend within the historic built environment analysis area and portions of the archaeological analysis area.

3.6.3.2.1 National Historic Landmarks

Fort Larned NHL

Fort Larned National Historic Site NHL (Fort Larned NHL) is located within the historic built environment analysis area approximately 1.7 miles southeast of the Project. Fort Larned Military Reserve was established in June 1860 by the federal government as a military outpost along the Santa Fe Trail. Fort Larned is significant for its relation to the Santa Fe Trail and westward expansionism; as an important site for diplomatic relations with Tribes (including the Cheyenne, Arapaho, Kiowa, and Comanche tribes); for its role in peacekeeping in a large geographic area; and as the best surviving example from a system of frontier forts on the central Plains. The original buildings are situated in a relatively undisturbed setting, contain intact architecture and furnishings, and together comprise one of the most complete military posts along the Santa Fe Trail. Fundamental resources and values of the NHL include: 1) historic structures and parade ground; 2) setting/cultural landscape; 3) Santa Fe Trail ruts; 4) original Fort Larned artifacts from its period of significance (1860-1884); and 4) archaeological remains from its period of significance (NPS n.d.).

Fort Larned was designated a National Historic Landmark in 1961, authorized for acquisition by Congress in 1964 and acquired by NPS in 1966. NPS restored the existing complex of buildings to represent its military use and appearance during the period from 1868 to 1878 (NPS 1999). Fort Larned was automatically listed on the NRHP when the program was established in 1966; a comprehensive nomination was prepared and approved in 1976 (NPS 1976). The Fort Larned National Historic Site currently encompasses 718 acres along the Pawnee River.

Due to Fort Larned Military Reserve's significance in the expansion of settlement during the nineteenth century and for Native American relations, there is a moderate to high potential for cultural resources to be present in the area surrounding the Fort. Due to the significance of Fort Larned NHL's setting and cultural landscape, eight KOPs were identified and analyzed for viewshed impacts (**Section 3.12; Appendix 3.12**).

Other Potential NHLs

National Park Service also provided information regarding the Cheyenne/Oglala Lakota Village Site (formerly known as the Indian Village on Pawnee Fork), an NRHP-listed property recently proposed for consideration as an NHL, pending NPS review. The village is located approximately 17 miles north of the historic built environment analysis area. Due to the distance of the village from the Project facilities and any surface disturbance areas, the Project would have no effect on the potential historic property. Therefore, the Cheyenne/Oglala Lakota Village Site is not discussed further.

3.6.3.2.2 National Historic Trails

Five NHTs extend within the historic built environment analysis area and portions of the archaeological analysis area, including the Santa Fe NHT, California NHT, Oregon NHT, Pony Express NHT, and Lewis and Clark NHT. As noted above, although the NHTs are considered historic properties, they also include aesthetic and recreational values and are considered separately in **Section 3.7.** Specific impacts to NHTs are not discussed further in this section.

3.6.3.2.3 Other Historic Built Environment Resources

Review of the Kansas SHPO and Missouri SHPO databases identified the presence of 20 state-inventoried historic resources within the historic built environment analysis area.[5] All 20 resources are located in Kansas and are outside of the surface-disturbance area but are within the APE. No previously inventoried NRHP-listed historic resources are within the historic built environment analysis area in Missouri (MDNR 2023). Six of the resources are historic stone or concrete bridges that date to the early- to mid-twentieth century. The other 14 resources include two churches, one rectory, two schools, four farmsteads, one residential dwelling, a stone culvert, and three resources associated with Camp Concordia (a World War II-era prisoner-of-war [POW] camp). Of the 20 state-inventoried historic resources, three are listed in the NRHP, one is recommended as potentially eligible for listing in the NRHP, one is listed in the Kansas State Historic Register, one has been demolished, two are considered not eligible for listing in the NRHP, and the remaining 12 have not been evaluated for NRHP eligibility. These historic built environment resources would be subject to field investigation and evaluated for NRHP

[5] Fort Larned, a NRHP-listed site and an NHL, is not included in this total and is discussed in **Section 3.6.3.2.1**.

eligibility in advance of construction. A list of these historic resources is presented in **Table 3** in **Appendix 3.6-1**.

A review of topographic maps was also conducted to identify cemetery and potential grave locations, which may be indicated by labeled cemeteries or anomalies on the maps. The review revealed 60 total locations in Kansas and Missouri, including 45 cemeteries, 3 unmarked graves, and 12 potential unmarked grave areas within the historic built environment analysis area.

Historic resources field investigations of the HVDC converter stations were conducted in December 2022. The historic built environment analysis area buffer applied at these locations was 1.0 mile, which extended from the exterior parcel lines. The investigation resulted in the identification of 14 historic resources within the historic built environment analysis area. The 14 resources, composed of domestic dwellings and farmsteads, have been recommended as not eligible for listing in the NRHP due to a lack of integrity and/or a lack of significant historical association. These 14 resources are listed in **Table 4** in **Appendix 3.6-1**.

Field investigations of the historic built environment analysis area to identify and evaluate historic resources for NRHP eligibility and assess for potential effects are ongoing. This phase of the investigation is anticipated to continue through the second quarter of 2025. Should subsequent investigations for identification, eligibility evaluation, and effects assessment of historic resources be required, those investigations would be completed under the terms and protocols defined within the PA currently under development by DOE LPO and other consulting parties.

3.6.3.3 Native American Traditional Resources and Values

Resources of potential significance to the Tribes that could be present within the Native American traditional resources and values analysis area include (but are not limited to) ceremonial grounds, homestead allotments, burial sites, archaeological evidence of precontact and historic Indian occupations and activities, natural resources, and other features of tribal origin or importance. While many of these types of resources would overlap with known state- and/or federal-inventoried archaeological and historic built environment resources, the location and significance of these resources often require identification by tribal entities. Additionally, Native American traditional resources may include ecological resources such as plant and mineral gathering areas, animals and animal habitat, springs, landforms and geological formations, dance grounds, clay sources, and other traditional use areas as determined by tribal entities. Engagement with and input from the Tribes are critical elements of the identification and evaluation of resources of potential significance to tribes.

In response to tribal outreach (refer to **Chapter 5**), the Osage Nation, Pawnee Nation of Oklahoma, and the Wichita and Affiliated Tribes provided AOIs, and the Osage Nation also provided AOAs (**Appendix 3.7-2**). The Osage Nation has requested that their AOAs be avoided by Project facilities and surface-disturbing activities, including surveys.

The primary concerns expressed by the Tribes to date have focused on AOIs and AOAs that overlap with Project facilities where there would be surface-disturbing activities. The Applicant, therefore, has committed to EPMs (**Appendix 2.4**) including avoiding ground disturbance in AOAs identified by the Osage Nation.

Ongoing DOE LPO and tribal consultation has not yet identified information regarding tribal treaty rights (such as hunting and fishing rights, water rights, tribal land use), which could potentially be impacted within the Native American traditional resources and values analysis area. Should subsequent investigations for identification and effects assessment of tribal resources be required, those investigations would be completed under the terms and protocols defined within the PA currently under development by DOE LPO and other consulting parties.

3.6.4 Environmental Consequences of Proposed Federal Action

3.6.4.1 Methods and Assumptions

The DOE LPO, in consultation with cooperating agencies and consulting parties, will make determinations of effect to historic properties under the Section 106 process, as stipulated in the PA. The PA will guide ongoing identification of historic properties in the Project APE, including tribal cultural resources, as well as the assessment of potential Project effects and treatment measures. The PA will ensure that measures are considered to avoid, minimize, or mitigate adverse effects to historic properties.

The PA includes a Phased Identification and Assessment Plan providing steps to minimize potential adverse effects and outlining guidance for monitoring requirements. In addition, the PA includes an Inadvertent Discovery Plan, which describes procedures to follow and actions to take should cultural resources be discovered during construction activities. Further, the PA directs the Applicant, in consultation with DOE LPO, the Tribes, and other consulting parties, to develop Historic Properties Treatment Plans (HPTPs) to address the resolution of adverse effects on historic properties that could not be avoided or where effects could not be minimized to a finding of No Adverse Effect. The HPTPs would be developed after the signing of the PA and would define the mitigation and treatment methods for adversely affected historic properties, codify the detailed mitigation measures for that particular historic property or property type, include processes for archaeological data recovery, and include a Monitoring Plan defining monitoring objectives and the methods needed to obtain those objectives, the methods for implementing cultural monitoring, necessary communication protocols, and processes and protocols for Tribal Monitor participation during construction.

The Project-related impacts to cultural resources presented here are preliminary assessments based on the known resources in the APE. The analysis is based on the review of files and information described in **Section 3.6.3** in relation to Project construction, operations and maintenance, and decommissioning activities. The analysis presented here of the Project is based on NEPA definitions of direct and indirect effects, and context and intensity. The NHPA criteria for determining adverse effects is not used. Potential effects on cultural resources are considered where possible through measurable data; where data is unavailable, professional judgment or qualitative assessments are used to describe potential effects.

3.6.4.1.1 Section 106 Definition of Adverse Effect

Eligibility and adverse effect criteria as outlined in the Section 106 regulations (36 CFR 800.4 and 800.5) provide a standard for identifying and determining the context and intensity of potential impacts to archaeological and historic built environment resources. The primary concern regarding impacts on these two types of resources is the loss of historical integrity that makes the resource eligible for the NRHP. Section 106 eligibility and effects-determination standards are used to assess whether the Project's actions would have an adverse effect, which is one that would "alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the NRHP in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association" (36 CFR 800.5(a)(1)). An adverse effect on a historic property would be determined by the amount or degree of physical destruction of, damage to, or alteration of all or part of the property, which also includes removal of the property from its historic location and a change of the character of the property's use or features within the setting that contributes to its significance, and the introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features.

If cultural resources are determined to be eligible for listing on the NRHP, but the Project's effects do not meet the criteria of adverse effect, then there would be either "no adverse effect" or "no effect" to historic properties. A "no adverse effect" determination would apply in two circumstances: when historic properties may be impacted by the Project, but the Project would not alter, directly or indirectly, any of the characteristics or integrity that qualify the property for inclusion in the NRHP in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association; or if the Project is modified or conditions are applied to avoid impacts that have an adverse effect, as determined through the Section 106 consultation process. A "no effect" determination would apply if the federal agency determines either that "no historic properties are present or there are historic properties present but the undertaking will have no effect upon them" (36 CFR 800.4(d)(1)).

3.6.4.1.2 Native American Traditional Resources and Values

Native American traditional resources and values may or may not be eligible for listing in the NRHP, and the criteria noted above for determining the context and intensity of effects may not apply. The types, context, and intensity of effects upon Native American traditional resources and values are best determined through tribal consultation. Additionally, the laws, regulations, and policies pertinent to determining effects on Native American traditional resources and values were considered. Known information, including the AOAs and AOIs, was considered in the analysis, and conclusions were drawn based on an understanding of how Project-related activities could affect Native American traditional resources and values. Due to the confidential nature of the information, resource descriptions and discussion of Project effects may be limited in this EIS.

Potential impacts to Native American traditional resources and values from the Project include the following:

- Conflict with land uses, management, and the economic wellbeing of adjacent or nearby reservations, trust lands, restricted Native American allotments, and dependent Native American communities;
- Activities that are incompatible with the continued existence or use of places of traditional religious and cultural importance;
- Project impacts that could have adverse effects on historic properties or their settings, including TCPs eligible for the NRHP under Section 106 of the NHPA;
- Adverse impacts to culturally important plant or animal species;
- Changed or reduced access to traditionally used or culturally important water sources, including springs; and
- Impact on sacred sites or their settings, access, or use.

The Native American traditional resources and values analysis area could include lands where Native American traditional resources and values are not currently identified. Where the tribes have identified AOIs and AOAs and provided information on potential impacts, such as those listed above, DOE LPO has included an analysis. The DOE LPO will continue to coordinate with the Tribes to identify areas with Native American traditional resources and values and potential impacts from the undertaking throughout the NEPA and NHPA Section 106 processes and include avoidance, minimization, and mitigation measures as required.

As noted above and in **Section 3.6.3**, Native American consultations and field investigations are ongoing and likely to identify additional cultural resources. As the information is incomplete and likely to be updated in the future, the environmental consequences are based on anticipated impacts to the known resources identified through research and consultation and assumed to apply to similar resource types within the analysis areas. To address this circumstance, DOE LPO is undertaking development of a PA with input from consulting parties as previously noted. The PA will define a phased approach for identification and evaluation of historic properties and memorialize the process for identifying avoidance, minimization, and mitigation measures to resolve adverse effects.

3.6.4.2 Construction

3.6.4.2.1 Archaeological Resources

Project construction activities have the potential to pose direct effects on archaeological resources within the archaeological analysis area. Impacts to archaeological resources from construction may include destruction or disturbance by vertical and horizontal displacement of soil containing archaeological materials; damage to or destruction of artifacts and features; and loss of archaeological data due to surface-disturbing activities, such as clearing, grading, excavation, erosion, and compaction, and using temporary multi-use yards for storing equipment and supplies.

Increases in the use of vehicles and equipment, as well as human access to previously inaccessible areas, could expose archaeological sites to increased looting, vandalism, and trampling, depending on their accessibility and visibility; for example, conspicuous site types, such as precontact cairns, would be especially vulnerable. To minimize these potential impacts, Project personnel would be instructed on the federal, state, and tribal laws that protect historic properties, including prohibition of collection and removal of cultural material, as noted in the EPMs in **Appendix 2.4**.

Archaeological sites that are determined to be not eligible for the NRHP and do not represent a tribally defined TCP or location of significance could still have the types of impacts noted above, but as they are not historic properties, the archaeological resources would require no further management under the PA. However, if a “not eligible” site was found to have material that is otherwise sensitive (e.g., contains features sensitive to Tribes or stakeholders), it may be considered for avoidance.

If surface disturbance associated with construction has direct impacts to archaeological historic properties, these impacts could represent an adverse effect under NHPA Section 106, as defined in 36 CFR 800.5(a)(1), and require the development and implementation of measures to avoid, minimize, or mitigate the adverse effect(s). Avoidance of the historic property entirely or its contributing site elements may be sufficient to result in a determination of no effect or no adverse effect on historic properties, as appropriate. If impacts to an archaeological historic property could not be avoided, and the impacts would alter the characteristics or diminish the integrity of the site that qualify it for inclusion in the NRHP, the determination would result in an adverse effect.

The potential exists to inadvertently encounter undocumented archaeological resources during construction activities within the surface-disturbance areas, which could result in an impact that has adverse effect by displacement or loss (either complete or partial) of an archaeological historic property. Displacement of cultural material could diminish the potential to understand the context of the site and limit the ability to extrapolate data regarding settlement and subsistence patterns. Potential impacts from inadvertent encounters could have greater effects on previously unknown sites than on previously identified sites because this damage occurs prior to their recordation and evaluation. To avoid or minimize potential impacts to inadvertent discoveries, Project EPMs in **Appendix 2.4** include the development and implementation of the Inadvertent Discovery Plan that outlines protocols for contractors upon encountering unanticipated cultural remains during construction.

Currently, there are 16 previously documented archaeological sites within or up to 250 feet from the planned Project ROW (**Table 1** in **Appendix 3.6-1**). One of these sites (23CA1171) was previously determined not eligible for the NRHP. Thus, any impacts to this site would not constitute an impact to a historic property that would need to be addressed under the PA. The remaining 15 sites have not been previously assessed for NRHP eligibility and would be reinvestigated during the ongoing archaeological field reconnaissance surveys.

The archaeological field studies conducted at the two HVDC converter stations resulted in the identification of nine archaeological sites, six in Ford County, Kansas, and three in Monroe County, Missouri (**Table 2 i**n **Appendix 3.6-1**). The nine sites are recommended not eligible for the NRHP due to a lack of subsurface context and/or evidence for intact archaeological deposits and features. The Kansas and Missouri State Historic Preservation Officers have provided their concurrence with these determinations.

Any archaeological sites encountered during the ongoing archaeological field investigations would be assessed for NRHP eligibility and included in the NHPA Section 106 consultation process. The PA currently under development will outline the process for implementing identification, assessment, and/or resolution of Project impacts that have an adverse effect on archaeological historic properties.

3.6.4.2.2 Historic Built Environment Resources

National Historic Landmarks – Fort Larned NHL

The fort at Fort Larned NHL (commonly referred to as Fort Larned National Historic Site) is approximately 1.7 miles from the planned Project ROW and areas where construction activities would occur. No physical effects from Project construction on Fort Larned NHL are anticipated, as surface disturbance associated with construction would be located within agricultural fields more than a mile from the NHL boundary.

During construction, the temporary presence of construction equipment, laydown yards, and other construction-related activities would modify the visual environment within the viewshed of historic properties and could temporarily introduce an inconsistent and contrasting element into the landscape. Upon completion of construction, vehicles and equipment would depart, and disturbed portions of the site would be restored. Potential effects would be primarily the result of the following activities:

- Truck traffic would temporarily increase on area roadways.
- Temporary laydown yards would be occupied by equipment/materials for the duration of a construction phase.
- Temporary erosion control measures would be implemented, such as low black silt fencing, staked hay bales, and similar.
- Construction equipment would be visible within work areas; concrete trucks, excavators, cranes, and similar.

During construction, contractors would be directed to extinguish nighttime exterior lights at any temporary construction work sites, equipment, and laydown yards when not in use, except for what is needed for site security and safety. Any overnight site security lighting would be shielded to project light downward. With the use of minimal temporary lighting and implementation of shielding methods and downward direction of any construction-related lighting, the potential for spill outside of the work area or glare into the night sky would be minimized (**Appendix 2.4**). In addition, any night lighting would be temporary and limited to a short duration in locations of active construction.

Temporary effects (those associated with construction activities) to landscape character would occur primarily as a result of the presence of construction equipment, materials, and activities that could temporarily modify the visual landscape by introducing inconsistent and contrasting elements to the existing visual environment during construction of the Project. While temporarily creating a new visual element within the landscape, construction activity is not uncommon, and the presence of large construction equipment would not be manifestly different than the presence of large machinery associated with agricultural operations common within the Project area.

Due to the distance (over a mile) and intervening vegetation between the Project ROW and the Fort Larned NHL that screens outward views, temporary visual impacts from construction are anticipated to be minor. Temporary visual impacts would last only the duration of construction activities in the localized area along the planned Project ROW, which is anticipated to be approximately four weeks. Noise and atmospheric impacts are not anticipated due to the distance of the Project from the NHL.

Other Historic Built Environment Resources

Project construction activities could also impact other historic built environment resources, including direct physical alteration of the built resource (for example a building or bridge), as well as surface disturbance to landscape features that contribute to the significance and integrity that qualifies a resource for inclusion in the NRHP. These impacts could occur from the installation of towers, the introduction of multi-use yards, and constructing or improving access routes located within the boundary of a historic property, as well as visual impacts from adding contrast through visual clutter and alterations to the landscape composition, such that the viewer's experience may be temporarily affected. In addition, construction activities could have a temporary indirect impact on historic built environment resources, such as noise impacts from construction activities.

As the Applicant is intending to avoid any direct impacts to historic built environment resources such as structures, buildings, bridges, and cemeteries to the greatest extent possible, the potential for direct impacts to these types of historic properties from construction would be limited. These visual impacts would be temporary and would be removed upon completion of the construction activities. Therefore, mitigation of construction-related impacts that have direct adverse effects on built environment historic properties is unlikely to be needed. **Section 3.12** provides additional information related to visual impacts.

Currently, there are three known NRHP-listed built environment historic properties and one Kansas state-inventoried resource within the historic built environment analysis area. Potential construction-related impacts to these resources are detailed below:

- **Brown's Creek Tributary Masonry Arch Bridge**. The bridge is listed in the NRHP under Criterion C for engineering and is 0.53 mile north of the planned Project ROW. Construction may have short-term impacts, such as visibility of construction equipment, construction noise, and exhaust fumes that may travel to the property location. However, these impacts are not anticipated to represent an adverse effect on this historic property due to the bridge's distance from the surface-disturbance areas.

- **Cather Farm**. The farm is listed in the NRHP under Criterion A for agriculture and Criterion C for architecture. The exterior boundary of the NRHP-listed Cather Farm is 175 feet south of the planned Project ROW. Construction may have short-term impacts, such as visibility of construction equipment, construction noise, and exhaust fumes that may travel to the property location. However, these impacts are not anticipated to represent an adverse effect on this historic property due to their temporary nature. Additionally, an existing transmission line is located between the farm boundary and the planned Project ROW. Therefore, impacts from Project construction activities are not anticipated to pose an adverse effect on this historic property.
- **St. Benedict's Church**. The property is listed in the NRHP under Criterion C for architecture and is 0.48 mile south of the planned Project ROW. There are no major vertical obstructions between the church and the planned Project ROW. The integrity of setting, feeling, and association is not discussed in the NRHP listing, but Project construction activities are likely to be visible along the northern horizon of the property. This impact could potentially result in limited visual effects on the historic property.
- **POW Camp Concordia Building T-9**. The historic building is listed in the Kansas State Historic Register (Kansas Historical Society 2023b) and is 0.3 mile north of the planned Project ROW. Considering the amount of modern development in the area surrounding the property, Project construction activities are anticipated to have no impact on this resource.

Potential impacts from Project construction activities that could affect the three listed historic properties would be further assessed as part of the ongoing historic built environment investigations being conducted for the Project. The one known state-inventoried resource would also be evaluated for NRHP eligibility and assessed for impacts, if required, as part of the ongoing historic built environment investigations.

In addition to avoiding historic buildings, structures, objects, and districts, the Project design would avoid impacts to previously recorded cemeteries, unmarked graves, and high-potential unmarked burial areas identified by the Kansas SHPO as a part of their state-specific unmarked burial program. The Missouri SHPO does not maintain a comparable dataset.

As previously noted, DOE LPO is developing a PA with consulting parties. Subsequent investigations for historic built environment resources are being conducted in conformance with the PA. As noted above under Methods and Assumptions, the PA and Phased Identification and Assessment Plan provide the guidance for avoiding, minimizing, and mitigating requirements to resolve adverse effects from the Project on historic properties, including the development of an HPTP.

3.6.4.2.3 Native American Traditional Resources and Values

As noted in **Chapter 2**, the Applicant would not conduct construction-related activities, including surveys, in Osage Nation-provided AOAs. As a result, there would be no impact on tribal resources within these AOAs. Cultural resource surveys are ongoing in the AOIs provided by the Osage Nation, Pawnee Nation, and Wichita and Affiliated Tribes to the extent they intersect the analysis area.

While tribal engagement has, to date, defined AOIs and AOAs within the Native American traditional resources and values analysis area, the extent and types of extant tribal resources have not yet been determined. Therefore, only generic descriptions of potential direct and indirect impacts to tribal resources are currently feasible. Potential impacts to tribal resources would generally be similar to those that may result in adverse effects on other types of historic properties, such as archaeological resources and historic built environment resources, as outlined above. Should the Project have an impact that is determined to be an adverse effect to a tribal resource, consultation with the appropriate tribe and Tribal Historic Preservation Officer and/or SHPO would be conducted to avoid, minimize, or mitigate the adverse effect caused by the Project impact.

3.6.4.3 Operations and Maintenance

3.6.4.3.1 Archaeological Resources

As noted in **Chapter 2**, operations and maintenance activities would occur at Project facilities and within the established transmission line ROW and include inspections (usually aerial, but also ground-based as needed), vegetation management (removal and/or control of vegetation with herbicides and manual work methods), and repairs and other permitted uses within the ROW. The nature and types of effects from these activities are similar to those described for construction, with the key difference that the activities occur within previously inventoried and/or disturbed areas and any adverse effects on historic properties would have been resolved through the measures detailed in an HPTP. As such, there would be no ongoing adverse effects on historic properties, although the potential exists for inadvertent discoveries and inadvertent damage, illegal collecting of artifacts, and/or vandalism. Treatment of inadvertent discoveries and inadvertent damages would be the same as that noted under **Section 3.6.4.2.1**. With treatment plans and procedures in place to avoid, minimize, and/or mitigate potential effects, there would be little to no direct effect on archaeological resources or historic properties.

The permanent infrastructure of the Project during operation and maintenance includes the two HVDC converter stations and multiple optical regeneration facilities and associated driveways, and the transmission structures and conductors themselves. Potential indirect effects on archaeological resources are primarily visual impacts, including the intrusion of new, modern infrastructure within the viewshed of historic properties. Visual indirect impacts are most likely to occur in locations with open terrain, as described in **Section 3.12**. Introduction of structures into an otherwise rural or natural setting could diminish a historic property's integrity of setting, design, feeling, and association that contribute to its NRHP eligibility (though properties may be otherwise eligible due to other factors such as materials or workmanship); therefore, the impact would have an adverse effect. Visual adverse effects would be resolved through consultation with consulting parties to avoid, minimize, or mitigate the effect as outlined in the PA and with specific measures detailed in an HPTP under development.

3.6.4.3.2 Historic Built Environment Resources

National Historic Landmarks – Fort Larned NHL

Operation and maintenance activities would occur after completion of construction activities and throughout the life of the Project, including inspections, vegetation management, routine maintenance, and damage repair, but they would not include any future significant upgrades or rebuilds. Operations and maintenance activities within the Project ROW in the vicinity of the Fort Larned NHL may have similar temporary visual effects on the NHL as described under construction. As the Project ROW is approximately 1 mile from the National Historic Site boundary and over 1.7 miles from any visitor location within the NHL, temporary visual impacts are not anticipated to have a disruptive impact on the setting or visitor experience and are considered to be minimal.

The presence of overhead transmission lines, supporting structures, ancillary facilities, and vegetation clearing would introduce a new source of potential increased visual contrast. The Project ROW comes closest to the Fort Larned National Historical Site boundary at the point it crosses Kansas State Highway 156. At this location, the transmission line is approximately 0.9 miles from the western boundary of the

Historical Site along K-156, 1.7 miles from the picnic area, 1.6 miles from the parking lot, and 1.7 miles from the historical fort (see **Appendix 3.12**). The height of the transmission line structures within ten miles of Fort Larned would range between 135 and 200 feet tall. In comparison, the heights of the transmission structures within the viewshed of KOPs at Fort Larned, as identified by NPS, would range between 147 and 166 feet and would be located on relatively flat topography. Lighting is not required on transmission line structures less than 200 feet tall, and there are no permanent components requiring security lighting in the vicinity.

According to the viewshed analysis (**Appendix 3.12**), views of the Project from KOPs 1 to 7 would be screened by buildings or vegetation, unnoticeable, almost unnoticeable, or largely undiscernible, and the openness of the viewshed would be maintained (see **Section 3.12**). At these locations, impacts from the operation and maintenance activities and the presence of the line and facilities are anticipated to have minimal visual effects on views from Fort Larned NHL.

KOP 1 is in the parking lot within the visitor use area of the NHL. Multiple proposed transmission structures are discernible in the middle ground of the view, following a line and pattern similar to the existing visible transmission structures. The tall, thin structures fade with distance and are almost unnoticeable; they do not impede the skyline or horizon view, and the openness across the viewshed is maintained.

KOP 2 and KOPs 4 through 7 are within the historic core of Fort Larned. These views are screened by vegetation along the Pawnee River and/or by existing buildings and structures. Although the vegetation along the river was not extant during the historic period, NPS policy is to retain this vegetation to screen views to and from the historic core and promote sustainable landscape practices adopted by NPS (NPS 1999).

KOP 3 is from the recreational trail within a reconstructed prairie. Views of the proposed transmission structures are mostly screened by the foreground vegetation (even when barren). A break in foreground vegetation allows viewers on the nature trail a view out to three proposed transmission structures in the background. The tall, thin structures fade with distance and are almost unnoticeable, do not impede into the skyline or horizon view, do not dominate the view, and the openness across the viewshed is maintained.

At KOP 8, a recreational picnic area located approximately 0.3 mile north of the historical portion of the site, Project structures would be the most visible. For KOP 8, the viewshed analysis concludes the following:

> *Five or more proposed structures are visible across the expansive and open/unscreened views from this location. While the 2-mile distance fades and scales down the apparent size of the structures, they are clearly visible and protrude upward along the horizon with a prominent position on hillcrests against the horizon line. While adding to the visual clutter of the view, the new structures do not appear out of scale or context in the setting with existing visible transmission structures, including similar distant transmission structures, as well as single wooden poles in the foreground. They are similar in line, form, color, and texture to the existing infrastructure and do not create a new or distracting focal point within the view. The potential visual change from this location would be apparent to viewers, but not dominant or intrusive due to the presence of existing infrastructure.*

The visual simulations demonstrate that the severity of change and contrast in the landscape is typically in proportion to the distance of the viewer from Project components as well as the surrounding visual context. While adding to the visual clutter of the view, the new structures do not appear out of scale or context in the setting, with existing visible transmission structures, including distant towers and single wooden poles in the foreground. Visual intrusions would be further reduced by application of the EPMs, specifically acid bathing the galvanized finish of the transmission structure angle members and the use of non-specular conductors (the outer layer treated to reduce light reflectance) within a 5-mile radius (**Appendix 2.4**).

Noise and atmospheric impacts are not anticipated due to the distance of the Project from the NHL.

The DOE LPO is in ongoing consultations with NPS about whether this visual impact may constitute an adverse effect under Section 106 of the NHPA. If DOE LPO determines that the visual impact is an adverse effect under Section 106, stipulations regarding NHLs in Section 110 of the NHPA would also apply. These stipulations require federal agencies to take necessary steps to minimize harm to NHLs before approving any federal undertaking that could directly and adversely affect them. Appropriate mitigation measures to protect the setting, feeling, and association of the Fort Larned NHL would need to be developed in consultation with NPS and other consulting parties, as outlined in the PA. As stipulated in the PA for the Project, the DOE LPO will consider all prudent and feasible alternatives to avoid adverse effects on NHLs in accordance with the Secretary of the Interior's Standards and Guidelines for Federal Agency Historic Preservation Programs Pursuant to the National Historic Preservation Act (1998).

Other Historic Built Environment Resources

As noted above, operations and maintenance activities would occur at Project facilities and within the established transmission line ROW. The nature and types of effects from these activities are similar to those described above for construction, with the key difference that these activities occur within previously inventoried and/or disturbed areas. Any adverse effects would be resolved through the measures detailed in an HPTP, and the Applicant would continue avoiding any direct physical impacts to historic built environment resources during operations and maintenance activities. Potential operations and maintenance impacts to historic built environment resources are detailed below.

- **Brown’s Creek Tributary Masonry Arch Bridge**. Maintenance activities may have short-term impacts, such as visibility of equipment, noise, and exhaust fumes that may travel to the property location. However, these impacts are anticipated to be minor due to their temporary nature. Visual impacts, including the intrusion of new, modern infrastructure within the viewshed of historic properties, could also occur if the Project is visible. However, these impacts are not anticipated to represent an adverse effect on this historic property due to the bridge’s distance from the Project.
- **Cather Farm**. Maintenance activities may have short-term impacts, such as visibility of equipment, noise, and exhaust fumes that may travel to the property location. However, these impacts are anticipated to be minor due to their temporary nature. Visual impacts, including the intrusion of new, modern infrastructure within the viewshed of historic properties, could also occur. An existing transmission line is located between the farm boundary and the planned Project ROW. Therefore, impacts from Project construction activities are not anticipated to pose an adverse effect on this historic property.
- **St. Benedict’s Church**. Maintenance activities may have short-term impacts, such as visibility of equipment, noise, and exhaust fumes that may travel to the property location. However, these impacts are anticipated to be minor due to their temporary nature. Visual impacts, including the intrusion of new, modern infrastructure within the viewshed of historic properties, could also occur. There are no major vertical obstructions between the church and the planned Project ROW. The integrity of setting, feeling, and association is not discussed in the NRHP listing, but

the Project is likely to be visible along the northern horizon of the property. This impact could potentially result in limited visual effects on the historic property.

- **POW Camp Concordia Building T-9**. Maintenance activities may have short-term impacts, such as visibility of equipment, noise, and exhaust fumes that may travel to the property location. However, these impacts are anticipated to be minor due to their temporary nature. Considering the amount of modern development in the area surrounding the property, the physical presence of the Project is anticipated to have no impact on this resource.

As noted above, visual adverse effects would be resolved through the measures detailed in an HPTP.

3.6.4.3.3 Native American Traditional Resources and Values

Tribal engagement has, to date, defined AOIs and AOAs within the Native American traditional resources and values analysis area, although the extent and types of tribal resources and values have not yet been determined, and there is ongoing consultation regarding operations and maintenance activities and transmission line infrastructure. Based on consultation to date and the assumption that potential impacts to tribal resources and values would be generally similar to those on other types of historic properties, the Applicant would address them through consultation with the appropriate tribe and/or THPO, and actions would be implemented to avoid, minimize, or mitigate the adverse effect caused by operations and maintenance.

3.6.4.4 Decommissioning

Site decommissioning would be performed at the end of the service life of the Project in accordance with a Decommissioning Plan. The nature and type of direct effects on cultural resources resulting from decommissioning activities would likely be similar to operations and maintenance impacts, as activities would most likely occur in previously disturbed areas, though the visual impacts of the decommissioning activities would be similar to the visual impacts during construction. Once decommissioning is complete, the visual impacts associated with the presence of Project facilities would be eliminated or reduced with the removal of the aboveground infrastructure.

3.6.5 Environmental Consequences of No Action

Under the No Action Alternative, DOE LPO would not provide federal financial support (a federal loan guarantee) to the Applicant to construct and interconnect the Project. While this would not preclude the Applicant's Project from being constructed using non-federal funding, for the purposes of analysis, this EIS assumes that the Project would not be built. No effects on archaeological resources, historic properties, NHS and NHTs, and Native American traditional resources and values from construction, operation and maintenance, and decommissioning of the Project would occur.

The documentation and inventory of cultural resources within the archaeological resources analysis area, historic built environment analysis area, and Native American traditional resources and values analysis area would be available to help further inform the known precontact and historic landscapes of the regions crossed by the Project area.

3.7 Special Designation Areas

3.7.1 Issues for Analysis

Special designation areas are managed by federal or state agencies for the protection and enhancement of specific resources that are unique to that area and require more intensive management compared to surrounding public lands. Special designation areas may be Congressionally or agency-designated and include national wildlife refuges, national monuments, wilderness areas, wilderness study areas, wild and scenic rivers, national conservation areas, national historic and scenic trails, and other similar management areas. Based on input from federal, state, and local agencies and tribal governments, and comments received during scoping, the special designation areas analysis addresses the following:

- Potential direct and indirect effects on NHTs, including the Santa Fe NHT, the Oregon NHT, the California NHT, the Lewis and Clark NHT, and the Pony Express NHT.
- Potential direct and indirect effects on national wildlife refuges.

Discussion of the No Action Alternative is presented in **Section 3.1.**

3.7.1.1 National Trails System Act of 1968 (16 U.S.C. 1241 et seq.)

This act created a series of National Trails "to promote the preservation of public access to, travel within, and enjoyment and appreciation of the open-air, outdoor areas and historic resources of the Nation." Specifically, the act authorized three types of trails: National Scenic Trails, National Recreation Trails, and connecting and side trails. In 1978, as a result of a study of trails that were most significant for their historic associations, a fourth category of trail was added: National Historic Trails.

An NHT is a congressionally designated trail that is an extended, long-distance trail, not necessarily managed as continuous, that follows as closely as possible the original trails or routes of travel of national historic significance. The purpose of an NHT is the identification and protection of the historic route and the historic remnants and artifacts for public education and enjoyment. An NHT is managed to protect the nationally significant resources, qualities, values, and associated settings of the areas through which the trails pass, including the primary use or uses of the trail. Trails are managed or administered by a variety of land management agencies and trail organizations and aided by the Partnership for the National Trails System, American Trails, National Park Service, Bureau of Land Management, and the U.S. Forest Service.

Although NHTs are historic built environment resources and qualify as historic properties under the NRHP, they are also managed for their scenic and recreational qualities. Potential direct and indirect effects on the NHT's scenic and recreational use are discussed in **Section 3.7**.

3.7.2 Analysis Area

The analysis area for special designations encompasses the Project area plus a variable buffer, between 0.5 and 2 miles, of new aboveground infrastructure proposed for the Project (between 1 and 4 miles total), as explained in **Section 3.6**. The variable buffer accounts for potential direct and indirect effects from the Project on NHTs. Determination of the buffer distance applied to an area was based on the topography and potential viewshed of new aboveground infrastructure (primarily transmission structures and HVDC converter stations). The special designations analysis area is the same as the cultural resources historic built environment analysis area (**Section 3.6**).

3.7.3 Affected Environment

There are no special management areas, wild and scenic rivers, wilderness areas, or wilderness study areas located within the special designations analysis area. Swan Lake National Wildlife Refuge is located approximately 5.5 miles from the Project, outside of the special designations analysis area, and is not anticipated to be impacted by the Project. Therefore, these designations are not discussed further.

Five NHTs intersect the special designations analysis area. Of the five NHTs that extend within the analysis area, four are located in Kansas, and one is in Missouri.

The Santa Fe NHT (**Appendix 1.1**, Map 2 and 3, 5,7, 8, 10, 11, 13-15,) was used between 1821 and 1880 primarily as a commercial route connecting Missouri and Santa Fe, New Mexico. The Santa Fe NHT intersects the analysis area at two locations, approximately 11 and 24 miles east of Dodge City, Kansas, respectively. Based on a review of aerial imagery of the two sections of the Santa Fe NHT that intersect the analysis area, the historical landscape character within the special designations analysis area has been modified by development of roadways and the presence of agriculture. The westernmost section has likely been paved over during the construction of US 400, while the eastern intersection is located within a cultivated agricultural field and is no longer extant. Visitors in this area may traverse non-extant (i.e., no visible physical features present) portions of the trail that occur along US 400 within the special designations analysis area. Because other portions of the trail that occur within the special designations analysis area are located on private land and access is restricted, there are no other known recreational opportunities associated with the Santa Fe NHT. A section of the trail referred to here as the Santa Fe Ruts, located approximately 4 miles from the planned Project ROW and outside the special designations analysis area, is the closest extant location of the Santa Fe NHT and serves as an example of the local landscape character associated with the establishment and history of the trail. This location was identified in coordination with NPS.

The Oregon NHT (**Appendix 1.1**, Map 67) was first traveled by the Robert Stuart party in 1812, when they became the first European Americans to traverse the 2,000-mile trail from St. Louis, Missouri, to Fort Astoria, Oregon. The Oregon NHT intersects the special designations analysis area approximately 6 miles southwest of the city of Marysville, Kansas. The historical landscape character in this area has been modified with the introduction of modern features such as paved road surfaces, low-density rural development, and overhead utility and transmission lines. The portion of the trail within the special designations analysis area is non-extant, traversing a plowed field, and there are no trail-related amenities in or around this location. Because the portions of the trail that occur within the special designations analysis area are located on private land, and access is restricted, there are no known recreational opportunities associated with the Oregon NHT in this area.

The California NHT (**Appendix 1.1**, Map 67, 79, and 80) was first traversed by European American settlers in May 1841 by the Bidwell-Bartleson party, which left from Independence, Missouri, to emigrate west. The California NHT intersects the special designations analysis area in three locations; two crossings are located approximately 3.5 miles northwest and approximately 2.7 miles north-northwest of Powhattan, Kansas. The California NHT also crosses the special designations analysis area approximately 6 miles southwest of Marysville, Kansas, where it follows the same route as the Oregon NHT. The trail is non-extant in each location, traversing plowed agricultural fields and several stream crossings, and the historical landscape character has been replaced with modern features. Because the portions of the trail that occur within the special designations analysis area are located on private land and access is restricted, there are no known recreational opportunities associated with the California NHT in this area.

The Pony Express NHT (**Appendix 1.1**, Map 69, 75, 76, and 84) began operation in 1860 and lasted for 18 months using horseback riders to transport letters and newspapers more than 1,800 miles from St. Joseph, Missouri, to Sacramento, California, in only 10 days. The Pony Express NHT intersects the special designations analysis area in two Kansas locations. The historical landscape character along both locations has been replaced with modern features. The first location, approximately 4.5 miles southeast of the town of Seneca, Kansas, appears to be non-extant and has most likely been disturbed through seasonal cultivation. The second mapped intersection is approximately 4,000 feet northeast of the town of Denton, Kansas, and parallels/overlaps an abandoned route of the Chicago, Rock Island, and Pacific Railroad through agricultural fields. No known built environment historic properties associated with the Pony Express NHT are located along portions of the trail that intersect the special designations analysis area. Based on aerial imagery, there is no indication that the sections of the trail that intersect the special designations analysis area are extant. Because the portions of the trail that occur within the special designations analysis area are located on private land, and access is restricted, there are no known recreational opportunities associated with the Pony Express NHT in this area.

The Lewis and Clark NHT (**Appendix 1.1**, Map 87 and 88) is approximately 4,900 miles long, extending from Pittsburgh, Pennsylvania, to the mouth of the Columbia River near present-day Astoria, Oregon, following the historical outbound and inbound routes of the Lewis and Clark Expedition. The trail crosses 16 states and many tribal lands. The Lewis and Clark NHT intersects the special designation analysis area at the Missouri River bordering Missouri and Kansas where the trail occurs along the historic channel of the Missouri River. The intersection is approximately 8.1 miles southwest of St. Joseph, Missouri, within the Missouri River floodplain. The landscape character around this portion of the Missouri River remains intact and is representative of the visual experience encountered by the original users of the trail. The Missouri River Water Trail is a State-designated trail on the Missouri River in the special designations analysis area that follows the extant channel of the Missouri River and is administered by the Missouri Department of Natural Resources. Recreation opportunities along the Lewis and Clark NHT and the Missouri River Water Trail within the special designations area of analysis include boating, paddling, fishing, wildlife viewing, and birding along the Missouri River, and public access is provided via the Jentell Brees Access site. Areas where the Lewis and Clark NHT are located outside of the extant Missouri River channel occur within private land, and access is limited; thus, there are no known recreation opportunities within the special designations analysis area. In these areas, the trail primarily traverses plowed agricultural fields, and the historical landscape character has been replaced with modern features.

The Lewis and Clark NHT Auto Tour Route (**Appendix 1.1**, Map 85, 88, 109, 110, and 112) consists of a system of more than 8,900 miles of roads and highways paralleling the Lewis and Clark NHT that are managed by various agencies in each state, with the NPS providing signage. The Lewis and Clark NHT Auto Tour Route provides an important way for visitors to experience the trail, such as through the thousands of interpretive panels along the route and numerous points of interest available to visit. The Auto Route is available year-round, and visitors to the route are provided an overview of local trail history, geological features, and recreation opportunities (NPS 2023a). The planned Project ROW crosses this Auto Route four times as depicted in **Figure 3.11-1** and **3.11-2** in **Section 3.11**. In Kansas, the planned Project ROW would cross the Auto Route on State Highway 7, west of the Missouri River. In Missouri, the Planned Project ROW would cross the Auto Route on U.S. Highway 59, just west of the Bluffwoods Conservation Area – Goodell Memorial Annex, and then again two times just west of Sterling Price Community Lake on US 24 and State Highway 5.

In addition to the routes themselves, “high potential route segments” associated with the NHTs were considered in consultation with NPS. High potential route segments are “those segments of a trail which would afford high quality recreation experience in a portion of the route having greater than average scenic values or affording an opportunity to vicariously share the experience of the original users of a historic route” (16 U.S.C. 1251(2)). “High potential historic sites” are locations along a trail that are “related to the route, or sites in close proximity thereto, which provide opportunity to interpret the historic significance of the trail during the period of its major use. Criteria for consideration as high potential sites include “historic significance, presence of visible historic remnants, scenic quality, and relative freedom from intrusion" (16 U.S.C. 1251(1)).

As determined in consultation with the NPS, the planned Project ROW does not intersect with any high potential route segments of NHTs. High potential sites are located along the California/Oregon NHTs at Alcove Spring, Pony Express NHT, at the Marysville Pony Express Barn and Marshall Ferry, Fort Larned NHL (discussed in **Section 3.6**), and the Santa Fe NHT at the Lower Crossing of the Arkansas River. Of these high potential sites, in consultation with the NPS, it was determined Alcove Spring would not be affected, and no further evaluation was necessary, while the Pony Express NHT at the Marysville Pony Express Barn and Marshall Ferry is located over 2 miles from the planned Project ROW and therefore outside of the special designations analysis area. The section of the Santa Fe NHT at the Lower Crossing of the Arkansas River coincides with the modern US 400 two-lane road alignment within the analysis area and is no longer extant.

3.7.4 Environmental Consequences of Proposed Federal Action

3.7.4.1 Methods and Assumptions

Impacts to NHTs were determined by assessing the potential for Project construction, operations and maintenance, and decommissioning activities to impact cultural resources associated with the NHTs, the historic landscape character associated with the NHTs, and recreation access, opportunities, and experiences, taking into consideration the Project impacts to resources that contribute to the enjoyment and appreciation of the open-air, outdoor areas, and historic resources associated with the NHTs, particularly noise, visual, air quality, wildlife, and vegetation. Impacts resulting from the Project are assumed to be more likely within the Project area (particularly the planned Project ROW), where construction, operations and maintenance, and decommissioning activities would occur. Impacts would diminish with distance from the planned Project ROW within the rest of the special designations analysis area, and most of the potential impacts to the recreation experience in the vicinity of the NHTs would be related to relatively short-term construction activities. The analysis of impacts assumes that the EPMs listed in **Appendix 2.4** would be implemented.

3.7.4.2 Construction

Construction of the Project would not impact any known cultural resources associated with the NHTs. Project disturbance overlaps non-extant portions of the Santa Fe NHT, Oregon NHT, California NHT, Lewis and Clark NHT, and Pony Express NHT. The potential exists to inadvertently encounter undocumented archaeological resources associated with the NHTs during construction activities within the surface-disturbance areas. Construction impacts could include destruction or disturbance by vertical and horizontal displacement of soil containing archaeological materials; damage to or destruction of artifacts and features; and loss of archaeological data due to surface-disturbing activities, such as clearing, grading, excavation, erosion, and compaction, and using temporary multi-use yards for storing equipment and supplies. To avoid or minimize potential impacts to inadvertent discoveries, Project EPMs in **Appendix 2.4** include the development and implementation of the IDP that outlines protocols for contractors upon encountering unanticipated cultural remains during construction. Additional impacts to archaeological resources are discussed in **Section 3.6**.

The temporary introduction of new line and form elements related to construction activities, as well as visual clutter into the existing aesthetic, would cause visible contrast with the existing landscape. Noise and dust impacts from the construction of the Project would primarily result from the use of ground-based heavy construction equipment and machinery, and helicopters, which could further diminish the historic landscape character of the NHTs and recreational experiences within the special designations area of analysis. Noise impacts from the use of implosive splicing may also impact NHTs, though no implosive splicing is currently planned. To reduce potential impacts, use of the technique would not occur within 0.5 miles of NHTs. Construction activities may also require temporary restriction of transportation on the Missouri River, and delivery of heavy loads and overhead stringing may require temporary roadway closures, which could restrict public access and impact recreational experiences on NHTs within the special designations analysis area.

Visitors utilizing the Lewis and Clark NHT/Missouri River Water Trail would be temporarily impacted by construction activities. The introduction of construction activities, including visual impacts, noise, and dust, would reduce the historic look and feel of the landscape experienced by the original users of the trails and could cause a diminishment of the quality of visitor experiences, particularly for bird watchers, anglers, and boaters that desire a quiet, natural setting. Restriction of traffic on the Missouri River due to line stringing activities involving helicopters would be temporary (a few weeks) but would displace visitors to the trails during these times. To minimize impacts, construction associated with spanning the Missouri River would be conducted during the 5-day work week, though construction equipment may still be visible during periods when construction is not active. Notification of schedule would be communicated to the NPS up to three weeks in advance based on the Project's schedule.

The presence of construction activities would also be visible from portions of the Lewis and Clark NHT Auto Tour Route. The landscape surrounding the Lewis and Clark NHT Auto Tour Route has been replaced with modern features; however, construction activities would temporarily introduce additional noise, dust, and visual clutter. Temporary road or lane closures for Project construction activities, if required, would result in the temporary displacement or disruption of visitors on the Lewis and Clark NHT Auto Tour Route. These temporary road closures would occur likely over short distances for a short time, with most delays lasting minutes, though they could last longer depending on traffic volumes and the specific temporary road closure location. Road closures would be minimized to the greatest extent possible through appropriate scheduling of construction activities. During construction, visitors traversing sections of the Santa Fe NHT that occur along US 400 would also experience similar impacts.

As discussed in **Section 3.7.3**, there are no intact historic land trails, historic landscape character, or associated recreational opportunities within the special designations analysis area for the Oregon NHT, California NHT, and Pony Express NHT; thus, no impacts from construction activities are anticipated to these NHTs. Construction activities would also not be discernable (visually or audibly) from the Santa Fe Ruts section of the Santa Fe NHT, which is approximately 4 miles from the planned Project ROW at its closest point.

The planned Project does not intersect with high-potential route segments or the other high-potential historic sites associated with the NHTs noted above. Project construction activities would not be visible or audible from NHT high-potential historic sites identified in consultation with NPS.

3.7.4.3 Operations and Maintenance

Operations and maintenance impacts to NHTs from the Project are primarily associated with introducing a contrasting permanent feature into the existing landscape, as well as removal of vegetation within the Project ROW. Visual simulations from the NHTs provided in **Section 3.12** and **Appendix 3.12** represent potential views from various locations proximate to NHTs. Additional temporary impacts would be associated with maintenance activities such as inspections, vegetation management, and repairs. These activities are anticipated to occur once per year or as needed following extreme weather, as described in **Section 2.3.3**.

The permanent presence of the Project would result in changes to the recreation setting to the Lewis and Clark NHT/Missouri River Water Trail. The existing view does not contain any built facilities, and the structures would introduce the only human-made features into the natural setting. Additionally, tree clearing within the Project ROW would cause a noticeable break in the vegetation surrounding the Missouri River. These changes would create a contrast with the visual environment and diminish the historic landscape character by altering the landscape experienced by the NHT's original users. While the view from the nearby shorelines would be constant, views of the structures while boating or boat fishing would be fleeting due to the meander of the river, water speed, and viewing angle. The potential visual change from this location would be highly noticeable given the introduction of a dominant element in the visual setting. The introduction of new permanent facilities and vegetation clearing could cause a diminishment of the quality of visitor experiences during times the user is in proximity to the Project, especially those desiring to experience the NHT for its historic landscape character. The presence of the Project could have an impact on the quality of recreation experiences related to bird watching, paddling, fishing, and boating within visible distance of the Project along the Missouri River, depending on the viewer sensitivity to the Project in each particular setting.

The Project would also be visible from the Lewis and Clark NHT Auto Tour Route and contrast with adjacent agricultural and natural settings (**Section 3.12** and **Appendix 3.12**). The Lewis and Clark NHT Auto Tour Route passes existing transmission lines and development, and the Project would not be out of character with the current visual setting along the route; however, the introduction of new permanent facilities would introduce visual clutter to the landscape. Drivers using the Lewis and Clark NHT Auto Tour Route would pass the Project crossings quickly, and the planned Project ROW would not parallel the route. The setting would be impacted while approaching the structures, and the existing visual setting would resume once the vehicle passes the structures. Interpretative sites along the route would not be impacted. The Project would not impact users' abilities to interact with the interpretive panels or points of interest along the Auto Tour Route. Visitors traversing sections of the Santa Fe NHT that occur along US Highway 400 would also experience similar impacts from the introduction of new permanent facilities.

The Oregon NHT, California NHT and the Pony Express NHT would also be impacted by the visual presence of permanent Project facilities; however, as discussed above, these trails are not extant, and no recreation opportunities for these NHTs exist within the special designations analysis area, and thus, users are not anticipated to be impacted. Visual impacts from the Santa Fe Ruts section of the Santa Fe NHT would be unnoticeable (**Section 3.12**).

3.7.4.4 Decommissioning

Site decommissioning would be performed at the end of the service life of the Project in accordance with a Decommissioning Plan. The nature and type of direct effects on NHTs resulting from decommissioning activities would likely be similar to operations and maintenance impacts, as activities would most likely occur in previously disturbed areas, though the visual impacts of the decommissioning activities would be similar to the visual impacts during construction. Once decommissioning is complete, the visual impacts associated with the presence of Project facilities would be eliminated or reduced with the removal of the aboveground infrastructure.

3.8 Wildlife

3.8.1 Issues for Analysis

Based on NEPA statutory and CEQ/DOE regulatory requirements; input from federal, state, and local agencies and tribal governments; and comments received during scoping, the wildlife analysis addresses the following:

- Potential impacts to wildlife and wildlife habitat, including species protected by the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703-712);
- Potential impacts to special-status species and alteration of their habitats, including:
  - Species that are federally listed under the ESA (16 U.S.C.1531-1544) and their designated critical habitats;
  - Species proposed for listing or identified as candidates for listing under the ESA;[1]
  - Species protected by the Bald and Golden Eagle Protection Act (BGEPA) (16 U.S.C. 668-668d); and
  - Species listed as threatened or endangered under state law in Kansas or Missouri and their designated critical habitats.

Discussion of the No Action Alternative is presented in **Section 3.1**.

3.8.2 Analysis Area

The wildlife analysis area includes a 1.5-mile buffer surrounding the Project area (1,171,986 acres; **Figure 3.8-1**). The wildlife analysis area was selected as the maximum distance over which impacts from the Project have the potential to occur, including potential injury or mortality of wildlife species, noise disturbance (0.9 miles; SWCA 2023a), visual disturbance (1.5 miles, as described in **Section 3.11**), edge effects, and sediment mobilization and transport (0.25 miles, as described in **Section 3.4**).

3.8.3 Affected Environment

Wildlife and their habitats within the wildlife analysis area were analyzed using publicly available data sources and Project-specific survey data (detailed in SWCA 2023b). Data sources used to describe the affected environment included LANDFIRE National Vegetation Classification (LANDFIRE 2020), published literature and technical reports, federal and state wildlife agency management documents (e.g., state wildlife action plans), and maps of critical or sensitive habitats. LANDFIRE National Vegetation Classification vegetation classes were grouped into six higher-level vegetation classes used in this analysis to describe potential impacts to wildlife habitat (SWCA 2023c; **Table 3.8-1**).

Multiple factors have affected the quality and quantity of habitats within the wildlife analysis area for various wildlife species. The area is influenced by past and ongoing human activities, such as fire suppression, agricultural activities, and land development, including housing and infrastructure projects such as existing overhead transmission lines and related energy infrastructure. The ongoing land use practices and existing infrastructure affect wildlife species that are present or have the potential to occur in the wildlife analysis area.

[1] Candidate species are not presently protected by the ESA. Species that are proposed for ESA listing are subject to the ESA Section 7 conference requirements. Take of candidate and proposed species is not prohibited unless and until a final listing rule is published and becomes effective.

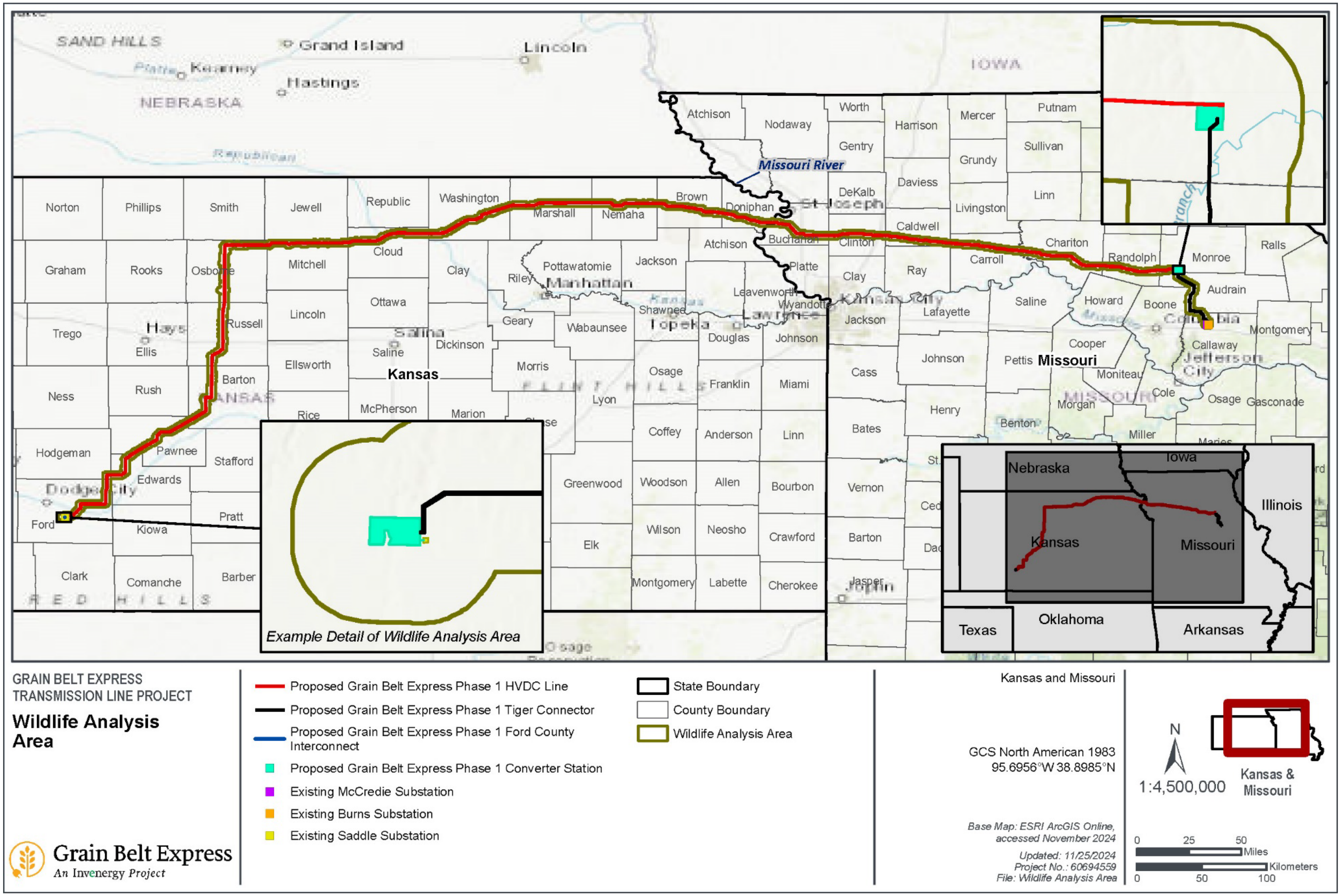

Figure 3.8-1. Wildlife Analysis Area

Climate change also affects the wildlife analysis area and is a general threat to biodiversity (MDC 2015; Rohweder 2022). Climate change has increased the frequency and severity of extreme weather events, including drought, extreme rainfall and flooding, and wildfire (IPCC 2021). These events can impact wildlife and their habitats in a variety of ways, including changes in the timing of available habitat resources and novel ecological interactions (Munson and Long 2017; Alexander et al. 2015). Some wildlife species have already exhibited range shifts in the past few decades, and it is anticipated that additional distributional shifts will occur as species respond to climatic changes (Iverson and McKenzie 2014). A changing climate may mean a shift in vegetation communities, timing of migration, or onset of breeding, and a resulting shift in the abundance and distribution of wildlife species. While no specific examples of range shifts due to climate change are documented within the wildlife analysis area, species that are projected to exhibit distributional shifts have the potential to occur in the wildlife analysis (MDC 2015; Rohweder 2022).

3.8.3.1 Wildlife Habitats

General wildlife habitat types within the wildlife analysis area were mapped by using the LANDFIRE National Vegetation Classification classes described in **Section 3.5** (**Table 3.8-1;** LANDFIRE 2020). The detail showing the numerous LANDFIRE vegetation classes rolled into the higher-level vegetation classes used in this assessment can be found in **Table 3.5-2**. The most common vegetation classes within the wildlife analysis area are Agriculture and Developed Vegetation (71.0 percent of the wildlife analysis area) followed by Shrub and Herb Vegetation (17.7 percent of the wildlife analysis area).

Table 3.8-1. Vegetation Classes Within the Wildlife Analysis Area

National Vegetation Class	Acres in Wildlife Analysis Area	Total Percentage of Vegetation Class in Wildlife Analysis Area
Agricultural and Developed Vegetation	831,706	71.0%
Shrub and Herb Vegetation	189,960	16.2%
Forest and Woodland Vegetation	89,203	7.6%
Developed[1/]	36,252	3.1%
Shrub and Herb Wetland and Riparian Vegetation	16,978	1.4%
Open Water[1/]	6,426	0.5%
Forest and Woodland Wetland and Riparian Vegetation	1,194	0.1%
Other[1/, 2/]	267	< 0.1%
Total[3/]	1,171,986	100%

Source: LANDFIRE 2020
[1/] Class does not represent vegetation cover.
[2/] Other includes Open Rock Vegetation, Quarries, Strip Mines, Gravel Pits, Energy Development, and Recently Disturbed or Modified classes.
[3/] Totals may not sum or exactly match the totals in Chapter 2 due to rounding.

State parks and wildlife areas that overlap with the wildlife analysis area include the Glen Elder Wildlife Area and State Park in Kansas and the Bluffwoods Conservation Area – Goodell Memorial Annex, Belcher Branch Lake Conservation Area, and Ronald and Maude Hartell Conservation Area in Missouri. No national parks or national wildlife refuges are present within the wildlife analysis area. Glen Elder Wildlife Area and State Park includes 13,200 acres of land surrounding the Glen Elder Reservoir. The area provides habitat for bald eagles, white-tailed deer, wild turkey, and upland game, such as pheasants and quail. Geese and ducks also use the area during migration, depending upon habitat conditions (KDWP 2024). The Bluffwoods Conservation Area – Goodell Memorial Annex overlooks the Missouri River floodplain and includes forest habitat. Belcher Branch Lake Conservation Area includes the 55-acre

Belcher Branch Lake, cropland, grassland, and forest habitat. The Ronald and Maude Hartell Conservation Area consists of six small impoundments ranging in size from two to five acres which provide wetland habitat.

3.8.3.2 General Wildlife

For this analysis, general wildlife species are those that are not listed, proposed to be listed, or candidate species under the ESA; are not state listed; and are not covered by the BGEPA . General wildlife also includes game species managed by state wildlife agencies, such as white-tailed deer (*Odocoileus virginianus*) and greater prairie-chicken (*Tympanuchus cupido*), and birds protected by the MBTA that are not listed under the ESA or by a state agency.

A range of general wildlife species occur in the wildlife analysis area either as residents or migrants. Some resident species with small home range sizes may spend a significant proportion of their life cycles within the wildlife analysis area, while others may pass through the wildlife analysis area periodically during migration.

3.8.3.2.1 Migratory Bird Treaty Act-Protected Birds

The MBTA states that it is unlawful to, among other things, pursue, hunt, take, capture, kill, possess, sell, purchase, barter, import, export, or transport any migratory bird, or any part, nest, or egg of any such bird. Despite the use of "migratory" in the name, typical long-distance migratory behavior is not required for species to be protected under the MBTA. This law does not provide protections for species non-native to the U.S. and numerous galliform species (e.g., grouse, ptarmigan, quail); it also allows the establishment of hunting seasons for certain game species. Given the wide range of bird species protected under the MBTA and the varied habitats that they occupy, impacts to MBTA-protected birds will be considered as part of the analysis on general wildlife.

3.8.3.3 Special-Status Species

Special-status species include species that are federally listed under the ESA, species proposed for listing or identified as candidates for listing under the ESA, species listed as threatened or endangered under state law in Kansas or Missouri, or species protected by BGEPA. Little brown bats, which are under review for listing under the ESA, were included in the analysis due to the likelihood that a listing decision will be made prior to the publication of the Final EIS. Thirty-one special-status species (**Table 3.8-2**) were identified as potentially occurring within the wildlife analysis area through queries of the USFWS Information for Planning and Consultation online database (USFWS 2024a), the USFWS National Domestic Listing Workplan (USFWS 2023b), the Kansas State Wildlife Action Plan (Rohweder 2022), the Missouri State Wildlife Action Plan (MDC 2015), and communication with USFWS Kansas and Missouri Ecological Field office and Kansas and Missouri state wildlife officials (Kansas Department of Wildlife, Parks, and Tourism 2020, MDC 2020). Additional listed species occur in counties crossed by the wildlife analysis area, but they were determined not to be at risk of impacts through the above-mentioned communications and are therefore not discussed further.

Table 3.8-2. Special-Status Species and Potential to Occur in the Wildlife Analysis Area

Common Name	Scientific Name	Federal Listing Status[1/]	State Listing Status		Potential to Occur in Wildlife Analysis Area[2/]
			Kansas	Missouri	
Mammals					
Eastern spotted skunk	*Spilogale putorius interrupta*	-	T	E	High (assumed present)

Common Name	Scientific Name	Federal Listing Status[1/]	State Listing Status		Potential to Occur in Wildlife Analysis Area[2/]
			Kansas	Missouri	
Gray bat	*Myotis grisescens*	E	E	E	Present
Indiana bat	*Myotis sodalis*	E	-	E	Present
Little brown bat	*Myotis lucifugus*	UR[3/]	-	-	Present
Northern long-eared bat	*Myotis septentrionalis*	E	T	E	Present
Tricolored bat	*Perimyotis subflavus*	PE	-	-	Present
Birds					
Bald eagle	*Haliaeetus leucocephalus*	BGEPA; DL	-	-	Present
Eastern black rail	*Laterallus jamaicensis* ssp. *jamaicensis*	T	-	-	Low
Eskimo curlew	*Numenius borealis*	E	-	-	Low
Golden eagle	*Aquila chrysaetos*	BGEPA	-	-	Present
Least tern (interior)	*Sternula antillarum athalassos*	DL	E	-	Low
Lesser prairie-chicken (Northern Distinct Population Segment)	*Tympanuchus pallidicinctus*	T	-	-	Present
Northern harrier	*Circus hudsonius*	-	-	E	Present
Piping plover	*Charadrius melodus*	T	T	-	Low
Rufa red knot	*Calidris canutus rufa*	T	-	-	Low
Whooping crane	*Grus americana*	E	E	-	Present
Fish					
Arkansas River shiner	*Notropis girardi*	T	E	-	Low
Flathead chub	*Platygobio gracilis*	-	T	E	High
Lake sturgeon	*Acipenser fulvescens*	-	-	E	High (assumed present)
Pallid sturgeon	*Scaphirhynchus albus*	E	E	E	Present
Peppered chub	*Macrhybopsis tetranema*	E	E	-	Low
Plains minnow	*Hybognathus placitus*	-	T	-	High (assumed present)
Shoal chub	*Macrhybopsis hyostoma*	-	T	-	High (assumed present)
Sicklefin chub	*Macrhybopsis meeki*	-	E	-	Moderate
Silver chub	*Macrhybopsis storeriana*	-	E	-	High (assumed present)
Sturgeon chub	*Macrhybopsis gelida*	-	T	-	Moderate
Topeka shiner	*Notropsis topeka*	E	T	E	Low
Western silvery minnow	*Hybognathus argyritis*	-	T	-	High (assumed present)
Insects					
Monarch butterfly	*Danaus plexippus*	PT	-	-	High (assumed present)
Regal fritillary	*Argynnis idalia*	PT			High (assumed present)

Common Name	Scientific Name	Federal Listing Status[1/]	State Listing Status		Potential to Occur in Wildlife Analysis Area[2/]
			Kansas	Missouri	
Mussels					
Cylindrical papershell mussel	*Anodontoides ferussacianus*	-	E	-	High (assumed present)

[1/] BGEPA: Bald and Golden Eagle Protection Act, DL: Delisted, E: Endangered, PE: Proposed Endangered, T: Threatened, UR: Under Review.
[2/] Low = likely extirpated or no habitat present, Moderate = low-quality habitat present but no documented records, High = suitable habitat present and/or records within proximity to Project, Present = documented presence through surveys or known records in the area.
[3/] Little brown bat was included due to the likelihood that a decision on this species will be made prior to publication of the Final EIS.

The potential for each special-status species to occur in the wildlife analysis area was evaluated based on the species' range, habitat requirements, and the presence of suitable habitat within the wildlife analysis area. Species identified as present were documented within the analysis area during surveys completed by the Applicant or through known records in the area.

Descriptions of the range, distribution, and habitat requirements of the 23 species identified as present or having a high or moderate potential to occur within the wildlife analysis area are provided below. These species are considered in the analysis presented in **Section 3.7.4**. Nine special-status species were categorized as having low potential to occur in the wildlife analysis area (**Table 3.**). These species are not considered further in this EIS.

3.8.3.3.1 Federally Threatened, Endangered, Proposed, or Candidate Species

This section discusses species that are federally listed, proposed for listing, or identified as candidates for listing under the ESA and that have been identified as present or having a high to moderate potential to occur within the wildlife analysis area. Note that the Applicant is also preparing a Biological Assessment in coordination with DOE LPO to address the effect of the Project on ESA-listed species, designated critical habitats, and species that are proposed for listing under the ESA.

Gray bat: The gray bat range that overlaps with the wildlife analysis area includes Missouri and extreme southeastern Kansas (KDWP 2022; USFWS 2022a; **Figure 3.**). Gray bats typically roost in caves year-round but may use different roost caves in summer and winter. Non-cave roosts have been reported (USFWS 2009) and include quarries, tunnels, and bridges in northern Missouri (Boyles, Timpone, and Robbins 2009). Gray bats prefer to forage over and along open water but will also forage in riparian areas, field edges, and forested blocks (Moore et al. 2017). Gray bats may travel long distances from roosts to forage, up to 44 miles, and many summer roosts are within 0.6 mile to 2.5 miles of water (USFWS 2009). Gray bats have been documented in the immediate vicinity of the wildlife analysis area, east of Keytesville, Chariton County, Missouri, and elsewhere in Chariton and Randolph counties, Missouri (ESI 2021a, 2021b).

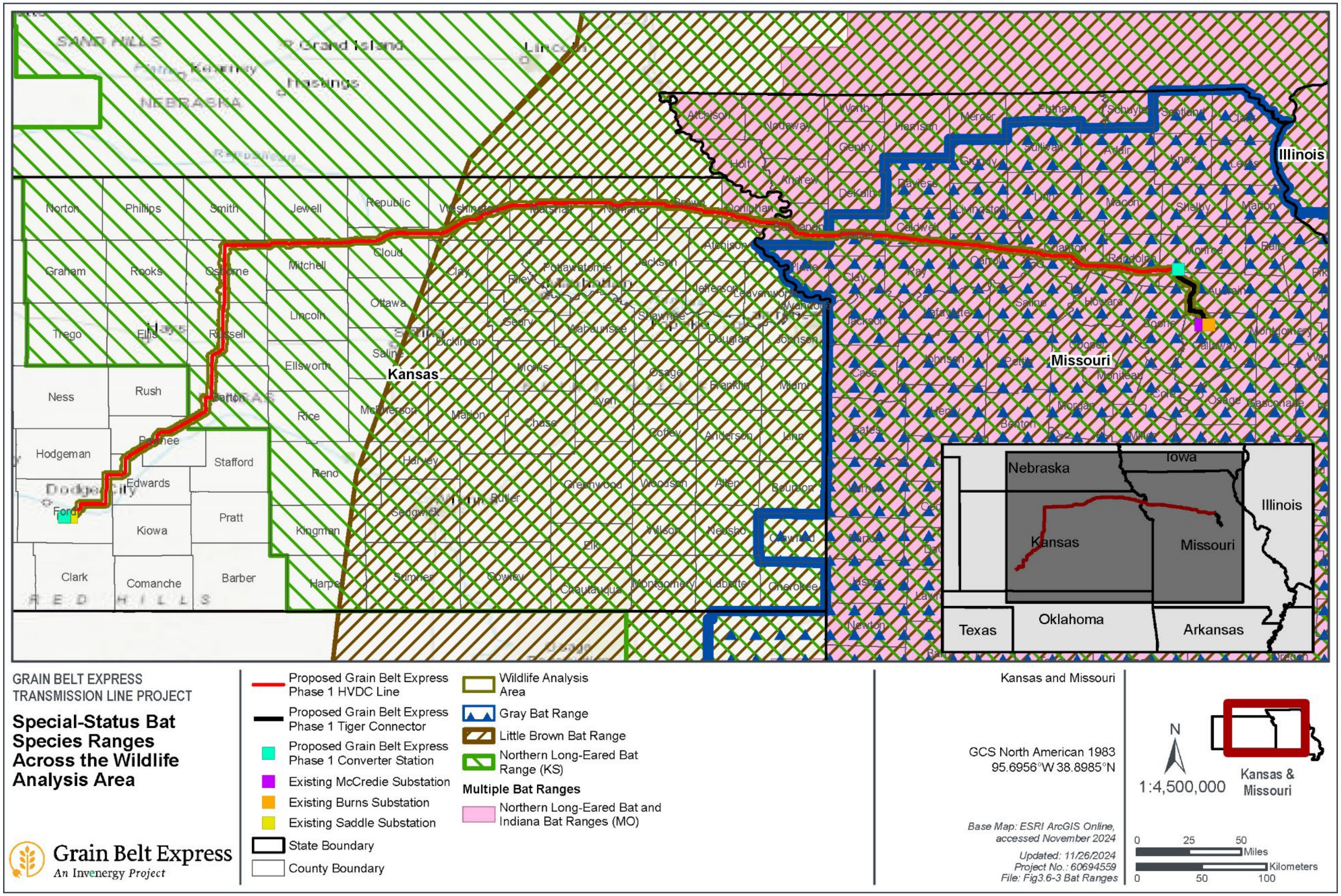

Figure 3.8-2. Special-Status Bat Species Ranges Across the Wildlife Analysis Area

Nine gray bats were captured in Chariton and Randolph counties, Missouri, during a 2021 mist-net survey for the Project (ESI 2021c). Automated analysis (i.e., computer software analysis of bat calls through Kaleidoscope Pro software) of acoustic survey data collected within the Project area between Clinton and Monroe counties, Missouri, identified likely gray bat vocalizations at 124 of 133 sites (ESI 2021a). Subsequent visual review (i.e., review of bat call files by an expert bat acoustic identification specialist) of acoustic data confirmed the scattered presence of gray bats within the surveyed area at sites east of approximately Keytesville in Chariton County, Missouri, but not at sites to the west of this location (ESI 2023). No known gray bat summer roosts or hibernacula occur in the wildlife analysis area. Additional mist-nest and acoustic surveys were conducted in summer 2024; coordination with USFWS is ongoing and results of the surveys will be incorporated prior to the publication of the Final EIS.

Indiana bat: The range of the Indiana bat includes Missouri but not Kansas (USFWS 2019a, 2022c). Although USFWS depicts the range of the Indiana bat as extending throughout Missouri, USFWS confirmed that Indiana bats are unlikely to occur along the westernmost 33 miles of the Project area in Missouri (ESI 2021c). Indiana bats typically forage in semi-open to closed forested habitats with open understory, forest edges, and riparian areas. Summer roost sites include forested areas under the exfoliating bark of dead or dying trees that retain large, thick slabs of peeling bark. In the winter, Indiana bats gather in large numbers to hibernate in caves or mines (USFWS 2007a). Surveys by USFWS documented habitat presumed to be occupied by Indiana bats in Clinton, Caldwell, Chariton, Randolph, and Monroe counties, Missouri (ESI 2021a). Indiana bats have also been detected during acoustic surveys or captured within the Project area in Clinton, Monroe, and Randolph counties, Missouri (ESI 2021a). During a 2021 mist-net survey, 13 Indiana bats were captured in Randolph and Monroe counties, Missouri (ESI 2021c). Indiana bat summer roosts have been documented in the immediate vicinity, but outside of, the Project area (ESI 2021c). No Indiana bat hibernacula or associated swarming habitats (i.e., forested areas within 10 miles of a hibernacula) are known to occur in the wildlife analysis area. Additional mist-net and acoustic surveys were conducted in summer 2024; coordination with USFWS is ongoing and results of the surveys will be incorporated prior to the publication of the Final EIS.

Little brown bat: The estimated range of the little brown bat includes 48 U.S. states and much of Canada (USFWS 2024b). The species is considered potentially present in the eastern half of Kansas and throughout Missouri (USFWS 2024b; **Figure 3.8-2**). In Kansas, however, occurrence records are sparse and suggest that the species may be extirpated (Schmidt *et al*. 2021). Little brown bats hibernate in caves or cave-like structures, such as mines (Fenton and Barclay 1980). Compared to other Myotis species, little brown bats appear to roost in artificial structures relatively frequently, especially when in proximity to forest (Johnson et al. 2019; Randall et al. 2014; Riskin and Pybus 1998). Little brown bats forage in a variety of forested habitats but seem to prefer wetlands, riparian areas, and bottomland forest (Bergesen et al. 2013; Nelson and Gillam 2017). Available studies indicate that little brown bats also prefer open areas for flight; they commonly forage along forest edges, which can take the form of forest-field edge and corridors (e.g., riparian corridors, logging roads), as well as relatively mature forests with minimal clutter (Nelson and Gillam 2017; Patriquin and Barclay 2003; Thomas et al. 2019). Accordingly, there is some evidence that little brown bat foraging activity is higher along fragmented forest edges as compared to forest interiors, as areas adjacent to open habitats (e.g., fields, wetlands, clear-cuts) may provide additional access to both roosting and foraging areas for the species (Ethier and Fahrig 2011).

Little brown bats have been detected during acoustic surveys along the Project at 28 locations (ESI 2021a). No little brown bats were captured during a 2021 mist-net survey (ESI 2021c). No known maternity roosts for this species occur in the wildlife analysis area (Colatskie 2017; ESI 2021c). Known hibernacula used by this species occur in Russell and Marshall counties, Kansas, within the wildlife analysis area (Schmidt et al. 2021; Sprague 2018; USFWS 2015). Additional mist-nest and acoustic surveys were conducted in summer 2024; coordination with USFWS is ongoing and results of the surveys will be incorporated prior to the publication of the Final EIS.

Northern long-eared bat: The estimated range of the northern long-eared bat includes 37 U.S. states and much of Canada (USFWS 2022b). The species is considered potentially present in the eastern half of Kansas and throughout Missouri (USFWS 2022b; **Figure 3.8-2**). In the summer, northern long-eared bats roost in forested habitats, under the loose bark of trees, in tree cavities, and occasionally in rocky crevices, buildings, or other structures. Reproductively mature females form summer maternity colonies, while non-reproductive females and males may roost in small groups up to 100 individuals or singly (USFWS 2014, 2022d). Northern long-eared bats forage primarily in large contiguous blocks of forest under the canopy and occasionally along forest edges and over water (USFWS 2014). In the winter, northern long-eared bats hibernate in caves and similar features, such as abandoned mines. Rather than hibernating in large clusters, northern long-eared bats roost individually, often deep within recesses and cracks (USFWS 2014).

Northern long-eared bats were detected in 2020 during acoustic surveys within the Project area between Clinton and Monroe counties, Missouri (ESI 2021a). No northern long-eared bats were captured during a 2021 mist-net survey (ESI 2021c). No known maternity roosts for this species occur in the wildlife analysis area (Colatskie 2017; ESI 2021c). Known hibernacula used by this species occur in Russell and Marshall counties, Kansas, within the wildlife analysis area (Schmidt et al. 2021; Sprague 2018; USFWS 2015). Additional mist-nest and acoustic surveys were conducted in summer 2024; coordination with USFWS is ongoing and results of the surveys will be incorporated prior to the publication of the Final EIS.

Tricolored bat: The tricolored bat is widespread and is considered present in central and eastern Kansas and throughout Missouri (MDC 2022; Schmidt et al. 2021; USFWS 2022c). In Kansas and Missouri, the tricolored bat is a forest-dwelling species that winters in subterranean hibernacula. During the summer, tricolored bats roost in the foliage of live trees and occasionally on buildings. Females may roost alone or in small colonies. This species forages in more open areas such as forest openings and areas of early successional vegetation (Loeb and O'Keefe 2006). Tricolored bats are likely to occur in the wildlife analysis area, especially in forests and in areas with human-made structures such as barns and unoccupied buildings. Automated analysis of acoustic survey data collected within the Project area between Clinton and Monroe counties, Missouri, identified likely tricolored bat vocalizations at 30 of 133 sites (ESI 2021a). Subsequent visual review of acoustic data revealed that tricolored bats were present at sites scattered throughout this area (ESI 2023). No known tricolored bat hibernacula occur in the wildlife analysis area (Schmidt et al. 2021; Sprague 2018). Additional mist-nest and acoustic surveys were conducted in summer 2024; coordination with USFWS is ongoing and results of the surveys will be incorporated prior to the publication of the Final EIS.

Whooping crane: The Aransas-Wood Buffalo population of the whooping crane nests in northwest Canada and overwinters in Texas (Metzger et al. 2020). Whooping cranes migrate during spring (March–May) and fall (September–November) along an approximately 200-mile-wide corridor that includes central Kansas (Pearse et al. 2018; **Figure 3.8-3**). Whooping cranes use a variety of habitats during migration, including croplands for feeding and wetlands for roosting (Howe 1989; Lingle, Wingfield, and Ziewitz 1991). Approximately 83 percent of the wildlife analysis area occurs within the whooping crane migratory corridor for the Aransas-Wood Buffalo population (Pearse et al. 2018). A desktop assessment identified 67 wetland features associated with 160 acres of suitable stopover habitat that whooping cranes may use for migration within the wildlife analysis area (SWCA 2022). Whooping cranes have been historically detected in the wildlife analysis area (USFWS 2022a). Coordination with USFWS is ongoing and results of additional analysis of the whooping crane will be incorporated prior to the publication of the Final EIS.

Lesser prairie-chicken: The range of the Northern Distinct Population Segment of the lesser prairie-chicken encompasses portions of southeastern Colorado, southwestern Kansas, western Oklahoma, and the Texas panhandle (USFWS 2022d). In Kansas, the lesser prairie-chicken occupies much of the western third of the state, occurring as far northeast as Ellis County and southeast to Barber County (**Figure 3.8-3**). The species does not occur elsewhere in Kansas and is absent from Missouri. This species requires large, ecologically intact grasslands and shrublands with a diversity of grass and low-growing shrub species and limited human-made structures and trees (USFWS 2022d). The wildlife analysis area overlaps 7,839 acres of the lesser prairie-chicken estimated occupied range. A habitat assessment determined that 19,098 acres of suitable habitat occurs within the wildlife analysis area, with 4,276 acres likely or known occupied and 14,823 acres likely unoccupied (SWCA 2024).

Lesser prairie-chickens use display grounds, known as leks, where groups of males gather and perform courtship displays in competition for females. Known leks[2] within the wildlife analysis area include two active and three historic leks in Edwards County, Kansas (SWCA 2021; Western Association of Fish and Wildlife Agencies 2022). Project-specific lek surveys were completed by the Applicant in spring 2021, and one potential lek was identified approximately 0.5 mile west of the planned Project centerline in Edwards County, Kansas (SWCA 2021a).

Pallid sturgeon: The pallid sturgeon is a benthic species that occurs in large rivers with high turbidity and a natural hydrograph (USFWS 2021). The range of the pallid sturgeon includes several states associated with the Missouri and Mississippi Rivers, sections of their major tributaries, reservoirs on the Missouri River main stem, and the Atchafalaya River (USFWS 2021). The Missouri River between Kansas and Missouri and the Grand River in Missouri are within the current distribution of the species (USFWS 2021) and intersect the wildlife analysis area.

[2] Known leks include leks that have been verified to be actively used by lesser prairie-chickens in the past five years; historic leks include leks that were once active but are either no longer active or their activity level has not been verified within the past five years; potential leks include areas that may be utilized by lesser prairie-chickens for lekking but enough information to verify if they are active or not has not been collected.

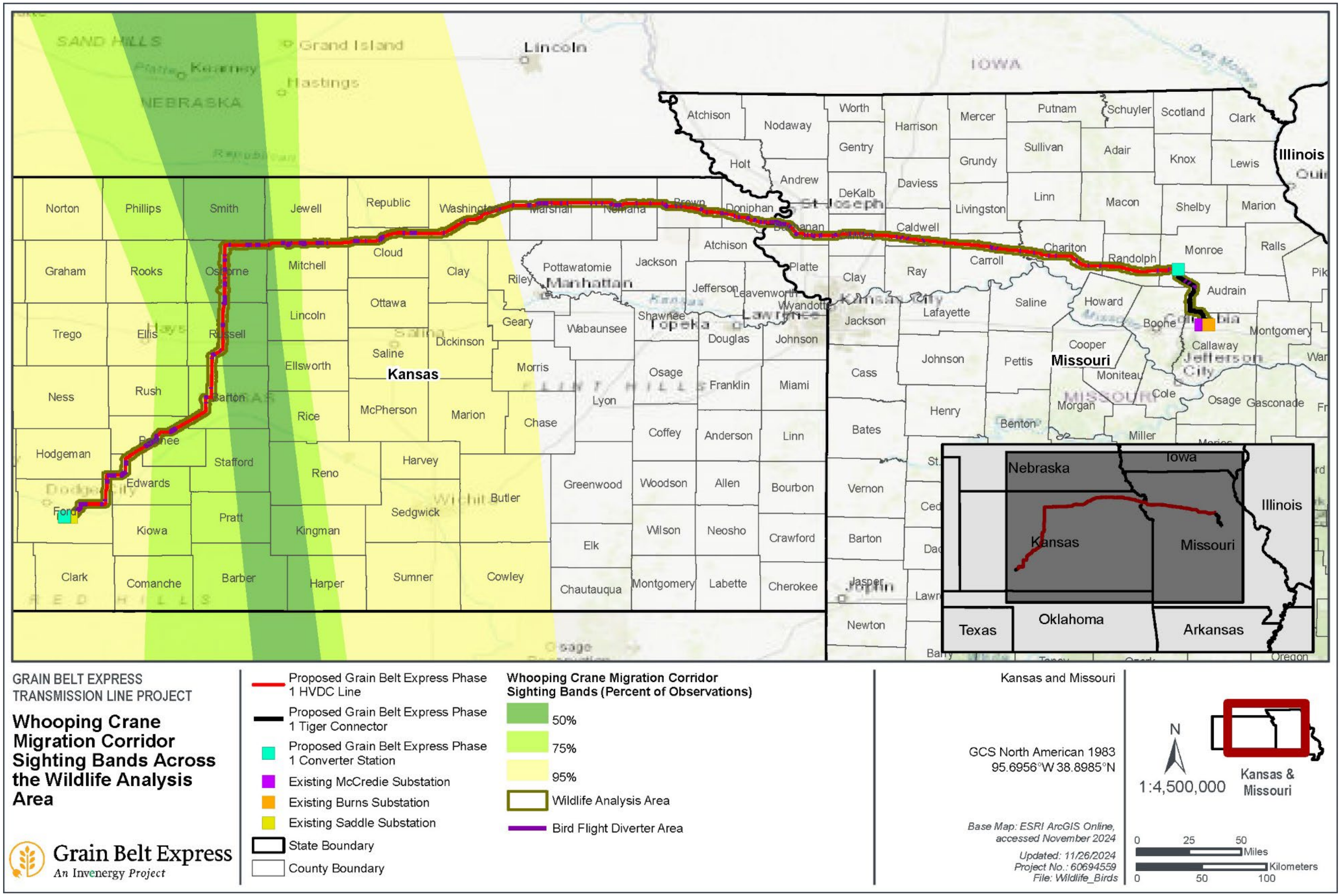

Figure 3.8-3. Whooping Crane Migration Corridor Sighting Bands Across the Wildlife Analysis Area

<u>Monarch butterfly:</u> The monarch butterfly occurs throughout the United States, including Kansas and Missouri, in open habitats including fields, meadows, weedy areas, marshes, and roadsides (USFWS 2022e). To successfully reproduce, monarch butterflies require milkweed (*Asclepias* spp.) as a host plant for their larvae. Monarch butterflies can use a variety of habitats, including agricultural, developed, and native grassland habitats where milkweeds and nectar-producing plants are present.

<u>Regal fritillary:</u> The regal fritillary primarily inhabits grasslands that include nectar resources during the adult flight period and suitable larval host species (i.e., *Viola* spp.) (Selby 2007; Swengel and Swengel 2016). Regal fritillary habitat includes tallgrass prairie, pastures, open wet meadows, and marshes (Nature Serve 2023c). Bird-foot violet (*Viola pedata*) and crow-foot violet (*Viola pedatifida*) are believed to be the preferred larval host plants during this critical development period throughout the Great Plains and Midwest region (McCullough 2016).

3.8.3.3.2 Critical Habitat

Some species listed under the ESA or similar state laws also have designated critical habitat. Critical habitat is essential for the long-term survival and recovery of species listed as threatened or endangered. The ESA regulates the destruction or adverse modification of federally designated critical habitat independent of the associated listed species. States regulate state-designated critical habitat and may require permits and mitigation. The wildlife analysis area does not contain any federally designated critical habitat or Missouri state-designated critical habitat.

In Kansas, the eastern spotted skunk is listed as threatened under the Kansas Nongame and Endangered Species Conservation Act (K.S.A. 32-957). State-designated critical habitat for this species occurs in two areas: throughout Barton County, and within 0.5 mile of the Arkansas River in Ford County (KDWP 2024). Suitable habitat for this species consists of brushy, rocky, and wooded areas that provide opportunities for den sites as well as cover to escape aerial predators; the eastern spotted skunk typically avoids open areas that contain minimal shelter (SWCA 2023b). Areas of eastern spotted skunk state-designated critical habitat within a 1,320-foot-wide corridor, which is the corridor width within which the HVDC Line was routed in Kansas (SWCA 2023b), are displayed in **Appendix 1.1**.

There is also state-designated critical habitat for multiple special-status aquatic species in Kansas, including the cylindrical papershell mussel (in the Saline River and Smoky Hill River), shoal chub (in the Missouri River and Republican River), plains minnow (in the Missouri River, Republican River, South Fork Big Nemaha River, Rock Creek, Brush Creek, and several unnamed streams), flathead chub (in the Missouri River and South Fork Big Nemaha River), western silvery minnow (in the Wolf River and Missouri River), sturgeon chub (in the Missouri River), sicklefin chub (in the Missouri River), silver chub (in the Missouri River), and pallid sturgeon (in the Missouri River). The locations of these critical habitat areas are displayed in **Appendix 1.1**.

3.8.3.3.3 Bald and Golden Eagles

Bald eagle nests are generally located in large deciduous or coniferous trees or cliffs less than one mile from perennial rivers or lakes containing fish (Buehler 2022). Bald eagles are opportunistic foragers and feed on a wide variety of prey species, including fish, mammals, and carrion. Across the central plains, foraging bald eagles use a variety of habitats, including riparian areas, agricultural lands, and roads (Lingle and Krapu 1986). Project-specific nest surveys were conducted within 0.25 mile of the Project corridor to identify whether any nests were located within 660 feet, the distance at which USFWS has determined nest disturbance may occur. These surveys identified four occupied bald eagle nests within the wildlife analysis area, comprising three nesting territories (SWCA 2021b). Prior to construction, the

Applicant would conduct eagle nest surveys within 1 mile of the Project corridor in Kansas and within 0.25 mile of the Project corridor in Missouri. The extended survey area in Kansas is due to the potential for nesting golden eagles, which have a larger disturbance buffer recommendation in the USFWS's *Permits for Incidental Take of Eagles and Eagle Nests* final rule (89 FR 9920–9965 [February 12, 2024]) (USFWS 2024c).

Golden eagles are an uncommon-to-rare migratory transient and winter visitor in the wildlife analysis area (USFWS 2024c). No suitable breeding habitat is present; however, there are sporadic records of migrating and wintering golden eagles at various lakes and wildlife refuges (i.e., Wilson Lake, Glen Elder State Park) in the wildlife analysis area (eBird 2023, Audubon 2024).

3.8.3.3.4 State-Listed Species

This section discusses the state-listed species identified as present or having a high to moderate potential to occur within the wildlife analysis area. Note that designated critical habitat for state listed species is addressed in **Section 3.7.3.3.2**.

Eastern spotted skunk: The eastern spotted skunk is listed under state law as threatened in Kansas and endangered in Missouri. Eastern spotted skunks prefer forest edges and upland prairie grasslands with brushy, rocky, and wooded areas. Critical habitat for this species is discussed in **Section 3.7.3.3.2**.

Northern harrier: The northern harrier is listed as endangered in Missouri. In Missouri, the northern harrier is a rare breeding species in areas of extensive grassland (MDC 2022). Outside the breeding season, the Missouri population is augmented by an influx of migrants. Northern harriers are strongly associated with open habitats, including marshes and grasslands (SWCA 2023b), and have been documented within the wildlife analysis area (eBird 2024).

Flathead chub: The flathead chub is listed as threatened in Kansas and endangered in Missouri. The species historically inhabited the entire Missouri River and some of its tributaries, but it is now nearly extirpated from Missouri (MDC 2022). Flathead chubs occupy the main channel of sandy, turbid streams (Wyoming Game and Fish Department 2017).

Lake sturgeon: The lake sturgeon is listed as endangered in Missouri. In Kansas and Missouri, this species occurs mainly in the Mississippi and Missouri Rivers, but it is also known to occur in large tributaries of these rivers (MDC 2022). Lake sturgeon occur in large or small rivers and lakes, migrating between deep and shallow waters. Lake sturgeon also migrate into smaller rivers for spawning and exhibit fidelity to spawning sites (KDWP 2022).

Plains minnow: The plains minnow is listed as threatened in Kansas. This species requires sufficient water flow, and flow rates with high and low extremes to complete its life cycle (KDWP 2022).

Shoal chub: The shoal chub is listed as threatened in Kansas. The shoal chub inhabits riffles of large, low-gradient streams with sand substrates (KDWP 2022).

Sicklefin chub: The sicklefin chub is listed as endangered in Kansas. The sicklefin chub occurs in large, turbid, free-flowing river systems with areas of strong current (Steffensen, Stukel, and Shuman 2014).

Silver chub: The silver chub is listed as endangered in Kansas. The silver chub occupies large, sandy rivers (MDC 2022).

Sturgeon chub: The sturgeon chub is listed as threatened in Kansas. The sturgeon chub occurs in main stem, turbid rivers with strong flow (MDC 2022; Steffensen, Stukel, and Shuman 2014).

Western silvery minnow: The western silvery minnow is listed as threatened in Kansas. This species inhabits the backwaters and pools of small to large rivers, usually over sand or mud (KDWP 2022).

Cylindrical papershell mussel: The cylindrical papershell mussel is listed as endangered in Kansas. This species inhabits shallow water in small creeks, streams, and lakes in sand or fine gravel (NatureServe 2022a).

3.8.4 Environmental Consequences of Proposed Federal Action

This section discusses the potential impacts, or environmental consequences, of the Project construction, operation and maintenance, and decommissioning on wildlife and their habitats within the wildlife analysis area.

3.8.4.1 Methods and Assumptions

Potential impacts to wildlife species and their habitats were quantified through an analysis of impacts to habitat as identified by vegetation class (**Table 3.7-3-**). Temporary and permanent acreages of impacts are based on locations of Project facilities and their distribution across the wildlife analysis area as represented in the Project disturbance model. Generally, to quantify the acreage of direct habitat disturbance, the footprints of Project components were attributed as permanent or temporary and their acreages tallied. To quantify the acreage of indirect impacts, various-sized buffers were applied (depending on the type of impact [e.g., visual, noise, etc.]) around the Project components and overlapping LANDFIRE vegetation classes.

Several assumptions were made regarding the analysis of wildlife species and their habitats that guide the discussion in this section:

- Species listed under the ESA would be reviewed in greater detail as part of the Section 7 ESA consultation with USFWS. Species determinations and avoidance and minimization measures, if needed, would be detailed in a Project-specific Biological Assessment.
- Impacts to bald eagle nests within and adjacent to the Project area that could not be avoided would be resolved through the BGEPA compliance and permitting process in coordination with USFWS.
- The Project area would cross Kansas state-designated critical habitat for the eastern spotted skunk and multiple special-status aquatic species. Potential Project-related impacts would be addressed in part through conditions identified in the permitting process with the KDWP (i.e., through an Action Permit).
- EPMs, as outlined in **Appendix 2.4**, would be implemented as part of the Project. Additional EPMs may be required in accordance with permits required for the Project, such as those identified during consultation with USFWS and state wildlife agencies. EPMs are not reiterated for each potential species impact that would be minimized by implementation of the EPMs.

3.8.4.2 Construction

The impacts of Project construction on wildlife species and their habitats would include habitat loss and modification; potential injury and mortality; and disruption/disturbance.[3] Note that construction-related disruption/disturbance impacts may include increased potential for spills of fuel, hydraulic fluids, and other

[3] Additional details such as tables of construction impacts to special-status species present or with a moderate to high potential to occur within the wildlife analysis area are provided in Section 6.1 in Appendix 3.6.

hazardous materials; however, the potential for spills would be minimal due to the implementation of EPMs and therefore are not discussed further in the EIS.

3.8.4.2.1 Wildlife Habitats

Construction of the Project would result in permanent and temporary habitat loss and conversion of habitat utilized by wildlife. Permanent habitat loss would occur through the clearing of vegetation for the construction and operation of permanent project features (e.g., HVDC converter stations, optical regeneration facilities and associated driveways, tower structures), which would contain permanent impervious surfaces (e.g., concrete, asphalt, or tower structures) and would no longer function as suitable wildlife habitat following construction. Habitat conversion would include the permanent conversion of one habitat type to another (e.g., conversion of a forested habitat to a shrub or grassland habitat type), which would occur within portions of the planned Project ROW. These habitat conversions would result from the removal of incompatible vegetation within the planned Project ROW, and although this represents a permanent impact to existing habitat conditions in that specific area, the modified areas could still support wildlife species adapted to the newly converted shrub or grassland conditions.

Temporary disturbance to habitats would occur due to the clearing and grading of temporary access routes and multi-use yards that would later be regraded and reseeded with herbaceous species. These areas would be restored to preconstruction condition to the extent practical. Revegetation of temporarily disturbed areas would be conducted in compliance with the EPMs listed in **Appendix 2.4** and would include decompaction of compacted soils, seeding to provide proper drainage, and establishing erosion control devices to minimize erosion and sedimentation.

Table 3.8-3 identifies the acres of permanent and temporary disturbance and habitat conversion that would result from Project construction.

Table 3.8-3. Temporary and Permanent Disturbance and Habitat Conversion in Wildlife Habitats Based on Vegetation Classes

National Vegetation Class	Total in Wildlife Analysis Area (acres)	Temporary Disturbance (acres)	Habitat Conversion (acres)[1/]	Permanent Disturbance (acres)	Total Disturbance (acres)
Forest and Woodland Vegetation	89,203	83	606	0	689
Shrub and Herb Vegetation	189,960	823	580	2	1,404
Agricultural and Developed Vegetation[2/]	831,706	4,664	331	204	5,199
Forest and Woodland Wetland and Riparian Vegetation	1,194	3	7	0	9
Shrub and Herb Wetland and Riparian Vegetation	16,978	37	46	0	83
Vegetated Totals	*1,129,041*	*5,609*	*1,569*	*206*	7,385
Non-Vegetated Cover Classes[3/]	42,945	136	27	6	169
Non-Vegetated Totals	***42,945***	*136*	*27*	6	169
Total[4/]	**1,171,986**	**5,745**	**1,596**	**212**	**7,553**

Sources: LANDFIRE 2020

[1/] Inconsistencies with the LANDFIRE dataset occur as a result of the methods of determining where areas of habitat conversion would occur (see **Section 2.3.2.4**) and limitations of GIS data. Habitat conversion would only occur where trees and other woody vegetation cleared within the ROW would not be allowed to reestablish, as their height is incompatible with the NESC vegetation clearance requirements.

[2/] Vegetation group is routinely modified.

[3/] Non-Vegetated Cover Classes includes developed or disturbed land, open water, open rock, quarries, strip mines, gravel pits, and energy development.

[1/] Totals may not sum or exactly match the totals in Chapter 2 due to rounding.

The Project was sited to minimize impacts to native vegetation and was located within Agriculture and Developed Vegetation to the extent feasible (approximately 204 acres of the total 212 acres of permanent disturbance occur within Agriculture and Developed Vegetation). Temporary workspaces outside the planned Project ROW would be sited away from Forest and Woodland Vegetation in previously disturbed areas to the extent practicable and would be revegetated to preconstruction conditions to the extent practical once construction is complete, as described in the EPMs in **Appendix 2.4**.

Construction impacts to aquatic wildlife habitat include direct disturbance (e.g., clearing of habitat for road crossings or culvert installation) and a potential short-term reduction in habitat quality (e.g., temporary increase in erosion, sedimentation, and turbidity following soil disturbance). To minimize the potential for effects to aquatic wildlife or their habitats, the Project was sited to avoid wetlands and waterbodies to the extent feasible; however, some aquatic habitats (in the form of wetlands and riparian areas) would still be required to be crossed and potentially impacted by the Project due to the linear nature of the Project. The extent of wetlands and riparian areas impacted by the Project are summarized in **Table 3.8-3** and are further discussed in **Section 3.4**. As discussed in **Section 3.4**, if waterbodies are crossed, properly designed culverts would be installed, or the waterbody would be bridged to maintain flow and reduce impacts to aquatic habitat based on a loss of connectivity. Erosion and sedimentation, which could result from work done near or within a waterbody, can result in changes to water quality (e.g., increase turbidity within the waterbody) and reduce the quality of available aquatic wildlife habitat; however, the Project would utilize proper erosion control devices and pre-established limits on the areas authorized for disturbance to minimize the potential for, and scope of, erosion and sedimentation. The Applicant would further manage the potential for water quality impacts through implementation of EPMs as described in **Appendix 2.4**. Applicable EPMs include developing and implementing an SWPPP that details the required erosion and sedimentation control measures that would be used before and during construction to maintain water quality standards in affected areas.

No disturbance is proposed within any state park or wildlife area; thus, no direct impacts are anticipated to wildlife habitat in these areas.

3.8.4.2.2 General Wildlife

Loss and modification of wildlife habitat due to construction activities may cause local impacts to individuals in the vicinity that use the habitat. Project construction activities would have the potential to result in injury and mortality to wildlife species. Some species could potentially be crushed by vehicles along access routes, during vegetation clearing, or from crushing of occupied dens during construction. Species that are prone to injury and mortality on roads include small-bodied or slow-moving species such as reptiles and amphibians and some fast-moving species such as mammals (e.g., white-tailed deer) and birds (which often fly low across roads). To minimize the risk of collisions and mortality, Project access routes would have a 25-mph speed limit imposed. To minimize impacts to avian species during the avian nesting season (April 1 to July 15), ground-disturbing habitat removal, clearing or cutting of vegetation, and grubbing outside of agricultural land cover would only be conducted following preconstruction nesting clearance surveys, and active nests would be avoided (buffer determined by species) until birds have fledged from the nest (see the EPMs detailed in **Appendix 2.4**).

Project construction activities could also have the potential to result in injury or mortality to aquatic species. Sedimentation or exposure to hazardous materials (e.g., fuel, herbicides) could change water quality, causing injury or mortality to aquatic wildlife. Vehicle and equipment repair, refueling, and staging would occur at least 1,000 feet from the edge of a water conveyance channel or wetland to minimize the impacts to aquatic species. (see the EPMs detailed in **Appendix 2.4**).Avian injury and mortality from collisions with the transmission structures, conductors, or Project facilities could potentially occur. Although the risk of this impact would be most prevalent during operations (see **Section 3.7.4.3**), some effects could still occur during construction (Dorian et al. 2005). To minimize the risk of avian collisions and mortalities, EPMs detailed in **Appendix 2.4** would be implemented, such as installation of bird flight diverters and designing the Project to meet APLIC suggested practices to reduce electrocution and collision risk. Coordination with USFWS to determine the exact location of bird flight diverters is ongoing and will be incorporated into the Final EIS.

Elevated noise levels compared to background levels would occur during construction (e.g., vegetation clearing, drilling for the transmission structure foundations, and the general use of heavy equipment and helicopters for erecting structures or line-stringing activities), which could result in disruption and disturbance to wildlife present in the area. Noise measurements for humans are roughly used as a proxy for wildlife herein, with the understanding that wildlife can detect noise across different frequencies than humans.[4] The highest construction noise level arising from the use of heavy equipment and machinery at the closest human noise-sensitive receptor (165 feet; L_{eq}) is estimated to range from 62 to 71 dBA, depending on the type of construction activity (not including the use of helicopters for placement of structures) (refer to **Table 3.13-3** in **Section 3.13**) (FHWA 2006). For humans, this noise level is similar to standing 10 feet away from a vacuum cleaner. Construction noise may travel out to 4,752 feet (0.9 mile) before attenuating to the level of the ambient background (SWCA 2023a). However, areas located closer to the construction sites where active construction is occurring would experience higher noise levels (e.g., in habitats directly adjacent to active work areas) that would likely result in disturbance and displacement of wildlife from these areas. Noise due to Project construction would be temporary and primarily limited to daytime hours.

Different wildlife species respond differently to noise stimuli, depending on their level of tolerance/habituation to human-induced noise; however, it is expected that wildlife would generally avoid areas with loud construction noise for the duration of the construction activity. Most wildlife species would likely temporarily avoid areas near active construction and then reoccupy the same general areas after the activity is complete. If adults abandon their young or nests due to construction noise, these disruptions could result in the death of offspring.

Artificial light may disturb or disorient wildlife, particularly nocturnal species. Construction activities would generally be limited to daylight hours to the extent practical; however, nighttime construction may be required under certain conditions, such as during emergencies. In those situations, artificial lighting would be required to safely work at night. Migrating avian species may be attracted to and disoriented by artificial lighting, thereby exposing these species to increased risk of disruption, injury, and mortality. Artificial lighting could also attract insects to the area, resulting in a potential collision risk for predators such as nocturnal birds and bats pursuing those insects. Artificial lighting could also disrupt natural wildlife processes, such as foraging, reproduction, and communication, within areas that are artificially lit during limited instances of nighttime construction. In accordance with the EPMs in **Appendix 2.4**, overnight site-security lighting would be shielded to project lights downward and reduce the potential for light pollution into adjacent areas. With the use of minimal temporary lighting, implementation of shielding methods, and downward direction of construction-related lighting, the impacts to general wildlife from artificial lighting would be minimized.

[4] Potential impacts of noise (primarily focusing on effects on humans) are discussed in detail in **Section 3.12**.

The physical presence of construction equipment, vehicles, and personnel across the planned Project ROW may cause disruption to wildlife species and thereby cause them to avoid the area during construction activities. Responses by wildlife may include temporary avoidance of the area immediately around construction activities (which can effectively reduce the amount of habitat available for species), stress, and disorientation. Construction disturbance may cause animals to move to less suitable areas where they could experience decreased fitness and increased risk of injury or mortality. Individuals may be more tolerant to the presence of equipment, vehicles, and personnel if they frequently use areas where disturbance is common due to the current land use.

3.8.4.2.3 Special-Status Species

In general, impacts to special-status species would be similar to those discussed above for general wildlife species. The following addresses species-specific differences or information applicable to special-status species.

Construction would result in 689 acres of disturbance to Forest and Woodland Vegetation (83 acres of temporary disturbance and 606 acres of habitat conversion), which may be used by gray bat, Indiana bat, northern long-eared bat, and tricolored bat for roosting or foraging (see **Table 3.7-3**). Additionally, 6,603 acres of Shrub and Herb Vegetation and Agricultural and Developed Vegetation (5,487 acres of temporary disturbance, 911 acres of habitat conversion, and 206 acres of permanent disturbance) that may be used by foraging gray bats and tricolored bats and 92 acres of Wetland and Riparian Vegetation (40 acres of temporary disturbance, 53 acres of habitat conversion, and less than 1 acre of permanent disturbance) that may be used by foraging gray bats and Indiana bats would be disturbed.[5]

Construction activities associated with noise, visual changes, and physical presence of construction equipment, vehicles, and personnel could impact bat species, potentially causing temporary avoidance or reduced use of active construction areas. Bats would potentially avoid roosting near active construction and may alter their foraging behavior near active construction sites. No tree clearing would occur in areas identified through surveys and coordination with appropriate agencies during bats' active season (April 1–October 15 for gray bat, Indiana bat, and little brown bat; May 15–July 31 for northern long-eared bat or tricolored bat; see the EPMs detailed in **Appendix 2.4**). No known hibernacula, caves, or mines would be impacted by the Project; therefore, impacts to hibernating bats that may utilize these types of habitats would not be expected to occur.

Bat species typically avoid stationary structures when using echolocation while active at night. They may also use vision during dawn and dusk, depending on lighting conditions or the presence of artificial lighting. Bats are generally considered skilled at avoiding collisions with stationary objects, and most Project construction would take place during the day when bats are not active. Therefore, collisions are not expected.

The eastern spotted skunk has a high potential to occupy forest habitats in the wildlife analysis area; therefore, the disturbance of Forest and Woodland Vegetation could affect this species. There would be less than 1 acre of permanent habitat removal, approximately 4 acres of permanent habitat conversion from woodland to grassland, and approximately 146 acres of temporary impacts to grassland that would be restored to preconstruction conditions of Kansas state-designated critical eastern spotted skunk habitat. Impacts from construction resulting in injury or mortality would be similar to those described for general wildlife. The eastern spotted skunk would likely move away from construction disturbance but

[5] Impacts are based on LANDFIRE habitat data. These estimates would be refined in the ESA Section 7 consultation process.

could be impacted through noise and general disturbance of construction by having to relocate to less preferred habitat. Potential Project-related impacts to the eastern spotted skunk and associated habitat would be addressed in part through conditions identified in the permitting process with the KDWP (i.e., through an Action Permit).

The Aransas-Wood Buffalo whooping crane population migrates through the wildlife analysis area each spring and fall; however, no suitable wetland stopover habitat within the wildlife analysis area would be physically removed by construction activities. Based on the findings of Ellis et al. (2022), there is a potential 1.25-mile “zone of influence” for power lines, wherein whooping cranes still use such areas but at lower rates. This study indicates there is some functional habitat loss created by the construction of the power lines. Avoidance by whooping cranes of areas within the zone of influence could make 132 acres of previously suitable wetland stopover habitat fully or partially unavailable for whooping crane use during spring and fall migration.[6] Although the power line zone of influence could shift the distribution of where whooping cranes stop over during migration, it would not likely have a measurable impact on individual cranes or the population. Impacts to whooping cranes resulting from functional habitat loss would be considered permanent and continue from construction through operation and maintenance of the Project (primarily along the planned Project ROW).

Whooping cranes would potentially experience noise and visual disruption in the Project area during construction. However, any construction activities within migration periods for whooping cranes (March 6–April 28 and October 13–November 22) would require a biological monitor. Biological monitors who are trained to identify whooping cranes would monitor construction areas daily. During the migration periods, biological monitors would be embedded with construction crews during active construction to ensure minimization measures are implemented. Monitoring would focus on areas in the vicinity of identified whooping crane stopover habitat that is within 0.5-mile of active construction. Construction activities would be temporarily ceased if a whooping crane is detected within 0.5 mile of the construction activity. Activities would resume when whooping cranes move beyond 0.5 mile from the construction activity (see the EPMs detailed in **Appendix 2.4).**Published studies on sources of whooping crane mortality have not reported collisions with construction equipment; therefore, injury or mortality during construction would not be expected.

Project construction would result in 44 acres of surface disturbance to the estimated occupied range of the lesser prairie-chicken.[7] USFWS-determined avoidance buffers of the Project infrastructure such as the transmission lines and newly constructed gravel roads overlap with 2,070 acres of the estimated occupied range (USFWS 2021c). However, functional habitat loss may already have occurred in some portions of the wildlife analysis area because of an existing high-voltage transmission line (shown on **Figure 3.10-1** in **Section 3.10**) and existing roads and other infrastructure. Taking existing features into account, a total of 729 acres of suitable habitat may be functionally lost as a result of the construction of the Project. Of the 729 acres of suitable habitat, 163 acres are known to be or likely occupied, and 566 acres are likely unoccupied (SWCA 2024). Impacts to lesser prairie-chicken habitat resulting from potential habitat loss, including avoidance, would be considered permanent beginning during construction and continuing through operations and maintenance of the Project (primarily along the planned Project

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[6] These estimates will be refined in the ESA Section 7 consultation process.

[7] USFWS recognized in the lesser-prairie chicken listing decision that “many acres included in the [estimated occupied range] are not lesser prairie-chicken habitat because either they are impacted by anthropogenic features, or they do not possess the vegetative composition and structure necessary to support the species.” 87 Fed. Reg. 72,674, 72720 (November 25, 2022). Thus, the 39 acres of direct loss and the functional loss of 2,070 acres may be an overestimate of impacts to actual suitable habitat. These estimates would be refined in the ESA Section 7 consultation process.

ROW). The Applicant would avoid engaging in any construction activities during the lesser prairie-chicken lekking season (March 1-July 15) between the hours of 3:00 a.m. and 9:00 a.m. This seasonal activity restriction would be applicable within 3 miles of a lesser prairie-chicken lek confirmed as active within the prior 5 years, regardless of the presence or absence of suitable habitat at the activity site. (see the EPMs detailed in **Appendix 2.4**).

Two special-status raptor species regularly occur in the wildlife analysis area: northern harrier and bald eagle. The Project would impact 1,200 acres of Shrub and Herb Vegetation potentially utilized by the northern harrier. Ground-disturbing habitat removal, clearing or cutting of vegetation, and grubbing in northern harrier habitat (open grasslands, marshes, meadows, wetlands) would only be completed following preconstruction nesting clearance surveys during the nesting season (March 1–July 31). Active nests would be avoided (0.5-mile buffer) until birds have fledged from the nest (see the EPMs detailed in **Appendix 2.4**). The Project would disturb approximately 698 acres of Forest and Woodland Vegetation, including Forest and Woodland Wetland and Riparian Vegetation (86 acres of temporary disturbance, 613 acres of habitat conversion, and less than one acre of permanent disturbance), that may be utilized by nesting and foraging bald eagles.

Of the four nests within the wildlife analysis area, only one known bald eagle nest occurs within 660 feet[8] of Project disturbance. This nest occurs within the Project ROW; however, this nest tree would not be removed. Furthermore, the Applicant would avoid disturbance within 660 feet of the nest during the nesting season (December 1–August 31) to the extent practicable. If disturbance cannot be avoided during the nesting season, the Applicant would pursue a bald eagle nest disturbance permit with USFWS. If additional bald eagle nests are discovered within the Project area during and prior to completion of construction, USFWS would be notified and consulted. The Applicant would temporarily halt construction activity within 660 feet of occupied bald eagle nests while necessary permits are pursued (USFWS 2007b). Impacts to golden eagle nests are not anticipated because they are not known to nest in the wildlife analysis area.

For special-status aquatic species, no permanent impacts from habitat loss, modification, injury, or mortality are anticipated because no permanent facilities would be placed within streams or rivers, aquatic sites would be spanned, and construction equipment would be kept out of flowing stream channels and active drainages to avoid directly impacting special-status aquatic species and their habitats. Additionally, no ground-disturbing activities would be conducted within the ordinary high water mark of KDWP-designated critical habitat streams. Transmission structures and other permanent Project components would be sited outside the 100-year floodplain of state-designated critical habitat streams, to the extent practicable, and no surface-disturbing activities would be conducted within the ordinary high watermark of critical habitat streams from April 1 – August 31.

The amount of vegetation removed along streambanks would be limited; activities within riparian areas would be conducted in accordance with a Project-specific Stormwater Pollution Prevention Plan; and in areas of Kansas-designated critical habitat, grading and riparian vegetation removal would be minimized. Temporarily disturbed areas would be revegetated to preconstruction conditions to the extent practical once construction is complete. Additional measures would be taken to minimize the risk of indirect impact to aquatic habitats, such as proper use of erosion control devices (see **Table 2-5** in Chapter 2). No

[8] The USFWS has established 660 feet as a disturbance buffer for bald eagle nests. Activities that occur greater than 660 feet from bald eagle nests are unlikely to bother eagles to the degree that causes nest abandonment (USFWS 2024a).

impacts to special-status aquatic species are anticipated from noise, vibration, or visual disruption from the Project during construction.

Construction of the Project would disturb 1,404 acres of Shrub and Herb Vegetation (823 acres of temporary disturbance, 580 acres of habitat conversion, and 2 acres of permanent disturbance) that could potentially be suitable for the monarch butterfly (i.e., areas that could support milkweeds and nectar-producing plants). Additionally, 606 acres of Forest and Woodland Vegetation would be converted to Shrub and Herb Vegetation, which could support monarch butterflies after that conversion.[9] There may be impacts to monarch butterflies if they are flushed or otherwise disturbed by construction activities while nectaring, mating, or breeding. Injury and mortality of adult monarchs may occur from vehicle collisions and during vegetation clearing. Butterfly eggs, caterpillars, and chrysalis may be crushed during construction activities that involve machinery, vehicles, or foot traffic in areas where milkweed is present.

Construction of the Project would disturb 1,404 acres of Shrub and Herb Vegetation (823 acres of temporary disturbance, 580 acres of habitat conversion, and 2 acres of permanent disturbance) and 42 acres of Shrub and Herb Wetland and Riparian Vegetation that could potentially be suitable for the regal fritillary. Additionally, 525 acres of Forest and Woodland Vegetation would be converted to Shrub and Herb Vegetation that could support regal fritillary.[10] Impacts would be similar to those described above for monarch butterflies.

3.8.4.3 Operations and Maintenance

The potential impacts associated with operations and maintenance of the Project on wildlife habitats, general wildlife, and special-status species are discussed below.

3.8.4.3.1 Wildlife Habitats

As described in **Table 3.8-3**, approximately 212 acres of vegetated cover would be permanently converted to impervious surfaces; this habitat would be unavailable to wildlife for the life of the Project.

While initial vegetation removal within the planned Project ROW would occur during construction, vegetation conversion from Forest and Woodland Vegetation to Shrub and Herb Vegetation would persist during operations and maintenance. During operations and maintenance, a Vegetation Management Program would ensure vegetation is managed for safety and reliability, retaining vegetation compatible with electric transmission clearance requirements in NESC and FAC-003-5 (NERC 2024). Tree removal and intense vegetation management would occur within Forest and Woodland Vegetation (see **Table 3.7-3**), resulting in the removal of forest and woodland habitat and the establishment of new Shrub and Herb Vegetation.

The effects of operations on Shrub and Herb Vegetation or Agricultural and Developed Vegetation areas would be substantially less; however, operational impacts to these areas would still occur. Recurring operations and maintenance would have short-term impacts on other Shrub and Herb or Agricultural and Developed Vegetation when equipment, vehicles, or crews access the planned Project ROW and drive on, manage, or incidentally modify vegetation. For example, driving or operating vehicles in the ROW when performing annual inspections or repairs could cause vegetation to be crushed or the soil surface to be rutted (i.e., these impacts could create vehicle tracks across areas of vegetation). These impacts

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[9] These estimates will be refined in the ESA Section 7 consultation process.

[10] These estimates will be refined in the ESA Section 7 consultation process.

would be expected to be minor as most inspections would be conducted aerially. Operations and maintenance work would be conducted in accordance with the EPMs outlined in **Appendix 2.4**.

Some types of repairs may also require new surface disturbance, such as if a transmission structure were replaced, which would result in impacts similar to those described for construction activities. Maintenance in new wetlands or waterbodies would have similar impacts to construction including disturbance and reduction in habitat quality, though the impacts would be shorter in duration. While any of the vegetation in the ROW could be modified during operations and maintenance activities, not all of the vegetation in the ROW would be modified in any given year or even over many years (See **Section 3.5** for additional details). While some portions of the planned Project ROW may experience vegetation modification each year when repair work is needed, the extent and frequency would be limited overall and primarily completed during annual inspection; thus, limiting impacts to wildlife habitat in these areas.

The impacts of recurring operations and maintenance activities on the Kansas Smoky Hills EFA and Missouri COAs would have a long-term impact on tree and shrub cover in these areas by keeping this form of vegetation at or below the height required by NERC reliability standards.

3.8.4.3.2 General Wildlife

The conversion of forested areas to shrub or grassland habitat would result in modifications to the use of and species mix found in the modified habitat (King and Byers 2002, Russo et al. 2021). Species that utilize shrub and grassland habitats (e.g., white-tailed deer, early successional shrubland and grassland dependent birds, and certain pollinators) may benefit from this habitat modification, while species dependent on trees, tree cover, and/or continuous forest could be negatively impacted. The amount of benefit that conversion of forested habitats to shrubland habitats would have to specific species that utilize these types of modified habitats would vary with the management techniques used during vegetation maintenance of the planned Project ROW; for example, the use of herbicides during maintenance could have adverse effects to invertebrate pollinators in areas where herbicides are not already causing impacts (see **Section 3.5** for a description of the vegetation maintenance that would occur).

Operations and maintenance activities create a recurring risk of collision primarily with transmission structures, electrical conductor, and the optical ground wire. Migratory birds use general north-south flyways that are the main transit corridors between southern wintering grounds and northern breeding areas[11]. A variety of factors influence the rate of avian collisions with power lines or other anthropogenic features, including configuration and location of power lines (often in relation to the surrounding vegetation and water features); the tendency of certain species to collide with structures based on behavioral flight patterns; and environmental factors such as weather, topography, and habitat (APLIC 2012). Less agile birds, such as heavy-bodied birds, or birds that travel in flocks, can collide with power lines while taking off, landing, and flying low, especially during low light, fog, and other inclement weather situations. Rivers and other waterbodies often serve as stopover habitat or migratory corridors for migrating birds, but these comprise a low proportion of the planned Project ROW. However, the collision risk for general wildlife, especially MBTA-protected birds, would be reduced through placement of bird flight diverters and lighted marker balls on portions of the line. Red lights and unlit marker balls would be used at the Missouri River Crossing. The Project would be built following APLIC guidance, which outlines design features and measures to minimize risks of avian collision and electrocution (**Appendix 2.4**).

[11] The planned Project ROW crosses both the Central and the Mississippi Flyways.

Species sensitive to tall structures, including greater prairie-chicken, could be impacted by the physical presence of an approximately 115–220-foot-tall transmission line maintained in habitats that otherwise did not have tall structures present prior to construction (e.g., grassland habitats). The introduction of tall transmission towers would represent a permanent reduction in suitable habitat, as greater prairie-chickens may avoid tall structures by between 0.25 and 1 mile (KDWP 2023). Because transmission structures and lines already exist within the area (shown on **Figure 3.9-1** in **Section 3.9**), greater prairie-chickens and other species sensitive to tall structures may already be avoiding these areas.

There is the potential for wildlife species collisions with equipment and vehicles transiting existing access roads and from vegetation management activities (as was discussed in detail above for construction). This is a particular concern for birds that nest on the ground or in low brushy habitat in the planned Project ROW. Wildlife that cannot avoid Project equipment, such as young birds, newborn mammals, and larval forms of insects, could also be crushed during routine vegetation management. There is also a potential for injury and mortality during vegetation management if dens, burrows, or young are encountered and crushed or killed. However, EPMs in **Appendix 2.4**, such as speed limits on Project access roads, would be implemented to reduce the potential for mortality.

Operations and maintenance inspection activities would usually be conducted via helicopter or drone. Noise impacts from helicopter inspections would be similar to those described for construction, including temporary disturbance and displacement while the helicopter is hovering in an area at a low elevation during transmission line inspections or repairs, or if close flybys occur near avian nests. Inspection via drone could also result in similar temporary disturbance and displacement of wildlife, though impacts would likely be reduced, depending on the noise created by the drone used. Impacts would be reduced in areas where similar noise disturbances are already occurring, such as agricultural areas where drones or other aircraft are used for monitoring and spraying crops. As the transmission line ages or as maintenance needs arise, ground-based inspection techniques may also be required on an as-needed basis. These ground-based activities could result in elevated noise levels (compared to background conditions) resulting in disruption and disturbance to wildlife species in the area. Typical noise impacts associated with operations and maintenance activities would likely include noise generated by pickup trucks, boom trucks, mowers, and chainsaws (to maintain vegetation and in the event of emergency repairs). However, the EPMs in **Appendix 2.4** would be implemented to minimize the scope and magnitude of these effects.

At permanent Project facilities requiring security lighting (e.g., converter stations and optical regeneration facilities), full cut-off lighting fixtures would be installed so that all light is projected in a downward direction and no upward component of light is emitted. This would minimize light spill outside of the areas requiring illumination and glare into the night sky. Overall impacts from lighting during operations and maintenance would be similar to the impacts described for construction.

The creation of perches and nesting opportunities for ravens, crows, and raptors on the transmission structures would have the potential to impact prey species (e.g., nesting birds, small mammals, reptiles, and amphibians). While species that take advantage of the new transmission structures on the landscape for foraging and nesting could benefit, the species they feed on could experience increased predation.

Additional potential impacts that could occur during operations and maintenance include the spread of nonnative invasive plant species, increased potential for wildland fire, changes in microclimate and sun exposure, and risk of windthrow. The likelihood of these impacts is increased through edge effects. Edge effects occur when one dominant vegetation class is bisected, often by a road or other linear feature (such as a transmission line ROW) and creates edges where the habitat was formerly intact. Edges are created during construction, and edge effects extend into operations and maintenance. The sensitivity to and extent of edge effects experienced by wildlife species (i.e., the distances from the edge where the effects are realized by an individual species) vary widely (e.g., some wildlife species may experience edge effects at a distance of only a few inches, while others may experience these effects at distances of a mile or more). Edge effects may also positively benefit some species. Species that occur primarily in Forest and Woodland Vegetation may experience increased edge habitat and a potential for predation along the edge of the planned Project ROW where the Forest and Woodland Vegetation abuts Shrub and Herb Vegetation. Edge effects are discussed in greater detail in **Section 3.5**.

3.8.4.3.3 Special-Status Species

In general, impacts to special-status species during operations and maintenance would be similar to those discussed above for general wildlife species. Impacts are anticipated to occur over a short time span and infrequently, primarily during routine vegetation trimming, transmission line inspections, and repair activities, and may result in special-status species avoiding areas adjacent to the Project while these maintenance activities occur. The following addresses species-specific differences or information applicable to special-status species.

For special-status bat species (which primarily roost in forested habitats), no additional habitat loss or modification impacts are anticipated to their Forest and Woodland Vegetation habitat within the planned Project ROW as these habitat types would have already been cleared during construction. Operational impacts to shrubland and grassland habitats that may be used by these species for foraging would be minimal during operations and maintenance due to the infrequent mowing schedule and availability of adjacent shrubland and grassland habitats for the species to use during maintenance activities. Bat injury and mortality are also unlikely during operations and maintenance, as bats are generally able to avoid collision with the transmission structures and lines. There is a lack of peer-reviewed published data on bat mortality from collisions with transmission structures and electrical conductors, suggesting that the risk of such mortality is generally not of concern.

For eastern spotted skunk, operations and maintenance activities could potentially cause recurring impacts from habitat modification through vegetation management if skunks use the planned Project ROW for foraging or sheltering. Because eastern spotted skunks use a mosaic of habitats, including vegetation adjacent to Forest and Woodland Vegetation, routine vegetation management could result in recurring impacts to habitats and disturbance to this species. Eastern spotted skunk would experience collision, injury, or mortality in a similar manner to general wildlife. Therefore, the potential for injury and mortality of eastern spotted skunk is anticipated to be reoccurring and ongoing during operations and maintenance.

Additional disruption impacts to special-status species from edge effects during operations and maintenance would be similar to impacts previously discussed for general wildlife. Edge effects could provide additional habitat if species use the forest edge for foraging but may also increase the risk of predation.

The functional loss of habitat described previously (for construction) for whooping crane and lesser prairie-chicken would persist during operations and maintenance. Whooping cranes, whose annual migration flight path crosses the planned Project ROW, have the potential for collision with power lines. Collisions with power lines can occur at any time of day and under a variety of weather conditions but tend to occur more frequently when whooping cranes are taking off in the morning to start foraging (often in agricultural fields), flying back to roosting locations (often in wetlands), and in poor weather. While whooping cranes normally migrate well above the height of power lines, they stop every night to roost in shallow wetlands (Stehn and Wassenich 2008). Whooping cranes may encounter power lines when making short, low-altitude flights between foraging and roosting areas, which often occur near sunrise and sunset when light levels are reduced (Stehn and Wassenich 2008). The Project includes the installation of bird flight diverters along the entirety of the whooping crane migration corridor. Lesser prairie-chickens also have the potential for injury and mortality from collisions with Project equipment and vehicles during ground inspections and vegetation management. However, the anticipated risk of collisions for this species is not significant due to its behavioral avoidance of transmission lines and roads.

For special-status raptor species, impacts from habitat loss and modification in Shrub and Grassland habitats during operations and maintenance are expected to be minimal due to the infrequent mowing schedule and availability of adjacent habitat for species to use during maintenance activities. However, the two special-status raptor species likely to occur (bald eagle and northern harrier) would have a potential to be adversely impacted if individuals are injured or killed by collisions. The potential for collisions with the HVDC Line would increase during periods of inclement weather due to lowered visibility. Collision impacts to golden eagle individuals are considered unlikely because individuals are rare in the wildlife analysis area and migration is largely concentrated in the western part of Kansas and along the Mississippi River (USFWS 2024a, eBird 2023, Miller et. al 2017). Measures from APLIC (2006) to mitigate collision risks and EPMs detailed in **Appendix 2.4** would be implemented to minimize the risk of injury or mortality of these as well as other avian species. Should future data indicate that eagle injuries or mortalities are likely to occur, the Applicant would coordinate with USFWS. No impacts to special-status aquatic species are anticipated during operations and maintenance given the incorporation and implementation of EPMs in **Appendix 2.4** around streams and other waterbodies. For example, special-status aquatic species are unlikely to experience injury and mortality from operations and maintenance activities, as the Applicant would avoid and minimize disturbance to areas of Kansas-designated critical habitat and other waterways occupied by special-status aquatic species. Furthermore, no ground-disturbing activities would be conducted within the ordinary high watermark of critical habitat streams, and the Applicant would restore riparian areas with regionally appropriate vegetation in areas of KDWP-designated critical habitat for listed aquatic species.

Monarch and regal fritillary butterflies may experience injury and mortality during routine vegetation management, depending upon the life stage when maintenance is conducted. While adult butterflies may avoid areas of active vegetation management, eggs and caterpillars may be crushed if encountered. In addition, the use of herbicides (if used) during ROW maintenance could result in mortality of invertebrate pollinators.

3.8.4.4 Decommissioning

Project decommissioning would be performed at the end of the service life of the Project in accordance with a Decommissioning Plan. Impacts to wildlife resources from activities to remove Project facilities would likely be similar to impacts during construction, though expected to be less extensive, in part due to continued vegetation management during operations and maintenance. Temporary access roads would be identified and used for the removal of the facilities; these would be restored after the facilities have been removed. Transmission line removal and transmission structure removal would likely entail much of the same equipment and preparatory actions (e.g., creation of temporary access roads) that were utilized during construction. Noise impacts to wildlife would be similar, and there would be a temporary disruption of wildlife through the increased presence of construction workers. Following decommissioning, disturbed areas would be revegetated to preconstruction condition to the extent practical. Revegetation of temporarily disturbed areas would be conducted in compliance with the EPMs listed in **Appendix 2.4** and as described in **Section 3.5**.

3.9 Transportation

3.9.1 Issues for Analysis

Based on NEPA statutory and CEQ/DOE regulatory requirements; input from federal, state, and local agencies and tribal governments; and comments received during scoping, the transportation analysis addresses the following:

- Increased traffic in rural areas;
- Impacts to existing roadway conditions/performance (rutting, drainage, potholes, lane markings, etc.);
- Road closures and impacts to existing access routes;
- Changes to rail line operations;
- Impacts to water navigation and maritime operations; and
- Impacts to local airstrips and aircraft, or alterations of flight paths or airspace.

Discussion of the No Action Alternative is presented in **Section 3.1**.

3.9.2 Analysis Area

The transportation analysis area includes a 5-mile buffer of the planned Project ROW centerline (10 miles total). This area was selected because it includes transportation infrastructure and nearby airport flight paths that may be impacted by Project activities such as delivery of construction materials and equipment, construction worker travel, conductor stringing, and access to Project facilities during operations and maintenance. The total acreage for the transportation analysis area is 3,770,459 acres.

3.9.3 Affected Environment

3.9.3.1 Surface Transportation

Existing surface transportation in the transportation analysis area consists of roadways and rail lines, which are presented in **Appendix 1.1**.

3.9.3.1.1 Roadways

The transportation analysis area features interstate highways (I-29, I-35, I-70, and I-229) and arterial roadways (US 24, US 36, US 50, US 56, US 59, US 63, US 65, US 73, US 75, US 77, US 81, US 183, US 281, and US 400). Interstate highways are the highest American Association of State Highway and Transportation Officials functional classification, providing high-speed/high-capacity mobility and featuring posted speed limits between 55 miles per hour (mph) and 75 mph. Interstate highways in the transportation analysis area have an annual average daily traffic (AADT) count that can range from 5,000 to over 20,000 vehicles (AADT is the total volume of vehicles on a roadway for a given year divided by 365 days). Arterial roadways generally connect urbanized areas, cities, and industrial centers. Arterial roadways in the transportation analysis area have an AADT count that can range from less than 1,000 to over 20,000 vehicles and feature posted speed limits between 50 and 70 mph.

Other roadways in the transportation analysis area include two-lane roadways and four-lane roadways. Two-lane roadways, functionally classified as local roads by the American Association of State Highway and Transportation Officials, have an annual AADT count between 100 and 849 vehicles in the transportation analysis area. Roadways classified as local roads tend to provide access to residential communities, small commercial areas, farms, and other local land uses, and generally feature posted speed limits between 20 and 45 mph.

In addition, while predominantly rural, the transportation analysis area includes part of the more populated area of St. Joseph, Missouri, where there are higher volumes/densities of passenger buses, school buses, and emergency response vehicles on local roads.

3.9.3.1.2 Rail Lines

A total of 23 rail lines are within the transportation analysis area, including 21 crossings by the HVDC Line and two crossings by the Tiger Connector. Detailed data regarding these rail lines, such as daily use, freight versus passenger lines, and shipment information, are not available from publicly accessible sources. A review of the Compilation of State Laws and Regulations Affecting Highway-Rail Grade Crossings (FRA 2021) did not find any statutes in Kansas or Missouri that would apply to the overhead transmission line. The Project would require a utility crossing license agreement for each railroad crossing (**Appendix 1.2**).

3.9.3.2 Water Transportation

Within the transportation analysis area, the Missouri River is the only waterbody used for commercial transportation. USACE constructed, operates, and maintains the Missouri River Bank Stabilization and Navigation Project, which provides a federal navigation channel from Sioux City, Iowa, to the confluence with the Mississippi River at St. Louis, Missouri, a distance of 734 river miles. From 2018 to 2022, total tonnage of commodities transported on the Missouri River ranged from approximately 4.2 to 5.6 million tons (USACE 2023). Approximately 113 active docks and ports were operating along the river as of 2016 (USACE 2018). Crossing of the Missouri River Bank Stabilization and Navigation Project would require USACE coordination under Section 10 and 14 of the Rivers and Harbors Act (also referred to as Section 408) (see **Appendix 1.2**). In addition, the Project would cross federal levee R443-448, which is a federal civil works project that would require USACE coordination under Section 408(see **Appendix 1.2**).

Coordination with USACE determined that the crossing of the Missouri River Bank Stabilization and Navigation Project and of federal levee R443-448is eligible for a categorical permission under Section 408. Categorical permissions are used to expedite and streamline review and decisions for requests that are similar in nature and have similar impacts to the USACE project and environment. The Applicant would file an application under Section 408 for crossing of the Missouri River Bank Stabilization and Navigation Project and for federal levee R443-448, consistent with the categorical permissions established by the USACE Kansas City District for Piping Systems and Small Structures in Undeveloped Areas.

3.9.3.3 Air Transportation and Airspace Use

Airports in the transportation analysis area include public airports, private airports, and heliports. Public airports tend to serve general aviation use, such as passenger transportation and recreational flyers, while private airports often serve agricultural uses. The FAA has established reporting requirements for construction or alterations around airport and heliport facilities, including construction involving objects that are taller than 200 feet (14 CFR 77). Locations of airports and the heliports in the transportation analysis area are shown in relation to the Project in **Appendix 1.1** There are 9 public and 6 private airports within the transportation analysis area in Kansas. Within the transportation analysis area in Missouri, there are 12 private airports and 1 private heliport, which is located in the City of Moberly.

The transportation analysis area does not include any military bases with airfields; however, the HVDC Line would traverse the Smoky Hill Air National Guard Military Operations Area southwest of Salina, Kansas. This is a training range serving U.S. Department of Defense aircraft that consists of designated airspace without corresponding landownership. No other military or special use airspace (i.e., airspace where activities must be confined because of their nature, or where limitations are imposed upon aircraft operations that are not a part of those activities) were identified in the transportation analysis area (FAA 2022).

3.9.4 Environmental Consequences of Proposed Federal Action

3.9.4.1 Methods and Assumptions

Transportation impacts are characterized by the following:

- Changes in roadway traffic volume and travel times due to Project-related traffic or road closures;
- Changes in rail line operations from Project-related activities;
- Changes in use of waterbodies for commercial transportation from Project-related activities; and
- Changes in flight paths or airspace use from Project-related activities.

The analysis of impacts to transportation assumes that the EPMs listed in **Appendix 2.4** would be implemented to manage impacts to transportation, traffic, and access.

3.9.4.2 Construction

Construction activities that would impact traffic volume include workers commuting to worksites and the delivery of materials, supplies, and equipment. Incidental congestion and delay would be expected from temporary land and road closures, slow-moving heavy vehicles, vehicle turning movements at construction access points, and potential changes in travel patterns resulting from construction activities at existing crossing locations, including along rail lines and the Missouri River.

For the purposes of the analysis, impacts would occur coincident with the construction sequencing and would only be experienced while construction was occurring in the specific area, which would be shorter than the overall construction duration (**Section 2.6.4.11**). Construction at the converter station sites, however, would span the majority of the construction duration; thus, impacts to transportation in the vicinity of the converter station sites would occur for the majority of the construction duration.

3.9.4.2.1 Surface Transportation

Project-Generated Traffic

Workers commuting to worksites, and the delivery of materials, supplies, and equipment, would generate Project-related traffic on existing roadways within the transportation analysis area. With the exception of the converter station sites, this induced traffic would be transitory and localized in nature, occurring in areas where and when construction is taking place. **Chapter 2** describes the peak workforce estimates for construction (**Section 2.6.4.12**). For this analysis, a conservative estimate assumes that the 160 workers per transmission line segment would carpool (two workers per car) to and from each segment, for a total of 160 Project-related passenger vehicle trips daily. For purposes of estimating emissions in **Section 3.2**, an average of 66 deliveries per day was assumed across the Project. This analysis assumes that daily deliveries would occur evenly across the segments, equaling up to 26 vehicle trips per day, per segment (Wakefield 2022). In total, there would be approximately 186 daily vehicle trips for HVDC Line, Tiger Connector, and Ford County Interconnect construction at any one segment. Construction of the

HVDC Line, Tiger Connector, and Ford County Interconnect, as discussed in **Chapter 2**, would progress along the planned Project ROW, which would minimize concentrations of traffic in any single location within the transportation analysis area, other than in proximity to the converter station sites.

Slow-moving trucks and large construction vehicles would generate additional traffic from the delivery of materials and equipment for construction activities. This additional traffic would be short term and spread throughout the day or night. Large construction vehicles and potential oversized-load deliveries would likely move slower than normal traffic and may cause localized traffic congestion, particularly on small, low-volume two-lane local roads.

Construction vehicle increases to the AADT volumes along roadways in the transportation analysis area are estimated in **Table 3.9-1.** The AADT increase, calculated by adding the total potential peak daily vehicle trips for a single construction segment to the existing AADT, is conservative. It assumes all transmission Project-related vehicles would be on one type of roadway at the same time, even though field crews would work concurrently on different segments and may use different roadways at different times to effectively distribute the volumes more evenly for site access or delivery of materials and equipment. Further, the workforce needed for construction of the Tiger Connector is less than that for the HVDC Line and Ford County Interconnect, resulting in fewer Project-related vehicle trips in Audrain and Calloway counties than calculated for other counties within the transportation analysis area. It should be acknowledged that, when construction of the HVDC Line and Ford County Interconnect overlaps with work at the converter station site in Ford County, and when construction of the HVDC Line overlaps construction of the converter station site in Monroe County, there would be additional Project-related vehicular travel concentrated in those areas for the duration of the overlapping work. However, because the AADT increases shown in **Table 3.9-1** are based on the assumption that all transmission Project-related vehicles would be on one type of roadway at one time, instead of using different types of roadways concurrently, the increase in traffic on any one roadway in Ford and Monroe counties is not likely to be above the AADTs shown in **Table 3.9-1**.

Assuming that peak travel times for non-Project-related traffic occur during the morning and evening commuting hours of 7:00 a.m. to 9:00 a.m. and 4:00 p.m. to 6:00 p.m., Project-related passenger vehicle traffic is likely to occur outside of the morning and evening peak travel times, reducing impacts to traffic congestion.

Table 3.9-1. Construction Vehicle Increase to AADT on Roadways in the Transportation Analysis Area (2021)

Roadway	Location	AADT	AADT Plus Estimated Construction Traffic	Percent Increase
US 400	Kansas	3,150	3,318	5.3%
US 56	Kansas	4,670	4,838	3.6%
US 50	Kansas	2,500	2,668	6.7%
US 183	Kansas	690	858	24.3%
K-156	Kansas	1,690	1,858	9.9%
K-264	Kansas	1,150	1,318	14.6%
K-96	Kansas	2,290	2,458	7.3%
K-4	Kansas	765	933	22.0%
US 281	Kansas	1,380	1,548	12.2%
I-70	Kansas	15,400	15,568	1.1%
K-18	Kansas	410	578	41.0%

Roadway	Location	AADT	AADT Plus Estimated Construction Traffic	Percent Increase
US 24	Kansas	1,110	1,278	15.1%
K-181	Kansas	760	928	22.1%
K-128	Kansas	640	808	26.3%
K-14	Kansas	1,110	1,278	15.1%
K-28	Kansas	985	1,153	17.1%
K-9	Kansas	715	883	23.5%
US 81	Kansas	7,040	7,208	2.4%
K-115	Kansas	625	793	26.9%
K-15	Kansas	2,080	2,248	8.1%
K-148	Kansas	850	1,018	19.8%
K-119	Kansas	535	703	31.4%
US 36	Kansas	2,770	2,938	6.1%
US 77	Kansas	2,540	2,708	6.6%
K-99	Kansas	1,770	1,938	9.5%
K-87	Kansas	235	403	71.5%
K-110	Kansas	1,060	1,228	15.8%
K-187	Kansas	1,150	1,318	14.6%
K-178	Kansas	520	688	32.3%
K-63	Kansas	1,470	1,638	11.4%
K-236	Kansas	195	363	86.2%
US 75	Kansas	4,520	4,688	3.7%
US 73	Kansas	3,130	3,298	5.4%
K-20	Kansas	485	653	34.6%
K-120	Kansas	390	558	43.1%
K-7	Kansas	1,210	1,378	13.9%
US 59	Missouri	4,847	5,015	3.5%
SR 752	Missouri	7,143	7,311	2.4%
SR 371	Missouri	1,345	1,513	12.5%
I-229	Missouri	10,153	10,321	1.7%
I-29	Missouri	32,592	32,760	0.5%
SR 31	Missouri	731	899	23.0%
SR 169	Missouri	3,466	3,634	4.8%
SR 33	Missouri	1,829	1,997	9.2%
I-35	Missouri	24,798	24,966	0.7%
SR 69	Missouri	984	1,152	17.1%
SR 116	Missouri	1,582	1,750	10.6%
SR 13	Missouri	3,414	3,582	4.9%
US 65	Missouri	2,594	2,762	6.5%
SR 139	Missouri	244	412	68.9%
SR 11	Missouri	1,427	1,595	11.8%
SR 5	Missouri	1,056	1,224	15.9%
US 24	Missouri	2,457	2,625	6.8%
SR 129	Missouri	732	900	23.0%
SR 3	Missouri	1,181	1,349	14.2%
US 63	Missouri	16,488	16,656	1.0%
SR 151	Missouri	420	588	40.0%
SR 22	Missouri	4,618	4,786	3.6%

Roadway	Location	AADT	AADT Plus Estimated Construction Traffic	Percent Increase
SR 124	Missouri	5,337	5,505	3.1%
I-70	Missouri	34,630	34,798	0.5%
SR 54	Missouri	12,079	12,247	1.4%

Sources: KDOT 2022; MoDOT 2022
AADT: annual average daily traffic

The impacts would be greatest for roadways that have the smallest volume of daily traffic and smallest AADT count. Roadways in the transportation analysis area with less than 1,000 AADT include 1 U.S. Route (US Route 183), 14 Kansas Highways (K-4, K-18, K-181, K-128, K-28, K-9, K115, K-148, K-119, K-87, K-178, K-236, K-20, and K-120), and 5 Missouri State Routes (SR 31, SR 69, SR 139, SR 129, and SR 151). These roadways could see an increase in traffic between 17 and 86 percent. Roadways in the transportation analysis area with AADT between 1,000 and 2,499 include ten Kansas Highways (K-7, K-14, K-15, K-63, K-96, K-99, K-110, K-156, K-187, and K-264), six Missouri State Routes (SR 3, SR 5, SR 11, SR 33, SR 116, and SR 371), and two U.S. Routes (US Route 24, and US Route 281). These roadways may experience a small increase in traffic (between 7 and 16 percent increase).

Prior to construction, road-use agreements would be established with counties where construction activities would occur (see **Appendix 1.2**). These road-use agreements would establish roads anticipated for use by large or oversized vehicles during construction and construction traffic patterns. Improvements may be necessary to bolster public roadways to facilitate the transportation of converter station equipment. This would ensure that the roads to be used could accommodate large or oversized vehicles without deterioration.

Traffic Delays and Road Closures

Delivery of heavy loads and overhead stringing may require temporary traffic controls that modify existing traffic patterns or necessitate limited roadway closures (with closures typically anticipated to have relatively short durations lasting minutes), which could restrict public access to certain roadways. Depending on where the roadway closure is needed, coordination with local transportation agencies could be required to develop detour and maintenance traffic plans, which would add travel time for facility roadway users. Where construction work would occur immediately adjacent to a state-maintained roadway, state authorities would approve such closures. Encroachment permits would be obtained from the appropriate state or local entity with roadway jurisdiction at each crossing location.

Delivery of heavy loads may require roadway traffic pattern modification(s), resulting in traffic delays; most delays would last minutes, although delays could be longer, depending on the type of load and the specific roadway being utilized. Heavy load deliveries would likely occur during low-traffic hours. Certain deliveries may occur during high-traffic hours, which could be more disruptive; however, these deliveries would be infrequent.

Project construction activities would include conductor stringing over roadways (also referred to as overhead crossings or stringing operations). During stringing operations, temporary guard structures would be installed at roadway crossings; the purpose of these guard structures is to prevent a conductor that is being strung from falling into the roadway in the event of equipment failure. Conductor stringing operations may require roadway traffic delays for a limited duration (minutes) and would be scheduled during daylight hours in times with low traffic. Traffic control personnel would be stationed at roadways with overhead crossings as necessary to ensure the general safety of the public and to maintain traffic. These activities would occur at 19 roadway crossings in Kansas and 15 roadway crossings in Missouri, as summarized in **Table 3.9-2**.

Table 3.9-2. Number of Overhead Transmission Line Crossings by Type of Surface Transportation Infrastructure

Crossings	Type of Surface Transportation Infrastructure			
	Interstate	U.S. Route	State Highway	Total
Kansas Crossings	1	9	9	19
Missouri Crossings	2	4	9	15
Total	**3**	**13**	**17**	**34**

Source: SWCA 2023

Traffic resulting from construction activities may impact passenger bus, school bus, and emergency response vehicle routes and travel patterns near St. Joseph, Missouri. Roadways in the transportation analysis area near St. Joseph are 2,500 AADT or above and would experience less than a 4 percent increase in traffic. Given this, and because most Project-related traffic is expected to occur before and after commute times, overall potential impacts to these services would be expected to be minimal, and emergency response routes and traffic-related impediments would be addressed as part of the Construction Traffic Control Plan noted in **Appendix 1.2**.

Access points to temporary construction access routes and driveways to converter stations along existing public and private roadways would be introduced and/or modified as described in **Chapter 2**. Converter station and optical regeneration facility driveways are not expected to have traffic at levels that would affect connecting roadways, and therefore, there would be no impacts to existing public and private roadways from project access routes to these facilities. However, the Applicant plans to repair existing private roadways before and after construction, with paving limited to approach aprons at intersections with existing paved roadways and all-weather access roads to converter stations, unless otherwise required by jurisdictional authorities (see **Appendix 1.2**).

Rail Lines

The Project would require 19 overhead crossings of rail lines (18 for the HVDC Line and 1 for the Tiger Connector), including some rail lines that would be crossed more than once. An additional four rail lines occur within the transportation analysis area and would not be crossed by the HVDC Line, Tiger Connector, or Ford County Interconnect. These could facilitate delivery of Project materials but would not otherwise be impacted by Project construction. Utility crossing license agreements would be obtained from affected rail line owners, and conductor stringing would be performed in compliance with utility crossing licenses. In accordance with railroad requirements, the Project would have only overhead wires at each crossing location, and structures would be located outside of the railroad ROW. Through the utility crossing license process (see **Appendix 1.2**), the Applicant would work with rail line owners to avoid impacts to rail line operations and to conduct construction activities between passing trains. It is not anticipated that trains would be stopped due to Project construction.

3.9.4.2.2 Water Transportation

The HVDC Line crossing location for the Missouri River is roughly 1,000 feet from top-of-bank to top-of-bank. The design of the Missouri River crossing would provide for a minimum clearance height of 52 feet from the 2 percent flow line elevation, plus an additional clearance of 35 feet, as required for aerial power transmission lines crossing navigable WOTUS specific to the HVDC Line's voltage class (33 CFR 322.5(i)(2)). Construction activities related to conductor stringing, bird flight diverter installation, and/or structure placement may require temporary restriction of transportation on the Missouri River for a short period of time (a few days to a few weeks). The Applicant would coordinate with maritime operations agencies, such as the U.S. Coast Guard or other local regulatory governing bodies, to ensure safety and limit disruptions to commercial, recreational, or other transport and shipping vessels (see **Appendix 1.2**) and in accordance with any requirements related to the federal navigation channel developed through Section 408 consultation with USACE.)

The R443-448 levee system, which is a federal civil works project, is located along the eastern bank of the Missouri River in Buchanan County and situated within the planned Project ROW at the Missouri River crossing. Continual access to the levee system must be maintained. Therefore, Project deliveries to this area would be coordinated to provide continual access to the levee system during Project construction. Full utilization of the R443-448 levee system would be prioritized and maintained throughout Project construction, and in accordance with any requirements developed through Section 408 consultation with USACE.

3.9.4.2.3 Air Transportation and Airspace Use

Helicopters may be used for construction to avoid disturbing sensitive areas, to optimize specific construction activity (such as transmission line stringing over roadways), or to install bird flight diverters and marker balls on specific spans. Helicopter use during construction could introduce additional numbers of low-flying and hovering helicopters to the existing airspace. Activities involving helicopters would typically occur during daylight hours and fair-weather conditions. These impacts may last for several days at a time where construction is occurring at each segment. Noise impacts associated with helicopter use are discussed in **Section 3.13**.

No airports are located within 5 miles of converter station sites; therefore, no impacts would be expected to airspace from construction activities at those locations. Construction equipment for transmission structures and lines can become a hazard if they are above 200 feet (e.g., some construction cranes) or are located too close to airport operations; agricultural fields that utilize aerial application of agricultural materials including seed, fertilizer, and pesticides; or military airspace operating areas. Transmission line construction near an airport presents the potential for new flight safety issues. Impacts could occur depending on flight path proximity to transmission line locations, structure and conductor heights, and compliance with applicable requirements. Issues related to airports or airspace would require FAA review and coordination with specific facilities or entities. The Project would present new obstacles to aircraft used for aerial application of agricultural materials; however, these pilots frequently fly under transmission lines.

The range floor (bottom limit of the designated military airspace) for the Smoky Hill Military Operations Area is 10,000 feet above ground level (U.S. Air National Guard 2022). The Project would not impact airspace at or above 10,000 feet; therefore, the Smoky Hill Military Operations Area would not be impacted. Additionally, the Military Aviation and Installation Assurance Siting Clearinghouse has stated that the Project would have no impacts to other military operations conducted in the area (DOD 2023).

3.9.4.3 Operations and Maintenance

Operations and maintenance activities along the planned Project ROW that would impact transportation would include vehicles, drones, and helicopters used for inspections, repairs, and vegetation management. All applicable EPMs listed in **Appendix 2.4** would be followed during operations and maintenance activities as listed in **Section 3.9.4.2.** If large-scale maintenance becomes necessary during Project operation, a localized Traffic Management Plan would be prepared and followed.

3.9.4.3.1 Surface Transportation

Project-Generated Traffic

Vehicle use for operations and maintenance activities would occur after construction is complete and would be intermittent and short-term throughout the lifespan of the Project. Approximately two personnel would be commuting daily to the converter stations, which would not noticeably increase AADTs in the transportation analysis area. Where practical, inspections and repairs would be conducted by helicopter or drone. A ground inspection could be required to mitigate imminent threats, isolate an issue, address safety concerns, or investigate findings identified during an operations and maintenance inspection. Typically, equipment repair or replacement would be conducted by a four-person crew with two or three 4x4 trucks, a boom or line truck, an aerial truck, and an assist truck. The duration would occur in a limited timeframe, ranging from hours to a few days. Equipment and material deliveries would not occur regularly as part of operations and maintenance activities. During operations and maintenance, the Applicant would conduct routine inspections of vegetation. As described in **Section 3.5**, the need for vegetation management would be limited because the planned Project ROW would be predominantly located in farmland, pastureland, or prairie. Due to the small number of vehicles needed and the short-term nature of the activities, operations and maintenance vehicle use would not noticeably increase AADTs in the transportation analysis area.

Traffic Delays and Road Closures

Temporary road or travel lane closures are not anticipated for routine operations and maintenance activities, though emergency repairs, such as those required due to a severe weather event, may necessitate temporary closures. Routine operations and maintenance findings could identify the need for targeted equipment replacement, which could require brief traffic breaks to set up protective netting over interstate crossings. Work permits with traffic control plans would be approved by the governing authority to minimize possible impacts to traffic in the affected vicinity. No potential impacts to passenger bus, school bus, and emergency response vehicles associated with operations and maintenance are anticipated.

Rail Lines

Rail line operations would not be altered for operations and maintenance activities, though emergency repairs, such as those required due to a severe weather event, may require temporary alterations to rail line operations while repairs are being conducted.

3.9.4.3.2 Water Transportation

No disruptions to maritime operations, or access to the federal navigation channel or the R443-448 levee system are anticipated due to operations and maintenance activities at the Missouri River crossing location.

3.9.4.3.3 Air Transportation and Airspace Use

The Applicant plans to design most of the Project's transmission structures such that their heights would not trigger FAA reporting requirements. However, the transmission structure heights would exceed 200 feet at the Missouri River crossing. The Applicant would submit a notice of proposed construction or alteration to the FAA and would implement any FAA requirements. The closest airport to the Missouri

River crossing is a private airport located in Buchanan County, Missouri. This private airport is approximately 3 miles from the proposed crossing. The permanent presence of new transmission structures and conductor at the Missouri River crossing could potentially affect flights and use of airspace by small aircraft in the area by necessitating flight path changes or presenting additional potential safety risks. However, with the implementation of FAA requirements for transmission structures, the impacts to flight paths or airspace would generally not alter operations.

Aircraft are commonly used in the transportation analysis area for aerial application of agricultural materials, including seed, fertilizer, and pesticides. Flight patterns for aerial applications are characterized by short, low-altitude flights that are typically made at a speed of about 110 mph at 3 to 5 feet above the crop; pilots frequently fly under power lines. The Project would present new obstacles to aerial application.

Aerial inspections of the Project would be conducted by helicopter, drone, or other comparable technology and would comply with relevant FAA requirements. Aerial inspections would be performed semi-annually and on an as-needed basis for line maintenance (e.g., after severe weather). This short-term and intermittent use of helicopters would not change or alter the use of airports and airspace. No impacts would be expected from the use of drones or other comparable technology, as the Project would be located outside controlled airspace (Aloft 2023).

The range floor (bottom limit of the designated military airspace) for the Smoky Hill Military Operations Area is 10,000 feet above ground level (U.S. Air National Guard 2022). The Project would not impact airspace at or above 10,000 feet; therefore, the Smoky Hill Military Operations Area would not be impacted. Additionally, the Military Aviation and Installation Assurance Siting Clearinghouse has stated that the Project would have no impacts to other military operations conducted in the area (DOD 2023).

3.9.4.4 Decommissioning

Site decommissioning would be performed at the end of the service life of the Project in accordance with a Decommissioning Plan. Impacts to transportation resources from activities to remove Project facilities would likely be similar to impacts during construction but with fewer passenger vehicles and equipment vehicles due to a reduced workforce. Temporary road closures, similar to those needed for construction, would likely be needed for decommissioning. Impacts to air and water transportation activities would be similar to those discussed above for construction activities.

3.10 Land Use

3.10.1 Issues for Analysis

Based on NEPA statutory and CEQ/DOE regulatory requirements; input from federal, state, and local agencies and tribal governments; and comments received during scoping, the land use analysis addresses the following:

- Impacts to agricultural lands and practices, such as:
  - Loss or reduction of farmable areas and associated crop yields;
  - Loss or reduction of grazing areas and transmission line impacts to livestock;
  - Interference to use of GPS-based farming equipment; and
  - Changes or limitations to use of farming equipment, including aerial crop dusting near the line and irrigation systems or other operating equipment near transmission structures.
- Impacts to nearby schools, residences, and Amish communities; and
- Impacts to lands in conservation easements and programs.

Discussion of the No Action Alternative is presented in **Section 3.1**.

3.10.2 Analysis Area

The land use analysis area includes a 1-mile buffer of the HVDC Line and the Tiger Connector and Ford County Interconnect AC transmission lines (2 miles total) and a 1-mile buffer of the HVDC converter station sites in Ford County, Kansas, and Monroe County, Missouri. This distance allows for consideration of land use patterns on the landscape, including municipalities or towns that could be affected, and the potential for interference with agricultural operations near the Project. **Appendix 3.10** depicts the land use analysis area within the context of regional land uses. The total acreage for the land use analysis area is 796,227 acres.

3.10.3 Affected Environment

This section includes a summary of land ownership, a description of local zoning and planning authorities, and an overview of the existing land uses in the land use analysis area. Additional details are provided for community and residential development, conservation easement program lands, and agricultural lands.

3.10.3.1 Land Ownership

The land use analysis area includes less than 1 percent federal and state lands, with the remainder of lands (greater than 99 percent) owned privately. Land ownership in the land use analysis area is listed in **Table 3.10-1**.

With the exception of lands under state or federal jurisdiction that would be crossed by the planned Project ROW, which include road and railroad crossings and the crossing of the Missouri River, the Project area is privately owned. The Project overlaps 1,642 individual privately owned parcels that would require easements from landowners.

The USACE has flowage easement rights associated with the Wilson Lake project in Russell County, Kansas. Thirteen structures are proposed to be placed within these flowage easements. These flowage easements constitute a civil works project that requires USACE coordination under Section 408 (Section

14 of the Rivers and Harbors Act) (see **Appendix 1.2**). The specific impacts to these flowage easements would be evaluated in coordination with USACE through the Section 408 process.

Table 3.10-1. Land Ownership in the Land Use Analysis Area

Land Ownership	Acres in Land Use Analysis Area	Percentage of Land Use Analysis Area
Private	795,818	99%
State	179	<1%
U.S. Department of the Interior (NPS and Bureau of Reclamation)	229	<1%
Total	**796,226**	**100%**

Source: USGS 2022

3.10.3.2 Existing Land Use Overview

Due to the size of the land use analysis area and the lack of site-specific land use data, the National Land Cover Database was used to determine current land uses within the land use analysis area (Dewitz 2021). The National Land Cover Database land cover categories in the land use analysis area are listed in **Table 3.10-2**.

Table 3.10-2. Land Cover Classes in the Land Use Analysis Area

Land Cover Class	Acres in Land Use Analysis Area	Percentage of Land Use Analysis Area
Cultivated Crops	464,379	58%
Grassland/Herbaceous	119,821	15%
Pasture/Hay	106,826	13%
Deciduous Forest	56,866	7%
Developed, Open Space	20,496	3%
Developed, Low Intensity	9,292	1%
Woody Wetlands	8,123	1%
Open Water	4,153	<1%
Developed, Medium Intensity	1,965	<1%
Emergent Herbaceous Wetlands	1,682	<1%
Mixed Forest	1,277	<1%
Shrub/Scrub	424	<1%
Barren Land (Rock/Sand/Clay)	407	<1%
Developed High Intensity	281	<1%
Evergreen Forest	234	<1%
Total[a]	**796,227**	**100%**

Source: Dewitz 2021

[a] *Totals may not sum or exactly match the totals in Chapter 2 due to rounding.*

Agriculture refers to the science and practice of farming and ranching, including cultivating land for growing crops or raising livestock. As indicated in **Table 3.10-2**, land cover data for the land use analysis area show land uses are dominated by agricultural uses, including cultivated crops and pastures, which occupy more than 71 percent of the land use analysis area (refer to **Appendix 3.10**).

Crop production, livestock production, and energy production are common land uses throughout the land use analysis area. Toward the western terminus, common crops are corn and soybean; livestock production includes hogs, cattle and dairy operations, and energy production includes oil and gas, wind, and solar energy facilities. Moving toward the eastern terminus, crop production includes corn, soybeans, wheat, alfalfa, hay, and grains, such as sorghum and barley; livestock production is primarily cattle and broiler chickens; and energy production is more often in the form of oil and gas facilities. Forest and woodland land cover types also become more predominant in the eastern portion of the land use analysis area (refer to **Appendix 3.10**).

Appendix 3.10 shows key land use features along the land use analysis area, including the locations of existing high-voltage transmission lines, pipelines, and wind turbines. Approximately 339 miles of high-voltage transmission lines and 262 miles of pipelines cross the land use analysis area. In addition, 44 wind turbines are located within the land use analysis area (Rextag 2021). The HVDC Line would follow existing linear infrastructure, particularly in Kansas, where more than 205 miles (38 percent of the total HVDC Line) would parallel existing transmission lines (Louis Berger Group 2013). In Missouri, approximately 4.5 miles of the HVDC Line would parallel existing transmission lines (0.8 percent of the total HVDC Line; Louis Berger Group 2014, 2016), and the Tiger Connector would parallel approximately 7.5 miles of existing infrastructure (21 percent; WSP USA Inc. 2022).

Existing land uses in the land use analysis area are discussed in the following sections and include agricultural lands, community and residential development, and conservation easements and programs.

3.10.3.2.1 Agricultural Lands

Agriculture dominates land uses in counties within the land use analysis area. In 2021, Kansas was number one in the United States for the “principal crops planted,” “production of sorghum for grain,” and “all wheat” categories (USDA National Agricultural Statistics Service 2022). Kansas was ranked third in livestock inventory for the “all cattle” and “calves and cattle on feed” categories in 2022. Missouri was ranked second in the United States for number of farms and for hay production (Missouri Department of Agriculture 2022). Missouri was also ranked third for beef cows and fourth for rice production.

Common agricultural practices include the use of heavy machinery, aerial application, center-pivot irrigation, and windbreaks. Combines, boom sprayers, tractors, and farm trucks are common farming equipment associated with agricultural operations that require room to navigate. Scoping comments indicated farmers may use GPS-based systems for planning and navigating the paths of large agricultural equipment for fuel efficiency, which is particularly true for boom sprayers that can reach 132 feet across. Planes, helicopters, and drones are also commonly used to apply fertilizer and pesticides (including herbicides) and for seeding during certain times of the year. Center-pivot irrigation systems (areas shown in **Appendix 3.10**) help to irrigate land with less labor and more water efficiency and can be used to apply fertilizer and pesticide. Irrigation systems require a dedicated water source, which means that farmers must already have or invest in building a well, pond, or other water source before an irrigation system is installed. Lastly, some agricultural lands may use windbreaks as a method to prevent soil erosion from wind and use controlled burns as a method of vegetation management.

Some farms within the land use analysis area practice organic farming. Organic farming is the practice of farming using no synthetic fertilizers or pesticides. Organic farms must prove compliance with various stipulations to be certified by a state or private organization. Kansas has 129 certified organic farms, and Missouri has 397 (USDA 2022).

Based on NRCS soil ratings data (NRCS 2022), 79 percent of the land use analysis area (over 607,100 acres) is considered prime farmland or farmland of statewide importance (including areas having the possibility to become prime farmland or farmland of statewide importance under certain conditions). Of the 576,567 acres that are classified as cultivated crops and hay/pasture in the National Land Cover

Database, 283,593 acres are considered prime farmland based on soil data. Impacts to soils, including prime farmland and farmland of statewide importance, are discussed further in **Section 3.3**.

3.10.3.2.2 Community and Residential Development

The land use analysis area includes scattered communities that vary in population size from 26 to 13,904 (Cubit 2022a, 2022b). Farmsteads and rural homes are scattered throughout the land use analysis area; however, most developed uses, including residences, occur near town or city centers. Within the land use analysis area, five municipalities are within 0.25 mile of the planned Project ROW for the HVDC Line: three in Kansas (Baileyville at 0.22 mile, Concordia at 0.22 mile, and Home at 0.23 mile) and two in Missouri (Cowgill at 0.01 mile and Renick at 0.23 mile). An additional 13 municipalities are between 0.25 and 1 mile of the planned Project ROW for the HVDC Line: Russell, Waldo, Scottsville, Clyde, Greenleaf, Marysville, Denton, and Bendena in Kansas, and Gower, Polo, Triplett, Keytesville, and Moberly in Missouri. Of these communities, Keytesville in Chariton County, Missouri, is the only community identified as containing an Amish settlement (Burdge 2021). There are several additional rural residential areas but no high-density areas (highly developed areas where people reside or work in high numbers).

Although specific data are not known for the entire land use analysis area, the previously conducted routing studies identified 1 privately owned school, 2 cemeteries, and an estimated 57 individual residences that would be within 500 feet of the HVDC and Tiger Connector lines, as filed with the KCC and MPSC (Louis Berger Group 2013, 2014, 2016; WSP USA Inc. 2022). No places of worship were identified within 500 feet of the HVDC and Tiger Connector lines. No residences or schools are currently located within the planned Project ROW.

In addition to an inventory of residences, schools, cemeteries, and places of worship, the Applicant has conducted a preliminary inventory of other structures occurring within the vicinity of the HVDC Line, including utility distribution poles, buildings (abandoned or unknown use), bridges, and other small structures (Invenergy 2023). Similar inventories along the Tiger Connector and Ford County Interconnect transmission lines have not been completed. This information, which is based on analysis at the time of the routing studies, may differ based on discussions with landowners regarding the presence and use of identified structures and other built features during the micro-siting efforts for the transmission lines.

3.10.3.2.3 Conservation Easements and Programs

Some privately owned, restricted-access lands within the land use analysis area are voluntarily enrolled in an easement under various federal programs and other types of conservation lands (which may include agricultural land). The federal conservation programs are administered primarily by NRCS and include the Wetland Reserve Program, the Emergency Wetlands Reserve Program, and wetland reserve easements under the Agricultural Conservation Easement Program that replaced the Wetland Reserve Program. Lands enrolled in the Wetland Reserve Program at the time it was replaced by the Agricultural Conservation Easement Program are still subject to the conditions of their agreements. In addition, the USDA Farm Service Agency administers the Conservation Reserve Program to incentivize farmers to temporarily convert highly erodible land or environmentally sensitive acreage to vegetative cover (16 U.S.C. 3831-3835).

Wetland Reserve Program lands are managed to help private and tribal landowners protect, restore, and enhance wetlands that were previously degraded due to agricultural uses. Agricultural Conservation Easement Program lands are managed to help landowners, land trusts, and other entities protect, restore, and enhance wetlands or protect working farms and ranches through conservation easements. Conservation Reserve Program lands are managed for environmental enhancements that reduce soil erosion, protect the nation's ability to produce food and fiber, reduce sedimentation in streams and lakes, improve water quality, establish wildlife habitat, and enhance forest and wetland resources (SWCA 2023).

The following list identifies the known private lands within the land use analysis area subject to easements under the conservation easement programs described above; only one parcel is known to overlap with the planned Project ROW.

- In Buchanan County, Missouri, there is a 36-acre conservation area under the interest of the Farm Service Agency, although the specific conservation program is unknown. This is located entirely within the land use analysis area.
- In Buchanan County, Missouri, two separate parcels that overlap with the land use analysis area are subject to easements under the Wetland Reserve Program. The northern parcel consists of 65 acres, 4 acres of which overlap with the land use analysis area. The southern parcel consists of 58 acres, all located in the land use analysis area.
- In Carroll County, Missouri, a 41-acre parcel is subject to a wetland reserve easement under the Agricultural Conservation Easement Program. The entire easement is located within the land use analysis area.
- In Carroll County, Missouri, one 93-acre parcel that overlaps with the land use analysis area is subject to a Wetland Reserve Program easement. The northern extent (9 acres) of this easement overlaps with the land use analysis area.
- In Carroll County, Missouri, a 41-acre parcel is subject to a wetland reserve easement under the Agricultural Conservation Easement Program. The entire easement is located within the land use analysis area.
- In Chariton County, Missouri, a 296-acre parcel is covered by an easement under the Emergency Wetlands Reserve Program. The majority (279 acres) of this easement extends into the land use analysis area. This is the only parcel within the land use analysis area (of the known private lands subject to easements) that overlaps with the planned Project ROW, which crosses the northern boundary of this parcel.
- In Chariton County, Missouri, four parcels, totaling about 694 acres, partially overlap with the land use analysis area and are subject to Wetland Reserve Program easements. Of the total 694 acres, 352 acres overlap with the land use analysis area.

Most lands enrolled in the Wetland Reserve Program and the Conservation Reserve Program are confidential; therefore, it is possible that that other locations exist within the land use analysis area.

3.10.4 Environmental Consequences of Proposed Federal Action

3.10.4.1 Methods and Assumptions

The analysis of land use impacts considers the potential for displacing, encumbering, or changing land uses, either temporarily or permanently, from Project construction, operations and maintenance, and decommissioning. Potential impacts have been analyzed for agricultural uses, community and residential uses (inclusive of the identified school), and conservation easement program lands.

Impacts from Project activity would be more intense in the Project area, where activities would be concentrated, and would diminish with distance through the rest of the land use analysis area. Impacts are quantified, where possible, based on an intersection of the land use analysis area with the existing land uses described in **Section 3.10.3.2**. For impacts that could not be quantified, a qualitative analysis is provided.

The analysis of land use impacts assumes that the EPMs listed in **Appendix 2.4** would be implemented.

3.10.4.2 Construction

Table 3.10-3 summarizes the land cover classes impacted by temporary disturbance associated with the Project. **Table 3.10-4** summarizes the land cover classes impacted by habitat conversion. **Table 3.10-5** summarizes the land cover classes impacted by permanent disturbance associated with the Project.

3.10.4.2.1 Agricultural Lands

Temporary impacts to agricultural lands (including land cover categories for cultivated crops and hay/pasture, as well as prime farmland, areas having the possibility to become prime farmland under certain conditions, and farmland of statewide importance) in the land use analysis area would result from vegetation-clearing activities; temporary access roads and laydown yards; and construction of transmission structures, converter stations, and access driveways. Because the construction areas would be used as workspaces while construction is occurring, construction impacts to agricultural operations nearest the Project area could consist of the following temporary disruption of land use: interference with movement of machinery, equipment, and irrigation implements; introduction of weeds and other pests; and livestock relocation. The Project may also displace livestock because of construction noise, including helicopter and heavy machinery use and the use of implosive splicing.

Impacts would be minimized by taking measures to reduce soil erosion, restoring agricultural lands after construction, where practicable, and providing compensation to landowners for crop loss. A dedicated Agricultural Inspector would be available to all landowners to address their concerns and to ensure that the Applicant is meeting any obligations outlined in the individual landowner agreements during construction. Additionally, the Applicant would have a dedicated Land Liaison Manager to work with landowners to address potential landowner issues or concerns during construction. After construction and reclamation are complete, agricultural activities could generally resume within the planned Project ROW.

The Applicant would coordinate with landowners prior to construction regarding the presence of organic farm production methods and other farming preferences. In these areas, the Applicant would avoid use of treated wood for construction matting and avoid pesticide and fertilizer application. The Applicant would coordinate with the organic farm owners regarding the specific certifications of that farm and develop an Organic Farm Site Plan for the individual farm crossing; this coordination is required per the Missouri Agricultural Impact Mitigation Protocol and would also be applied to Kansas, as detailed in **Appendix 1.2**. The plan would identify specific certifications or accreditations and the process by which reclamation would occur on the property to ensure no loss of those certifications or accreditations. For landowners of properties near or adjacent to the planned Project ROW and not part of an agreement with the Applicant, some localized spray or drift-spray contact to non-target vegetation could occur; however, this potential would be minimized through use of licensed and certified applicators. These and other actions to minimize impacts are discussed as EPMs in **Appendix 2.4**.

Table 3.10-3. Land Cover Classes Impacted by Temporary Project Facilities

Temporary Project Component		Land Cover Class (acres)														
		Barren Land (Rock/Sand/ Clay)	Cultivated Crops	Deciduous Forest	Developed, High Intensity	Developed, Low Intensity	Developed, Medium Intensity	Developed, Open Space	Emergent Herbaceous Wetlands	Evergreen Forest	Grassland/ Herbaceous	Mixed Forest	Open Water	Pasture /Hay	Shrub/ Scrub	Woody Wetlands
HVDC Line	Access Routes	0.7	1,203.5	30.5	0.3	20.7	2.7	60.7	3.4	0.0	332.5	0.3	1.3	279.0	1.4	3.8
	Pull or Tension Sites	-	309.6	9.5	-	1.9	0.3	6.9	-	-	46.1	0.1	<0.1	69.5	0.4	0.1
	Multi-Use Yards and Concrete Batch Plants	-	386.3	-	-	3.3	0.3	12.0	-	-	21.7	-	-	2.9	-	-
	Helipads and Fly Yards	-	326.6	0.6	-	1.5	0.3	4.9	-	-	12.4	-	-	29.7	-	-
	Workspace around Transmission Structures	0.3	1,336.1	23.1	-	5.4	0.9	25.3	0.7	0.1	312.5	0.1	1.2	270.0	1.6	2.9
Ford County Interconnect and HVDC Converter Station	Pull or Tension Sites	-	1.4	-	-	-	-	0.2	-	-	-	-	-	-	-	-
	Converter Station	-	70.4	-	-	0.2	-	3.4	-	-	110.7	-	-	-	-	-
	Workspace around Transmission Structures	-	1.0	-	-	-	-	0.2	-	-	-	-	-	-	-	-
Tiger Connector and HVDC Converter Station	Access Routes	<0.1	112.0	5.9	-	1.0	0.3	3.2	0.1	-	-	0.4	-	35.6	-	1.1
	Pull or Tension Sites	<0.1	45.5	2.8	-	<0.1	-	0.5	0.5	-	-	0.7	0.0	11.7	-	0.9
	Converter Station	-	65.5	4.1	-	-	-	-	-	-	-	-	-	3.2	-	-
	Helipads and Fly Yards	-	14.2	-	-	-	-	0.3	-	-	-	-	-	-	-	-
	Workspace around Transmission Structures	0.5	61.6	2.3	-	0.2	0.3	0.5	0.0	-	-	0.1	-	14.9	-	0.3
Total [a]		**1.5**	**3,933.7**	**78.8**	**0.3**	**34.2**	**5.1**	**118.1**	**4.7**	**0.1**	**835.9**	**1.7**	**2.5**	**716.5**	**3.4**	**81.9**

Sources: Dewitz 2021
[a] *Totals may not sum or exactly match the totals in Chapter 2 due to rounding.*

Table 3.10-4. Land Cover Classes Impacted by Habitat Conversion

Temporary Project Component		Land Cover Class (acres) [b]													
		Barren Land (Rock/Sand/Clay)	Cultivated Crops	Deciduous Forest	Developed, Low Intensity	Developed, Medium Intensity	Developed, Open Space	Emergent Herbaceous Wetlands	Evergreen Forest	Grassland/ Herbaceous	Mixed Forest	Open Water	Pasture/Hay	Shrub/Scrub	Woody Wetlands
HVDC Line	Vegetation Clearing	0.8	196.6	546.4	8.1	0.6	19.1	9.3	5.1	352.6	6.4	6.2	281.0	2.6	69.6
Tiger Connector and HVDC Converter Station	Vegetation Clearing	-	21.7	39.5	0.1	0.1	0.8	0.6	-	-	1.1	-	18.2	-	9.6
Total [a]		**0.8**	**218.3**	**585.9**	**8.2**	**0.7**	**19.9**	**9.9**	**5.1**	**352.6**	**7.5**	**6.2**	**299.2**	**2.6**	**79.2**

[a] *Totals may not sum or exactly match the totals in Chapter 2 due to rounding.*
[b] *Inconsistencies with the NLCD dataset occur as a result of the methods of determining where areas of habitat conversion would occur (see* ***Section 2.3.2.4****) and limitations of GIS data. Habitat conversion would only occur where trees and other woody vegetation cleared within the ROW would not be allowed to reestablish, as their height is incompatible with the NERC vegetation clearance requirements.*

Table 3.10-5. Land Cover Classes Impacted by Permanent Project Facilities

Permanent Project Component		Land Cover Class (acres)													
		Barren Land (Rock/Sand/Clay)	**Cultivated Crops**	**Deciduous Forest**	**Developed, Low Intensity**	**Developed, Medium Intensity**	**Developed, Open Space**	**Emergent Herbaceous Wetlands**	**Evergreen Forest**	Grassland/ **Herbaceous**	**Mixed Forest**	**Open Water**	**Pasture/ Hay**	**Shrub/Scrub**	**Woody Wetlands**
HVDC Line	Transmission Line Structures	-	1.7	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.4	<0.1	<0.1	0.4	<0.1	<0.1
	Optical Regeneration Facilities	-	1.5	-	<0.1	-	<0.1	-	-	0.2	-	-	0.2	-	-
	Optical Regeneration Facilities Access	-	0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-
Ford County Interconnect and HVDC Converter Station	Transmission Line Structures	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-
	HVDC Converter Station	-	117.2	-	-	-	6.1	-	-	<0.1	-	-	-	-	-
Tiger Connector and HVDC Converter Station	Transmission Line Structures	<0.1	0.1	<0.1	-	-	<0.1	-	-	-	-	-	<0.1	-	<0.1
	HVDC Converter Station	-	81.2	-	-	-	2.1	-	-	-	-	-	-	-	-
	Total [a]	**<0.1**	**201.8**	**0.1**	**0.1**	**<0.1**	**8.2**	**<0.1**	**<0.1**	**0.6**	**<0.1**	**<0.1**	**0.7**	**<0.1**	**<0.1**

Sources: Dewitz 2021.

[a] *Totals may not sum or exactly match the totals in Chapter 2 due to rounding.*

3.10.4.2.2 Community and Residential Development

The planned Project ROW would not cross incorporated municipalities and would not include lands that contain schools, cemeteries, places of worship, or residences, including those in the Amish community in Keytesville, Missouri, which is more than 0.25 mile from the planned Project ROW. However, current land use pertaining to community or residential development, such as use of gates, outbuildings, or other structures, would be disrupted during construction activities, and the duration and intensity of disruption would be variable across the planned Project ROW. Disruption would be temporary, occurring over days or weeks, with disruptions minimized through coordination with landowners on preferred access routes to the Project.

3.10.4.2.3 Conservation Easements and Programs

No transmission structures would be located on lands subject to the identified conservation program easements, but there could be transmission structures on lands enrolled in conservation programs that are not known to the Applicant at this time. The only identified conservation program area that would experience construction-related disturbance is one parcel in Chariton, Missouri, covered under the Emergency Wetlands Reserve Program. Less than 0.1 acre of this parcel would be disturbed. Potential impacts from construction activities on this identified parcel and other possible unidentified lands subject to conservation programs may include erosion, rutting, and compaction from construction equipment; introduction of invasive weeds from construction equipment; and temporary disruption to use of lands. These impacts, while limited in duration, could temporarily impair the lands in meeting conservation objectives or require lands to be removed from their respective program. The Applicant would coordinate with landowners and agencies on a site-by-site basis to minimize impacts to lands within conservation easement programs. If impacts associated with the Project cause the landowner’s property to be unenrolled from a conservation program, the Applicant would compensate the landowner for lost revenue resulting from removal of the land from the conservation program. This practice is required per the Missouri Agricultural Impact Mitigation Protocol and would also be applied to Kansas, as detailed in **Appendix 1.2**.

3.10.4.3 Operations and Maintenance

Through the life of the Project, impacts to land use from operations and maintenance would occur at converter stations and optical regeneration facilities, short permanent driveways to those facilities, and the transmission structures where a permanent structure would change the land use (e.g., undeveloped to developed). The permanent impacts described in **Table 3.10-5** would continue through the operations and maintenance phase of the Project. Additionally, approximately 1,596 acres of previously wooded areas would be permanently impacted due to the need to maintain short vegetation (i.e., grasses) for safety throughout operations and maintenance. Impacts from operations may include limited restrictions on land use, removal of lands from conservation programs, and interference with farming activities.

Maintenance activities may have the same types of impacts to land uses as discussed in **Section 3.10.4.2**, though the impacts would be temporary and intermittent and would be much shorter in duration at any one site than the overall construction activities and would occur on an as-needed basis. Maintenance activities would use existing access roads or access the transmission line via the Project ROW. If existing access roads are not available, off-road travel may be required, which could require vegetation clearing to allow vehicle access. Vegetation clearing would be minimized to the extent possible and coordinated with landowners.

Through the life of the Project, land uses compatible with reliability and safety requirements for the Project would be permitted in the ROW. Existing land uses, such as agriculture, grazing and other compatible land uses, are generally permitted. Incompatible land uses within the ROW include construction and maintenance of inhabited dwellings and any use requiring changes in surface elevation that could affect electrical clearances of existing or planned facilities. Limitations on land uses would be described in the easement agreements; these limitations could be modified in the easement based on site-specific conditions and/or coordination with landowners.

3.10.4.3.1 Agricultural Land

The anticipated impact of maintenance activities on the introduction or spread of noxious weeds is minimal given the inspection and vegetation management methods described in Chapter 2 (refer to **Section 3.5**). Potential impacts for farmers who are concerned about the chemicals used for vegetation management (e.g., Amish farmers or farmers operating organic farms) would be the same as during construction.

While only 212 acres within the land use analysis area would have a permanent conversion to utility use (of which 201 acres, or approximately 95 percent, are agricultural land), some long-term impacts may extend to areas beyond the foundation of the transmission structures. Large farming equipment (combines, sprayers, tractors, etc.) requires certain horizontal and vertical clearance from structures to avoid damaging the structure or machine and to make turns in a field; the placement of transmission structures may impact the routes taken by such equipment. This is particularly true where the planned Project ROW would not be sited along fence lines on a property and would create a new obstacle for farmers to navigate. This may require additional time and fuel, thereby increasing the operating costs for farmers. Depending on placement, structures may also put portions of property out of production as cropland due to the inability of large machines to safely navigate past the transmission structures or for irrigation systems to reach those portions. Up to 0.1 acre may be impacted for each structure in a way that makes navigating around it difficult or impossible, or that blocks irrigation equipment. Additionally, permanent loss of agricultural land would also occur underneath the transmission line structures where farm equipment could no longer access the land for agricultural use. This area would account for 0.013-0.112 acres per structure that occurs within agricultural land depending on the type of tower (see **Table 2-5**). However, the exact acres lost in these scenarios depends on the size of the foundation, the size and maneuverability of farm equipment, and existing cropping patterns and terrace locations.

Where possible, micro-siting (i.e., specific placement of structures within the ROW to minimize impacts) in agricultural areas would generally follow along fence lines, between fields, or along public road ROWs to reduce potential impacts. Based on data from the routing studies completed for the Project (Louis Berger Group 2013, 2014, 2016; WSP USA Inc. 2022), the HVDC Line and Tiger Connector had the potential to overlap with the path of center-pivot irrigation systems. Through micro-siting efforts conducted by the Applicant based on landowner feedback, transmission structures would avoid the paths of existing center-pivot irrigation systems to the extent practicable. Landowners would be consulted during the easement acquisition process to accommodate their needs for long-term agriculture practices to the extent practicable.

Crops would not be restricted under the lines because the transmission wires of the HVDC Line would be a minimum of 34 feet above the ground and the Tiger Connector would be a minimum of 25 feet above the ground (refer to Chapter 2). Of the predominant crops within the land use analysis area, the tallest are corn (up to 10 feet) and sorghum (up to 15 feet). At its tallest height, sorghum would be approximately 19 feet below the HVDC Line and 10 feet below the Tiger Connector transmission line. This is still well within the minimum vegetation clearance distances required by NERC (FAC-003-5), which are approximately 12 feet for the HVDC Line and 5 feet for the Tiger Connector (NERC 2024). Therefore, agricultural production would be allowed and expected to continue under the transmission lines; any restrictions on land use related to agricultural production within the ROW would be determined based on the site-specific conditions and/or in coordination with landowners. Grazing and pasturage would be allowed under the transmission lines after construction is complete; no impacts from the presence of Project facilities are expected to livestock (Angell et al. 1990; Wenzel et al. 2020).

During scoping, comments raised concerns about potential electric and magnetic field (EMF) interference with GPS-based farming equipment. Static transmission lines, such as the HVDC Line, generally do not affect people or equipment; therefore, the HVDC Line is not expected to adversely affect GPS-based equipment. The EMFs from the Ford County interconnect and the Tiger Connector AC transmission lines occur at a frequency that is substantially below that of communications systems and do not typically pose interference problems for communication equipment. Additional information is included in **Section 3.16**.

Existing irrigation systems would also be unaffected by the HVDC Line and Tiger Connector. Irrigation systems often incorporate long runs of metallic pipes that can be subject to magnetic field induction when located parallel and close to transmission lines. However, through micrositing efforts conducted by the Applicant to date, no transmission structures would overlap the paths of existing center-pivot irrigation systems along the HVDC Line or Tiger Connector.

Some landowners use controlled burns for prairie restoration and as a method of vegetation management. There would be limitations on burning underneath or near the transmission lines and structures. Coordination with the Applicant before a nearby controlled burn takes place would be required to ensure safety measures are met (Blocksome 2015).

The removal or partial removal of windbreaks, if needed within the planned Project ROW for the safe operation of the HVDC Line and the Tiger Connector and Ford County Interconnect AC transmission lines, could result in long-term reduced crop productivity during operations and maintenance due to loss of topsoil over time (Public Service Commission of Wisconsin 2013).

Restrictions on building in the ROW, structure removal, loss of revenue due to lower crop yields, and other limitations that the Project may require are factored into the easement negotiation process. Appropriate compensation would be negotiated with landowners for loss of use and impact to farming operations.

3.10.4.3.2 Community and Residential Development

The planned Project ROW would not cross local governments (cities and counties) with jurisdiction over the Project and would not include lands that contain schools, places of worship, or residences, including those in Amish communities; therefore, no displacement of land uses associated with community and residential development would occur from operations and maintenance activities. However, land uses would be restricted such that no structures could be established in the planned Project ROW; these restrictions would be addressed in landowner agreements.

3.10.4.3.3 Conservation Easements and Programs

No transmission structures would be located on lands subject to the identified conservation program easements, but there could be transmission structures on lands enrolled in conservation programs that are not known to the Applicant at this time. The enrollment status of lands in conservation programs is not publicly available information. Removal of lands from conservation programs would be a potential long-term impact if transmission structures are installed on lands under easements in these programs. The long-term presence of structures, and operations and maintenance activities, could result in the unenrollment of parcels from the program if the specific contracts prohibit placement of permanent structures or clearing of certain types of vegetation. Therefore, the environmental purpose of the particular program would go unfulfilled, which may result in penalty payments for which the Applicant would reimburse the landowner. If impacts associated with the Project cause a landowner's property to be unenrolled from a conservation program, the Applicant would compensate the landowner for lost revenue resulting from removal of the land from the conservation program. This practice is required per the Missouri Agricultural Impact Mitigation Protocol and would also be applied to Kansas, as detailed in **Appendix 1.2**. Any new contracts entered into following the construction of the Project would be at the discretion of the landowner and the agencies involved.

Maintenance activities for vegetation management and facility repair could impact land use similar to construction, including erosion, rutting, and compaction from equipment; water quality impacts from stormwater runoff, erosion, and hazardous materials spills; introduction of invasive weeds and other pests from construction equipment; and temporary loss of use of lands. Impacts would be reduced through the implementation of EPMs, including the development of an Erosion and Sediment Control Plan for the operations and maintenance phase and a Transmission Vegetation Management Plan (**see Appendix 1.2**). Impacts due to maintenance activities would be much shorter in duration at any one site than construction activities and would occur on an as-needed basis.

3.10.4.4 Decommissioning

Decommissioning would be performed at the end of the service life of the Project in accordance with a Decommissioning Plan; final details of the Decommissioning Plan are not known at this time. Impacts to land use resources from activities during decommissioning would likely be similar to those that would occur during construction. These would include disruption to use of land as workspaces and interference with the movement of machinery. The impacts would last roughly the same duration as construction impacts.

Following decommissioning, it is assumed that land use could revert to pre-Project conditions for a majority of the impacted areas. Removal of transmission structures would allow for full utilization of any agricultural lands that were restricted due to interference by machinery and irrigation. Following removal of the converter stations and optical regeneration facilities and access roads, crop cultivation and pasturage activities could resume if desired by the landowner. Reclamation could be necessary to restore soil productivity in these previously inaccessible areas. Similarly, deciduous forest and grassland/herbaceous lands could return to previous uses following the removal of Project facilities. Reestablishment of vegetation would be coordinated with landowners and detailed in the Decommissioning Plan.

All transmission line easements in Missouri would be terminated according to the MPSC Certificate of Convenience and Necessity. In Kansas, the Notice Granting Siting Permit from the KCC did not include decommissioning requirements or easement termination.

3.11 Recreation

3.11.1 Issues for Analysis

Based on NEPA statutory and CEQ/DOE regulatory requirements; input from federal, state, and local agencies and tribal governments; and comments received during scoping, the recreation analysis addresses the following:

- Impacts to recreational experiences, including changes to the setting of recreation opportunities (e.g., noise, dust, visual);
- Access restrictions or closures to existing recreation opportunities or resources;
- Impacts to forested and other natural areas used for recreation;
- Impacts to tourism at the Fort Larned NHL in Kansas;
- Impacts to private and public recreational areas, trails, and parks, including federal-, state-, and county-managed areas; and
- Impacts to game and wildlife habitat, agricultural uses (including agritourism), scenery, or other resources supporting recreation.

Discussion of the No Action Alternative is presented in **Section 3.1**.

3.11.2 Analysis Area

The area evaluated for the recreation analysis includes a 1-mile buffer (2 miles total) of the HVDC Line and AC transmission lines (i.e., 2-mile-wide corridor) and includes a 1-mile buffer of the HVDC converter station sites in Ford County, Kansas, and Monroe County, Missouri, to assess potential impacts that can occur over a distance, such as noise, and potential restrictions on access to nearby recreation areas. The recreation analysis area extends beyond the 2-mile corridor around the HVDC Line, Tiger Connector, and Ford County Interconnect alignments in certain areas to include access roads to designated recreational areas that could be affected by Project construction, operations and maintenance, and decommissioning activities. **Figure 3.11-1** and **Figure 3.11-2** depict the recreation analysis area in Kansas and Missouri, respectively. The total acreage for the recreation analysis area is 802,844 acres.

3.11.3 Affected Environment

Recreation areas include historical sites; state and local parks; forests, lakes, and rivers; hunting areas; and private properties with elements dedicated to public recreational opportunities and activities. Recreation opportunities range from hiking, wildlife viewing/birdwatching, boating, golfing, hunting, and fishing to sightseeing, car tours, and picnicking at many of the recreation areas throughout the recreation analysis area. Recreation areas evaluated within the recreation analysis area are depicted on **Figure 3.11-1** and **Figure 3.11-2** and further described in this section.

During the scoping period, commenters raised concern about the impacts to agritourism from the Project. Agritourism allows the public to view or enjoy rural activities, including farming, ranching, or historical, cultural, or natural attractions for recreational, entertainment, or educational purposes. No known registered agritourism businesses are located within the recreation analysis area in Kansas or Missouri (Kansas Tourism 2023; Missouri Farm Bureau 2023); impacts to agritourism in the recreation analysis area are evaluated as impacts to agricultural use in **Section 3.10**.

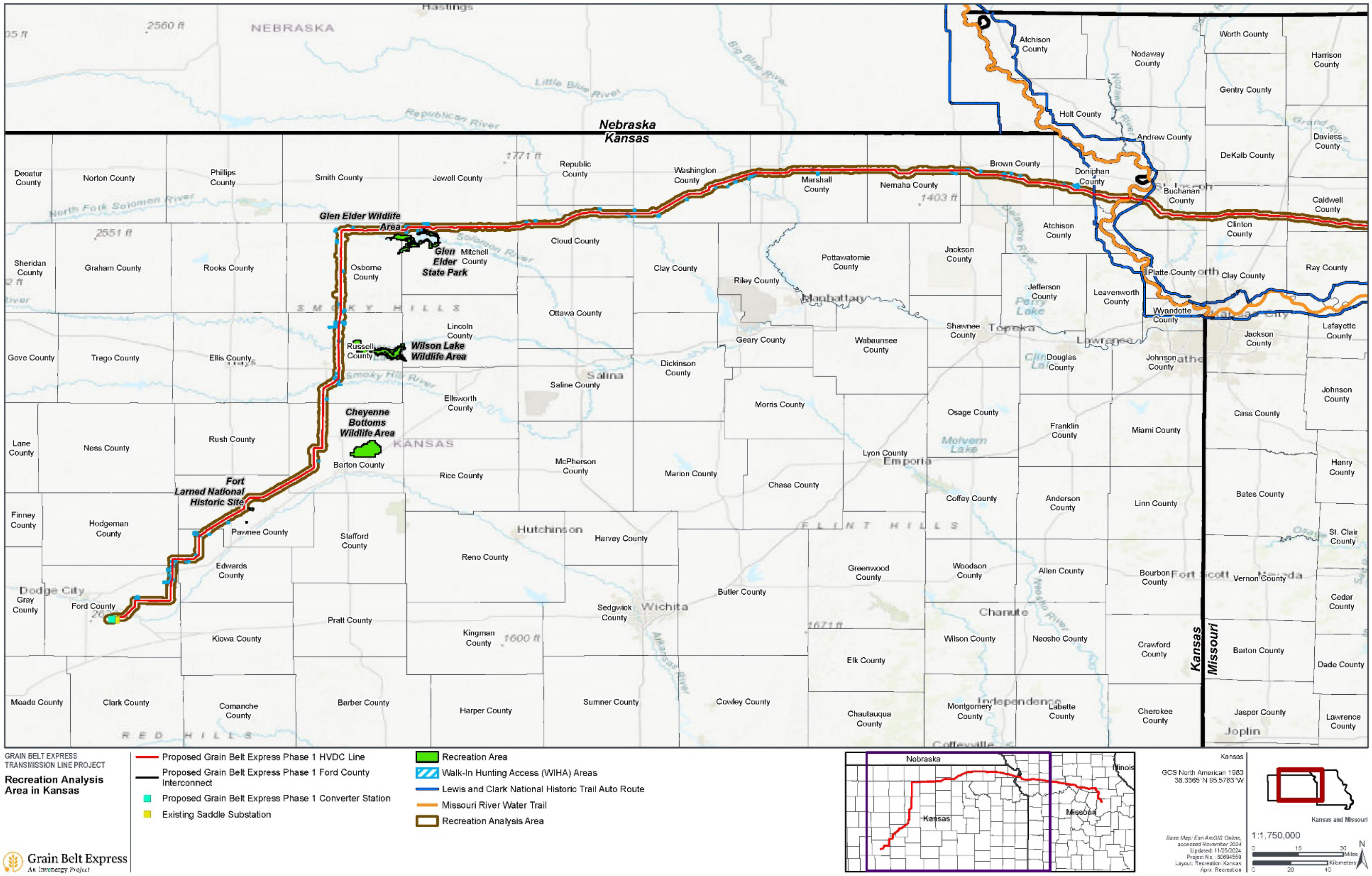

Figure 3.11-1. Recreation Analysis Area in Kansas

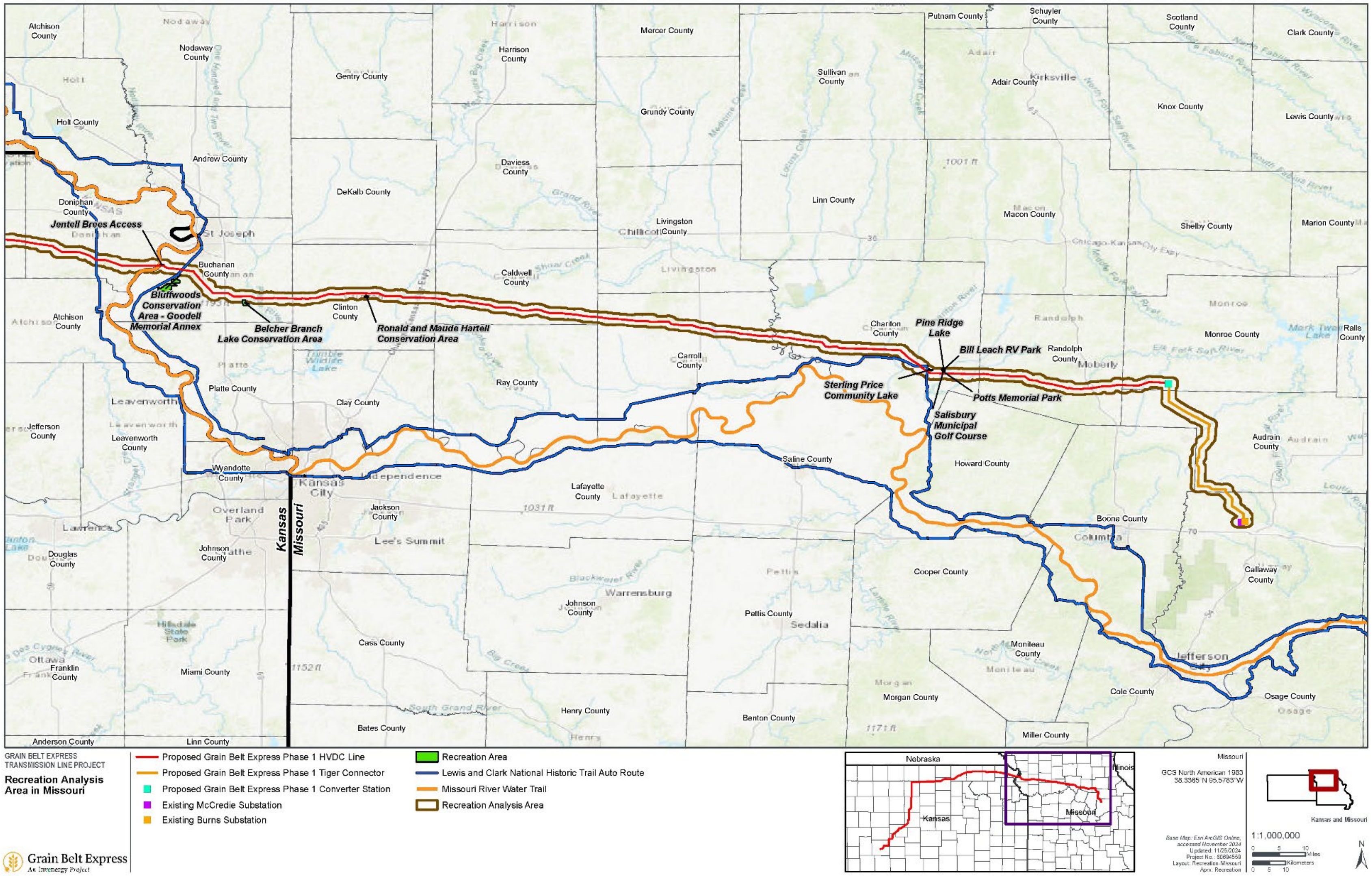

Figure 3.11-2. Recreation Analysis Area in Missouri

3.11.3.1 Fort Larned National Historic Landmark

The western boundary of the Fort Larned NHL and its primary access road are located within the recreation analysis area (**Figure 3.11-1**). The Fort Larned NHL offers hiking, picnicking, and educational/interpretive opportunities. There is a visitor center, history and nature trail, and picnic shelter at the historic site (NPS 2021). Fort Larned includes historic sandstone buildings surrounded by grassland and rural agricultural lands in the distance, which help induce the feeling of an isolated military fort in a prairie setting (NPS 1999). The picnic shelter is located along State Highway 156 and is used year-round by visitors. Historical context of the Fort Larned NHL is provided in **Section 3.6**. The NPS manages the Fort Larned NHL and follows the *Superintendent's Compendium of Designations, Closures, Permit Requirements and Other Restrictions Imposed Under Discretionary Authority* to manage the uses at the site, which "identifies areas closed for public use, provides a list of activities requiring either a special use permit or reservation, and elaborates on public use and resource protection" (NPS 2022).

3.11.3.2 Cheyenne Bottoms Wildlife Area

The Cheyenne Bottoms Wildlife Area (**Figure 3.11-1**) is located outside of the recreation analysis area but is included in the analysis due to the potential for impacts to access routes used to access the wildlife area. The area consists of 19,998 acres managed by the KDWP. The wildlife area consists of a series of dikes, canals, and dams that divert and impound water from the Arkansas River and Wet Walnut Creek into pools that provide marsh habitat that is used as a migration stopover for hundreds of species of birds, including the federally endangered whooping crane (*Grus americana*) (KDWP 2023a). Recreational opportunities at the wildlife area include hiking, bird watching, hunting, fishing, and trapping. Hunting opportunities within portions of the wildlife area include hunting for deer, pheasant, quail, waterfowl, snipe, and rail. Youth hunting is also available at the Mitigation Marsh located within the wildlife area. The Kansas Wetlands Education Center is located within the wildlife area and offers interactive exhibits, educational programming, and community outreach (KWEC 2023).

3.11.3.3 Wilson Lake

Wilson Lake (**Figure 3.11-1**) is located outside of the recreation analysis area but is included in the analysis due to the potential for impacts to access routes used to access the lake. Wilson Lake is a reservoir managed by the USACE located approximately 7 miles east of the recreation analysis area. Wilson Lake is surrounded by a number of recreation sites, including Lucas Park, Minooka Park, Sylvan Park, Wilson State Park, and Wilson Wildlife. Lucas Park, Minooka Park, and Sylvan Park are managed by USACE and offer modern, group, and primitive camping sites. Wilson State Park is located on the south side of Wilson Lake and is managed by KDWP. Wilson Wildlife Area is located on the northern end of Wilson Lake. The 8,069-acre public hunting area is made up of 5,000 acres of rugged rolling hills of native prairie, approximately 2,000 acres of cropland, and 1,000 acres of riparian timber (KDWP 2023b, KDWP 2023c). Recreational opportunities at recreation sites surrounding Wilson Lake include fishing, boating, hiking, biking, camping, trapping, and hunting.

3.11.3.4 Glen Elder Wildlife Area

The Glen Elder Wildlife Area (**Figure 3.11-1**) encompasses 13,200 acres surrounding the Glen Elder Reservoir and is managed by KDWP. Recreational opportunities at the wildlife area include fishing, hiking, biking, horseback riding, camping, trapping, and hunting. Hunting opportunities at the wildlife area include hunting for deer, turkey, pheasant, quail, doves, and waterfowl. Special hunts for pheasant, waterfowl, and deer are offered by application only and are generally for novice and youth hunters. Two areas are closed seasonally from November 1 to January 31 as refuges for these special hunts. These areas include 1,200 acres of land and water west of Cawker City Causeway and 600 acres of water near Granite Creek (KDWP 2023d), south of US 24. The portion of the Glen Elder Wildlife Area within the recreation analysis area is north of US 24 and includes several parking areas and lands around Granite Creek but not the Granite Creek refuge area itself.

3.11.3.5 Glen Elder State Park

KDWP also manages Glen Elder State Park (**Figure 3.11-1**), which is located along the northeast shoreline of the Glen Elder Reservoir. Though the state park is located outside of the recreation analysis area, the main entrance road to the park, State Highway 128, is within the recreation analysis area. Recreation opportunities at the state park include fishing, wading, boating, camping, picnicking, swimming, and visiting historic sites (KDWP 2023e).

3.11.3.6 Lewis and Clark National Historic Trail Auto Tour Routes

Partially located within the recreation analysis area, the Lewis and Clark NHT Auto Tour Routes (**Figure 3.11-2**) comprise a system of more than 8,900 miles of roads/highways paralleling the Lewis and Clark NHT that are managed by various agencies in each state, with the NPS providing signage. There are thousands of interpretive panels along the route, and driving directions to points of interest are available. The auto route is available year-round and provides an overview of local trail history, geological features, and recreation opportunities (NPS 2023). Impacts to the Lewis and Clark NHT Auto Tour Routes are discussed in **Section 3.7** and are not discussed further here.

3.11.3.7 Jentell Brees Access, Missouri River Water Trail, and the Lewis and Clark National Historic Trail

The Missouri Department of Conservation manages the approximately 32-acre Jentell Brees Access site in Buchanan County for public access to the Missouri River (**Figure 3.11-2**) (Conservation Commission of the State of Missouri [CCSM] 2009). Recreation opportunities at this access site include bird watching and fishing. The site also provides public boating access to the Missouri River (CCSM 2009, MDC 2023d). The Jentell Brees Access site is located entirely within the recreation analysis area.

The Missouri River Water Trail (**Figure 3.11-2**) is an officially designated water trail on the Missouri River that follows the Lewis and Clark NHT and is administered by the MDNR. Within the recreation analysis area, the Jentell Brees Access site provides public access to the Missouri River Water Trail. The closest access to the trail upstream from Jentell Brees is at Riverfront Park in St. Joseph, Missouri (approximately 10 miles from the recreation analysis area), and the closest downstream access to the trail is at Independence Park in Atchison, Kansas (approximately 17 miles from the recreation analysis area). The Missouri River Water Trail within the recreation analysis area is located within a remote, undeveloped setting. While impacts to the Jentell Brees Acess site are discussed below, impacts to the Lewis and Clark NHT and the Missouri River Water Trail are discussed in **Section 3.7** and are not discussed further here.

3.11.3.8 Bluffwoods Conservation Area – Goodell Memorial Annex

The Bluffwoods Conservation Area, managed by the MDC (**Figure 3.11-2**), is located in Buchanan County, Missouri, and consists of the main Bluffwoods Conservation Area (which is more than 2,200 acres) and the Goodell Memorial Annex (approximately 63 acres), which are approximately 1.5 miles apart (CCSM 2018). Only the Goodell Memorial Annex overlaps the recreation analysis area. The Bluffwoods Conservation Area – Goodell Memorial Annex is forested with no facilities or trails. Parking, restrooms, campsites, and trails are located in the main Bluffwoods Conservation Area (MDC 2023b).

Recreational opportunities at the annex include birdwatching, hunting, fishing, hiking, and outdoor photography. Hunting is allowed in the annex for deer, quail, squirrel, and turkey (MDC 2022a). The entirety of the 63-acre Goodell Memorial Annex is located within the recreation analysis area.

3.11.3.9 Belcher Branch Lake Conservation Area

The Belcher Branch Lake Conservation Area, managed by the MDC (**Figure 3.11-2**), encompasses 405 acres of cropland, grassland, and timber in Buchanan County, Missouri (MDC 2023a). The conservation area includes a 55-acre lake, five parking areas, restrooms, one boat ramp, one fishing pond, one floating dock, and two fishing piers (MDC 2017, 2023a; CCSM 2014). Recreational opportunities within the conservation area include bird watching, field trials (with special use permit), fishing, hunting, bicycling, hiking, and outdoor photography (MDC 2021a, 2023a). Hunting opportunities include hunting for deer, quail, rabbit, squirrel, turkey, and waterfowl (MDC 2023a). Approximately 146 acres (36 percent) in the northern portion of the Belcher Branch Lake Conservation Area are within the recreation analysis area.

3.11.3.10 Ronald and Maude Hartell Conservation Area

Ronald and Maude Hartell Conservation Area, managed by the MDC (**Figure 3.11-2**), encompasses 111 acres in Clinton County, Missouri (MDC 2023f). The conservation area includes seven lakes and stream frontage on the Little Platte River (Smith Fork). A range of facilities are provided at the conservation area, including eight parking areas, two restrooms, three boat ramps, one fishing dock, one fishing platform, access trails, a hiking trail, and an education center (CCSM 2008). The seven lakes are managed for high-quality bass and bluegill fishing. Educational opportunities at the conservation area include teacher workshops, fishing clinics, and demonstrations (MDC 2023f). Other recreation opportunities at the conservation area include hiking, bird watching, outdoor photography, and picnicking (MDC 2022b, 2023f). The entirety of the Ronald and Maude Hartell Conservation Area is within the recreation analysis area.

3.11.3.11 Sterling Price Community Lake

Sterling Price Community Lake (**Figure 3.11-2**) is in Chariton County, Missouri, and is managed by the Missouri Department of Conservation for public access and recreation. It is an 84-acre area that includes a 35-acre lake, forest, one boat ramp, one restroom, and three parking areas (CCSM 2007, MDC 2023g). Recreational opportunities at the lake include birdwatching, deer and turkey hunting, fishing, hiking, outdoor photography, and wildlife viewing (MDC 2021b, 2023g). The entirety of the Sterling Price Community Lake is located within the recreation analysis area.

3.11.3.12 Potts Memorial Park

Potts Memorial Park (**Figure 3.11-2**) is a municipal park owned and operated by the City of Salisbury. The park includes access to Pine Ridge Lake, the Bill Leach Recreational Vehicle (RV) Park and Campground, and the Salisbury Municipal Golf Course. The entirety of Potts Memorial Park is located within the recreation analysis area.

3.11.3.12.1 Pine Ridge Lake

Pine Ridge Lake (**Figure 3.11-2**) encompasses roughly 25 acres in Chariton County, Missouri. It is managed by the City of Salisbury in cooperation with the MDC's Community Assistance Program to maintain facilities, which include a parking lot, a restroom, a boat ramp, a fishing dock, and a picnic shelter (City of Salisbury 2023a, CCSM 2010). Recreation opportunities include fishing, frogging, primitive camping, hiking, picnicking, outdoor photography, nature study, and birdwatching (MDC and City of Salisbury 2011). The entirety of Pine Ridge Lake is within the recreation analysis area.

3.11.3.12.2 Bill Leach RV Park and Campground

This City of Salisbury-managed RV park and campground is located along the entrance road to Pine Ridge Lake in Chariton County, Missouri (**Figure 3.11-2**) and includes a shower house. The campground is generally closed in the winter (City of Salisbury 2023b). The entire RV park and campground are within the recreation analysis area.

3.11.3.12.3 Salisbury Municipal Golf Course

The Salisbury Municipal Golf Course (**Figure 3.11-2**) is a public 9-hole golf course located south of Pine Ridge Lake in Chariton County, Missouri. The golf course includes a clubhouse and driving range and is open to the public seven days a week (City of Salisbury 2023c). The entire golf course is within the recreation analysis area.

3.11.3.13 Hunting and Fishing Areas

In Kansas, hunting on public lands within the recreation analysis area is allowed in the Cheyenne Bottoms Wildlife Area, Wilson Lake Wildlife Area, and Glen Elder Wildlife Area. Public hunting on private lands is allowed during certain periods of the year through the state's walk-in hunting access (WIHA) program. Over 1 million acres in the state are enrolled in this program, within more than 4,000 discrete areas. Within the recreation analysis area, there are 77 WIHA areas totaling approximately 11,200 acres. Individual WIHA areas are open to hunting at various periods throughout the year. The WIHA areas are only open to public hunting during the contracted time period and for WIHA only; other activities are prohibited without permission from the landowner, and no vehicular traffic is allowed (KDWP 2023a). Over 50 percent of the WIHA areas within the recreation analysis area include deer, pheasant, and quail as seasonal game species. Other game species within these WIHA areas include turkey, dove, furbearers, geese, greater prairie-chicken, and waterfowl. Allowable hunting seasons vary by species, and hunting permits are required.

In Missouri, three public recreation areas within the recreation analysis area allow hunting: Bluffwoods Conservation Area – Goodell Memorial Annex, Belcher Branch Lake Conservation Area, and Sterling Price Community Lake. Species hunted in these three public recreation areas include deer, quail, rabbit, squirrel, turkey, and waterfowl. The seasons for each of these species vary, and hunting permits are required.

Hunting is allowed on private property in Missouri with the permission of the landowner (MDC 2023c); hunting permits are required. Due to the nature of the private contractual agreements between property owners and hunters, and with little to no official recordkeeping, hunting on private property in the recreation analysis area (apart from the WIHA areas) cannot be tracked nor further specified as part of this analysis.

Four public recreation areas within the recreation analysis area in Kansas provide opportunities for fishing: Cheyenne Bottoms Wildlife Area, Wilson Lake, Glen Elder Wildlife Area, and Glen Elder State Park. The Missouri River, which crosses the recreation analysis area, is considered a public river in Kansas, and it is open to the public between the ordinary high water marks on each bank. While there is no public access to the Missouri River on the Kansas side within the recreation analysis area, the river offers fishing opportunities with a license (KDWP 2023f).

Six public recreation areas in Missouri within the recreation analysis area provide opportunities for fishing (with a fishing permit): Jentell Brees Access, Bluffwoods Conservation Area – Goodell Memorial Annex, Belcher Branch Lake Conservation Area, Ronald and Maude Hartell Conservation Area, Sterling Price

Community Lake, and Pine Ridge Lake. Waterbodies within the recreation analysis area that provide fishing opportunities include the Missouri River, Platte River, and Grand River (MDC 2023e). However, there is no public access to the Platte and Grand Rivers within the recreation analysis area. One site within the recreation analysis area, the Jentell Brees Access site, provides public access to the Missouri River.

3.11.4 Environmental Consequences of Proposed Federal Action

3.11.4.1 Methods and Assumptions

Impacts to recreational resources and experiences were determined by assessing the potential for Project construction, operations and maintenance, and decommissioning activities to restrict or alter recreation access, opportunities, and experiences in the recreation analysis area, taking into consideration the Project impacts to visual resources, wildlife, land use, socioeconomics, air quality, and noise. **Section 3.11**, **Section 3.2**, and **Section 3.12** were used to evaluate potential for impacts from the presence of the Project, and **Section 3.8** was used to determine Project impacts to wildlife species and habitat that could affect hunting. Impacts resulting from the Project are assumed to be more likely within the Project area (particularly the planned Project ROW), where construction, operations and maintenance, and decommissioning activities would occur. Impacts would diminish over distance from the planned Project ROW within the rest of the recreation analysis area. The analysis of recreation impacts assumes that the EPMs listed in **Appendix 2.4** would be implemented.

3.11.4.2 Construction

3.11.4.2.1 Fort Larned National Historic Site

The boundary of the Fort Larned NHL site is located approximately 0.9 miles east of the planned Project ROW, and the primary access road for Fort Larned NHL, State Highway 156, crosses the planned Project ROW. Noise or dust from, or visual presence of, Project construction activities within the recreation analysis area would cause a temporary change to the recreation setting and the experience of visitors participating in recreation opportunities at Fort Larned NHL and near the Project ROW. Access to Fort Larned NHL via State Highway 156 would be maintained during construction. Increased levels of traffic along State Highway 156 due to construction would cause a change to visitor experiences at Fort Larned NHL by temporarily causing increased dust, noise, and visual impacts. Visitors at the picnic shelter along State Highway 156 would be particularly impacted by construction-related traffic due to the proximity of the shelter to the highway.

3.11.4.2.2 Jentell Brees Access

The planned Project ROW would be located 0.1 mile south of the Jentell Brees Access site, where it would cross over the Missouri River. Along the Missouri River, construction of the transmission structures would impact recreational users of the river through temporary closures or delays of nearby roads that access the water trail. The restrictions would be coordinated between local authorities and the contractor and would be temporary, lasting a few days to a few weeks, while construction occurs in this area. During Project construction activities at the Missouri River crossing, helicopters would be used for conductor stringing, bird flight diverter installation, and/or structure placement. Therefore, boating in the vicinity of Jentell Brees Access site may be temporarily restricted for a few days to a few weeks, which would temporarily limit recreation opportunities available from the Jentell Brees Access site.

Noise and visual presence of Project construction activities near the Jentell Brees Access site may temporarily impact the quality of visitor experiences at this site, particularly for bird watchers, anglers, and boaters who desire a quiet, natural setting.

3.11.4.2.3 Salisbury Municipal Golf Course

The planned Project ROW would be located approximately 85 feet from a southern portion of the Salisbury Municipal Golf Course, and thus the noise, dust, and visual impacts (including vegetation removal) from construction activities would be noticeable at certain areas of the golf course and would temporarily impact the quality of recreation experiences. Trees that are not required to be cleared could screen the view of construction activities from golfers. The closest golf course for displaced patrons from the Salisbury Municipal Golf Course is 20 miles away at Heritage Hills Golf Course in Moberly, Missouri. Disruption or displacement would likely only occur during the approximately four weeks when construction is actively occurring near the course. The Applicant would inform the Salisbury Municipal Golf Course of planned construction days once a detailed schedule has been developed.

3.11.4.2.4 Hunting and Fishing Areas

Construction noise and the presence of construction activities and workers would cause temporary impacts to wildlife seeking to avoid the Project construction area, as discussed in **Section 3.8**. Game species may temporarily alter their habitat use or movement patterns during construction activities. The temporary potential displacement of game species from the Project area during hunting seasons would reduce the quality of hunting experiences at Glen Elder Wildlife Area, Cheyenne Bottoms, Wilson Lake, Bluffwoods Conservation Area – Goodell Memorial Annex, Belcher Branch Lake Conservation Area, and Sterling Price Community Lake, where hunting is allowed. Impacts would only be expected to occur if construction activities near these locations coincide with the hunting season, and conditions would return to existing conditions after construction is completed.

No WIHA area is entirely within the Project area, where hunting is expected to be most impacted. Impacts to hunting would decrease with distance from the Project area. In Kansas, a total of 118.5 acres from 22 WIHAs (of 11,200 acres comprising 77 WIHAs within the recreation analysis area) would be located within the Project area. If Project construction were to occur during the season in which a WIHA was contracted for use, hunting could be temporarily restricted during construction for safety reasons.

Noise, dust, and visual presence of construction activities, in addition to potential access restrictions to waterbodies and WIHA areas and changes in traffic and road access due to construction, could temporarily decrease the quality of hunting and fishing experiences near the planned Project ROW and in WIHA areas within the Project area. Hunters and anglers may choose to visit areas farther from the Project area to avoid construction activities during the relevant time periods.

During construction, as discussed in **Chapter 2**, specific activities at each transmission structure location would occur intermittently over approximately 4 weeks and at multi-use yards over several months. The durations of specific activities are discussed in **Section 2.3.2.11**. As a result, some hunters and anglers may be temporarily displaced to other hunting or fishing areas to avoid construction activities.

3.11.4.2.5 Multiple Recreation Areas

As depicted on **Figure 3.11-1** and **Figure 3.11-2**, the multiple recreation areas listed below are located partially or entirely within the recreation analysis area but at a greater distance from the planned Project

ROW; therefore, the following areas would not experience temporary restrictions to, or closures of, recreation opportunities during construction:

- Wilson Lake (3.8 miles east of the planned Project ROW)
- Glen Elder Wildlife Area (0.3 mile south of the planned Project ROW)
- Glen Elder State Park (1 mile south of the planned Project ROW)
- Bluffwoods Conservation Area – Goodell Memorial Annex (0.7 mile south of the planned Project ROW)
- Belcher Branch Lake Conservation Area (0.7 mile south of the planned Project ROW)
- Ronald and Maude Hartell Conservation Area (0.3 mile south of the planned Project ROW)
- Sterling Price Community Lake (0.2 mile northeast of the planned Project ROW)
- Pine Ridge Lake (0.6 mile north of the planned Project ROW)
- Bill Leach RV Park and Campground (0.7 mile north of the planned Project ROW)

Noise or dust from, or visual presence of, nearby Project construction activities could temporarily affect the experience of visitors participating in recreational opportunities within the above recreation areas, except for Cheyenne Bottoms Wildlife Area.[1] Impacts from construction noise and presence may temporarily decrease recreation opportunities and the general quality of the recreation experience related to activities such as outdoor photography, fishing, wildlife viewing, or bird watching. In addition, construction-related traffic and temporary road or lane closures that affect the access roads into recreation sites could affect visitor recreation experiences. It is anticipated that most delays would last minutes, though some could be up to an hour, and detours would be provided when necessary (see **Section 3.8**).

3.11.4.3 Operations and Maintenance

Routine operations and maintenance activities would not result in road closures or an increase in traffic, and therefore, would not be expected to result in changes that could impact access to the recreation areas discussed below. Emergency repairs, such as those required due to a severe weather event, may require temporary closures and access to the recreation areas could be temporarily impacted while repairs are being conducted.

3.11.4.3.1 Fort Larned National Historic Landmark

The permanent presence of the Project would result in changes to the recreation setting at Fort Larned NHL. Though views of the Project would not affect the ability of visitors to participate in recreation opportunities, the transmission structures would be visible where visitors picnic. The Project would be apparent, but not dominant or intrusive, when viewed from the picnic area. Given the distance of Fort Larned NHL from Project facilities and screening of views toward the Project, other recreation activities at Fort Larned are not expected to be impacted (**Section 3.12**).

Operations and maintenance activities would result in temporary impacts similar to those described for construction; however, operations and maintenance activities would be less intensive, more localized, and shorter in duration (up to a few days). Maintenance activities would result in temporary noise along

[1] The Cheyenne Bottoms Wildlife Area is included in this list due to potential access impacts. Due to its distance from the Project ROW, the Cheyenne Bottoms Wildlife Area would not be affected by noise, dust, or the visual presence of Project construction activities.

the planned Project ROW; however, these activities would not be expected to diminish the recreational experience at Fort Larned NHL.

3.11.4.3.2 Jentell Brees Access

As noted in **Section 3.12**, the permanent presence of the Project would alter the recreation setting at the Jentell Brees Access site at the Missouri River where the transmission structures would rise above the shoreline vegetation into the open skyline, with the conductors visible between the structures across the river. The existing view of the river from the Jentell Brees Access site does not contain any built facilities; therefore, the Project would introduce human-made features into the natural setting. Recreation experiences based on both the natural and/or historic setting would be affected by viewshed changes from the Project at the River crossing location (**Section 3.12**). The presence of the Project would, therefore, have a potential impact to the quality of recreation experiences related to bird watching, paddling, fishing, and boating within visible distance of the Project along the Missouri River. Views of the structures while boating or fishing would be fleeting due to the meander of the river, water speed, and viewing angle.

Operations and maintenance activities would result in temporary impacts similar to those described for construction; however, operations and maintenance activities would be less intensive and shorter in duration. Operations and maintenance activities would result in temporary noise along the planned Project ROW; however, these activities are not expected to diminish recreation experiences at Jentell Brees Access site or the Missouri River.

3.11.4.3.3 Salisbury Municipal Golf Course

Currently, trees are located between the planned Project ROW and the southern edge of the Salisbury Municipal Golf Course. However, some of these trees may be removed to comply with regulatory requirements regarding vegetation in the ROW. Therefore, golfers could have a foreground view of the Project at the southern section of the golf course, depending on final vegetation requirements for this area. If the Project were to be readily visible from this section of the golf course, the Project would alter the rural, wooded recreation setting of the southern end of the golf course. Trees that are not required to be cleared could screen the view of the transmission structure from golfers.

Operations and maintenance activities would result in impacts similar to those described for construction; however, operations and maintenance activities would be less intensive and shorter in duration and would not be anticipated to restrict golfing. Operations and maintenance activities would result in temporary noise along the planned Project ROW; however, these activities are expected to have only minimal effects to recreation experiences at the golf course.

3.11.4.3.4 Hunting and Fishing Areas

In publicly accessed hunting areas and WIHA areas, the permanent presence of transmission structures and vegetation clearing may reduce suitable habitat for some game species, which could be forced to relocate outside of publicly accessible hunting areas. Additionally, the creation of perches and nesting opportunities for ravens, crows, and raptors on the transmission structures would have the potential to impact raptor prey species abundance and distribution. Thus, there could be reduced opportunities for hunting and reduced hunting experience quality for hunters. However, alternative locations for hunting opportunities within and in proximity to the recreation analysis areas are available.

Maintenance activities would lead to the temporary displacement of game in the recreation analysis area for a short time (up to a few days) due to noise and human presence, as described in **Section 3.8**. If activities such as vegetation maintenance were to occur during hunting seasons, a decrease in hunting experience quality could occur due to game displacement within the planned Project ROW. Similarly, maintenance activities would temporarily diminish experiences for anglers, when inspections or vegetation maintenance activities occur within audible range.

3.11.4.3.5 Multiple Recreation Areas

As discussed for construction, the following multiple recreation areas are located partially or entirely within the recreation analysis area, but at a greater distance from the planned Project ROW.

- Cheyenne Bottoms Wildlife Area
- Wilson Lake
- Glen Elder Wildlife Area
- Glen Elder State Park
- Bluffwoods Conservation Area – Goodell Memorial Annex
- Belcher Branch Lake Conservation Area
- Ronald and Maude Hartell Conservation Area
- Sterling Price Community Lake
- Pine Ridge Lake
- Bill Leach RV Park and Campground

The recreational setting for these areas would be unchanged due to distance from the Project and/or vegetation that would block views of the Project. Operation and maintenance activities that occur near these recreation areas would result in temporary impacts similar to those described for construction; however, operations and maintenance activities would be less intensive, more localized, and shorter in duration. These activities are not expected to be noticeable or to diminish recreation experiences at these recreation areas. Impacts would typically last a few days in duration for any one location and would have similar effects as other activities that occur routinely in the area.

Helicopter inspections may temporarily result in noise disturbance to activities in these recreation areas, such as fishing, bird watching, or other recreational activities within audible range of the inspection activity and may result in reduced opportunities and/or experience quality for activities that require a quiet, natural, and/or historic setting. However, impacts from these aerial activities would last only minutes.

3.11.4.4 Decommissioning

Site decommissioning would be performed at the end of the service life of the Project in accordance with a Decommissioning Plan. Activities during decommissioning would likely be similar to those during construction, and therefore, impacts to recreational resources from noise, dust, and visual presence of decommissioning activities would be similar to impacts during construction. Some temporary displacement of recreational activities may occur due to impacts to the setting or access.

Following decommissioning, impacts to recreational resources that occurred during operations and maintenance related to the Project would cease.

3.12 Visual Resources

3.12.1 Issues for Analysis

Based on NEPA statutory and CEQ/DOE regulatory requirements; input from federal, state, and local agencies and tribal governments; and comments received during scoping, the visual resources analysis addresses the following:

- Changes to landscape character from Project lighting on night skies;
- Changes to views from properties of historic significance;
- Changes to views from designated scenic resources and public recreation resources; and
- Changes to views and impacts to viewers from transportation corridors, towns, and rural residences.

Discussion of the No Action Alternative is presented in **Section 3.1**.

3.12.2 Analysis Area

The visual resources analysis area was determined based on the overall topography, the built environment, existing vegetation, and inventoried visually sensitive resources. The visual resources analysis area includes a 1.5-mile buffer of the HVDC Line, and Tiger Connector and Ford County Interconnect AC transmission lines centerlines (3 miles total). In addition, the visual resources analysis area was extended to a 3-mile buffer of the HVDC Line, Tiger Connector, and Ford County Interconnect at intersections with NHTs and near Fort Larned NHL (6 miles total) to ensure these sensitive areas were considered in the analysis. The total acreage for the visual resources analysis area is 1,171,986 acres.

The visual resources analysis area was established to capture where views of the landscape could be dominated or altered by Project facilities. As it is not possible to address views from every viewing location within the Project viewshed, KOPs (**Appendix 1.1**) were selected within the visual resources analysis area to represent typical Project views from a variety of perspectives, including from historic landmarks, public lands and recreation areas, transportation routes, towns, and rural residences. In addition to evaluating views at the specific locations, the KOPs allow for an understanding of how the Project would appear in typical views from other areas at similar distances and under similar conditions. Some locations beyond the visual resources analysis area may still be able to view the Project, but those views would be less intrusive or dominant relative to those within the visual resources analysis area due to increased distance from the Project and intervening topography, vegetation, or other obstructions.

3.12.3 Affected Environment

3.12.3.1 Landscape Character

In general, as a viewer moves across the visual resources analysis area from west to east through Kansas into Missouri, the more open, expansive views allowed by the low shrub brush, grasses, and limited intervening topography give way to more variable topography and taller vegetation, resulting in more partial and limited views. Thus, opportunities to see the Project from a greater distance decrease as the landscape changes from west to east when considering both topography and vegetation.

Existing landscape character in the visual resources analysis area was assessed based on the Level III Ecoregions as an objective measure of landscape character, which is a composite of landscape elements. Landscape elements in this ecoregion typically include landform, vegetation, water, and cultural modifications (BLM 1986). The arrangement of these elements' form, line, color, and texture determines landscape character and provides an objective baseline measure of the landscape to assess contrast created by the Project's introduction. The planned Project ROW crosses three Level III Ecoregions from west to east:

- Central Great Plains ecoregion (mostly flat with a mixture of fine, medium-height tallgrass and shortgrass, with few trees and shrubs in western and central Kansas)
- Western Corn Belt Plains ecoregion (flat to gently undulating plains with 80 percent of land used for agriculture in northeastern Kansas and northwestern Missouri)
- Central Irregular Plains ecoregion (irregular topography of flat to undulating ground plains with grasslands and forests of deciduous and coniferous trees in eastern portions of Kansas and northern Missouri) (SWCA 2023)

Additional information on ecoregions is provided in **Section 3.5**.

3.12.3.2 Properties of Historic Significance

Five congressionally designated NHT routes occur within the visual resources analysis area: Santa Fe NHT, California NHT, Oregon NHT, Pony Express NHT, and Lewis and Clark NHT. Through coordination with NPS, Fort Larned was also included in the visual resources analysis area because of its status as an NHL. The NHT alignments are shown relative to the Project area in **Appendix 1.1**.

3.12.3.2.1 National Historic Trails

The segments of the NHTs that intersect with the visual resources analysis area are non-extant. The landscapes of these historic trails are generally viewed from adjacent locations, such as road crossings and nearby automobile routes. Additional details specific to these resources can be found in **Section 3.7**.

- **Santa Fe NHT** intersects the visual resources analysis area in two locations, approximately 11 and 24 miles east of Dodge City, Kansas, respectively. Of these two sections, one appears to have been paved over during construction of State Highway 400 and the other appears to be non-extant (within a plowed agricultural field). A section of the trail referred to here as the Santa Fe Ruts, located approximately 4 miles from the planned Project ROW and outside the visual resources analysis area, is the closest extant location of the Santa Fe NHT and serves as an example of the local landscape character associated with the establishment and history of the trail.
- **Oregon NHT** intersects the visual resources analysis area approximately 6 miles southwest of the city of Marysville, Kansas. The portion of the trail within the visual resources analysis area is non-extant (within a plowed field), and there are no trail-related amenities in or around this area. In addition, the historical landscape character in this area has been modified with the introduction of modern features such as paved road surfaces, low-density rural development, and overhead utility and transmission lines.
- **California NHT** intersects the visual resources analysis area in three locations; two crossings are located approximately 3.5 miles northwest and approximately 2.7 miles north-northwest of Powhattan, Kansas. The California NHT also crosses the visual resources analysis area approximately 6 miles southwest of Marysville, Kansas, where it follows the same route as the Oregon NHT. The trail is non-extant in each location (within plowed fields), and the historical landscape character has been replaced with modern features.

- **Pony Express NHT** intersects the visual resources analysis area in two locations in Kansas, approximately 4.5 miles southeast of Seneca and 0.75-mile northeast of Denton, respectively. The trail is non-extant in both locations, and the historical landscape character has been replaced with modern features.
- **Lewis and Clark NHT** intersects the visual resources analysis area on the Missouri River approximately 8.1 miles southwest of St. Joseph, Missouri. The trail is non-extant and located in the Missouri River floodplain in this area. The landscape character around this portion of the Missouri River remains intact and is representative of the visual experience encountered by the original users of the trail. The Lewis and Clark NHT Auto Tour Route, a system of roads and highways that extends across multiple states and follows either side of the Lewis and Clark NHT, provides the primary way for visitors to experience the trail. The planned Project ROW crosses this auto route four times. The Missouri River Water Trail is a state-designated water trail on the Missouri River in the visual resources analysis area that follows the Lewis and Clark NHT and is administered by the Missouri Department of Natural Resources. Potential impacts to the auto route and Missouri River Water Trail are discussed below in **Section 3.11.3.4**.

3.12.3.2.2 Fort Larned National Historic Landmark

Located in Pawnee County, Kansas, Fort Larned NHL is entirely within the visual resources analysis area, which was extended to a 3-mile buffer of the HVDC Line at this location following coordination with NPS. Visitor amenities associated with the site include parking, restrooms, a lunch pavilion, site tours, recreational nature trail, and a visitor center (NPS 2019). The fort structures at Fort Larned NHL are located approximately 1.7 miles east of the planned Project ROW, on the opposite side of mature vegetation along the Pawnee River.

3.12.3.3 Designated Scenic Resources

Two designated scenic resources were identified within the visual resources analysis area: one National Scenic Byway, and one state scenic byway, which were designated by the U.S. Secretary of Transportation and the Secretary of the Kansas Department of Transportation, respectively.

- **Wetlands and Wildlife National Scenic Byway**. This National Scenic Byway is a 77-mile route in central Kansas that connects two significant wetlands and passes through seven rural communities. The northern terminus of the byway, which is the closest point to the planned Project ROW, is in Barton County, Kansas, approximately 1.4 miles from the planned Project ROW; at that location, the byway is collocated with SR 4. There are no amenities or scenic resources associated with the byway in the visual resources analysis area. **Appendix 1.1** shows where the planned Project ROW would cross SR 4, which occurs west of the northern terminus of the scenic byway.
- **Glacial Hills State Scenic Byway**. This state scenic byway (along SR 7 in Kansas) is a 63-mile route that traverses rolling hills and rock-strewn valleys left over from ancient glaciers (Kansas Tourism 2023). The byway crosses the planned Project ROW approximately 6.5 miles south of Bendena, Kansas. This crossing location is shown in **Appendix 1.1**, labeled as SR 7.

3.12.3.4 Public Lands and Recreational Resources

Public lands and recreational resources identified in the visual resources analysis area include recreation areas, state parks, designated trails, and local parks. These areas and their distances from the planned Project ROW at their respective closest points are identified in **Table 3.12-1**. Additional details regarding the recreational resources, and their mapped locations, are provided in **Section 3.10**.

Table 3.12-1. Public Lands and Recreational Resources in the Visual Resources Analysis Area

Recreation Area[b]	Location	Distance from Planned Project ROW
Fort Larned National History and Nature Trail	Kansas	0.9 mile
Glen Elder Wildlife Area	Kansas	0.3 mile
Glen Elder State Park	Kansas	1.0 mile
Glen Elder Reservoir	Kansas	1.0 mile
Lewis and Clark NHT Auto Tour Route	Kansas, Missouri	Intersects
Jentell Brees Access	Missouri	0.1 mile
Missouri River (including the Missouri River Water Trail)	Kansas, Missouri	Intersects
Bluffwoods Conservation Area – Goodell Memorial Annex	Missouri	0.7 mile
Belcher Branch Lake Conservation Area	Missouri	0.7 mile
Ronald and Maude Hartell Conservation Area	Missouri	0.3 mile
Sterling Price Community Lake	Missouri	0.2 mile
Salisbury Municipal Golf Course[a]	Missouri	85 feet
Pine Ridge Lake[a]	Missouri	0.6 mile
Bill Leach RV Park and Campground[a]	Missouri	0.7 mile
Hunting Areas	Kansas and Missouri	Varies

RV = recreational vehicle

[a] Part of Potts Memorial Park

[b] Cheyenne Bottoms and Wilson Lake, described in **Section 3.10**, are not located in the visual resources analysis area.

3.12.3.5 Transportation Corridors, Towns, and Rural Residences

High-use public areas present within the visual resources analysis area include U.S. highways, interstates, state routes (shown in **Section 3.9**), and residential areas. Views along the identified transportation corridors are dominated by automobiles, pavement, guardrails, cut rock shoulders, existing transmission infrastructure, and informational signage, backed by views of adjacent agricultural and vegetated landscape. Typically characterized by broad areas of pavement and wide medians, these highways allow for open views down the roadway corridor, with perpendicular views often screened by trees and/or steep embankments lining the highways. Existing energy infrastructure, such as transmission and distribution lines, often parallel transportation corridors and are a common visual element. Wind energy turbines are also becoming a more common visual element along roadways, particularly in the western portion of the visual resources analysis area.

Cities or towns (i.e., incorporated municipal areas) identified partially within the visual resources analysis area are generally small rural towns with moderate populations and moderate-density residential development. Many of these rural towns include downtown areas, where the majority of community services, schools, and churches are concentrated. Often, views from developed town locations are partially obscured due to foreground structures and vegetation. Rural residences outside of clustered communities may have more open views across the landscape, depending on terrain and vegetation. **Figures 3.9-1** through **3.9-4** in **Section 3.9** show existing infrastructure (pipelines and transmission lines) and developed areas that are visual elements within the Project's visual resources analysis area.

3.12.4 Environmental Consequences of Proposed Federal Action

3.12.4.1 Methods and Assumptions

The methods used in the visual resources analysis are consistent with methods developed by various federal agencies, including the Bureau of Land Management, U.S. Forest Service, U.S. Department of Transportation, and USACE (SWCA 2023). The assessment defines locations from where the Project may be visible within the visual resources analysis area, identifies KOPs from which the Project may be viewed, describes existing landscape character, documents the degree of visual contrast resulting from the introduction of Project facilities as viewed from KOPs, and provides supporting simulations from select KOPs to aid in substantiating visual impact conclusions (KOP simulations are included in **Appendix 3.12**).

Impacts to visual resources are evaluated by comparing the degree of contrast on landscape character between baseline conditions and the anticipated future conditions with the Project. The following visual elements were considered in the analysis:

- **Form, line, color, and texture**: These four compositional elements define the visual character of a landscape, as well as a project. The extent to which these elements of a project are similar to, or contrast with, the same visual elements in the existing landscape is a primary determinant of visual impact.
- **Landscape composition**: The landscape composition consists of the spatial arrangement of objects and voids in the landscape. Basic landscape components include vegetation, landform, water, and sky.
- **Focal point:** Certain natural or anthropogenic landscape features that stand out and are particularly noticeable are considered focal points. Focal points often contrast with their surroundings in terms of form, line, color, and texture, and therefore, tend to draw a viewer's attention.
- **Order**: Natural and cultural landscapes have an underlying order determined by natural processes and logical patterns of development, respectively. Elements that are inconsistent with the natural order and existing built environment may detract from scenic quality.
- **Project scale**: The apparent size of a project in relation to its surroundings can define the compatibility of its scale within the existing landscape. Perception of scale varies with distance and context.
- **Visual clutter:** Unrelated built elements within a view can create visual clutter, which may adversely affect scenic quality.

3.12.4.1.1 Viewshed Analysis

As part of the visual resources assessment, a topographic-only viewshed analysis was completed that identified areas where the Project facilities could potentially be visible without considering the screening effect of existing vegetation or structures (SWCA 2023). The viewshed analysis illustrated a varied amount of visibility throughout the visual resources analysis area, with changes broadly corresponding to the differing landform and topographic characteristics of the three Level III Ecoregions within the visual resources analysis area. Based on the topography , the westernmost portion of the visual resources analysis area has high visibility, given the relatively flat, uninterrupted terrain. Based on topography only, the visual resources analysis area from north of Fort Larned NHL to the Monroe County converter station has moderate visibility, consistent with broad and flat expanses that create increased visibility near the

Missouri River crossing. Based on topography only, the visual resources analysis area along the Tiger Connector increases to moderate or high, given the large expanses of relatively flat terrain.

3.12.4.1.2 Key Observation Point Selection and Visual Simulations

A total of 28 KOPs were identified for analysis, including 15 KOPs identified through the viewshed analysis. The following KOPs were selected based on coordination with the NPS regarding important resources in the visual area of analysis, including the Fort Larned NHL: eight KOPs from Fort Larned, one from Santa Fe Ruts, and four representing the Lewis and Clark NHT Auto Tour Route. Photorealistic visual simulations representing the Project design and visual components from each of the 28 identified KOPs were prepared to support the analysis and conclusions (**Appendix 3.12**).

3.12.4.1.3 Sensitive Viewers

The analysis of impacts to visual resources also considers sensitive viewers. Sensitive viewers are members of the public who have potential views of the Project and may be sensitive to changes in the visual environment. Viewer sensitivity can depend on several factors, including viewing distance, duration of view, viewing condition, degree of visibility, and scenic expectation. Sensitive viewing locations throughout the visual resources analysis area are limited and primarily of short duration (certain recreational viewers or vehicular travelers). Sensitive viewers who would be potentially affected at the visually sensitive resource areas described in **Sections 3.11.3.1** through **3.11.3.5** include:

- **Tourists/Recreational viewers**. Includes viewers visiting static viewing locations for activities such as historic-site visitation, passive recreation, and active recreation. These viewers may also experience scenic resources from moving vehicles, such as along scenic routes or when driving for pleasure, with short-duration views. Sensitivity to the visual setting can be moderate for tourists or recreationalists expecting a specific aesthetic.
- **Motorists**. Includes viewers in moving motor vehicles. With the exception of viewers traveling on scenic routes or driving for pleasure, motorists are generally considered to have a low expectation of scenic quality and character because their views are temporary as they pass the Project, and the view is dynamic as the vehicle is moving.
- **Residential viewers**. Includes viewers from dwelling units where duration of view would be extended. Within towns, views may include more screening from vegetation and buildings, resulting in low sensitivity, compared to dispersed rural residential viewers where sensitivity would be moderate to high depending on screening. Additional potential impacts to municipalities, towns, and dispersed residences are described further in **Section 3.9**.

3.12.4.2 Construction

Construction activities would occur at different stages within the Project area; therefore, construction impacts would not affect the resources in an area for the entire construction duration, except at the converter station sites, since construction of the converter stations would take place over a 34-month period. Once construction is complete, vehicles and equipment would depart, and disturbed portions of the site would be restored to preconstruction conditions. Impacts to visual resources would primarily be the result of the following:

- Construction equipment (concrete trucks, excavators, cranes, helicopters, and similar) and personnel would be visible when construction activities are occurring.

- Truck traffic would temporarily increase on area roadways. Construction vehicles for implementation of the Project would include a mix of pickup trucks, dump trucks, and 18-wheeled delivery trucks.
- Temporary multi-use yards, with nighttime security lighting, would be occupied by equipment/materials for the duration of a construction phase.

3.12.4.2.1 Landscape Character

Temporary impacts to landscape character would occur primarily as a result of the construction equipment, materials, and activities that would be introduced to the existing visual environment during construction of the Project. Ongoing construction activities, including increased traffic, could temporarily modify the visual landscape by introducing inconsistent and contrasting elements into the landscape. Construction of the Project would temporarily introduce new lines, form elements, and clutter that may cause visible contrast within the visual resources analysis area. While temporarily creating a new visual element within the landscape, the presence of large construction equipment within the viewshed would not differ greatly from the presence of large machinery associated with agricultural operations common within much of the visual resources analysis area. Construction-related activities would be short term and last only the duration of active construction in one location (days to weeks; **Section 2.6.4.11**), as construction would move linearly along the planned Project ROW. The exception to this statement is at the converter station sites, since construction of the converter stations would take place over a 34-month period. Additionally, much of the Project would be in areas that are sparsely populated, and the changes in landscape character during construction would be observed to a lesser degree in those areas. Thus, the temporary introduction of construction activities would not cause a long-term modification or alteration to the landscape character.

During construction, with the use of minimal temporary lighting and implementation of shielding methods and downward direction of construction-related lighting, as detailed in the EPMs in **Appendix 2-4**, the potential for impacts outside of the work area or glare into the night sky would be minimized. In addition, night lighting impacts would be temporary and limited to a short duration in locations of active construction. Night lighting impacts would last the duration of the construction period (34 months) at the converter station sites.

3.12.4.2.2 Properties of Historic Significance

The temporary presence of construction equipment, multi-use yards, and other construction-related activities would modify the visual environment within the viewshed of historic properties and could temporarily introduce an inconsistent and contrasting element into the landscape. The temporary introduction of new line and form elements related to construction activities, as well as visual clutter into the existing aesthetic, may cause visible contrast with historic settings and structures. As discussed in **Section 3.11.3.2.1**, there are no intact historic land trails or associated amenities within the visual resources analysis area. Construction activities would not be discernable from the Santa Fe Ruts section of the Santa Fe NHT, which is approximately 4 miles from the planned Project ROW at its closest point.

The fort at Fort Larned NHL is approximately 1.7 miles from the planned Project ROW and areas where construction activities would occur. Due to the distance (1.7 miles) and intervening vegetation between the Project ROW and the Fort Larned NHL that screens outward views, Fort Larned NHL would experience temporary and minimal visual impacts from construction activities, lasting only the duration of construction activities in the localized area (a few days to a few weeks) along the planned Project ROW.

3.12.4.2.3 Designated Scenic Resources

Construction activities, including increased traffic, along the planned Project ROW are not expected to affect viewers traveling the Wetlands and Wildlife National Scenic Byway due to the viewing distance and the short duration of construction activities in the localized area. The presence of construction equipment and activity where the planned Project ROW crosses the Glacial Hills State Scenic Byway would have short-term, temporary visual impacts for viewers traveling this part of the Byway. Construction activities, including increased traffic, would add clutter and contrast into the natural order of the landscape that would be inconsistent with the expectation of uninterrupted scenic views in this location. These impacts would only last for the duration of construction activities at this location, which would be limited to a few days to a few weeks.

3.12.4.2.4 Public Lands and Recreational Resources

Visitors to public lands and recreational resource areas in the visual resources analysis area participate in various outdoor recreation activities, including wildlife viewing, trail use, hunting, fishing, boating, and camping. Scenic and natural settings are important to the experience sought at most locations. Visual impacts from construction could result from adding contrast through visual clutter and alterations to the landscape composition, such that the viewer’s experience may be impacted. Impacts would be most apparent in locations where scenic resources contribute to the recreation experience. Potential impacts during construction would range from slightly noticeable to apparent depending on the specific resource and viewing distance, lasting only the duration of construction activities in the localized area (a few days to a few weeks).

Construction-related night lighting could impact visitors engaging in activities at night on public lands and at recreational sites, including camping and hunting. EPMs would be implemented as described in **Section 2.5.3.**, and night lighting impacts would be temporary and limited to a short duration in locations of active construction. Night lighting impacts would last the duration of the construction period (34 months) at the converter station sites.

Potential impacts would be most apparent at the Missouri River (including the Missouri River Water Trail), Jentell Brees Access, Ronald and Maude Hartell Conservation Area, Salisbury Municipal Golf Course, and Sterling Price Community Lake, and from portions of the Lewis and Clark NHT Auto Tour Route due to the open viewsheds provided by the Missouri River channel.

3.12.4.2.5 Transportation Corridors, Towns, and Rural Residences

Static locations offer the longest duration of views and the greatest potential for visual impacts from the introduction of construction activities into a view. Static high-use public areas, such as locations within towns, may typically have a different landscape composition, consisting of a more built environment with structures and associated foreground visual screening. While the built environment has different form, line, and texture than more natural areas, and the presence of equipment and development activity is more common within the setting, these views can still be impacted and contrasted with Project construction activities. Views from rural residences could be impacted depending on the direction of view and intervening structures or vegetation, which would vary from residence to residence. Views from transportation corridors are usually from moving vehicles and for short durations, which leads to less sensitivity to change in the landscape. Overall, Project construction activities, including increased traffic and night lighting, would have a temporary visual impact to views from transportation corridors, towns, and rural residences, lasting only the duration of construction activities in the localized area (a few days to a few weeks).

3.12.4.3 Operations and Maintenance

Operations and maintenance activities would include inspections, vegetation management, routine maintenance, and damage repair, but would not include any significant upgrades or rebuilds. The presence of overhead transmission lines, supporting structures, ancillary facilities, and vegetation clearing would introduce a new source of potential increased visual contrast over the life of the Project.

Visual simulations of the Project at 28 KOPs are included as **Appendix 3.12**. The appendix shows existing conditions and simulated conditions following construction for each KOP. Potential visual impacts from each KOP were evaluated based on these simulations, and the results are presented in **Table 3.12-2**.

Table 3.12-2. Evaluation of Operations and Maintenance Impacts based on Visual Simulations from KOPs[a]

KOP Number and Name Distance to nearest visible Project facility	Potential Visual Impact
1. Fort Larned NHL – Visitor Parking Lot approximately 2.1 miles	Multiple proposed structures are discernible in the middle ground of the view, following a line and pattern similar to the existing visible transmission structures. The tall, thin structures fade with distance and are almost unnoticeable and do not impede into the skyline or horizon view, and the openness across the viewshed is maintained. The Project facilities would not visually dominate the view.
2. Fort Larned NHL – Officers Row North End approximately 4.0 miles	Views of the proposed structures are screened from this location by the foreground vegetation (even when barren) associated with the banks of the Pawnee River. Any potential views of the structures are unnoticeable due to distance.
3. Fort Larned NHL – Recreational Nature Trail approximately 3.8 miles	Views of the proposed structures are mostly screened by the foreground vegetation (even when barren). A break in foreground vegetation allows viewers on the nature trail a view out of Fort Larned NHL to three proposed structures in the background. The tall, thin structures fade with distance, are almost unnoticeable, and do not impede the skyline or horizon view, and the openness across the viewshed is maintained. The Project facilities would not visually dominate the view.
4. Fort Larned NHL – Interior Walkway approximately 3.1 miles	Views of the proposed facilities are mostly screened by the foreground vegetation (even when barren). A break in vegetation allows viewers on the interior walkway a view out of Fort Larned NHL to one proposed structure in the background. The tall, thin structure fades with distance, is almost unnoticeable, does not impede the skyline or horizon view, and does not dominate the view; the openness across the viewshed is maintained.
5. Fort Larned NHL – Central Parade Ground approximately 1.7 miles	Views of the proposed structures are entirely screened by the Officers' Barracks and vegetation associated with the Pawnee River.
6. Fort Larned NHL – East Parade Ground approximately 2.9 miles	Views of the proposed structures are entirely screened by the Officers' Barracks and vegetation associated with the Pawnee River.
7. Fort Larned NHL – Cemetery approximately 3.9 miles	Views of the proposed structures are mostly screened by the foreground vegetation (even when barren); however, a break allows viewers to see out of Fort Larned NHL Cemetery to the Project. A portion of one proposed structure may be visible in the background of the view, though it may be largely indiscernible from existing structures and vegetation based on distance.
8. Fort Larned NHL – Recreational Picnic Area approximately 2 miles	Five or more proposed structures are visible across the expansive and open/unscreened views from this location. While the 2-mile distance fades and scales down the apparent size of the structures, they are clearly visible and protrude upward along the horizon with a prominent position on hillcrests against the horizon line. While adding to the visual clutter of the view, the new structures do not appear out of scale or context in the setting with existing visible transmission structures, including similar distant transmission structures, as well as single wooden poles in the foreground. They are similar in line, form, color, and texture to the existing infrastructure and do not create a new or distracting focal point within the view. The

KOP Number and Name Distance to nearest visible Project facility	Potential Visual Impact
	potential visual change from this location would be apparent to viewers, but not dominant or intrusive due to the presence of existing infrastructure.
9. Santa Fe NHT – Santa Fe Ruts approximately 4.2 miles	At this distance, it is difficult to discern the Project in contrast to the background, and where interspersed with screening vegetation, agricultural facilities, and wind turbines. The tall, thin structures fade with distance and are almost unnoticeable and do not impede the skyline or horizon view, and the openness across the viewshed is maintained.
10. Lewis and Clark NHT Auto Tour Route – Chariton River Access Area approximately 0.8 mile	Two proposed structures are visible above the middleground vegetation and are the only vertical elements above the tree line in the middleground views. The distant sky view is interrupted only by transmission structures; however, with distance the narrow structures fade into the sky and are not dominant, even though their height is the main vertical element in the vicinity. The transmission structures add an infrastructure element into the rural aesthetic. The potential visual change would range from slightly noticeable to apparent to viewers.
11. Lewis and Clark NHT Auto Tour Route – U.S. Highway 24 approximately 0.5 mile	Ten proposed structures are visible heading in a diagonal path across agricultural land in the middleground. The structures contrast against the overcast sky and add a very distinct linear pattern across the landscape. The horizon view is interrupted by the structures rising in the foreground near the highway and fading with distance. Existing roadside utility poles are adjacent to the viewer; however, the scale of the proposed structures is substantial relative to the existing infrastructure. The potential visual change would be highly noticeable given the introduction of a dominant element in the visual setting.
12. Jentell Brees Missouri River Access approximately 0.5 mile	Two proposed structures are visible on the Kansas side of the river, rising above the shoreline vegetation into the open skyline, while the conductors are visible between the structures and stretching across the river. The round marker balls spaced along the conductors over the river serve to make the facility more visible for aircraft safety as required by the FAA; however, they do not substantially increase the overall contrast and encroachment of the new features into the visual environment. The contrast of the structures and Project scale over existing viewshed components compete for visual dominance with the moving water. The existing view does not contain any built facilities, and the structures would introduce the only human-made features into the natural setting and create a contrast with the visual environment. While the view from the nearby shorelines would be constant, views of the structures while boating or boat fishing would be fleeting due to the meander of the river, water speed, and viewing angle. The potential visual change from this location would be highly noticeable given the introduction of a dominant element in the visual setting.
13. Lewis and Clark NHT Auto Tour Route – U.S. Highway 59 (Southwest Bluff Woods Road) approximately 0.2 mile	Due to the proximity to the viewer, the proposed structure size dominates the adjacent flat and open agricultural field as it rises above the background into the expansive sky view. Existing roadside utility poles are present; however, their scale replicates the existing landscape character, whereas the proposed structure visually contrasts in scale, form, color, and texture with the surrounding agricultural setting. The addition of conductors perpendicular to the existing lines creates a crisscross pattern that clutters the sky views. The potential visual change would be highly noticeable given the introduction of a dominant element in the visual setting.
14. U.S. Highway 77 approximately 0.5 mile	Proposed structures are prominently visible at the height of land. The structures alter the natural rolling landscape and expansive sky views, and the contrasting form, color, and texture are distinct in the viewshed. Existing built infrastructure associated with the road corridor is present but appears small in scale relative to the proposed structures. While existing infrastructure lowers the scenic quality of the landscape and protrudes into the horizon view, the magnitude of the new transmission structures is dominant.
15. Union Road approximately 0.3 mile	A proposed structure is visible in the corn field on the opposite side of the road. An existing wooden H-frame transmission structure is present in the same field; however, this structure barely rises above the background vegetation, and the magnitude of the proposed transmission structure dominates the view and alters the landscape composition. The contrasting form, color, and texture of the structure is

KOP Number and Name Distance to nearest visible Project facility	Potential Visual Impact
	distinct and dominant. There are no other unique features or focal points present in the area of this KOP.
16. County 671 Avenue approximately 0.3 mile	Proposed structures parallel an existing wooden H-frame transmission corridor. Although the structures are greater in scale, the pattern of infrastructure crossing the viewshed is present within the agricultural landscape, and foreground vegetation and busy patterns of the crops partially screen and lower portions. The proposed structures intrude on the horizon view; however, their dominance is reduced by the presence of dark colored trees in the foreground that also rise into the skyline.
17. Corner of 2nd Street and Ola Avenue approximately 0.5 mile	Two proposed structures are visible in the expanse of agricultural fields stretching into the background and create a distinct and strong horizon line. Two existing communication towers are present within the same view, as well as an existing transmission corridor and infrastructure. The communication towers are taller than the proposed structures and made of similar material, thus reducing new contrast in form, line, and color of the view from the proposed structures. The proposed structures add some visual clutter to the view, but it is not out of context with the existing development.
18. Walters Lane approximately 0.6 mile	Proposed structures are visible traversing the middleground hay field. Existing H-frame structures and a communication tower extend above the brightly colored vegetation and distant rolling hills; however, the proposed structures are more distinct in detail and color against the skyline. The proposed structures are located closer to the viewer than most visual features and create a contrast with the color and form of the flat fields and vegetation.
19. County Route 379 (Northeast Estep Road) approximately 0.2 mile	One proposed structure is partially visible, screened by the roadside vegetation from this KOP. The viewshed includes the adjacent interstate corridor and associated roadway infrastructure, a billboard, fence lines, and communication tower. The proposed structure and conductors add electrical infrastructure into the view and create a new horizontal line that cuts through the sky view but does not substantially change the existing landscape composition, which is unorganized and not uniform or orderly.
20. Main Street approximately 0.3 mile	Roadside vegetation and residential buildings are immediately adjacent to the road; thus, no proposed structures are visible from this location. The conductors allude to the visibility of structures though breaks in the intervening screening. The visibility of conductors increases the electrical infrastructure in the view and creates a new horizontal line that cuts through the sky perpendicular to the existing distribution lines, but does not substantially change the landscape composition, which is cluttered and unorganized with existing features.
21. County Routes 107 and M approximately 0.3 mile	One proposed structure is visible and adds a distinct focal point to the view, drawing the eye from the straight road corridor and parallel transmission corridor to the tall vertical structure. The existing utility poles along the road provide scale to the proposed structure, which at this distance changes the composition of the landscape with clear and contrasting lines, form, mass, and color. The size of the structure rising into the expansive sky view is intrusive in the low, flat viewshed that stretches to the horizon.
22. County Routes 1061 and Y approximately 0.4 mile	One proposed structure is visible within the view, adjacent to a stand of trees and open fields. The field edge is an intact deciduous hedgerow, creating a unique color and texture within the landscape. The removal of vegetation to accommodate the proposed ROW is noticeable to the left of the access route. The structure adds a focal point consisting of infrastructure in a view currently composed of mature forest stand and active agricultural fields. The proposed structure intrudes into the skyline; however, the dominance is reduced by the presence of mature trees that also rise into the skyline and blend with the bottom half of the transmission structure.
23. Ronald and Maude Hartell Conservation Area – Hartell Lake approximately 0.6 mile	The proposed structures are screened by foreground vegetation associated with the conservation area. The very top portion of one structure is visible within the tree canopy. Conductors are visible where vegetation screening is not present, but they fade into the background and are almost unnoticeable at this distance and do not intrude on the view.

KOP Number and Name Distance to nearest visible Project facility	Potential Visual Impact
24. U.S. Highway 169 approximately 0.5 mile	The very top portion of one structure is visible within the tree canopy, with conductors visible crossing the road corridor. Roadside vegetation alternates between mature forest stands, maintained lawn, and various stages of fields. Due to the seasonal variation in vegetation, potential visibility changes as users travel the linear roadway with the greatest impact nearest the Project crossing. The selected KOP is representative of the most typical view of the Project from motorists traveling this highway.
25. Belcher Branch Lake Conservation Area – State Route MM Southeast approximately 0.7 mile	Proposed structures are partially visible, screened by intervening vegetation. The structures and conductors add a new pattern to the landscape, changing the natural order. However, at this distance the structures are slightly faded into the background and do not clearly dominate within the viewshed due to the cluttered appearance of vegetation and structures interspersed across the landscape.
26. County Route 313 (45th Road Southeast) approximately 0.3 mile	One proposed structure is visible rising from the hillside into the skyline with conductors crossing perpendicular to the Interstate 29 corridor. The proposed structure stands above other built elements within the view and is stark against the sky at this distance. The scale of the structure is substantial relative to other built elements in the view.
27. Intersection of Highway C and County Road 248 approximately 0.4 mile	A dense row of trees obscures views beyond the agricultural fields in the foreground and the topography dips down on the other side of the trees, obscuring the bottom half of the two proposed structures that are visible. The new monopole structures rise above the vegetation and into the expansive skyline. Existing distribution poles are vertical elements in the landscape but are not at the same scale as the proposed structures. The presence of existing infrastructure in the foreground aids in reducing the starkness of the new structures and creates a visual environment that already includes infrastructure.
28. Intersection of North Rangeline Road and State Route 22 approximately 0.5 mile	Two types of proposed structures are visible within this view, and both use a monopole design; however, the dead end includes an additional structure. The existing road, railroad corridor, and distribution poles create a developed viewshed with strong linear lines. While the horizon and skyline are already cluttered and rough, with various vertical elements of vegetation and existing infrastructure, the new structures rise into the light sky, creating a distinct vertical element that is larger in scale and contrast than the existing structures. Although the proposed structures are significantly larger in scale than the existing poles, in this view, they would mix together and minimize the overall contrast.

Source: SWCA 2023.

FAA = Federal Aviation Administration, KOP = key observation point, NHL = National Historic Landmark, NHT = National Historic Trail, ROW = right-of-way

[a] Visual simulations and KOP details are presented in **Appendix 3.12.**

3.12.4.3.1 Landscape Character

Impacts to landscape character would occur primarily as a result of the physical features that would be introduced to the visual environment, including cleared ROWs, new transmission structures and lighting, new conductors, and additional associated equipment and facilities. The series of visual simulations developed for the Project show that the severity of change and contrast in the landscape is typically in proportion to the distance of the viewer from Project facilities, as well as the surrounding visual context. Project facilities would generally have slightly noticeable to clearly detectable visual impacts to the landscape character.

Lighting would generally not be required on transmission structures that are less than 200 feet tall. Transmission structures that are 200 feet or taller would be subject to review by the FAA, and the Applicant would comply with any lighting requirements as part of those reviews. Lighting would be expected on the transmission structures at the Missouri River crossing, where the structures would be over 200 feet tall. At the Missouri River crossing, FAA-required marking and lighting systems (14 CFR Part 77) would be designed to minimize visual impacts through the use of red lights and non-lighted marker balls crossing the river. Information about the nine types of transmission structures to be used across the HVDC Line is provided in **Table 2-3**.

At permanent Project facilities requiring security lighting (e.g., converter stations, optical regeneration stations), full cut-off lighting fixtures that project light in a downward direction and emit no upward component of light would be installed. This would minimize impacts outside of areas requiring illumination and reduce glare into the night sky. In many cases, this security lighting may be a new source of light in an otherwise unlit rural setting; however, viewers of these facilities and the associated lighting would generally be limited, and the light would be highly localized and non-intrusive beyond the facility.

3.12.4.3.2 Properties of Historic Significance

The Project could impact historical landscape settings by introducing a contrasting permanent feature into the existing landscape, potentially altering the landscape composition and drawing attention away from existing focal points. The introduction of the Project within the viewshed of these historic trail alignments would create new visual contrast. Visual impacts from the Santa Fe Ruts section of the Santa Fe NHT, approximately 4 miles from the planned Project ROW at its closest point, would be unnoticeable (KOP 9). Additional impacts to NHTs are discussed in **Section 3.8**.

The visual simulations from KOPs 1 through 8 shown in **Appendix 3.12** represent potential views from various locations throughout Fort Larned NHL. Transmission structures within the viewshed of Fort Larned are approximately 147–166 feet tall. The visual simulations show that foreground vegetation (even when barren) and built structures would visually screen most, if not all, of the Project from view. Overall, the Project would have slightly noticeable impacts to views from Fort Larned NHL, except at the picnic area (KOP 8), where visual impacts would be apparent to viewers.

3.12.4.3.3 Designated Scenic Resources

Of the two identified scenic byways, only the Glacial Hills State Scenic Byway intersects the planned Project ROW; the planned Project ROW crosses this byway (SR 7) approximately 6.5 miles south of Bendena, Kansas (**Appendix 1.1**). A specific KOP was not included along the byway, but the visual simulations for KOPs 13 and 14 represent similar views of the Project crossing a roadway (see **Appendix 3.12**). Views of the Project in the foreground would be the most impactful based on the ability to discern the Project facilities in detail, adding to the noticeable contrast. As the viewer travels away from Project facilities, the starkness of the structure fades and color and texture begin to merge, creating less contrast and disruption to the landscape view. The Wetlands and Wildlife National Scenic Byway does not cross the planned Project ROW, but its western terminus is within the visual resources analysis area (refer to SR 4 in relation to the Project on **Appendix 1.1**). Westbound travelers near the northern terminus of the route would have fleeting distant views (1.5 miles or more) of Project structures.

3.12.4.3.4 Public Lands and Recreational Resources

The Project would introduce additional visible transmission structures of a different size, material, style, and color to the viewshed of some public lands and recreational resources. Impacts would be most noticeable in the foreground and include a disruption to the order of the natural landscape or a change in the landscape composition. Not all recreational resources within the visual resources analysis area have associated KOPs, but the types of potential visual impact would be similar to those described for other recreational resources and highly dependent on distance, obstructions of views, and view/activity direction relative to the Project facilities.

Lighting of transmission structures and permanent Project facilities (e.g., converter stations, optical regeneration stations) could impact visitors engaging in activities at night on public lands and at recreational sites, including camping and hunting. Lighting would be installed as described in **Section 3.11.4.3.1**. This lighting may be a new source of light in an otherwise unlit rural setting and may diminish visitors' enjoyment. Impacts from lighting would decrease with distance from the Project facilities.

Visual simulations such as those from KOP 12 from the Jentell Brees Access recreational area; KOP 23 from the Ronald and Maude Hartell Conservation Area; and KOP 3 from the Fort Larned NHL Recreational Nature Trail are representative of the potential impacts to public/recreational resources and the range of severity of the visual change. Visual changes on the Lewis and Clark NHT Auto Tour Route (KOPs 10, 11, and 13) would range from detectable to substantial given the foreground viewing distance and introduction of new contrasting elements. Overall, operations and maintenance activities would result in slightly noticeable to clearly apparent changes in views from public lands and recreational resources, with a potentially substantial change to views at the Jentell Brees River Missouri River Access (which is also representative of the Missouri River Water Trail) given the introduction of new contrasting and dominant features.

3.12.4.3.5 Transportation Corridors, Towns, and Rural Residences

High-use public areas present within the visual resources analysis area include U.S. highways, interstates, state routes, and residential areas. Static locations offer the longest duration of view and the greatest potential for visual impacts. Views from high-use roadways are typically fleeting as motorists move through the area; Project facilities are typically seen for a short duration, which leads to less sensitivity to change in the landscape. Examples of Project visibility from high-use roadways are shown in KOPs 11, 14, 19, 24, 27, and 28. Potential views of the Project from cities and towns would be intermittent and limited, as landscape, buildings, and infrastructure in general would aid in screening views toward the Project. From rural residences, impacts would be highly dependent on viewing direction and distance from the residence and could range from indiscernible to substantial changes to the landscape and views. Potential changes to views would, however, be more likely at the western end of the planned Project ROW, where limited topography and vegetative screening generally allow for more open, expansive views.

3.12.4.4 Decommissioning

Site decommissioning would be performed at the end of the service life of the Project in accordance with a Decommissioning Plan. Impacts to visual resources from activities to remove Project facilities would likely be similar to impacts during construction.

Following decommissioning, no Project facilities would be visible from KOPs in the visual resources analysis area. The areas of disturbance within the planned Project ROWs would take time to revegetate, becoming less noticeable over time as they gradually blend into the surrounding environment.

3.13 Noise

3.13.1 Issues for Analysis

Based on NEPA statutory and CEQ/DOE regulatory requirements; input from federal, state, and local agencies and tribal governments; and comments received during scoping, the noise analysis addresses the following:

- Noise impacts from construction:
  - Ground-based construction activities; and
  - Fly yard and helipad construction activities.
- Noise impacts from operation and maintenance:
  - Maintenance of the transmission lines and HVDC converter stations;
  - Operation of transmission lines; and
  - Operation of HVDC converter stations.

Discussion of the No Action Alternative is presented in **Section 3.1**.

3.13.2 Analysis Area

The noise analysis area includes land within a 4,695-foot buffer of the Project area. The distance of 4,695 feet (approximately 0.9 mile) was determined to be the extent of the noise analysis area, as this is the distance from construction activities at which the greatest noise impacts associated with the Project would attenuate to background noise levels (SWCA 2023). Residential dwellings are commonly the primary concern for noise analyses, since occupants could be exposed to excessive noise for increased periods of time. Noise impacts to wildlife species are discussed in **Section 3.8**. The total acreage for the noise analysis area is 410,800 acres.

3.13.3 Affected Environment

Noise is generally defined as sound that is loud, disagreeable, unexpected, or unwanted. Whether something is perceived as noise is influenced by the type of sound, the perceived importance of the sound and its appropriateness in the setting, the time of day, the type of activity during which the noise occurs, and the sensitivity of the listener. Sound levels are measured in decibels (dB) using a logarithmic scale. To quantify noise impacts to people, a weighting system is applied to the sound, reflecting the typical frequency-dependent sensitivity of average healthy human hearing. This adjustment is called “A-weighting,” and the measured decibel level is referred to as A-weighted decibels, or dBA. Throughout this analysis, noise impacts are quantified using the dBA scale.

Table 3.13-1 provides a summary of the closest noise-sensitive receptor to each Project facility. Noise-sensitive receptors generally are defined as locations where people reside or where the presence of unwanted sound may adversely affect the existing land use. Examples of noise-sensitive receptors include residences, performance spaces, offices, schools and day-care facilities, hospitals, long-term care facilities, places of worship, and libraries, as well as nature and wildlife preserves, recreational areas, and parks. The closest noise-sensitive receptor to the Ford County HVDC converter station is 3,700 feet away. The closest noise-sensitive receptor to the Monroe County HVDC Is 2,500 feet away. The closest noise-sensitive receptor to the HVDC Line, Tiger Connector, and Ford County Interconnect ROWs is located 165 feet away. The next nearest noise-sensitive receptor to the Ford County HVDC converter station is a single-family home approximately 4,695 feet away. The next nearest noise-sensitive receptor to the Monroe County HVDC converter station is a single-family home approximately 3,338 feet away. Multiple noise-sensitive receptors along the planned Project ROW would share similar nearest distances of approximately 165 feet. In general, sound would attenuate at a rate of approximately 6 dB for every doubling of distance from the HVDC converter station sites, and by 3 dB for every doubling of distance from the HVDC Line, Tiger Connector, and Ford County Interconnect.[1]

The maximum, instantaneous noise level registered during a measurement period, L_{max}, is often used to describe the maximum sound level generated by a piece of construction equipment. Human noise exposure is typically assessed over a period of time (e.g., 1-hour or 24-hour exposure). Variations in noise exposure over time are expressed in terms of an equivalent continuous sound level (L_{eq}), which represents the steady-state acoustical energy across a given measurement period, often considered an average sound level for that period. Because people in residential areas are more sensitive to noise intrusion during the night, 24-hour community noise descriptors such as the day/night noise level (L_{dn}) apply a "penalty" to noise generated during these sensitive periods.

Table 3.13-1. Project Component Distance to Nearest Noise-Sensitive Receptors

Project Component	Approximate Distance to Nearest Noise-Sensitive Land Use	Land Use Type
Ford County Converter Station facilities (Kansas)	3,700 feet / 0.70 mile	Single-Family Home
Monroe County Converter Station facilities (Missouri)	2,500 feet / 0.47 mile	Single-Family Home
HVDC Line, Tiger Connector, and Ford County Interconnect Rights-of-Way (Kansas and Missouri)	165 feet / 0.03 mile	Single-Family Home

The American National Standards Institute (ANSI) has developed estimates of general ambient noise levels (e.g., assumed existing noise exposure) based on detailed descriptions of land use categories. The noise analysis area in both Kansas and Missouri encompasses or is adjacent to quiet and sparsely populated rural areas of primarily agricultural land use; therefore, Land Use Category 6, which corresponds to Very Quiet, Sparse Suburban, or Rural Areas as defined by ANSI (2013), was selected to represent the ambient noise environment for the noise analysis area. This corresponds to a daytime average equivalent continuous sound level (L_{eq}) of 43 dBA, a nighttime average L_{eq} of 37 dBA, and a 24-hour day-night average sound level (L_{dn}) of 45 dBA[2] (SWCA 2023).

3.13.4 Environmental Consequences of Proposed Federal Action

According to the World Health Organization (WHO), potential health effects of noise include sleep disturbance; annoyance; decreased performance on complex cognitive tasks, such as reading, attention, problem-solving, and memorization; physiological effects, such as hypertension and heart disease (after many years of constant exposure, often by workers, to high noise levels); and hearing impairment (generally after long-term occupational exposure, or short-term exposure to noise levels greater than 100 dBA) (WHO 2018). Continuous sources of mechanical noise can contribute to unhealthy ambient noise levels. The effect of noise on receptors depends on both time and context. For example, continuous noise

[1] Due to the way sound spreads from different sources, attenuation for point sources, such as the converter stations, is different than line sources, such as transmission lines.

[2] A 10-dBA penalty was applied to the nighttime average to calculate the 24-hour day-night average sound level.

from highway traffic can make conversation at a normal vocal effort difficult or impossible, while a short-term pass-by of a motorcycle with a modified exhaust during nighttime periods can disturb sleep.

3.13.4.1 Methods and Assumptions

Project-related impacts are characterized as changes in ambient noise levels (measured in decibels) at noise-sensitive receptors. Noise-sensitive receptors were analyzed for potential impacts from Project-generated noise due to construction (e.g., operation of construction-related equipment), operations and maintenance (e.g., maintenance activities, corona noise from the transmission line, and converter station operational noise sources), and decommissioning.

The Federal Transit Administration (FTA) *Transit Noise and Vibration Impact Assessment* manual (FTA 2018) provides recommendations on construction noise impact thresholds for construction activities based on the available construction details, duration, local limits, and community sensitivity. For this Project, the FTA's "General Assessment" construction noise level limit of 90 dBA, $L_{eq(1hr)}$, is considered appropriate due to the large distances to noise-sensitive receptors and the temporary nature of construction activities. This value is representative of the energy-equivalent average of fluctuating construction noise levels over a 1-hour period during the daytime.

EPA guidance specifically addresses issues of community noise (EPA 1974). This guidance contains recommended goals for sound exposure levels affecting residential land uses. The recommended day-night sound level (L_{dn}) is less than or equal to 55 dBA at exterior locations (equivalent to a continuous noise level of 48.6 dBA L_{eq}). The states of Kansas and Missouri do not have environmental noise regulations with numerical decibel limits. In the absence of a quantified sound level threshold from federal or state regulations, 55 dBA L_{dn} is the preferred guidance-based threshold for determining potential sound-level Project impacts to noise-sensitive receptors (EPA 1974). Therefore, impacts for permanent operational noise were assessed using the EPA guidance residential noise exposure limit of 55 dBA L_{dn}.

The analysis of noise impacts assumes that the EPMs listed in **Appendix 2.4** would be implemented to minimize impacts to potential noise-sensitive receptors.

3.13.4.2 Construction

3.13.4.2.1 Ground-Based Construction Activities

Short-term, intermittent noise impacts associated with construction activities would primarily result from the use of ground-based heavy construction equipment and machinery, such as graders, dozers, drill rigs, and cranes. Noise levels would vary throughout construction depending on the number and locations of operating equipment, distance to the noise-sensitive receptor from the equipment, time of day, atmospheric conditions, and intervening topography or barriers (e.g., structures, hills, or vegetation). Construction activities associated with vegetation clearing and grading are expected to generate the highest noise levels due to the planned noise-generating equipment (e.g., graders); these activities would occur along the planned Project ROW and at HVDC converter station parcels. Construction activities for the HVDC Line, Tiger Connector, and Ford County Interconnect would occur at specific locations along the planned Project ROW (as opposed to throughout the planned Project ROW at the same time); therefore, noise impacts would be limited to a relatively short period of time (several days to a few weeks per transmission structure, depending on the specific construction activities required at specific locations). Noise impacts from constructing the HVDC converter stations would extend for approximately 34 months. The HVDC converter station is located further away from sensitive receptors, therefore, the construction noise impacts would be attenuated to lower than predicted levels. Noise from Project construction was calculated using the typical representative construction equipment in **Table 3.13-2** for each construction activity and predicting noise from the loudest noise-generating piece of equipment. A summary of the predicted maximum noise impact for each construction activity is provided in **Table 3.12-3**.

Table 3.13-2. Construction Equipment Noise Analysis Inputs

Construction Equipment Type	Maximum Sound Level at 50-foot Distance (L_{max}, dBA)	Acoustical Usage Factor (percent per hour)	Average Hourly Sound Pressure Level at 50-foot Distance (L_{eq}, dBA)
Concrete-mixer truck	79	40%	75
Crane	81	16%	73
Dozer	82	40%	78
Drill rig	84	20%	77
Dump truck	76	40%	73
Excavator	81	40%	77
Flat-bed truck	74	40%	70
Grader	85	40%	81
Pickup truck	75	40%	71

Source: FHWA 2006b

dBA: A-weighted decibel; L_{eq}: energy average continuous equivalent sound level; L_{max}: maximum sound pressure level

Table 3.12-3. Predicted Maximum Noise Impacts by Construction Activity

Construction Activity	Loudest Equipment Associated with Activity	Reference Noise Level at 50 feet (L_{eq}, dBA)	Construction Noise Level at Closest Noise-sensitive receptor (165 feet) (L_{eq}, dBA)
Conductor stringing	Dozer	78	68
Disturbance area restoration	Dozer	78	68
Excavation for foundations	Drill rig	77	67
Foundation installation	Concrete-mixer truck	75	65
ROW preparation	Grader	81	71
Structure assembly and erection	Crane	73	62

Source: FHWA 2006b

dBA: A-weighted decibels, L_{eq}: energy average continuous equivalent sound level, ROW: right-of-way

Ground-based construction noise levels associated with the Project were estimated using the Federal Highway Administration (FHWA) Roadway Construction Noise Model (RCNM) version 1.1 (FHWA 2006b). Reference sound levels for construction equipment built into the model are based on the measured maximum sound level (L_{max}) (i.e., the maximum sound level the equipment would produce at any given time) for each type of equipment. The software also provides a “usage factor” for each piece of construction equipment, which adjusts the reference maximum sound level downward to account for the fact that certain types of construction equipment are not always operated in a full-throttle condition or in a continuously running condition for a given 1-hour period. **Table 3.13-2** lists each type of construction equipment used in the analysis with its reference maximum sound level, the applicable usage factor assigned by the software, and the resulting 1-hour average sound level (L_{eq}) adjusted to a standard distance of 50 feet.

The highest predicted construction noise level at the nearest noise-sensitive receptor to the Project (165 feet away) is 71 dBA L_{eq}. The highest predicted construction noise level at the nearest noise-sensitive location to the HVDC converter stations (2,500 feet away) is 44 dBA L_{eq} , both based on the operation of a dozer. Project construction noise levels would impact other noise-sensitive receptors within the noise analysis area but would decrease with distance from the Project; therefore, the Project would not exceed the FTA guidance construction noise limit of 90 dBA L_{eq} at any noise-sensitive receptor during the daytime period for ground-based construction activities. Noise due to Project construction would be temporary and would only occur during construction activities.

3.13.4.2.2 Fly Yard and Helipad Construction Activities

Helicopters used during construction may briefly result in greater noise levels than ground-based construction activities at noise-sensitive receptors. Helicopter activities would be spread across fly yard locations, each of which would be used to support construction activities for the adjacent Project segment during the daylight hours. Fly yards may be used to support various construction activities, such as conductor stringing activities, installation of conductor bird flight diverters, vegetation clearing and management, and transmission structure placement. The greatest potential noise impact from helicopter use would occur at noise-sensitive receptors located adjacent to or near helipads and fly yards. Light-duty helicopters typically result in noise of 72 to 81 dBA at 250 feet from the helicopter. Heavy-lift helicopters typically result in noise of 90 to 96 dBA at 250 feet from the helicopter (Helicopter Association International Fly Neighborly Committee 1993). Noise from helicopters would be more transient and shorter in duration than ground-based construction activities, and because construction activities would be linear in nature, helicopters would not be operated in the vicinity of one noise-sensitive receptor for an extended period. These land uses would be exposed to recurring noise from helicopter warm-up, take-off, and landing procedures. Each aerial construction activity requires helicopters of varying lift capacities, which positively correlates to helicopter noise generation. Helipad locations (co-located with fly yards) would be chosen to minimize impacts to potential noise-sensitive receptors, and pilots would be instructed to fly helicopters at appropriate altitudes to avoid unnecessary noise-related impacts. Helipad locations would be located no closer than 0.5-mile from the nearest noise sensitive land uses. At the time of the Draft EIS preparation, helicopters are only planned to be used at the Missouri River Crossing.

3.13.4.2.3 Implosive Splicing

As discussed in **Section 2.1**, implosive couplers may be used for splicing conductor strings during Project construction, though this technique is not currently planned for the Project. Implosive splicing would result in momentary (seconds) loud booms of about 150 dB (USFWS 2018a), resulting in noise impacts to noise sensitive receptors. Implosive splicing would not be utilized within 0.5-mile of a noise sensitive receptor (e.g., recreational sites, occupied dwellings, school, and cemeteries). In areas where implosive splicing would be utilized, coordination with local emergency services and notification to landowners would be required (see EPMs in **Appendix 2.4**).

3.13.4.3 Operations and Maintenance

3.13.4.3.1 HVDC Line, Tiger Connector, Ford County Interconnect, and Converter Stations

Maintenance activities for the HVDC Line, Tiger Connector, and Ford County Interconnect would include inspecting the transmission line aerially; making necessary repairs, which may involve construction equipment; and managing vegetation in proximity to Project facilities. As the line ages, or as maintenance needs arise, ground-based inspection techniques may also be required. Typical noise effects associated with maintenance activities at the transmission lines and/or HVDC converter stations would likely include noise generated by drones, pickup trucks, boom trucks, mowers, and chainsaws. Due to the short duration of transient helicopter events during transmission line inspection, and lack of long-term fly yard use in the vicinity of noise-sensitive receptors, noise from helicopter operations would be notably less than that generated during construction and less than that generated by ground-based maintenance equipment and activities.

At the closest noise-sensitive receptor distance of 165 feet from the HVDC Line, Tiger Connector, and Ford County Interconnect, hourly noise levels from a boom truck would generate approximately 61 dBA L_{eq}. At the closest noise-sensitive receptors to the HVDC converter stations (2,500 feet or greater distance), these noise levels would attenuate to 37 dBA, L_{eq} or less.

Maintenance activities throughout the life of the Project would include repair or replacement of damaged or defective components due to normal wear and tear, severe weather events, or vandalism. The noise impacts due to maintenance activities would be transient and intermittent, as they would only occur where and when maintenance is needed and would be limited to the duration of the maintenance activity, which in some cases could be completed in as little as a few hours. Due to the nature of maintenance work, these activities may be completed during daytime or nighttime periods.

3.13.4.3.2 Transmission Line Corona Noise

When an AC or DC transmission line is in operation, an electric field is generated in the air surrounding the conductors. When the intensity of the electric field exceeds the insulating strength of the air surrounding the conductor, a corona discharge occurs. Corona discharges may generate small impacts to the air pressure surrounding the conductor, which can result in the emission of sound. Sound is most prominent when dust particles or water droplets come into contact with the conductor surface, which accentuates the electric field and produces audible noise.

Audible noise from AC and DC transmission lines is a phenomenon experienced when there is high moisture content in the air (e.g., during a precipitation event). However, during periods of heavy rain, the ambient noise generated by the falling raindrops would typically be greater than the noise generated by corona (Electric Power Research Institute 2005). Thus, audible corona noise generated during fog and drizzle conditions would be more noticeable to a listener.

Corona effects would generate a hissing or crackling sound that may be heard at ground level beneath the transmission line, depending on weather, conductor elevation above ground, and system voltage. **Table 3.13-4** presents predicted corona noise levels at the closest noise-sensitive receptor distance from the HVDC Line, Tiger Connector, and Ford County Interconnect.

Table 3.13-4. Predicted Noise Impact from Corona Noise

Noise Source	Corona Noise Level at 165 feet (L_{dn}, dBA)	Representative Ambient Noise Level (L_{dn}, dBA)	Predicted Corona + Ambient Noise Level (L_{dn}, dBA)	Relative Increase to Ambient Noise Level (dBA) [c]
AC corona (fair weather) [a]	29	45	45	<1
AC corona (wet weather) [a]	50	45	51	6
HVDC corona (all weather) [b]	39	45	46	1

Source: SWCA 2023

AC: alternating current, dBA: A-weighted decibel, HVDC: high-voltage direct current, L_{dn}: day-night average sound level

[a] AC corona noise levels in fair and wet weather obtained from Pearson (n.d.).

[b] HVDC corona noise levels in all weather obtained from Shin et al. (2019).

[c] Decibels do not sum arithmetically, but instead sum logarithmically. For example: 50 dBA + 50 dBA = 53 dBA and 60 dBA + 50 dBA = 60.4 dBA.

The maximum potential noise from corona discharges at noise-sensitive receptors near the Tiger Connector and Ford County Interconnect was calculated to be 29 dBA L_{dn} at the closest analysis distance of 165 feet during fair weather conditions, which is roughly the sound level of leaves rustling. When combined with the estimated ambient noise level, corona noise would not result in a measurable increase to existing noise levels during fair weather conditions at this distance. During wet weather conditions, the maximum potential noise from corona discharges at noise-sensitive receptors near the Tiger Connector and Ford County Interconnect was calculated to be 50 dBA L_{dn} at the closest analysis distance of 165 feet. When added to the representative ambient noise level, corona noise would result in a potential increase of up to 6 dBA at the nearest noise-sensitive receptor during wet weather conditions, which is considered to be a readily perceptible change in outdoor noise levels. Note, however, that the increase in ambient noise levels would occur solely during high-moisture events, when outdoor human activities would likely be limited, and would not be representative of typical noise levels generated by the Tiger Connector and Ford County Interconnect during fair weather. Furthermore, predicted future corona noise levels at the nearest noise-sensitive receptor during high-moisture events would be approximately 4 dBA lower than the EPA guidance threshold of 55 dBA L_{dn}.

The maximum potential noise from corona discharges at noise-sensitive receptors near the HVDC Line was calculated to be 39 dBA L_{dn} at the closest analysis distance of 165 feet during all weather conditions. When added to the representative ambient noise level, corona noise shows a maximum increase of up to 1 dBA at the nearest potential noise-sensitive receptor, a change that is not readily perceptible to the human ear.

3.13.4.3.3 HVDC Converter Station Noise

HVDC converter stations contain several noise sources that would generate continuous noise throughout both daytime and nighttime hours. **Table 3.13-5** provides a summary of noise sources associated with the HVDC converter stations and their reference noise levels.

Using these noise source quantities and reference sound power levels, future HVDC converter station operational noise was predicted at the nearest noise-sensitive receptors for each HVDC converter station site. **Table 3.13-6** provides a summary of predicted noise levels for each HVDC converter station.

Operational noise from the HVDC converter stations at the closest noise-sensitive receptors is predicted to range from 46 to 49 dBA, L_{dn}. Summed with the existing noise environment, future operation of the HVDC converter stations would result in an overall noise exposure increase of 4 to 6 dBA at noise-sensitive receptors.

The Ford County HVDC converter station would generate a noise level increase of 6 dBA at the nearest noise-sensitive receptor location, which would result in a readily perceptible increase in noise exposure. Future noise levels at the closest noise-sensitive receptor would be 51 dBA, L_{dn}, which is below the EPA guidance limit threshold of 55 dBA L_{dn}.

Table 3.13-5. HVDC Converter Station Noise Sources and Reference Sound Levels

Equipment Type	Quantity Modeled for Kansas Site	Quantity Modeled for Missouri Site	Reference A-Weighted Sound Power Level per Source (L_wA)
AC Filters	12	6	95
Air Handling Units	12	6	90
Converter Cooler	4	2	99
Converter Transformer	12	6	110

Equipment Type	Quantity Modeled for Kansas Site	Quantity Modeled for Missouri Site	Reference A-Weighted Sound Power Level per Source (L_wA)
DC Smoothing Reactor	24	12	95
Rooftop Cooling Units	8	4	90
Valve Hall Building Interior	4	2	85

Source: Hankard Environmental 2023a and 2023b
L_wA: A-weighted sound power level

Table 3.13-6. Noise Impacts from HVDC Converter Stations at the Predicted Worst-Case Noise-Sensitive Receptor Location

Converter Station	Estimated Ambient Noise (L_{dn}, dBA)	Predicted Operational Noise Level (L_{eq}, dBA)	Predicted Operational Noise Level (L_{dn}, dBA)	Predicted Combined Future Noise Level (L_{dn}, dBA)	Relative Increase to Ambient Noise Level (dBA) [a]
Ford County (Kansas)	45	43	49	51	+6
Monroe County (Missouri)	45	40	46	49	+4

Source: Hankard Environmental 2023a and 2023b. Values converted to Ldn by AECOM
dBA: A-weighted decibels, HVDC: high-voltage direct current, L_{dn}: day-night average sound level
[a] Decibels do not sum arithmetically, but instead sum logarithmically. For example: 50 dBA + 50 dBA = 53 dBA and 60 dBA + 50 dBA = 60.4 dBA.
[b] Predicted operational noise levels do not incorporate mitigation measures.

The Monroe County HVDC converter station would generate a noise level increase of 4 dBA at the nearest noise-sensitive receptor location, which would result in a slightly perceptible increase in noise exposure. Future noise levels at the closest noise-sensitive receptor would be 49 dBA, L_{dn}, which is below the EPA guidance limit threshold of 55 dBA L_{dn}.

Converter station maintenance activities are expected to require minimal equipment such as trucks and lifts, which would not generate much noise. Based on the nature of the equipment likely needed for maintenance, and the periodic basis on which it would be conducted, noise levels associated with converter station maintenance are anticipated to be low and would not result in additional impacts to noise-sensitive receptors.

3.13.4.4 Decommissioning

Site decommissioning would be performed at the end of the service life of the Project in accordance with a Decommissioning Plan. Impacts to noise resources from activities to remove Project facilities would likely be similar to impacts during construction. Decommissioning activities, such as converter station and transmission structure demolition, would likely generate temporary noise similar to that which was predicted for their construction.

3.14 Social, Economic, and Community Resources

3.14.1 Issues for Analysis

Based on NEPA statutory and CEQ/DOE regulatory requirements; input from federal, state, and local agencies and tribal governments; and comments received during scoping, the social, economic, and community resources analysis addresses the following:

- Impacts to population and employment;
- Impacts to the supply of temporary housing and public services (e.g., health care and police/fire services) capacity to meet increased demand from an influx of non-local workers;
- Impacts to land use and property values; and
- Impacts to taxes and government revenues.

Discussion of the No Action Alternative is presented in **Section 3.1**.

3.14.2 Analysis Area

The social, economic, and community resources analysis area (the socioeconomic analysis area) consists of the 14 counties in Kansas (Kansas socioeconomic analysis area) and the 9 counties in Missouri (Missouri socioeconomic analysis area) where construction, operations and maintenance, and decommissioning of the Project would take place (**Figure 3.14-1**). It is anticipated that socioeconomic impacts from the Project would be experienced primarily by the communities adjacent to the Project within these counties as they are most likely to be affected by the presence of the Project, any potential influx of non-local workers, and increased Project-related spending and other economic effects.

3.14.3 Affected Environment

3.14.3.1 Existing Socioeconomic Conditions

The affected environment is the socioeconomic setting for the Project and provides context for potential impacts to socioeconomic indicators and effects on environmental justice communities (**Section 3.15**). The socioeconomic setting is discussed separately for Kansas and Missouri in the following sections. Existing socioeconomic conditions in the analysis areas are characterized using information from published sources including federal, state, local government agencies and databases and county-level data for the Kansas and Missouri socioeconomic analysis areas. County-level data for Kansas are presented in geographic order from the Project's westernmost terminus (Ford County, Kansas) eastward to the Missouri border in Doniphan County, Kansas. County-level data for Missouri are presented in geographic order from its westernmost county, Buchanan County (which borders Kansas) eastward to the Project's Tiger Connector terminus in Callaway County, Missouri. These areas are also aggregated by state and are compared to state-wide statistics in the following analysis.

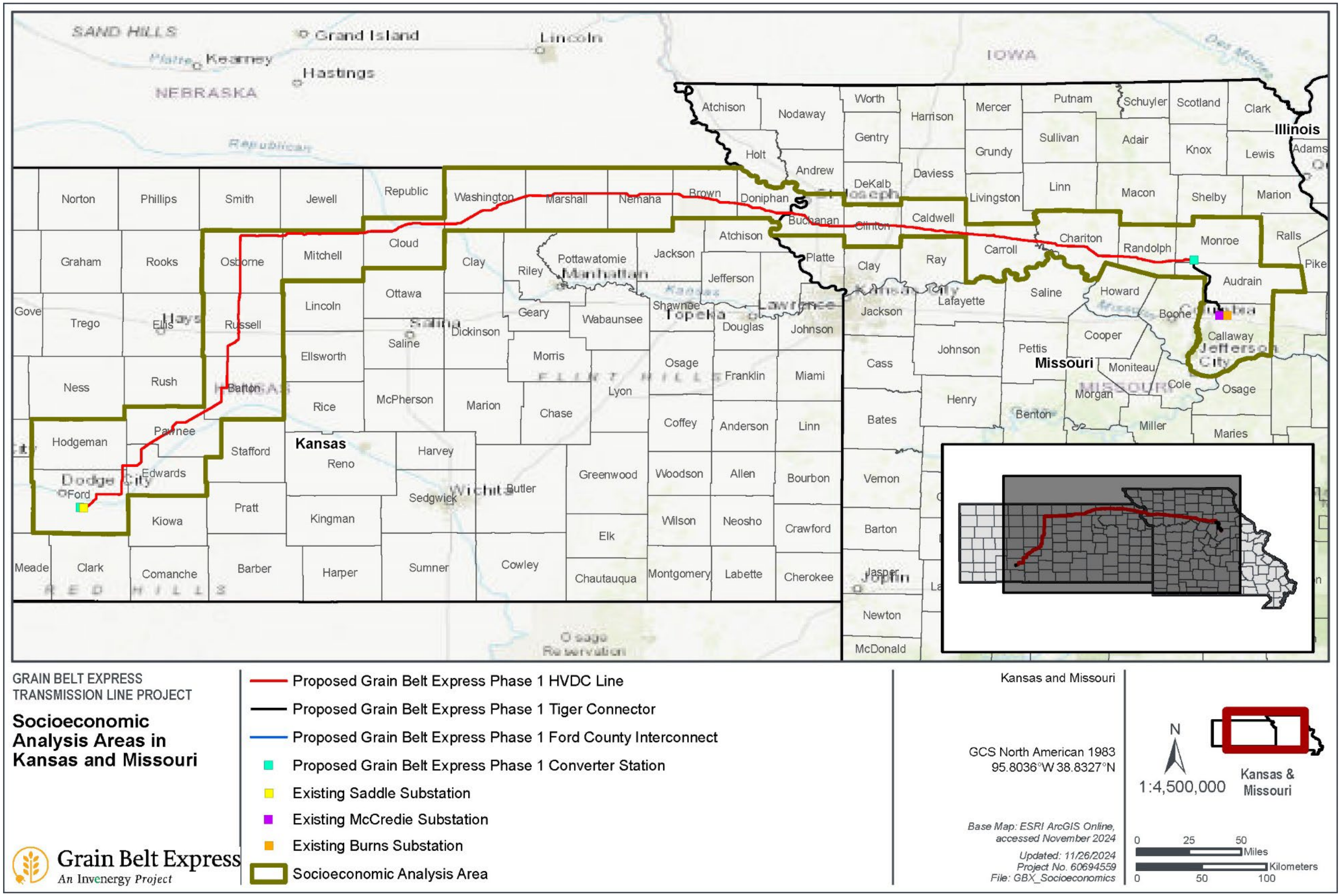

Figure 3.14-1. Socioeconomic Analysis Areas in Kansas and Missouri

3.14.3.2 Kansas

3.14.3.2.1 Population

Table 3.14-1 presents population information for the 14 counties that make up the Kansas socioeconomic analysis area and the state as a whole. Data are provided for 2010, 2020, and 2023. The Kansas socioeconomic analysis area had a total estimated population of 136,410 in 2023, which represented approximately 4.6 percent of the statewide population. Ford County (33,980 residents) and Barton County (24,899 residents) are the most populated counties in the Kansas socioeconomic analysis area, with respective population densities of 30.9 and 27.8 residents per square mile, which are relatively close to the comparable statewide average of 36.0 residents per square mile. The remaining 12 Kansas counties are more sparsely populated, with population densities ranging from 1.9 (Hodgeman County) to 19.0 (Doniphan County) residents per square mile. Only eight communities in the Kansas socioeconomic analysis area have more than 3,000 residents (**Table 3.14-1**).

Table 3.14-1. Population Characteristics in the Kansas Socioeconomic Analysis Area

State and County	2010 Population	2020 Population	Population Change 2010 to 2020 (percent)	2023 Population	Population Density, 2023 (per square mile)	Cities with Populations Over 3,000
Kansas	2,853,118	2,937,880	3.0%	2,940,546	36.0	90
Ford	33,848	34,287	1.3%	33,980	30.9	Dodge City
Hodgeman	1,916	1,723	-10.1%	1,655	1.9	0
Edwards	3,037	2,907	-4.3%	2,733	4.4	0
Pawnee	6,973	6,253	-10.3%	6,126	8.1	Larned
Barton	27,674	25,493	-7.9%	24,899	27.8	Great Bend
Russell	6,970	6,691	-4.0%	6,723	7.6	Russell
Osborne	3,858	3,500	-9.3%	3,427	3.8	0
Mitchell	6,373	5,796	-9.1%	5,719	8.1	Beloit
Cloud	9,533	9,032	-5.3%	8,854	12.4	Concordia
Washington	5,799	5,530	-4.6%	5,504	6.2	0
Marshall	10,117	10,038	-0.8%	9,933	11.0	Marysville
Nemaha	10,178	10,273	0.9%	10,114	14.1	0
Brown	9,984	9,508	-4.8%	9,250	16.2	Hiawatha
Doniphan	7,945	7,510	-5.5%	7,493	19.0	0
Kansas Socioeconomic Analysis Area Total	144,205	138,541	-3.9%	136,410	12.5	8

Note: Data for 2010 and 2020 are decennial counts; data for 2023 are annual estimates.
Source: U.S. Census Bureau 2010, 2020, 2022, 2024a

As shown in **Table 3.14-1**, from 2010 and 2020, the population in the state of Kansas increased by 3.0 percent. The population in the Kansas socioeconomic analysis area declined by 3.9 percent (5,664 residents) during the same period. Twelve of the 14 counties in the Kansas socioeconomic analysis area lost population over this period, with declines ranging from 0.8 percent (Marshall County) to approximately 10 percent (Hodgeman and Pawnee counties). The two exceptions were Ford and Nemaha counties, which experienced modest population increases of 1.3 percent and 0.9 percent, respectively (**Table 3.14-1**).

3.14.3.2.2 Employment

Summary labor force data are presented for the 14-county Kansas socioeconomic analysis area and the state of Kansas in **Table 3.14-2**. Together, the 14 counties had a combined civilian labor force of 70,390 and an average annual unemployment rate of 2.3 percent in 2023. The civilian labor force in the Kansas socioeconomic analysis area accounted for about 5 percent of the statewide labor force, which had an annual average unemployment rate of 2.7 percent in 2023 (**Table 3.14-2**). Viewed by county, unemployment rates in 2023 ranged from 1.7 percent in Nemaha County to 2.8 percent in Brown and Cloud counties (U.S. Bureau of Labor Statistics 2024).

Table 3.14-2. Annual Average Labor Force Characteristics in the Kansas Socioeconomic Analysis Area (2023)

Geographic Area	Civilian Labor Force	Employed	Unemployed	Unemployment Rate (percent)
Kansas Socioeconomic Analysis Area	70,390	68,757	1,633	2.3
State of Kansas	1,510,988	1,470,936	40,052	2.7

Source: Kansas Labor Information Center 2024, U.S. Bureau of Labor Statistics 2024

An estimated 95,144 people were employed in the 14-county Kansas socioeconomic analysis area in 2022 (**Table 3.14-3**). The government and manufacturing sectors were the largest employers in the 14-county area accounting for 16 percent and 14 percent of total employment, respectively. Statewide, the government and health care and social assistance sectors were the largest employers, accounting for about 15 percent and 11 percent of total employment, respectively (**Table 3.14-3**). Comparison with the statewide distribution of employment suggests that that the Kansas socioeconomic analysis area is relatively specialized in the agriculture, mining, and manufacturing sectors with respective location quotients (LQs) of 2.6, 2.6, and 1.6 (**Table 3.14-3**, footnote 3).

Viewed by County, agriculture as a share of total employment ranged from 3 percent in Ford County to 32 percent in Hodgeman County and also accounted for a relatively large share of total employment in Edwards and Washington counties (19 percent and 20 percent of the total, respectively). Mining accounted for a relatively large share of total employment (26 percent) in Russell County. Manufacturing made up a large share of employment (29 percent) in Ford County (U.S. Bureau of Economic Analysis 2023).

Table 3.14-3. Employment by Economic Sector in the Kansas Socioeconomic Analysis Area (2022)

Economic Sector [1/]	Kansas Socioeconomic Analysis Area		State of Kansas [2/]		LQ [3/]
	Number of Jobs	Percent of Total	Number of Jobs	Percent of Total	
Total employment (number of jobs)	95,144	100%	1,982,258	100%	1.0
Agriculture	7,524	8%	61,129	3%	2.6
Forestry, fishing, and related	376	0%	11,727	1%	0.7
Mining	4,083	4%	32,913	2%	2.6
Utilities	325	0%	6,308	0%	1.1
Construction	4,235	4%	98,664	5%	0.9
Manufacturing	13,200	14%	175,340	9%	1.6

Economic Sector [1/]	Kansas Socioeconomic Analysis Area		State of Kansas [2/]		LQ [3/]
	Number of Jobs	Percent of Total	Number of Jobs	Percent of Total	
Wholesale trade	3,233	3%	63,964	3%	1.1
Retail trade	7,909	8%	178,827	9%	0.9
Transportation and warehousing	3,053	3%	98,726	5%	0.6
Information	715	1%	23,778	1%	0.6
Finance and insurance	3,858	4%	116,460	6%	0.7
Real estate and rental and leasing	2,382	3%	87,841	4%	0.6
Professional, scientific, and technical services	1,808	2%	114,830	6%	0.3
Management of companies	138	0%	26,274	1%	0.1
Administrative and waste services	2,400	3%	105,189	5%	0.5
Educational services	240	0%	28,790	1%	0.2
Health care and social assistance	4,479	5%	208,635	11%	0.4
Arts, entertainment, and recreation	865	1%	31,937	2%	0.6
Accommodation and food services	3,264	3%	121,470	6%	0.6
Other services	4,280	4%	97,044	5%	0.9
Government	14,805	16%	292,412	15%	1.1

[1/] Employment estimates include self-employed individuals. Employment data are by place of work, not place of residence, and, therefore, include people who work in the area but do not live there. Employment is measured as the average annual number of jobs, both full- and part-time, with each job counted at full weight.
[2/] Percentages for the Kansas socioeconomic analysis area do not sum to 100 because employment counts are not provided for some sectors in some of the counties in the Kansas socioeconomic analysis area to avoid disclosing confidential information.
[3/]LQs measure an area's economic specialization relative to a larger geographic unit (in this case the state of Kansas). LQs divide an industry's share of local employment by the corresponding state share for that industry. An LQ of 1.0 means that the area and state are equally specialized in a particular sector. An LQ greater than 1 indicates that an industry has a greater share of the local area employment than is the case statewide.
Source: U.S. Bureau of Economic Analysis 2023

3.14.3.2.3 Housing and Public Services

Non-local construction workers temporarily relocating to the Kansas socioeconomic analysis area would require accommodations, which could include temporary housing. Housing resources are summarized for the Kansas socioeconomic analysis area in **Table 3.14-4**. The U.S. Census Bureau defines a housing unit as a house, apartment, mobile home or trailer, group of rooms, or single room occupied or intended to be occupied as separate living quarters. There was an estimated total of 63,722 housing units in the Kansas socioeconomic analysis area in 2022, with an estimated 1,895 units vacant and available for rent. In addition, an estimated 1,441 units classified for seasonal, recreational, or occasional use were identified in the Kansas socioeconomic analysis area counties. A portion of these units would also be available for short-term use by incoming construction workers.

Rental housing options for non-local construction workers may also include other special living situations, such as Airbnb units and spare bedrooms in homes that residents would be willing to rent to construction workers. These types of potential housing opportunities are not included in the data presented in **Table 3.14-4**.

Table 3.14-4. Rental Housing Availability in the Kansas Socioeconomic Analysis Area (2022)

Geographic Area[1/]	Total Housing Units	Total Rental Units[2/]	Rental Vacancy Rate	Units Available for Rent	Units for Seasonal, Recreational, or Occasional Use[2/]
Kansas	1,278,548	416,170	7.0%	29,053	13,376
Ford County	12,568	4,502	7.5%	337	37
Hodgeman County	851	138	0.0%	0	43
Edwards County	1,549	290	9.7%	28	47
Pawnee County	3,065	1,070	14.2%	152	31
Barton County	12,396	3,743	12.1%	453	244
Russell County	3,693	843	14.7%	124	184
Osborne County	2,050	463	13.6%	63	159
Mitchell County	3,128	728	12.4%	90	167
Cloud County	4,520	1,261	14.4%	182	126
Washington County	2,736	589	7.0%	41	53
Marshall County	4,766	981	24.1%	236	78
Nemaha County	4,507	1,040	9.9%	103	81
Brown County	4,507	1,042	2.5%	26	109
Doniphan County	3,386	615	9.8%	60	82
Kansas Socioeconomic Analysis Area Total	63,722	17,305	11.0%	1,895	1,441

Source: U.S. Census Bureau 2023a, 2023b.
Notes:
1/ All data are annual estimates from the American Community Survey 5-year estimates for 2018-2022.
2/ Total rental housing includes units that are classified by the Census as renter-occupied; rented, unoccupied; or for rent.
3/ Housing units for seasonal, recreational, or occasional use are generally considered to be vacation homes. They are not included in the estimated number of housing units available for rent.

Information on hotels and motels and recreational vehicle (RV) parks/campgrounds in the Kansas socioeconomic analysis area is provided in **Table 3.14-5**. As of 2022, there were at least 87 hotels and motels within the Kansas socioeconomic analysis area. The average economy chain hotel or motel has approximately 75 rooms, with a peak summer occupancy rate of 60 to 70 percent (Statista 2023a, 2023b). The American Hotel and Lodging Association (2022) reports the average hotel in western and northern Kansas has 59 to 64 rooms.

As a result, the 87 hotels and motels within the Kansas socioeconomic analysis area likely represent approximately 5,350 rooms, of which approximately 1,870 are likely unoccupied, even during the peak season. In addition, the 57 campgrounds and RV parks within the Kansas socioeconomic analysis area likely represent approximately 1,100 camp sites, of which approximately 385 are likely unoccupied even during the peak season.

Table 3.14-5. Temporary Lodging Availability in the Kansas Socioeconomic Analysis Area (2022)

County	Hotels and Motels	Estimated Hotel / Motel Rooms[1/]	Campgrounds and RV Parks	Estimated RV/Camp Sites	Total Lodging Units[2/]	Estimated Temporary Lodging Available[2/ 3/]
Ford	22	1,353	6	145	1,498	524
Hodgeman	1	62	3	48	110	38

County	Hotels and Motels	Estimated Hotel / Motel Rooms[1/]	Campgrounds and RV Parks	Estimated RV/Camp Sites	Total Lodging Units[2/]	Estimated Temporary Lodging Available[2/ 3/]
Edwards	3	185	1	24	209	73
Pawnee	2	123	1	15	138	48
Barton	13	800	8	90	890	311
Russell	9	554	9	135	689	241
Osborne	3	185	0	0	185	65
Mitchell	8	492	8	85	577	202
Cloud	5	308	3	62	370	129
Washington	1	62	5	85	147	51
Marshall	9	554	3	40	594	208
Nemaha	3	185	4	135	320	112
Brown	7	431	6	232	663	232
Doniphan	1	62	0	0	62	22
Total	87	5,356	57	1,096	6,452	2,256

Sources: Microsoft Bing Maps 2022; AllStays 2022.
[1/] Based on an average hotel size of 62 rooms.
[2/] Temporary lodging in this context refers to hotel/motel rooms and RV/camp sites.
[3/] Based on an average occupancy rate of 65 percent for both hotels/motels and camp sites.

Table 3.14-6 shows the primary public services within the Kansas socioeconomic analysis area in 2022. Except for Doniphan County, every county in the Kansas socioeconomic analysis area has at least one hospital with overnight care facilities. Doniphan County residents rely on hospital facilities in neighboring Saint Joseph, Missouri (Mosaic Life Care hospital, 246 beds) or Atchison County, Kansas (Atchison Hospital, 25 beds). As of 2022, a total of 17 hospitals with an estimated 492 beds are available for patient use in the Kansas socioeconomic analysis area. This excludes long-term senior and psychiatric care facilities, as well as health clinic and urgent care facilities that provide out-patient health services. In addition, local fire departments also frequently provide first response and emergency medical services.

An estimated 40 law enforcement (police) departments are located within the Kansas socioeconomic analysis area (**Table 3.14-6**). With the exception of Hodgeman County, every county in the Kansas socioeconomic analysis area has at least two police departments serving their residents. Similarly, 62 fire stations have service areas in the Kansas socioeconomic analysis area, with each county supported by three or more fire stations, with the exception of Edwards County, which has two fire stations. This suggests police and fire resources are generally available in the Kansas socioeconomic analysis area.

Table 3.14-6. Public Services in the Kansas Socioeconomic Analysis Area (2022)

County	Hospitals[1/]	Hospital Bed Count	Law Enforcement Departments	Fire Stations
Ford County	1	99	3	3
Hodgeman County	1	25	1	4
Edwards County	1	12	3	2
Pawnee County	1	25	4	4
Barton County	3	81	3	8
Russell County	1	25	3	6
Osborne County	1	16	2	5
Mitchell County	1	35	3	3
Cloud County	1	25	2	6

County	Hospitals[1/]	Hospital Bed Count	Law Enforcement Departments	Fire Stations
Washington County	2	50	2	6
Marshall County	1	25	4	3
Nemaha County	2	49	3	5
Brown County	1	25	2	4
Doniphan County	0	0	5	3
Total	**17**	**492**	**40**	**62**

Source: Google Earth Pro 2022; Kansas Hospital Association 2023.
[1/] Does not include urgent care and health clinics.

3.14.3.2.4 Land Use and Property Values

As discussed in **Section 3.10**, agriculture is the predominant regional land use in the Kansas socioeconomic analysis area. In 2022, farmland accounted for approximately 86 percent of land use in the Kansas socioeconomic analysis area, as well as statewide (**Table 3.14-7**). There are a total of 55,734 farms in Kansas, with an average farm size of 804 acres and sales per farm of $430,350. Livestock accounts for almost two-thirds (65 percent) of statewide agricultural sales in 2022, with crops accounting for the remaining 35 percent. There are a total of 6,725 farms in the Kansas socioeconomic analysis area, with an average farm size of 890 acres and sales per farm of $568,789. The land in farms and total number of farms in the Kansas socioeconomic analysis area counties account for 13 percent and 12 percent of the corresponding state totals, respectively. Livestock accounts for slightly more than half (53 percent) of Kansas socioeconomic analysis area sales, with crops accounting for the remainder. Viewed by county, average farm size in the Kansas socioeconomic analysis area ranges from 458 acres (Doniphan County) to 1,704 acres (Edwards County), with farms located in the west portion of the Kansas socioeconomic analysis area (i.e., Ford to Mitchell counties) typically larger than those in the east (Cloud to Doniphan counties) (**Table 3.14-7**).

Table 3.14-7. Farmland Characteristics in the Kansas Socioeconomic Analysis Area (2022)

Geographic Area	Land in farms (acres)	Share of Land Area (percent)	Number of farms	Average size of farm (acres)	Average Sales per farm (dollars)	Crops[1/] (percent)	Livestock[2/] (percent)
Kansas	44,794,702	86%	55,734	804	430,350	35%	65%
Ford County	698,533	99%	536	1,303	1,245,860	20%	80%
Hodgeman County	518,034	94%	439	1,180	516,037	28%	72%
Edwards County	396,962	100%	233	1,704	1,365,066	37%	63%
Pawnee County	412,958	86%	337	1,225	1,037,869	(D)	(D)
Barton County	562,598	98%	575	978	854,600	25%	75%
Russell County	432,200	76%	510	847	131,005	65%	35%
Osborne County	424,101	74%	308	1,377	300,407	81%	19%
Mitchell County	421,946	94%	372	1,134	453,938	64%	36%
Cloud County	328,457	72%	419	784	269,557	85%	15%
Washington County	443,162	77%	642	690	412,139	54%	46%
Marshall County	443,244	77%	708	626	305,893	79%	21%
Nemaha County	410,751	89%	834	493	537,157	42%	58%
Brown County	340,917	93%	475	718	566,706	87%	13%
Doniphan County	154,259	61%	337	458	391,928	97%	3%

Geographic Area	Land in farms (acres)	Share of Land Area (percent)	Number of farms	Average size of farm (acres)	Average Sales per farm (dollars)	Crops[1/] (percent)	Livestock[2/] (percent)
Kansas Socioeconomic Analysis Area	**5,988,122**	**86%**	**6,725**	**890**	**568,789**	**47%**	**53%**

Notes:
(D) Withheld to avoid disclosing data for individual farms
[1/] Crops, including nursery and greenhouse crops
[2/] Livestock, poultry, and their products
Source: U.S. Census Bureau 2022, USDA 2024

Within the Kansas socioeconomic analysis area, dry (i.e., non-irrigated) cropland annual cash rents in 2022 ranges from approximately $36.50 (Hodgeman County) to $189 (Doniphan County) per acre, with values increasing for counties closer to the northeast corner of the state (Kansas State University Agricultural Economics 2022). In 2021, statewide average farmland values in Kansas range from $2,100 per acre for pastureland to $3,800 for irrigated cropland, with agricultural land values trending upward over the previous 5 years (Kansas State University 2022).

The median housing value for owner-occupied units in Kansas in 2022 is $189,300. Median values are lower than the state median in all 14 Kansas socioeconomic analysis area counties, ranging from $65,500 (Osbourne County) to $174,500 (Nemaha County) (U.S. Census Bureau 2023a).

3.14.3.2.5 Taxes and Government Revenues

Several streams of government revenues fund the provision of public services. These include taxes (e.g., sales and property taxes), intergovernmental transfers (i.e., payments from one government entity to another, as in federal funding of state-initiated road improvement projects), and other fees and charges, such as hunting and fishing licenses.

Table 3.14-8 provides information on state and local taxes and revenues in Kansas in 2021. Data are provided for the state and all counties and local governments. Local in this context includes municipal and other governmental entities aside from county, state, and federal governments. The source data for this table were obtained from the U.S. Census Bureau (2024c). The data reported by U.S. Census Bureau are aggregated across local government entities in Kansas. The fiscal conditions in the Kansas socioeconomic analysis area presented below are estimated on a per-capita basis. This approach assumes there is a direct correlation between county population and county/local revenue, and that each county's local revenues are proportional to its share of the statewide population.

Table 3.14-8 shows the estimated annual total government revenues in the Kansas socioeconomic analysis area in 2021 based on the per-capita share of the state's economy. Using this approach, general tax revenues collected by the county and local government agencies in the Kansas socioeconomic analysis area were estimated to be $627 million, with $233 million of this revenue generated by taxes, including property ($177 million), sales ($49 million), and other miscellaneous ($7 million) taxes (**Table 3.14-8**).

Table 3.14-8. Summary of Kansas State and Local Revenues (2021)

Geographic Area	General Revenue ($ million)[1/]	All Taxes ($ million)[2/]	Property Taxes ($ million) [2/]	Sales Taxes ($ million)[2/]
State of Kansas	$24,485	$11,616	$815	$4,970
All county and local governments in Kansas	$15,681	$5,847	$4,444	$1,224
Kansas socioeconomic analysis area (estimated)	$627	$233	$177	$49

Source: U.S. Census Bureau 2024c.
Note: Values are shown in 2021 dollars.
[1/] General revenue includes taxes, intergovernmental revenue, current charges, and miscellaneous general revenue.
[2/] All taxes include property, sales, income, and other miscellaneous taxes. Property and sales taxes are also reported separately.

3.14.3.3 Missouri

3.14.3.3.1 Population

Table 3.14-9 presents population information for the nine counties that make up the Missouri socioeconomic analysis area and the state as a whole. Data are provided for 2010, 2020, and 2023. The Missouri socioeconomic analysis area had a total estimated population of 231,181 in 2023, which represented approximately 3.7 percent of the statewide population. Buchanan County (82,956 residents) and Callaway County (44,731 residents) are the most populated counties in the Missouri socioeconomic analysis area. The population density of the Missouri socioeconomic analysis area as a whole (43.2 residents per square mile) was slightly less than half the corresponding state average (90.1 percent) in 2023. Population densities in the individual Missouri socioeconomic analysis area counties ranged from 9.8 to 203.2 residents per square mile in Chariton and Buchanan counties, respectively. Only eight communities in the Missouri socioeconomic analysis area have more than 3,000 residents (**Table 3.14-9**).

Table 3.14-9. Population Characteristics in the Missouri Socioeconomic Analysis Area

State and County	2010 Population	2020 Population	Population Change, 2010 to 2020 (percent)	2023 Population	Population Density, 2023 (per square mile)	Cities with Populations Over 3,000
Missouri	5,988,927	6,154,913	2.8%	6,196,156	90.1	199
Buchanan County	89,201	84,793	-4.9%	82,956	203.2	St. Joseph
Clinton	20,743	21,184	2.1%	21,548	51.4	Cameron
Caldwell	9,424	8,815	-6.5%	8,955	21.0	0
Carroll	9,295	8,495	-8.6%	8,391	12.1	Carrollton
Chariton	7,831	7,408	-5.4%	7,399	9.8	0
Randolph	25,414	24,716	-2.7%	24,109	49.9	Moberly
Monroe	8,840	8,666	-2.0%	8,698	13.4	0
Audrain	25,529	24,962	-2.2%	24,394	35.2	Mexico, Vandalia
Callaway	44,332	44,283	-0.1%	44,731	53.6	Fulton, Holts Summit
Missouri Socioeconomic Analysis Area Total	**240,609**	**233,322**	**-3.0%**	**231,181**	**43.2**	**8**

Note:
[1/] Data for 2010 and 2020 are decennial counts; data for 2023 are annual estimates.
Source: U.S. Census Bureau 2010, 2020, 2022, 2024b.

From 2010 and 2020, the population in the state of Missouri increased by 2.8 percent. The population in the Missouri socioeconomic analysis area declined by 3.0 percent (7,287 residents) over the same period. All of the counties in the Missouri socioeconomic analysis area lost population over this period, with declines ranging from 0.1 percent (Callaway County) to 8.6 percent (Carroll County) (**Table 3.14-1**).

3.14.3.3.2 Employment

Summary labor force data are presented for the nine-county Missouri socioeconomic analysis area and the state of Missouri in **Table 3.14-10**. Together, the nine counties had a combined civilian labor force of 110,915 and an average annual unemployment rate of 3.0 percent in 2023. The civilian labor force in the Missouri socioeconomic analysis area accounted for about 4 percent of the statewide labor force, which had an annual average unemployment rate of 3.0 percent in 2023 (**Table 3.14-2**). Viewed by county, unemployment rates in 2023 ranged from 2.7 percent in Chariton County to 3.5 percent in Randolph County (U.S. Bureau of Labor Statistics 2024).

Table 3.14-10. Annual Average Labor Force Characteristics in the Missouri Socioeconomic Analysis Area (2023)

Geographic Area	Civilian Labor Force	Employed	Unemployed	Unemployment Rate (percent)
Missouri Socioeconomic Analysis Area	110,915	107,600	3,315	3.0
State of Missouri	3,087,759	2,993,587	94,172	3.0

Source: Missouri Economic Research and Information Center 2024, U.S. Bureau of Labor Statistics 2024

An estimated 129,165 people were employed in the nine-county Missouri socioeconomic analysis area in 2022 (**Table 3.14-11**). The manufacturing, government, and retail sectors were the largest employers in the nine-county area accounting for 14 percent, 13 percent, and 10 percent of total employment, respectively. Statewide, health care and social assistance, government, and retail trade were the largest employers, accounting for about 12 percent, 11 percent, and 10 percent of total employment, respectively (**Table 3.14-11**). Comparison with the statewide distribution of employment suggests that that the Missouri socioeconomic analysis area is relatively specialized in the agriculture and manufacturing sectors with location quotients of 2.7 and 1.8, respectively (**Table 3.14-11**, footnote 3).

Viewed by county, agriculture as a share of total employment, ranged from 1 percent in Buchanan County to more than 20 percent in Caldwell, Carroll, Chariton, and Monroe counties. Manufacturing made up a large share of employment Audrain and Buchanan counties, 16 percent and 20 percent, respectively (U.S. Bureau of Economic Analysis 2023).

Table 3.14-11. Employment by Economic Sector in the Missouri Socioeconomic Analysis Area (2022)

	Socioeconomic Analysis Area		State of Missouri		
Economic Sector	Number of Jobs[1/]	Percent of Total[2/]	Number of Jobs[1/]	Percent of Total	LQ[3/]
Total employment (number of jobs)	129,165	100%	3,934,395	100%	1.0
Agriculture	8,219	6%	93,207	2%	2.7
Forestry, fishing, and related	276	0%	14,994	0%	0.6
Mining	99	0%	7,921	0%	0.4
Utilities	307	0%	12,203	0%	0.8
Construction	7,458	6%	216,462	6%	1.0

Economic Sector	Socioeconomic Analysis Area		State of Missouri		LQ[3/]
	Number of Jobs[1/]	Percent of Total[2/]	Number of Jobs[1/]	Percent of Total	
Manufacturing	17,587	14%	295,203	8%	1.8
Wholesale trade	2,841	2%	138,827	4%	0.6
Retail trade	13,416	10%	386,934	10%	1.1
Transportation and warehousing	6,175	5%	189,914	5%	1.0
Information	883	1%	59,870	2%	0.4
Finance and insurance	5,214	4%	236,768	6%	0.7
Real estate and rental and leasing	4,603	4%	204,471	5%	0.7
Professional, scientific, and technical services	4,358	3%	243,353	6%	0.5
Management of companies	333	0%	65,992	2%	0.2
Administrative and waste services	3,615	3%	204,765	5%	0.5
Educational services	529	0%	95,612	2%	0.2
Health care and social assistance	8,678	7%	454,774	12%	0.6
Arts, entertainment, and recreation	1,366	1%	75,450	2%	0.6
Accommodation and food services	6,428	5%	275,193	7%	0.7
Other services	6,166	5%	212,103	5%	0.9
Government	16,565	13%	450,379	11%	1.1

Notes:
[1/] Employment estimates include self-employed individuals. Employment data are by place of work, not place of residence, and, therefore, include people who work in the area but do not live there. Employment is measured as the average annual number of jobs, both full- and part-time, with each job counted at full weight.
[2/] Percentages for the Missouri socioeconomic analysis area do not sum to 100 because employment counts are not provided for some sectors in some of the counties in the Missouri socioeconomic analysis area to avoid disclosing confidential information.
[3/] LQs measure an area's economic specialization relative to a larger geographic unit (in this case the state of Missouri). LQs divide an industry's share of local employment by the corresponding state share for that industry. An LQ of 1.0 means that the area and state are equally specialized in a particular sector. An LQ greater than 1 indicates that an industry has a greater share of the local area employment than is the case statewide.
Source: U.S. Bureau of Economic Analysis 2023

3.14.3.3.3 Housing and Public Services

Table 3.14-12 provides information on the housing and rental units for the Missouri socioeconomic analysis area. There was an estimated total of 104,213 housing units in the Missouri socioeconomic analysis area in 2022, with an estimated 1,451 units vacant and available for rent. In addition, an estimated 1,967 units classified for seasonal, recreational, or occasional use were identified in the Missouri socioeconomic analysis area counties. A portion of these units may also be available for short-term use by incoming construction workers.

Rental housing options for non-local construction workers may also include other special living situations, such as Airbnb units and spare bedrooms in homes that residents would be willing to rent to construction workers. These types of potential housing opportunities are not included in the data presented in **Table 3.14-12**.

Table 3.14-12. Rental Housing Availability in the Missouri Socioeconomic Analysis Area (2022)

Geographic Area[1/]	Total Housing Units	Total Rental Units[2/]	Rental Vacancy Rate	Units Available for Rent	Units for Seasonal, Recreational, or Occasional Use[3/]
Missouri	2,795,030	850,700	5.3%	45,300	84,834
Audrain County	10,563	2,762	7.4%	204	109
Buchanan County	38,368	13,409	6.9%	924	205
Caldwell County	4,260	721	3.5%	25	96
Callaway County	18,573	3,837	3.8%	146	592
Carroll County	4,381	1,020	4.6%	47	156
Chariton County	3,819	504	5.8%	29	195
Clinton County	8,955	1,987	1.0%	20	149
Monroe County	4,493	861	3.9%	34	318
Randolph County	10,801	2,971	0.7%	22	147
Missouri Socioeconomic Analysis Area Total	104,213	28,072	5.2%	1,451	1,967

Source: U.S. Census Bureau 2023a, 2023b.
1/ All data are annual estimates from the American Community Survey 5-year estimates for 2018-2022.
2/ Total rental housing includes units that are classified by the Census as renter-occupied; rented, unoccupied; or for rent.
3/ Housing units for seasonal, recreational, or occasional use are generally considered to be vacation homes. They are not included in the estimated number of housing units available for rent.

Information on hotels, motels, campgrounds, and RV parks in the Missouri socioeconomic analysis area is provided in **Table 3.14-13**. As of 2022, there were at least 51 hotels and motels within the Missouri socioeconomic analysis area. The average economy chain hotel or motel has approximately 75 rooms, with a peak summer occupancy rate of 60 percent to 70 percent (Statista 2023a, 2023b). The American Hotel and Lodging Association (2022) reports the average hotel size in northern Missouri is 76 rooms. The 51 hotels and motels within the Missouri socioeconomic analysis area likely represent approximately 3,140 rooms, of which more than 1,100 are likely unoccupied even during the peak season. In addition, as of 2022, 56 campgrounds and RV parks are within the Missouri socioeconomic analysis area, estimated to represent approximately 450 camp sites, of which approximately 158 are likely unoccupied even during the peak season (**Table 3.14-13**).

Table 3.14-13. Temporary Lodging Availability in the Missouri Socioeconomic Analysis Area (2022)

County	Hotels and Motels	Estimated Hotel / Motel Rooms[1/]	Campgrounds and RV Parks	Estimated RV/Camp Sites	Total Lodging Units[2/]	Estimated Temporary Lodging Available[2/ 3/]
Buchanan	10	615	6	57	672	235
Clinton	8	492	3	42	534	187
Caldwell	3	185	4	13	198	69
Carroll	5	308	6	0	308	108
Chariton	1	62	7	46	108	38
Randolph	2	123	3	24	147	51
Monroe	4	246	8	108	354	124
Audrain	7	431	6	16	447	156

County	Hotels and Motels	Estimated Hotel / Motel Rooms[1/]	Campgrounds and RV Parks	Estimated RV/Camp Sites	Total Lodging Units[2/]	Estimated Temporary Lodging Available[2/ 3/]
Callaway	11	677	13	146	823	288
Total	51	3,139	56	452	3,591	1,256

Sources: Microsoft Bing Maps 2022; AllStays 2022.
[1/] Based on an average hotel size of 62 rooms.
[2/] Temporary lodging in this context refers to hotel/motel rooms and RV/camp sites.
[3/] Based on an average occupancy rate of 65 percent for both hotels/motels and camp sites.

Table 3.14-14 shows the primary public services within the Missouri socioeconomic analysis area in 2022. A total of 7 hospitals with an estimated 621 beds are available for patient use, excluding long-term senior and psychiatric care facilities and health clinic and urgent care facilities that provide outpatient health services. Three of the counties within the Missouri socioeconomic analysis area do not have a hospital with overnight care facilities (Caldwell, Chariton, and Monroe counties), requiring their residents to obtain hospital care in neighboring counties. However, local fire departments frequently provide first response and emergency medical services across all counties in the Missouri socioeconomic analysis area.

With the exception of Monroe County (which has only two police departments), every county in the Missouri socioeconomic analysis area has at least three law enforcement facilities serving its residents. As of 2022, a total of 35 police departments are in the Missouri socioeconomic analysis area. Similarly, every county in the Missouri socioeconomic analysis area is supported by at least three fire stations. Lastly, 56 fire stations have service areas in the Missouri socioeconomic analysis area.

Table 3.14-14. Public Services in the Missouri Socioeconomic Analysis Area (2022)

County	Hospitals[1/]	Hospital Bed Count	Law Enforcement Departments	Fire Stations
Buchanan	2	327	7	15
Clinton	1	74	3	7
Caldwell	0	0	4	3
Carroll	1	25	3	3
Chariton	0	0	5	4
Randolph	1	70	3	7
Monroe	0	0	2	3
Audrain	1	88	3	6
Callaway	1	37	5	8
Total	7	621	35	56

Source: Google Earth Pro 2022; CountyOffice.org. 2023.
[1/] Does not include urgent care and health clinics or long-term senior and psychiatric care facilities.

3.14.3.3.4 Land Use and Property Values

In 2022, farmland accounted for approximately 71 percent of land use in the Missouri socioeconomic analysis area and 61 percent statewide (**Table 3.14-15**). There are a total of 87,887 farms in Missouri, with an average farm size of 308 acres and sales per farm of $167,226. Crops account for slightly more than half (53 percent) of statewide agricultural sales in 2022, with livestock accounting for the remaining 47 percent. There are a total of 7,699 farms in the Missouri socioeconomic analysis area, with an average farm size of 316 acres and sales per farm of $185,749. The land in farms and total number of farms in the Missouri socioeconomic analysis area counties account for 9 percent of the corresponding state totals. Within the Missouri socioeconomic analysis area, sales from agricultural lands include 71 percent crops , with livestock accounting for the remainder. Viewed by county, average farm size in the Missouri socioeconomic analysis area ranges from 227 acres (Buchanan County) to 431 acres (Audrain County) (**Table 3.14-15**).

Table 3.14-15. Farmland Characteristics in the Missouri Socioeconomic Analysis Area (2022)

Geographic Area	Land in farms (acres)	Share of Land Area (percent)	Number of farms	Average size of farm (acres)	Average Sales per farm (dollars)	Crops[1/] (percent)	Livestock[2/] (percent)
Missouri	27,026,243	61%	87,887	308	167,226	53%	47%
Buchanan County	140,427	54%	619	227	118,171	94%	6%
Clinton County	190,097	71%	628	303	166,434	84%	16%
Caldwell County	218,258	80%	866	252	97,423	79%	21%
Carroll County	393,921	89%	960	410	217,937	92%	8%
Chariton County	372,047	77%	954	390	212,057	77%	23%
Randolph County	212,214	69%	791	268	123,535	69%	31%
Monroe County	285,759	69%	846	338	213,986	65%	35%
Audrain County	329,649	74%	764	431	390,136	66%	34%
Callaway County	289,024	54%	1,271	227	141,393	36%	64%
Missouri Socioeconomic Analysis Area	2,431,396	71%	7,699	316	185,749	71%	29%

Source: U.S. Census Bureau 2022, USDA 2024
[1/] Crops, including nursery and greenhouse crops
[2/] Livestock, poultry, and their products

Within the Missouri socioeconomic analysis area, dry (i.e., non-irrigated) cropland annual cash rents in 2022 ranges from $125 (Buchanan County) to $197 (Clinton County) per acre (USDA 2022c). In 2022, statewide average farmland values in Missouri ranged from $2,400 per acre for pastureland to $5,400 for irrigated cropland, with agricultural land values trending upward over the previous 5 years (University of Missouri Extension 2022).

The median housing value for owner-occupied units in Missouri in 2022 is $199,400. Median values are lower than the state median in all nine Missouri socioeconomic analysis area counties, ranging from $105,500 (Carroll County) to $187,200 (Clinton County) (U.S. Census Bureau 2023a).

3.14.3.3.5 Taxes and Government Revenues

Table 3.14-16 provides information on state and local taxes and revenues in Missouri in 2021. Data are provided for the state and all counties and local governments. Local in this context includes municipal and other governmental entities aside from county, state, and federal governments. The source data for this table were obtained from the U.S. Census Bureau (2024c). The data reported by U.S. Census Bureau are aggregated across local government entities in Missouri. The fiscal conditions in the Missouri socioeconomic analysis area presented below are estimated on a per-capita basis. This approach assumes there is a direct correlation between county population and county/local revenue, and that each county's local revenues are proportional to its share of the statewide population.

Table 3.14-16 shows the estimated annual total government revenues in the Missouri socioeconomic analysis area in 2021 based on the per-capita share of the state's economy. Using this approach, general tax revenues collected by the county and local government agencies in the Missouri socioeconomic analysis area were estimated to be $1,170 million, with $540 million of this revenue generated by taxes, including property ($327 million), sales ($165 million), and other miscellaneous ($48 million) taxes (**Table 3.14-16**).

Table 3.14-16. Summary of Missouri State and Local Revenue (2021)

Geographic Area	General Revenue ($ million)1/	All Taxes ($ million)2/	Property Taxes ($ million)	Sales Taxes ($ million)
State of Missouri	$37,442	$15,091	$37	$5,945
All counties and local governments in Missouri	$29,257	$13,521	$8,189	$4,129
Missouri socioeconomic analysis area (estimated)	$1,170	$540	$327	$165

Source: U.S. Census Bureau 2024c.
Notes: Values are shown in 2021 dollars.
1/ General revenue includes taxes, intergovernmental revenue, current charges, and miscellaneous general revenue.
2/ "All Taxes" include property, sales, income, and other miscellaneous taxes. Property and sales taxes are also reported separately.

3.14.4 Environmental Consequences of Proposed Federal Action

3.14.4.1 Methods and Assumptions

Chapter 2 includes preliminary workforce estimates for both construction and operation of the Project. A detailed construction planning and labor recruitment analysis has not been developed for the Project and specific construction staffing and deployment plans (by location and schedule) and operations and maintenance staffing plans have not been determined at this time. The workforce totals discussed in Chapter 2 represent reasonable estimates and timelines for the Project that are used in the following assessment to address potential impacts to population, housing, and public services.

The following assessment assumes for the purposes of analysis that the construction workforce for each segment would be non-local workers and that all of these individuals would temporarily in-migrate together to each of the affected counties and progress sequentially along the planned Project ROW on a weekly or monthly basis. Individuals working at converter stations and switchyards would be likely to work at that single location for the construction duration. The assumptions related to the HVDC Line workforce represent a conservative approach that likely overstates the potential influx of workers to some of the smaller counties along the route. It is likely that in practice construction crews would tend to locate near larger population and employment centers where temporary housing resources and retail and service establishments, including gas stations, grocery stores, and cafes/restaurants, are concentrated and commute daily via carpool to work site locations. Larger population and employment centers in the area include Dodge City (Ford County, Kansas), Columbia (Boone County and adjacent to Monroe, Audrain, and Callaway counties, Missouri), and St. Joseph (Buchanan County, Missouri). As a result, the assumption that all workers would be non-local also overstates the number of workers that would be likely to temporarily relocate to the region during construction.

Using the above assumptions, impacts to county populations are assessed by comparing the addition of workers for each county to existing population levels. Potential impacts to housing were assessed more broadly by comparing the estimated demand for temporary housing with the existing number of hotel and motel rooms, RV spaces, and rental housing units that are normally vacant and available for rent. Impacts to public services were assessed by considering potential increases in demand from incoming workers as a share of the existing populations presently served in the socioeconomic analysis areas.

In addition to creating direct jobs, construction and operation of the Project would support jobs elsewhere in the regional economy. For this reason, an economic impact analysis was undertaken (most recent update in 2022) by Strategic Economic Research, LLC (SER) to analyze the wider regional economic impacts from the Project. The economic impacts were estimated using the IMPLAN economic modeling software with separate state-level models used for Kansas and Missouri (SER 2022a). The resulting economic impact estimates are discussed below in **Section 3.14.3.2.5**. The IMPLAN analysis includes direct job estimates that include the workforce totals discussed in Chapter 2 but also include a broader range of construction and operations full time equivalent workforce estimates generated by the economic impact analysis.

3.14.4.2 Construction

3.14.4.2.1 Population

As described in Chapter 2, the Project would be constructed in segments, with construction activities planned for each segment of the HVDC Line and the Tiger Connector. Construction of each HVDC Line segment would be expected to involve an average of 115 workers, with a peak of approximately 160 workers employed at one time. Construction of the Tiger Connector would involve average and peak workforces of 85 and 110 workers, respectively. The Ford County Interconnect would be constructed in conjunction with the Ford County HVDC converter station site.

Viewed as a share of the estimated population in 2023 in each of the 14 counties that make up the Kansas socioeconomic analysis area, peak employment for each HVDC Line segment (160 workers) would represent less than 1 percent of the existing population in Ford and Barton counties and less than 5 percent in most of the other counties. The estimated peak HVDC Line workforce would exceed 5 percent of the estimated population in Edwards County (5.9 percent) and Hodgeman County (9.7 percent). These counties are, however, both adjacent to Ford County, and non-local workers would be more likely to stay in Dodge City and commute the short distances to work sites in Edwards and Hodgeman counties.

In the Missouri socioeconomic analysis area, the estimated peak HVDC Line workforce would range from 0.2 percent (Buchanan County) to 2.2 percent (Chariton County) of the existing population by county. Peak employment for the Tiger Connector (110 workers), located in Monroe, Audrain, and Callaway counties, Missouri, would range from 0.2 percent (Callaway County) to 1.3 percent (Monroe County) of existing population.

Construction crews at the HVDC converter station sites in Ford County, Kansas, and Monroe County, Missouri, would require separate workforces from those along the HVDC Line. Peak workforce for the converter station sites would require approximately 330 workers, with an average workforce of approximately 190 people during an assumed 34-month construction duration. Construction of the Ford County Interconnect would be completed in conjunction with the HVDC converter station site in Ford County, Kansas. Viewed as a share of the existing population, peak converter station employment (330 workers) would be equivalent to 1.0 percent and 3.8 percent of the existing populations in Ford and Monroe counties, respectively. The combined HVDC Line and HVDC converter station workforce in Ford County would be approximately 490 workers if peak construction for the HVDC Line and converter station were to coincide, which would be equivalent to 1.4 percent of the existing population in the county. If peak construction of the Tiger Connector and HVDC converter station site in Monroe County were to overlap, the combined maximum workforce would be approximately 440 workers, which would be equivalent to 5.1 percent of the existing county population. The converter station site in Monroe County would however be located near Audrain County, Missouri, and within a reasonable commuting distance (up to one hour) of both Boone and Randolph counties, Missouri. As a result, non-local workers employed on construction sites in Monroe County would be likely to stay in the wider four-county area.

As shown in **Tables 3.14-1** and **3.14-9**, population has declined over the past decade in most of the counties that make up the socioeconomic analysis areas. For most of these counties, the net loss in population from 2010 to 2020 exceeds the potential short-term increase in population that could occur during peak construction. In addition, seasonal farm employment is common in many rural counties suggesting that some local communities may be used to seasonal fluctuations in population (USDA 2022c).

As indicated in the preceding discussion, viewed by county, potential peak population increases during construction represent relatively small shares of existing population totals and would only occur if all workers were to come from outside and temporarily relocate to each county, which is considered unlikely as discussed above in **Section 3.14.4.1**.

3.14.4.2.2 Housing and Public Services

Housing

One potential Project-related impact during construction would be the increased demand for local lodging and accommodation. This demand may be considered beneficial by those offering accommodations but could be considered adverse if a county's lodging/rental capacity to absorb Project-related housing needs from the non-local construction workers is limited. Although some workers may choose to share accommodations, for the purposes of analysis, single occupancy is assumed for all non-local workers, with all construction workers assumed to be non-local.

As discussed in **Section 3.14.3.1**, an estimated 1,895 rental units are potentially available for rent by Project construction workers within the Kansas socioeconomic analysis area (**Table 3.14-4**). Further, an estimated 2,256 hotel/motel rooms and RV spaces could also be potentially available for use by the Project's construction workforce in Kansas (**Table 3.14-5**). Viewed by county, the estimated supply of temporary accommodations (rental housing, hotels/motels, and RV parks/campgrounds) exceeds potential demand from the peak HVDC Line workforce (160 housing units) in nine of the 14 Kansas socioeconomic analysis area counties. In counties where potential demand could exceed supply, additional temporary accommodations are available within daily commuting distance in nearby counties. In Ford County, peak demand for temporary housing could be as high as 490 units if peak construction for the HVDC Line and converter station were to coincide. If this were the case, the estimated supply would still exceed demand by approximately 370 units.

An estimated 1,451 units are potentially available for rent by future Project construction workers within the Missouri socioeconomic analysis area (**Table 3.10-10**). Further, an estimated 1,256 hotel/motel rooms and RV spaces would likely be available and suitable for use by the Project's construction workers (**Table 3.10-11**). Viewed by county, the estimated supply of temporary accommodations exceeds potential demand from the peak HVDC Line workforce in four of the nine Missouri socioeconomic analysis area counties. In counties where potential demand could exceed supply, additional temporary accommodations are available within daily commuting distance (up to one hour) in nearby counties. In Monroe County, peak demand for temporary housing could be as high as 440 units if peak construction for the Tiger Connector and HVDC converter station were to coincide. If this were the case, potential demand would exceed the estimated supply of available housing units in the county. However, as noted above with respect to population, workers employed at the converter station site in Monroe County would be likely to reside in a wider four-county area, where additional temporary accommodations are normally available for rent.

Based on the preceding review, the existing supply of temporary accommodations that is normally vacant and available for rent should be sufficient to accommodate Project-related demand.

Public Services

The temporary in-migration of non-local construction workers could potentially result in increased demand for local public services, such as emergency services and law enforcement. However, potential Project-related increases in population during construction represent relatively small shares of the existing population and, in many cases, would be limited in duration, as workers migrate along HVDC Line segments. As a result, current emergency and law enforcement services are anticipated to be sufficient to accommodate the additional population both in Kansas and Missouri, with minor effects anticipated to current service ratios. In addition, the short-term nature of construction-related jobs suggests that most non-local workers would not be accompanied by family members and, as a result, a substantial increase in demand for educational and child-related services is not anticipated.

3.14.4.2.3 Land Use and Property Values

Potential socioeconomic impacts related to land use during construction are described below; additional impacts to land use are discussed in detail in **Section 3.10**. Potential impacts to property values during construction are expected to be similar to those that would occur during operations and maintenance and are, therefore, discussed below in **Section 3.14.4.3.3**.

Temporary economic impacts to agricultural land uses from construction activities would be minimized by providing fair compensation to landowners, restoring agricultural lands where practicable, and coordinating with landowners to schedule construction activities to minimize disturbances to farming operations and crop-growing cycles (refer to EPMs in **Appendix 2.4**). Once construction and reclamation have been completed, agricultural activities would generally resume within these areas, although the timeframe required for crops to reestablish would differ among crop types.

As part of the Project, rights to the land in the Project area needed for construction and operations and maintenance would be acquired, primarily along the planned Project ROW and at the HVDC converter stations. For most properties, a private easement would be acquired rather than purchasing the property outright. Restrictions on land uses and potential impacts to property values during construction would be factored into the easement negotiation process. Fair compensation would be provided to the landowners for loss of use and impact on farming operations due to these restrictions.

Project construction would result in temporary disturbance to an estimated 4,418 acres of agricultural land and developed vegetation, which represents approximately 0.05 percent of the total farmland acreage (8.4 million acres) in the socioeconomic analysis area counties in Kansas and Missouri. As a result, Project construction would be expected to result in little to no economic impact to the Kansas and Missouri agricultural sectors.

3.14.4.2.4 Taxes and Government Revenues

During Project construction, the annual property taxes from the Project, payable to counties in the Kansas socioeconomic analysis area, would be approximately $6.7 million per year (based on an average over the first 20 years of the Project; SWCA 2023). Over the 44-month construction duration, the total property taxes paid to these Kansas counties would total $24.6 million. The annual total revenue in the same Kansas counties, independent of the Project, is estimated to be approximately $800 million (**Table 3.14-8**). Thus, the average annual property taxes during construction would represent an approximately 0.8 percent increase in local revenues.

During Project construction, the annual property taxes paid to counties within the Missouri socioeconomic analysis area are estimated to average approximately $2.8 million per year (based on an average over the first 20 years of the Project). Over the 44-month construction duration the total property taxes paid to these Missouri counties would total $10.3 million (SER 2022). The annual total revenue in the same Missouri counties, independent of the Project, is estimated as $1 billion to $1.2 billion (**Table 3.14-16**). Thus, the annual property taxes during construction would represent an increase of approximately 0.2 percent in local revenues.

3.14.4.2.5 Regional Economic Analysis

The economic impacts of the Project's future construction were estimated using the IMPLAN economic modeling software. Potential impacts were modeled using separate state-level models for Kansas and Missouri (SER 2022). First, construction costs were used to calculate direct jobs, earnings, and outputs. Construction costs include an array of budget categories, from labor and materials to consulting and legal services, and real estate costs that are required during Project construction. The direct earnings and outputs were then input into IMPLAN to estimate the direct, indirect, and induced impacts that would result from Project expenditures.

Direct impacts in the form of jobs, earnings, and output are those that support construction of the Project, including those required to support the direct purchase of materials and equipment, as well as those from Project-related services during construction. Indirect impacts in the form of jobs, earnings, and output are supply chain-related effects that result from the changing needs of the directly affected industry. For example, the increase in demand for steel from the Project results in additional indirect employment and output in the larger supply chain (e.g., sourcing and manufacturing of materials). Finally, induced impacts consist of jobs, earnings, and output and are due to the changes in spending patterns caused by changes in income generated from the direct and indirect effects. For example, newly hired workers purchasing goods and services in the local economy further supports jobs, earnings, and additional output. All employment estimates are expressed in FTE job-years. One FTE job-year represents 2,080 hours of work for one year.

Project construction would result in an estimated 4,194 direct FTE jobs in Kansas and Missouri. Project construction would also support indirect (supply chain-related) and induced (consumption-related) jobs elsewhere in the Kansas and Missouri statewide economies. Project construction is estimated to support a combined total of 5,967 indirect and induced full-time equivalent jobs in Kansas and an additional 4,214 indirect and induced FTE jobs in Missouri. The employment supported by Project construction (direct, indirect, and induced) is estimated to total 14,375 full-time equivalent positions. Project construction is also estimated to support $609 million and $351 million in direct earnings in Kansas and Missouri, respectively. Construction would also support indirect and induced earnings elsewhere in the state economies, with total (direct, indirect, and induced) earnings estimated to be $936 million in Kansas and $586 million in Missouri (**Table 3.14-17**).

The economic output from Project construction is also shown in **Table 3.14-17**. Output as expressed by IMPLAN represents the value of goods and services produced, which serves as a broad measure of economic activity. Project construction would support an estimated total (direct, indirect, and induced) of $1.5 billion in economic output in Kansas and $986 million in Missouri.

Table 3.14-17. Economic Impacts from Project Construction

Impact	Kansas	Missouri	Total [1/]
Employment (FTE)			
Direct	2,661	1,533	4,194

Impact	Kansas	Missouri	Total[1/]
Indirect	2,670	1,737	4,407
Induced	3,297	2,477	5,774
Total	8,628	5,747	14,375
Earnings ($ million)			
Direct	$608.9	$350.8	$959.7
Indirect	$158.7	$107.0	$265.7
Induced	$168.6	$128.6	$297.2
Total	$936.2	$586.4	$1,522.6
Output ($ million)			
Direct	$608.9	$350.8	$959.7
Indirect	$391.7	$244.9	$636.6
Induced	$527.1	$390.4	$917.5
Total	$1,527.7	$986.1	$2,513.8

Source: SER 2022.
FTE: full-time equivalent
[1/] Totals are for the duration of Project construction.

3.14.4.3 Operations and Maintenance

3.14.4.3.1 Population

Workforce requirements for operations and maintenance would primarily be for annual inspections and routine vegetation management and maintenance work. This type of activity would be infrequent in any single county and would require approximately 10 total workers on average. An average of two workers at each of the converter stations would also be on site daily. Project operations and maintenance activities are, therefore, not expected to have a measurable impact on the population in any single county.

3.14.4.3.2 Housing and Public Services

Since maintenance activities in any single county would be infrequent, and because of the small number of workers conducting such activities, there would be no measurable impacts to local housing or public services during operations and maintenance. Local housing resources would be more than sufficient to handle any overnight stays required for maintenance work in a single location.

3.14.4.3.3 Land Use and Property Values

The placement of transmission structures may impact aerial applications and large farming equipment use, especially where the planned Project ROW is not sited along a property's fence lines. The resulting restrictions on landowners' farming practices may result in increased operating expenses from additional labor and equipment use. Grazing and farming would be allowed under the HVDC Line, the Tiger Connector, and Ford County Interconnect during operations and maintenance.

An average agricultural landowner in the Kansas socioeconomic analysis area would have, at most, five transmission structures traversing their property based on an average 890-acre farm size and 1,500-foot span between transmission structures. The corresponding maximum acreage loss of 0.5 acre would represent less than 0.1 percent of the average farm acreage. Similarly, an average Missouri agricultural landowner would have a maximum average acreage loss of 0.3 acre, which would represent a less than 0.1 percent reduction in acreage. The economic impact from the decrease in agricultural land would be an adverse impact, and landowners would be compensated for property impacts through the easement negotiation process.

Future operations and maintenance activities would be limited in scale and short in duration and, except in the rare case of major repairs, would generally take place on an annual basis and would be limited to the planned Project ROW.

A literature review of studies that assess the impacts of transmission lines on mainly residential property values found that approximately half of the reviewed studies found no impacts (Bureau of Land Management 2013). For studies that did identify potential impacts, proximity was found to have an impact on property values; properties within 50 feet were found to experience the most negative effects on property values. Properties within 50 to 200 feet experienced small negative effects, while those beyond 200 feet did not experience any negative effects. Negative impacts on property values from transmission lines range from 1 to 9 percent (Elliott and Wadley 2002). These findings are for residential properties typically in dense urban settings. As noted elsewhere, these impacts may be less relevant to rural locations, like the socioeconomic analysis areas, where there are fewer homes in proximity to the transmission line (Bureau of Land Management 2013). As discussed in **Section 3.10**, previously conducted routing studies identified an estimated 57 individual residences that would be within 500 feet of the HVDC and Tiger Connector lines. No residences are currently located within the planned Project ROW, which would have a typical width of 150 to 200 feet. This suggests that the number of individual residences within 200 feet of the transmission line is likely to be small.

Other studies have specifically addressed the potential impacts of transmission lines on agricultural property values, with one analysis finding, based on a review of existing literature, that electric transmission line projects have resulted in negative impacts to farmland values that are greater than easement values (Colwell and Sanders 2017). Future restrictions on building in the ROW, structure removal, loss of revenue, property values, and other limitations from the Project that may require space would be factored into the easement negotiation process. Fair compensation would be provided by the Applicant to landowners for loss of use and impacts to farming operations. The impacts to land use from future operations and maintenance activities are anticipated to have minimal effect on landowners' farming operations (including transport of agricultural products).

Regionally, the approximately 273 acres of agricultural and developed vegetation land that would be impacted by the permanent Project facilities represents a small share (less than 0.001 percent) of the total farmland acreage (8.4 million acres) in the socioeconomic analysis area counties in Kansas and Missouri. As a result, there would be little to no economic impact, either permanent or temporary, on the agricultural sectors in Kansas and Missouri.

3.14.4.3.4 Taxes and Government Revenues

During the first 20 years of the Project's lifespan, the property taxes from the Project payable to Kansas counties within the socioeconomic analysis areas are estimated to average approximately \$6.7 million per year (SWCA 2023). The annual total revenue in the same Kansas counties, independent of the Project, is estimated to be approximately \$800 million (**Table 3.14-8**). As a result, the average annual property taxes paid over the first 20 years of the Project's life would represent an approximately 0.8 percent increase in local revenues, which would represent a small but measurable benefit to the economy of the Kansas socioeconomic analysis area.

Taxes paid to counties within the Missouri socioeconomic analysis area are estimated to average approximately \$9.2 million annually over the first 20 years of the Project's lifespan (SWCA 2023). The annual total revenue in the same Missouri counties, independent of the Project, is estimated to total nearly \$1.2 billion (**Table 3.14-16**). As a result, the annual property taxes during the first 20 years of operations and maintenance would represent a 0.8 percent increase in local revenues, which would represent a small but measurable benefit to the economy of the Missouri socioeconomic analysis area.

3.14.4.3.5 Regional Economic Analysis

The economic impacts of Project operations and maintenance were estimated using IMPLAN modeling software. **Table 3.14-18** shows the estimated annual economic impacts from Project operations and maintenance in terms of statewide employment, earnings, and output increases for Kansas and Missouri. Project operations and maintenance are estimated to support a total of 100 and 105 FTE positions (direct, indirect, and induced) in Kansas and Missouri, respectively. Operations and maintenance would also support an estimated $9.1 million in Kansas and $8.2 million in Missouri in total (direct, indirect, and induced) earnings (**Table 3.14-18**). **Table 3.14-18** also summarizes the estimated impact in terms of economic output, with operations and maintenance estimated to support a total (direct, indirect, and induced) economic output of $16.6 million and $15.8 million in Kansas and Missouri, respectively.

Table 3.14-18. Annual Economic Impacts from Project Operations and Maintenance

Impact	Kansas	Missouri	Total
Employment (FTE)			
Direct	24	14	38
Indirect	49	61	110
Induced	27	30	57
Total	100	105	205
Earnings ($ million)			
Direct	$5.3	$3.0	$8.3
Indirect	$2.4	$3.6	$6.0
Induced	$1.4	$1.6	$3.0
Total	$9.1	$8.2	$17.3
Output ($ million)			
Direct	$5.3	$3.0	$8.3
Indirect	$7.0	$8.1	$15.1
Induced	$4.3	$4.7	$9.0
Total	$16.6	$15.8	$32.4

Source: SER 2022
FTE: full-time equivalent

3.14.4.4 Decommissioning

Site decommissioning would be performed at the end of the service life of the Project (approximately 80 years) in accordance with a Decommissioning Plan. Impacts to social, economic, and community resources from activities to remove Project facilities would likely be similar to the impacts during construction. Specifically, impacts to population, housing, and public services, land use and property values, and taxes and government would likely be similar to the impacts from construction activities.

Following decommissioning, the employment provided from operations and maintenance would no longer occur, and the related beneficial and adverse socioeconomic impacts would cease. However, the impacts to socioeconomics during operations and maintenance are largely assessed to be negligible, and therefore, the absence of those impacts, both adverse and beneficial, would also be expected to be negligible.

3.15 Environmental Justice

3.15.1 Issues for Analysis

Based on NEPA statutory and CEQ/DOE regulatory requirements; input from federal, state, and local agencies and tribal governments; and comments received during scoping, the environmental justice analysis addresses the following:

- Potential for disproportionate adverse impacts to low income or minority communities; and
- Impacts related to environmental justice, including health impacts from pollution and exposure to increased industrial activities and noises, and increased risk of injury and exposure to hazardous materials.

Discussion of the No Action Alternative is presented in **Section 3.1**.

3.15.2 Analysis Area

The environmental justice analysis area consists of 87 census tracts, containing 136 census block groups, located within 3 miles of the HVDC Line, the Tiger Connector, and the Ford County Interconnect center lines (i.e., a 6-mile-wide corridor), and a 3-mile buffer of the HVDC converter station sites in Ford County, Kansas and Monroe County, Missouri (**Figures 3.15-1** through **3.15-5**). The environmental justice analysis area represents the geographic area where the Project could result in human health or environmental impacts. As such, the environmental justice analysis area was selected to assess potential impacts that can occur over a distance, such as noise and air quality, that would also be considered environmental justice impacts, acknowledging that the magnitude of impacts would typically diminish as one moves away from the Project and associated infrastructure.

This analysis considers impacts according to demographic data available from the U.S. Census Bureau, which include census tracts and blocks. Census tracts are geographic units generally made up of 2,500–8,000 people. Each census tract contains smaller census block units. Census blocks are statistical areas bounded by visible features, such as streets, roads, streams, and railroad tracks, as well as nonvisible boundaries, such as property lines and city, township, school district, and county limits, and short line-of-sight extensions of streets and roads. Census block groups are generally defined to contain between 600 and 3,000 people and usually cover a contiguous area. Census block groups do not cross state, county, or census tract boundaries but may cross boundaries of other geographic entities. This analysis considers the potentially affected communities within both census tracts and census block groups. Census data on income are reported only for a sample of the population and therefore are reported only at the census block group level. **Appendix 3.15** contains a list of census block groups in the environmental justice analysis area.

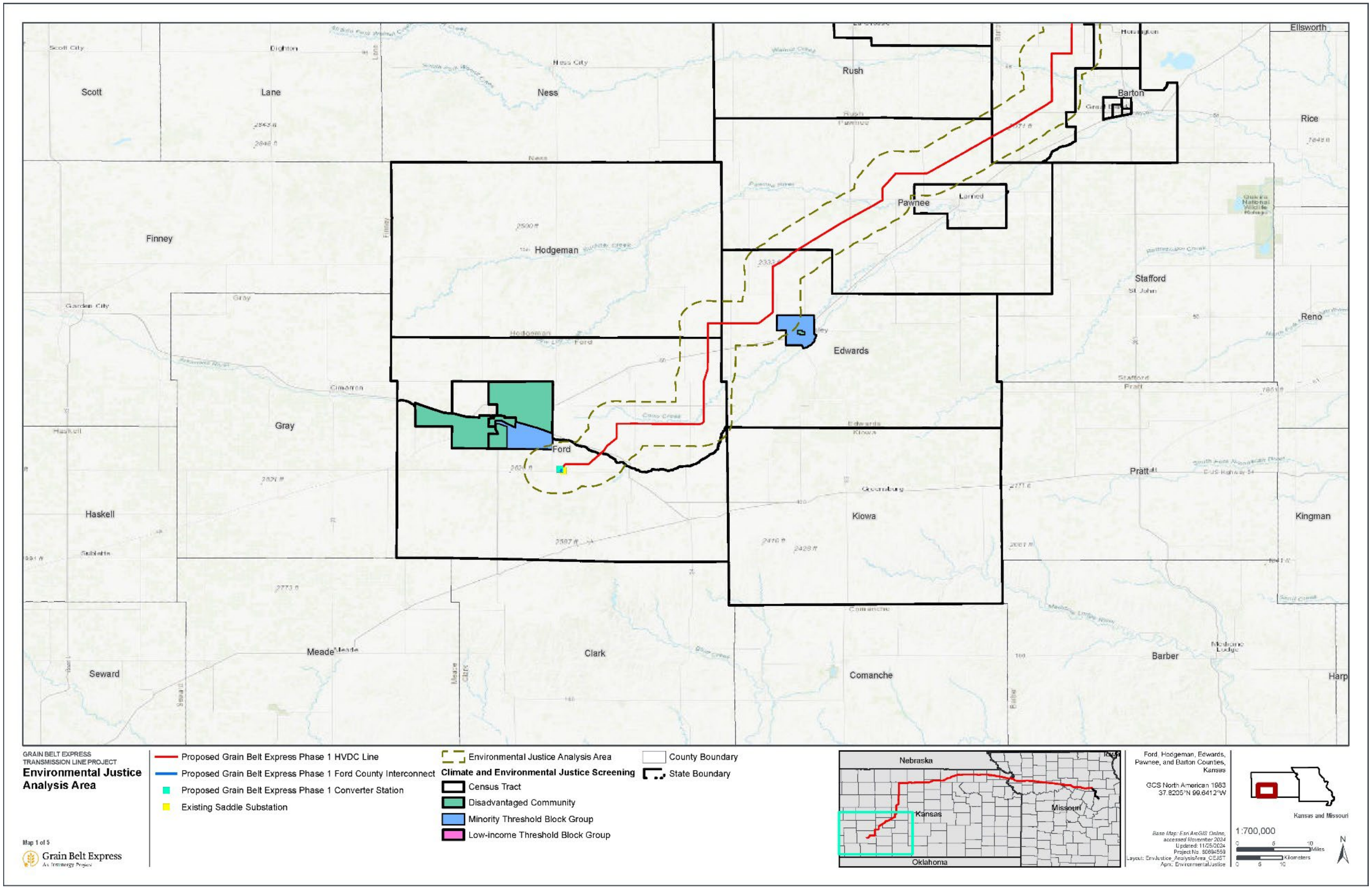

Figure 3.15-1. Environmental Justice Analysis Area (Ford County to Barton County, Kansas)

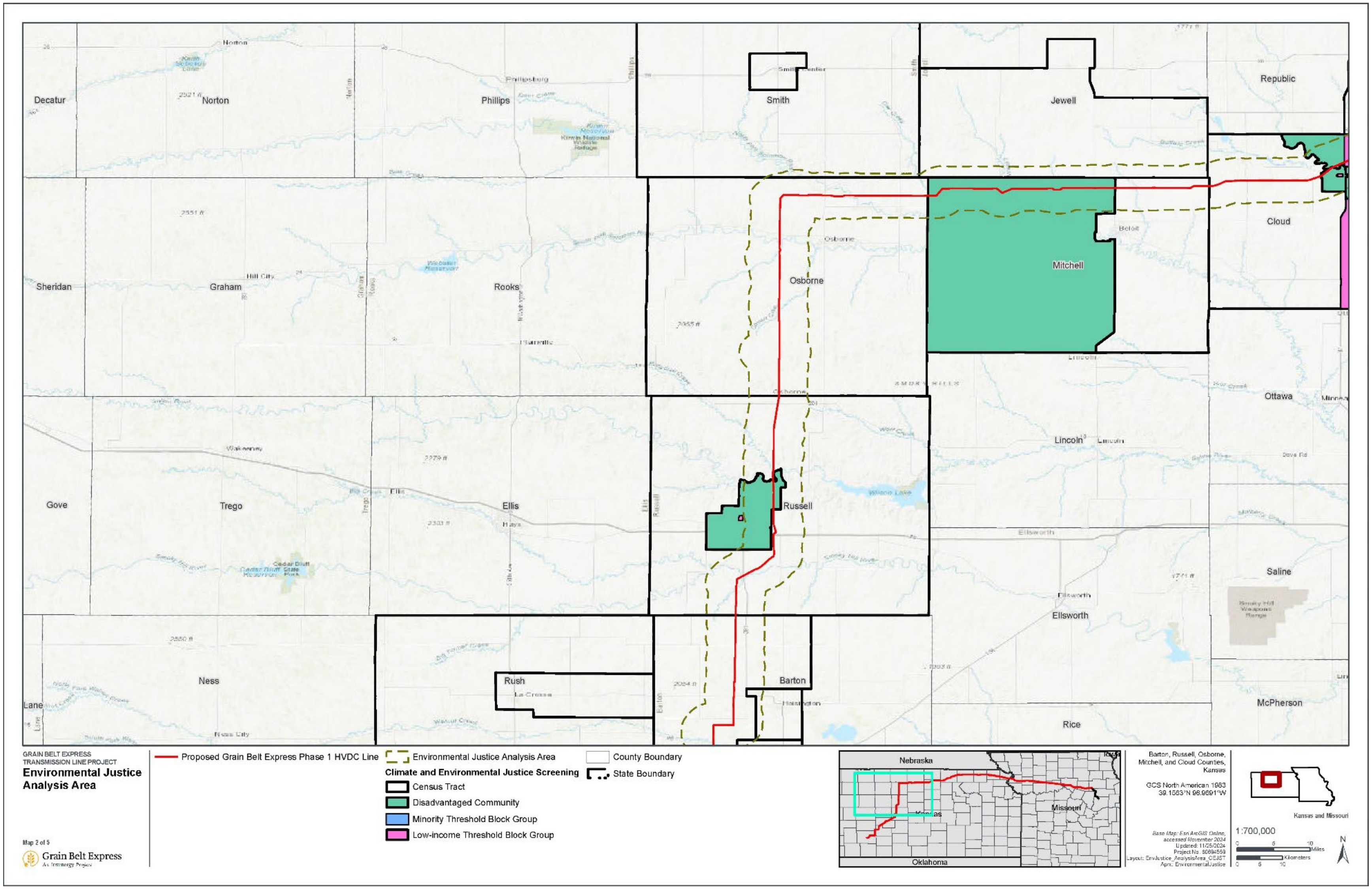

Figure 3.15-2. Environmental Justice Analysis Area (Barton County to Cloud County, Kansas)

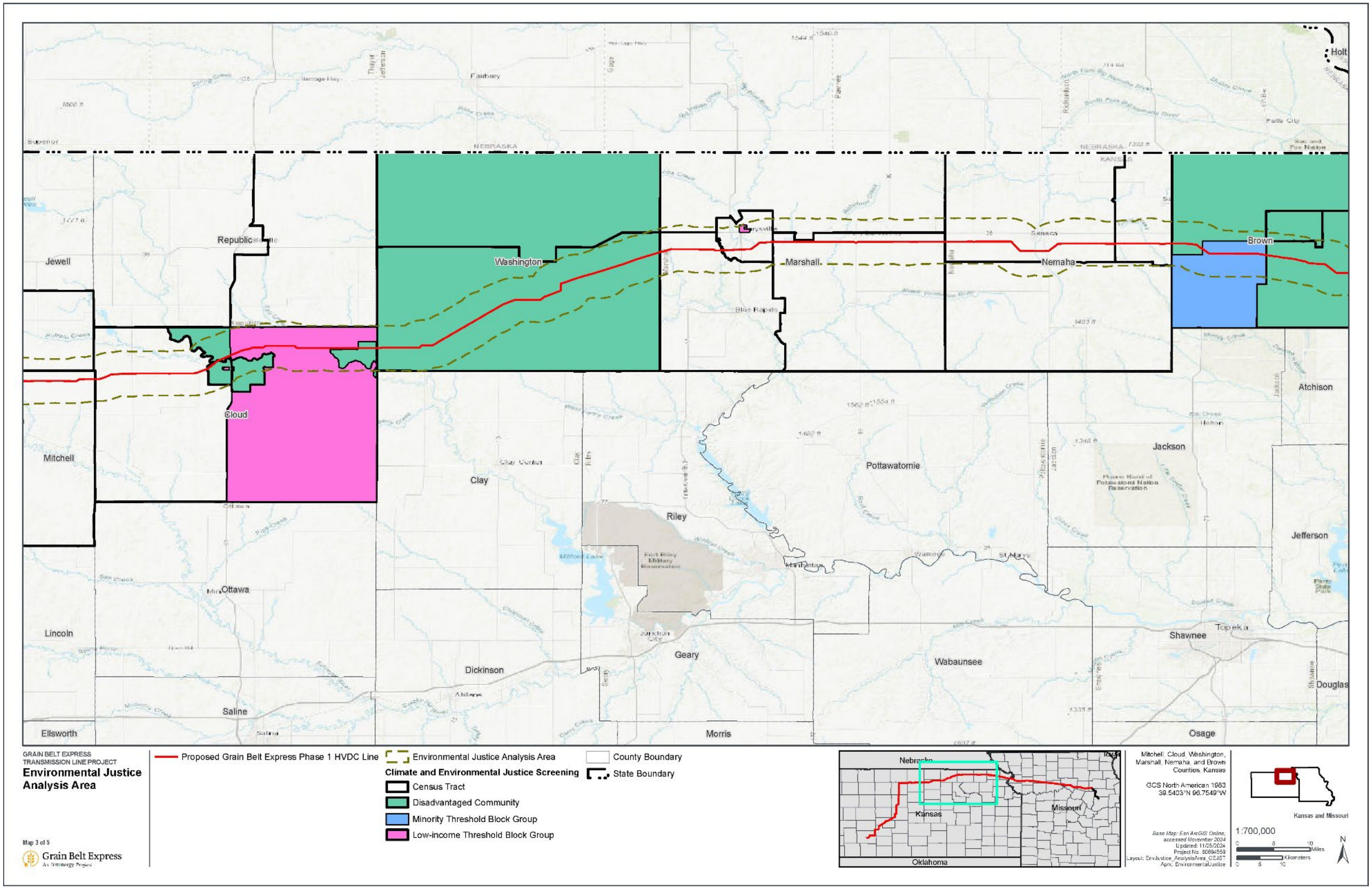

Figure 3.15-3. Environmental Justice Analysis Area (Mitchell County to Brown County, Kansas)

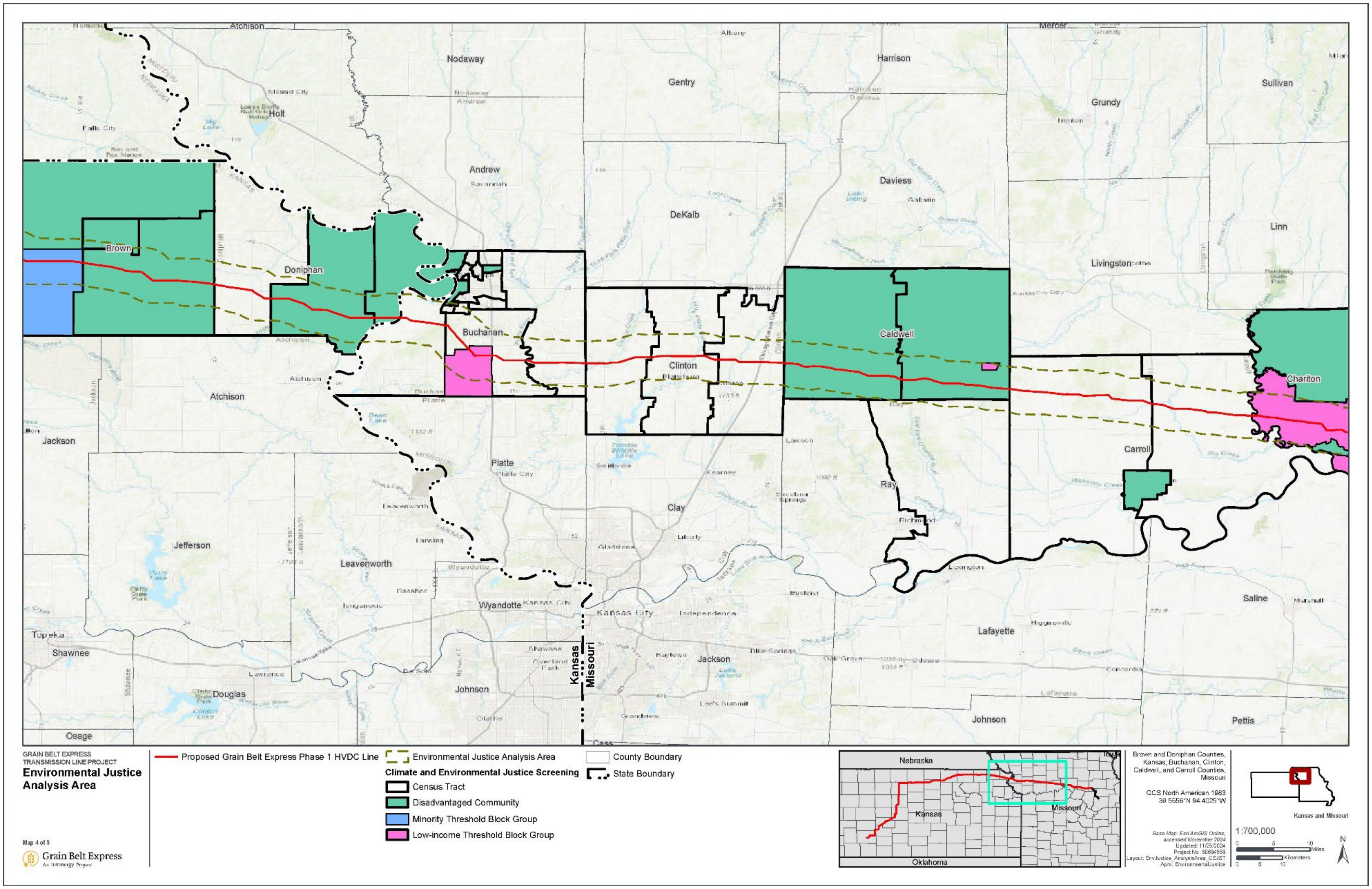

Figure 3.15-4. Environmental Justice Analysis Area (Brown County to Doniphan County, Kansas, and Buchanan County to Chariton County, Missouri)

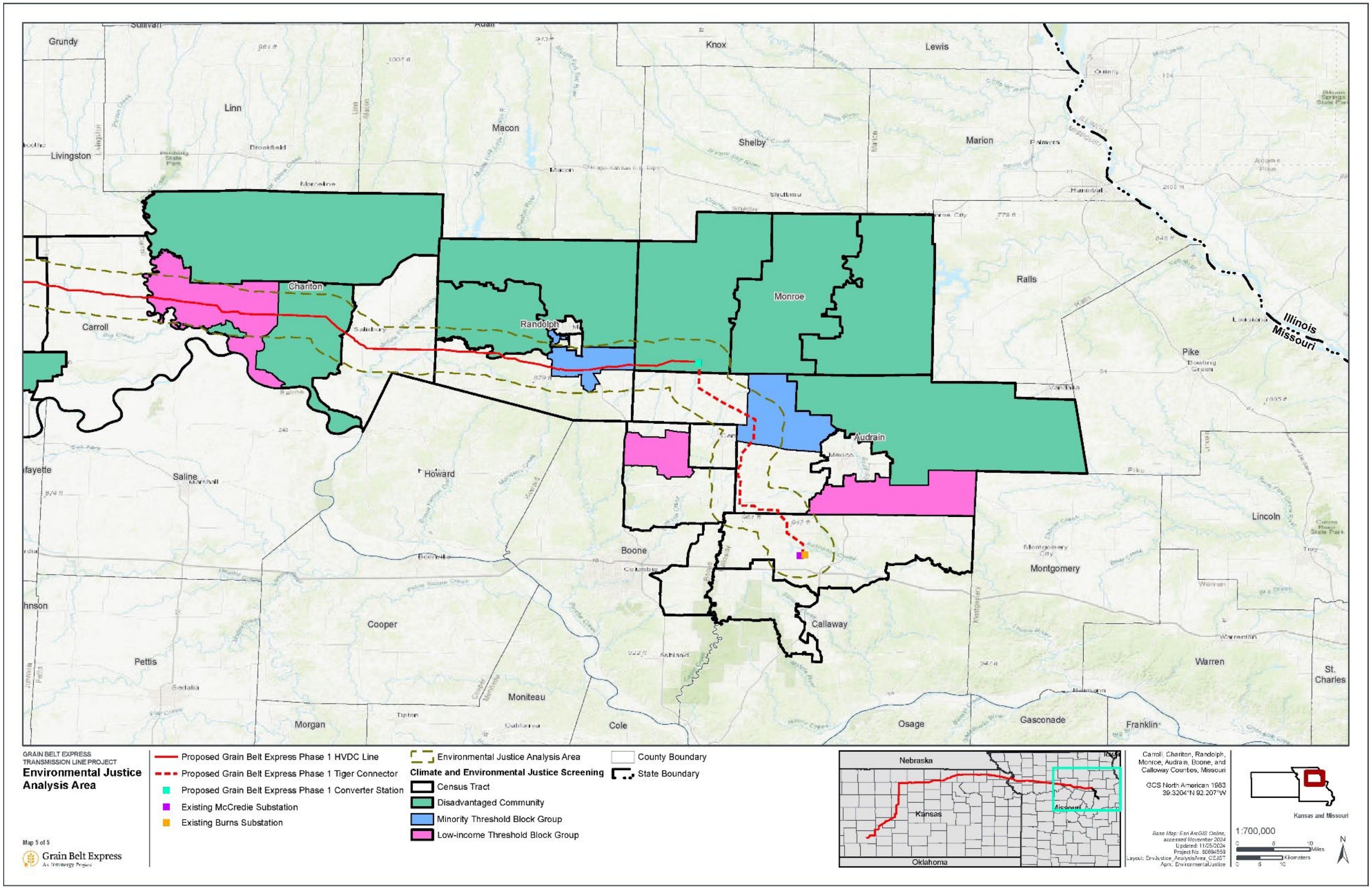

Figure 3.15-5. Environmental Justice Analysis Area (Carroll County to Callaway County, Missouri)

3.15.3 Affected Environment

Several relevant EOs pertain to environmental justice and how to address it in the NEPA process.

EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (59 *Federal Register* 7629), signed in 1994, requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority communities and low-income populations. Under EO 12898, demographic information is used to determine whether minority populations or low-income populations are present in the areas potentially affected by a project. If either is present, a determination must be made as to whether a project may result in disproportionately high and adverse human health or environmental effects on those populations.

The general principles of EO 12898 are as follows:

- Avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority and low-income populations.
- Ensure the full and fair participation of potentially affected communities in the decision-making process.
- Prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority and low-income populations.

EO 14096, *Revitalizing Our Nation's Commitment to Environmental Justice for All*, signed in 2023 (CEQ 2023), recognizes that every person has a right to breathe clean air, drink clean water, and live in a healthy community. It calls on agencies to implement and enforce the nation's environmental and civil rights laws, prevent pollution, address climate change and its effects, and work to clean up legacy pollution that is harming human health and the environment. EO 14096 specifies that agencies shall do the following when conducting environmental reviews under NEPA:

- Analyze direct, indirect, and cumulative effects of Federal actions on communities with environmental justice concerns;
- Consider best available science and information on any disparate health effects (including risks) arising from exposure to pollution and other environmental hazards, such as information related to the race, national origin, socioeconomic status, age, disability, and sex of the individuals exposed; and
- Provide opportunities for early and meaningful involvement in the environmental review process by communities with environmental justice concerns potentially affected by a proposed action, including when establishing or revising agency procedures under NEPA.

EO 14096 also amended the language of previous EO 12898. It uses the term "disproportionate and adverse" as a simpler, modernized version of the phrase "disproportionately high and adverse" that was used in EO 12898. The two phrases have the same meaning but removing the word "high" eliminates potential misunderstanding that agencies should only be considering large disproportionate effects.

EO 13985, *Advancing Racial Equity and Support for Underserved Communities Through the Federal Government,* signed in 2021, addresses equity across the Federal Government to help create opportunities for the improvement of communities that have been historically underserved. EO 14008, *Tackling the Climate Crisis at Home and Abroad,* also enacted in 2021, calls for securing environmental justice and economic justice in line with EO 12898.

3.15.3.1 Analysis Tools

The EPA 2016 *Technical Guidance for Assessing Environmental Justice in Regulatory Analysis* states "analysts should follow identified best practices for incorporating potential environmental justice concerns into regulatory analysis, when feasible and applicable." In addition, per guidance on the EPA Environmental Justice and National Environmental Policy Act website, "geographic information systems mapping tools can be used to assist practitioners in defining, delineating, and profiling communities with environmental justice concerns."

In accordance with these principles, two mapping tools were used in this analysis to illustrate the locations of potentially impacted environmental justice communities. The mapping identifies minority, low-income, and other disadvantaged communities, as described in further detail below.

3.15.3.1.1 EPA Environmental Justice Screening Tool (EJ Screen)

The EPA-developed environmental justice mapping and screening tool, known as EJ Screen, can be used to combine environmental and demographic indicators in maps and reports. The tool relies on US Census data for socioeconomic indicators, such as minority or low-income status, as very general indicators of potentially vulnerable populations, and combines this information with environmental indicator data for air (air toxics, particulate matter, ozone), wastewater, traffic (proximity and volume), lead paint, proximity to National Priorities List Superfund sites, proximity to Risk Management Program (RMP) facilities, proximity to hazardous waste management facilities, and proximity to underground storage tank and leaking underground storage tank sites.

3.15.3.1.2 Climate and Economic Justice Screening Tool (CEJST)

The DOE Climate and Economic Justice Screening Tool (CEJST) mapping tool tracks disadvantaged communities with respect to EO 14008. It uses datasets from the EJ Screen tool, along with DOE's Low-Income Energy Affordability Data Tool, which illustrates percentage of household income spent on energy bills, to identify disadvantaged communities by census tract. These are the communities that are considered disadvantaged because they are overburdened and underserved. The tool does not specifically consider minority populations in these criteria.

3.15.3.2 Minority Populations

Minority status is composed of both race and ethnicity. The CEQ defines minority individuals as persons from any of the following U.S. Census categories for race: Black/African American, Asian, Native Hawaiian or Other Pacific Islander, and American Indian or Alaska Native, other non-white race, or persons of two or more races and Hispanic or Latino (CEQ 1997). Race and ethnicity are not mutually exclusive; therefore, individuals who identify as Hispanic origin can be of any race (CEQ 1997).

A minority community is any readily identifiable group or groups of minority populations who live in geographic proximity to a project, as well as potentially geographically dispersed individuals (e.g., Native Americans) who would be similarly affected. Minority populations may reside in tightly clustered communities or be evenly or unevenly distributed throughout the general population. The federal definition of a minority environmental justice community requires that the minority population of that community either (1) exceeds 50 percent of the total population of the community, or (2) represents a meaningfully greater increment of the affected population than the minority population percentage in the general population or other appropriate unit of geographic analysis (CEQ 1997; FIWG 2016). For this analysis, a minority community is one where the minority population percentage of a census block group exceeds the state minority population percentage, in accordance with the EJ Screen tool.

Furthermore, EPA's environmental justice guidance states, "Impacts that may affect a cultural, historical, or protected resource of value to an Indian Tribe or a minority population, even when the population is not concentrated in the vicinity" should be considered in an environmental justice analysis (EPA 2022).

The discussion of minority populations herein is based on the federal definition provided above.

3.15.3.3 Low-Income Populations

The U.S. Census Bureau defines a "poverty area" as a census tract or block numbering area where at least 20 percent of residents are below the poverty threshold level, and an "extreme poverty area" as one with 40 percent or more of residents below the poverty threshold level (U.S. Census Bureau 2021). For reference, the federal poverty level in 2024 was $31,200 for a family of four (HHS 2024). The HHS poverty guidelines were used in comparison with the latest available median household income data provided at the block group level by the U.S. Census Bureau American Community Survey (U.S. Census Bureau 2024a).

Low-income populations may reside in tightly clustered communities, rather than being evenly distributed throughout the general population. For this analysis, a low-income community is considered one that is designated according to the EJ Screen Tool Low-Income Socioeconomic Threshold. The EJ Screen Tool identifies low-income communities as a percent of the census block group population in households where the household income is less than or equal to twice the federal poverty level. The areas mapped show block groups where 80 percent or more of the block groups meet the threshold.

3.15.3.4 Disadvantaged Communities

The CEJST uses datasets that are indicators of environmental justice burdens that could create a disadvantage for the community. These indicators reflect the multiple ways that a community may be experiencing burdens. The CEJST identifies disadvantaged communities based on all the indicators of burden included in its methodology; it was not designed to produce separate lists for each category of burdens. The tool ranks most of the burdens using percentiles, which show how much burden each census tract experiences compared to other census tracts.

Communities are considered disadvantaged if the following conditions are met:

- They are in census tracts that meet the thresholds for at least one of the tool's categories of burden, or
- They are located within the boundaries of Federally Recognized Tribes.

A community is highlighted as disadvantaged on the CEJST map if it is in a census tract that is (1) at or above the threshold for one or more environmental, climate, or other burdens (90th percentile or greater), and (2) at or above the threshold for an associated socioeconomic burden.

3.15.3.5 Kansas

Based on the low-income and minority criteria above for environmental justice communities, there are eight census block groups in the environmental justice analysis area in Kansas that meet the definition for either minority or low-income populations. **Tables 3.15-1** and **3.15-2** present key demographic data for these potentially affected environmental justice communities (from west to east). As shown in **Table 3.15-1**, three of the census block groups have higher percentages of minority residents than the state minority rate, ranging from 36.1 percent to 71.2 percent, compared to 26.6 percent for the state. As shown in **Table 3.15-2**, four census block groups are low-income populations with more than 80 percent of the population meeting the EJ Screen low-income threshold. None of the block groups meet both the minority and low-income thresholds for environmental justice communities.

Table 3.15-1. Kansas Census Block Groups in the Environmental Justice Analysis Area Meeting Minority Thresholds

Block Group	County	Project Facilities in County	Population Estimate	Minority Rate
Kansas				**26.6%**
200579621022	Ford	HDVC Line, HDVC converter station site, Ford County Interconnect AC transmission line	2,391	71.2%
200479697002	Edwards	HVDC Line	805	36.1%
200134806002	Brown	HDVC Line	799	59.3%

Sources: U.S. Census Bureau 2024a, 2024b; EPA 2024b

Table 3.15-2. Kansas Census Block Groups in the Environmental Justice Analysis Area Meeting Low-Income Thresholds

Block Group	County	Project Facilities in County	Population Estimate	Population Meeting the Low-income Threshold
200299772001	Cloud	HVDC Line	1,005	82%
200299773002	Cloud	HVDC Line	526	87%
201170605103	Marshall	HDVC Line	765	88%
201679738005	Russell	HVDC Line	611	90%

Source: EPA 2024b

Based on the criteria for disadvantaged communities outlined above for environmental justice communities, 17 census tracts in the environmental justice analysis area in Kansas exceed the 90th percentile for at least one of the indicators of burden. **Table 3.15-3** presents a list of the burden indicators for these potentially affected disadvantaged communities (from west to east). The most common indicators of burden for the census tracts that meet the criteria for disadvantaged communities were related to climate change and legacy pollution. There were also tracts that meet the criteria for workforce development, housing, water, waste, and health, illustrating some of the potential historic environmental justice challenges that the community faces. The full CEJST data set, including percentage of burden for each indicator, is included in **Appendix 3.15**.

Table 3.15-3. Kansas Census Tracts in the Environmental Justice Analysis Area Meeting Disadvantaged Community Thresholds

Census Tract	County	Project Facilities in County	Population Est	Climate Change Threshold	Housing Threshold	Health Threshold	Legacy Pollution	Water and Waste Threshold	Workforce Development Threshold
20057961800	Ford	HVDC Line, Existing Saddle Substation, HVDC converter station	9,323	X					
20057962000	Ford	HVDC Line, Existing Saddle Substation, HVDC converter station	5,912	X					X
20057962102	Ford	HVDC Line, Existing Saddle Substation, HVDC converter station	3,842	X	X				X
20057962101	Ford	HVDC Line, Existing Saddle Substation, HVDC converter station	3,698	X			X		X
20047969700	Edwards	HVDC Line	1,408	X	X				
20167973800	Russell	HVDC Line	4,343	X				X	
20123176700	Mitchell	HVDC Line	2,133	X			X		
20029977200	Cloud	HVDC Line	2,394	X					
20029977100	Cloud	HVDC Line	2,259	X					
20029977300	Cloud	HVDC Line	3,131	X		X	X		
20201978700	Washington	HVDC Line	2,527	X		X	X		
20201978600	Washington	HVDC Line	3,002	X					
20013480800	Brown	HVDC Line	3,409			X	X		
20013480700	Brown	HVDC Line	3,437	X			X		
20013480600	Brown	HVDC Line	2,914	X	X				
20043020300	Doniphan	HVDC Line	3,149	X			X		
20043020200 [a]	Doniphan	HVDC Line	1,908	X					

Source: CEQ 2024, Climate & Economic Justice Screening Tool (geoplatform.gov)

[a] This tract is not currently mapped as a disadvantaged community in CEJST 2024; however, the data show it meets the burden threshold for a disadvantaged community.
Note: The CEJST also evaluates Energy and Transportation burdens; however, all census tracts were below the burden thresholds with respect to Energy and Transportation.

3.15.3.6 Missouri

Based on the criteria for environmental justice communities (meeting either the minority or low-income thresholds), 11 census block groups in the environmental justice analysis area in Missouri meet the definition of either minority and/or low-income populations. **Tables 3.15-4** and **3.15-5** present key demographic data for these potentially affected environmental justice communities (from west to east). As shown in **Table 3.15-4**, three census block groups have a higher percentage of minority residents than the state (37.4 percent, and 23.8 percent, and 33.3 percent compared to 22.4 percent). As shown in **Table 3.15-5**, five census block groups are low-income populations with more than 80 percent of the residents meeting the EJ Screen low-income threshold. None of the census block groups in Missouri meet the thresholds for both the minority and low-income for environmental justice communities.

Table 3.15-4. Missouri Census Block Groups in the Environmental Justice Analysis Area Meeting Minority Thresholds

Block Group	County	Project Facilities in County	Population Estimate	Minority Rate
Missouri				**22.4%**
291754904003	Randolph	HVDC Line	1,558	37.4%
291754906001	Randolph	HVDC Line	2,426	23.8%
290079503002	Audrain	HVDC Line	986	33.3%

Source: U.S. Census Bureau 2024a, 2024b; EPA 2024b

Table 3.15-5. Missouri Census Block Groups in the Environmental Justice Analysis Area Meeting Low-Income Thresholds

Block Group	County	Project Facilities in County	Population Estimate	Population Meeting the Low-income Threshold
290210029001	Buchanan	HVDC Line	774	93%
290499603001	Clinton	HVDC Line	452	92%
290190020001	Boone	HVDC Line	990	81%
290414702002	Chariton	HVDC Lin	1,058	80%
290259502011	Caldwell County	HVDC Line	516	80%

Source: EPA 2024b

Based on the criteria for disadvantaged communities outlined above for environmental justice communities, there are 15 census tracts in the environmental justice analysis area in Missouri with concentrations that exceed the 90th percentile for at least one of the indicators of burden. **Table 3.15-6** presents a list of the burden indicators for these potentially affected disadvantaged communities. The most common indicators of burden for the census tracts that meet the criteria for disadvantaged communities were related to climate change, energy, transportation and health, highlighting some of the potential historical environmental justice challenges that the respective communities face. There were also tracts that meet the criteria for water and waste, legacy pollution, workforce, and housing. One of the tracts in Buchanan County meets all of the burden threshold criteria. The full CEJST data set, including percentage of burden for each indicator, is included as **Appendix 3.15-**.

Table 3.15-6. Missouri Census Tracts in the Environmental Justice Analysis Area Meeting Disadvantaged Community Thresholds

Census Tract	County	Project Facilities in County	Population Est	Climate Change Threshold	Energy Threshold	Housing Threshold	Health Threshold	Legacy Pollution	Transportation Threshold	Water and Waste Threshold	Workforce Development Threshold
29021000400	Buchanan	HVDC Line	1,444	X					X	X	
29021000300	Buchanan	HVDC Line	2,571					X			
29021000702	Buchanan	HVDC Line	4,198			X	X				
29021003000	Buchanan	HVDC Line	6,277	X	X	X	X	X	X	X	X
29025950200	Caldwell	HVDC Line	6,202				X		X		
29025950100	Caldwell	HVDC Line	2,674		X		X		X		
29033960300	Carroll	HVDC Line	3,743				X				
29041470200	Chariton	HVDC Line	2,491	X			X				
29041470100 [a]	Chariton	HVDC Line	2,384	X	X	X		X			
29175490200	Randolph	HVDC Line	3,296	X							
29175490100 [a]	Randolph	HVDC Line	3,850	X							
29137960300	Monroe	HVDC Line, HVDC converter station	2,266	X		X			X		
29137960200	Monroe	HVDC Line, HVDC converter station	2,486	X	X		X		X		
29137960100 [a]	Monroe	HVDC Line, HVDC converter station	3,574	X	X				X		
29007950200	Audrain	HVDC Line	4,738			X					

Source: CEQ 2024, Climate & Economic Justice Screening Tool (geoplatform.gov)
[a] This tract is not currently mapped as a disadvantaged community in CEJST 2024; however, the data show it meets the burden threshold for a disadvantaged community.

3.15.4 Environmental Consequences of Proposed Federal Action

3.15.4.1 Methods and Assumptions

According to CEQ and EPA guidelines, the first step in conducting an environmental justice analysis is to define minority and low-income populations. The minority and low-income populations present in the environmental justice analysis area are identified in **Section 3.15.3**. For this analysis, additional categories of burden that can indicate environmental justice vulnerability were also mapped.

According to CEQ guidance, environmental justice analysis requires that a determination be made regarding whether a "high and adverse" health or environmental effect to a minority and/or low-income population would occur. The CEQ guidance indicates that when determining whether the effects are high and adverse, agencies are to consider whether the risks or rates of effect "are significant (as that term is defined by the NEPA lead agency) or above generally accepted norms" (CEQ 1997). While some impacts may occur in proximity to the environmental justice communities identified above, the analysis below demonstrates that any Project impacts would affect all populations and communities within the environmental justice analysis area equally.

In accordance with the CEQ guidance, this environmental justice analysis included a review of significant impacts identified in all other sections of this EIS and determined whether environmental justice communities would experience disproportionate and adverse effects per CEQ (1997) guidelines. Disproportionate and adverse effects on environmental justice communities resulting from changes to the environment are identified by assessing the following factors:

- Whether there would be an impact to the natural or physical environment that adversely affects a minority population, low-income population, or Indian tribe.
- Whether environmental effects are or may be having an adverse impact to minority populations, low-income populations, or Indian tribes that appreciably exceeds or is likely to appreciably exceed those on the general population or other appropriate comparison group.
- Whether the environmental effects occur or would occur in a minority population, low-income population, or Indian tribe affected by cumulative or multiple adverse exposures from environmental hazards.

3.15.4.2 EJ Mapping

As noted above, multiple tools have been developed to help support identification of communities that may be vulnerable to environmental justice impacts (**Section 3.15.3.1**).

For the purposes of this analysis, the environmental justice analysis area was considered and mapped using both the EJ Screen tool and the CEJST. The combined approach offers a more comprehensive look into potential indicators of communities that may be vulnerable to environmental justice impacts or considered disadvantaged. The findings of both tools are mapped for comparison purposes.

In terms of environmental impacts that could also result in adverse effects on environmental justice communities, the following resource areas were determined not to have adverse impacts to any population, including environmental justice communities: paleontology and soils (**Section 3.3**); water resources (**Section 3.4**); vegetation (**Section 3.5**); special designation areas (**Section 3.7**); wildlife (**Section 3.8**); transportation (**Section 3.9**); land use (**Section 3.10**); recreation (**Section 3.11**); visual resources (**Section 3.12**), and public health and safety (**Section 3.16**).

In addition to the methodology described above, the environmental justice analysis considered which measures the Project would implement to avoid or minimize impacts or to provide benefits that would affect environmental justice communities. These environmental protective measures (EPMs), described in Chapter 2, would be applied during construction, operations and maintenance, and decommissioning in both environmental justice communities and non-environmental justice communities.

3.15.4.3 Construction

In accordance with the CEQ guidance, construction-related impacts identified in other sections of the EIS that could have potentially significant impacts to minority and low-income communities include air quality, greenhouse gas emissions, and climate change (**Section 3.2**), impacts to cultural resources (**Section 3.6**), increases in construction-related traffic (**Section 3.9**), noise (**Section 3.13**), and social, economic, and community resources (**Section 3.14**). **Table 3.15-7** summarizes in detail these potential construction-related impacts to environmental justice communities and whether they would be disproportionate and adverse. Temporary and localized construction-related impacts could include increases in vehicle emissions, increases in noise levels, and socioeconomic changes from an increase in demand for services and healthcare by construction workers.

With respect to cultural resources, even when protected in accordance with state and federal regulations, the potential for disproportionate impacts still exists if a minority group places high value on the cultural resource. For this Project, no such cultural resources have been identified at this time, and DOE LPO is in communication with tribes to identify any tribal interests, treaty rights, and heritage resources. The Applicant plans to avoid priority cultural areas during construction, operations and maintenance, and decommissioning activities (refer to **Section 3.6**).

Table 3.15-7. Potential Construction Impacts to Environmental Justice Communities

Resource Topic	Environmental Consequences
Air Quality, Greenhouse Gas Emissions, and Climate Change (**Section 3. 2**)	Given that air emissions in the Project area are lower than the pollutant de minimis levels and NAAQS thresholds (with the exception of CO), and that the small increase in county emissions from construction activities (including CO) would not cause an exceedance of NAAQS and would maintain each county's attainment status, minimal air quality impacts from construction are expected. Based on the estimated construction emissions, county-wide emission increases due to the Project would be less than 3 percent. The largest percentage increase (2.8 percent) would occur for SO_2 emissions in Osborne County, Kansas, which does not have any identified environmental justice populations. Given the small increase in county emissions, construction of the Project would not cause an exceedance of NAAQS and would maintain each county's attainment status; thus, it would not increase potential health effects or overexposure to environmental hazards. As such, the effects would not be considered to be disproportionate and adverse to environmental justice communities. Air quality impacts from dust would be managed through EPMs to protect topsoil and minimize soil erosion, which would limit the potential for fugitive dust and associated particulate matter. Impacts would be spread across the entirety of the Project area and would impact environmental justice communities the same as non-environmental justice communities. As such, the effects would not be considered disproportionate and adverse to environmental justice communities. **No disproportionate and adverse effects to environmental justice communities are anticipated.**
Cultural (**Section 3.6**)	Any archaeological sites encountered during the ongoing archaeological field investigations would be assessed for NRHP eligibility and included in the NHPA Section 106 consultation process.

Resource Topic	Environmental Consequences
	In addition to avoiding historic buildings, structures, objects, and districts, the Project design avoids previously recorded cemeteries, unmarked graves, and high-potential unmarked burial areas identified by the Kansas and Missouri SHPO as a part of their state-specific unmarked burial programs. As noted in **Appendix 2.4**, the Applicant would not conduct construction-related activities, including surveys, in Osage Nation-provided AOAs. As a result, there would be no impact to tribal resources within these AOAs. Should the Project have a potential impact that is determined to be an adverse effect to a tribal resource, consultation with the appropriate tribe and Tribal Historic Preservation Officer and/or SHPO would be conducted to avoid, minimize, or mitigate the adverse effect caused by the Project impact. Potential impacts to tribal resources would be addressed via consultation and mitigation. No specific tribal boundaries were identified during the environmental justice and disadvantaged community mapping for the project. Other potential cultural resource impacts of the Project, including potential impacts to archaeological resources and built environment resources, would not be expected to impact a particular population; thus Impacts would affect environmental justice communities the same as non-environmental justice communities. . **No disproportionate and adverse effects to environmental justice communities are anticipated**.
Transportation (**Section 3.9**)	Traffic resulting from construction activities may impact passenger bus, school bus, and emergency response vehicle routes and travel patterns. Because most Project-related traffic is expected to occur before and after commute times, overall potential impacts to these services would be expected to be minimal, and emergency response routes and traffic-related impediments would be addressed as part of the Construction Traffic Control Plan noted in **Chapter 2**. There would be no increase in potential traffic safety effects concentrated in the environmental justice communities identified. Impacts would be spread across the entirety of the Project area and would impact environmental justice communities the same as non-environmental justice communities. As such, the effects would not be considered to be disproportionate and adverse to environmental justice communities. **No disproportionate and adverse effects to environmental justice communities are anticipated.**
Noise (**Section 3.13**)	Noise due to Project construction would be temporary and only present during construction activities, which would be primarily limited to daytime hours. At the nearest residences along the planned Project ROW, which are approximately 165 feet away and not located in an environmental justice community, the loudest construction noise would be comparable to that of a vacuum cleaner operating 10 feet away. Project construction noise levels would decrease with distance to noise-sensitive receptors and would not exceed the Federal Transit Administration guidance on construction noise limits at any noise-sensitive receptor. Light-duty helicopters would be deployed from fly yards and helipads during construction activities, which typically result in noise of 72 to 81 dBA at 250 feet from the helicopter. Heavy-lift helicopters typically result in noise of 90 to 96 dBA at 250 feet from the helicopter (Helicopter Association International Fly Neighborly Committee 1993). Noise from helicopters would be more transient and shorter in duration than ground-based construction activities, and because construction activities would be linear in nature, helicopters would not operate in the vicinity of one noise-sensitive land use for an extended period. At the time of the Draft EIS preparation, helicopters are only planned to be used at the Missouri River Crossing. Therefore, there would not be an increase in potential health effects or overexposure to environmental hazards. Impacts would be spread across the entirety of the Project area and would impact environmental justice communities the same as non-environmental

Resource Topic	Environmental Consequences
	justice communities. As such, the effects would not be considered to be disproportionate and adverse to environmental justice communities. **No disproportionate and adverse effects on environmental justice communities are anticipated.**
Social, Economic, and Community Resources (**Section 3.14**)	The temporary residency of the non-local construction worker could result in increased demand for services such as emergency medical support. If the magnitude of the additional demand exceeds the providers' service capacity, the growth in demand would likely be viewed as adverse. However, for most of the counties, even if a specific county receives the full influx of construction workers, their populations and resulting demand for public services would remain below 2010 levels. Of the counties that would exceed the 2010 population levels should they receive the full influx of construction workers, Russell County is the only one with identified environmental justice populations (low-income); however, conservatively assuming an influx of 150 temporary, short-term non-local construction workers, the net temporary population increase would correspond to 130 more than the 2020 population, which is less than a 1.9 percent temporary population increase (see **Section 3.14**). Construction-related impacts to public service provision in these counties and the region would be characterized as an indiscernible change. Impacts would be spread across the entirety of the Project area and would impact environmental justice communities the same as non-environmental justice communities. As such, the effects would not be considered to be disproportionate and adverse to environmental justice communities. Project construction would result in additional employment from businesses supporting the Project construction (indirect) as well as jobs that result from spending by employees (both Project and supporting business) on goods and services (induced) within the state. This would have a beneficial effect on all communities proximate the Project area. **No disproportionate and adverse effects on environmental justice communities are anticipated.**

EPM: environmental protection measure; SO_2: sulfur dioxide

3.15.4.4 Operations and Maintenance

Long-term operations and maintenance-related impacts identified in other sections of the EIS that could have adverse impacts to minority and low-income communities include air quality, greenhouse gas emissions, and climate change (**Section 3.2**), transportation (**Section 3.9**), and noise (**Section 3.13**). Impacts could include increases in vehicle emissions, construction-related traffic, and noise levels. **Table 3.15-8** summarizes potential impacts to environmental justice communities from operations and maintenance activities and whether those impacts would be disproportionate and adverse.

Table 3.15-8. Potential Operations and Maintenance Impacts on Environmental Justice Communities

Resource Topic	Environmental Consequences
Air Quality, Greenhouse Gas Emissions, and Climate Change (**Section 3.2**)	The estimated operations and maintenance emissions would be less than the respective general conformity pollutant de minimis level of 100 tons per year. Therefore, Project operations and maintenance activities would not cause an exceedance of NAAQS, nor would they affect each county's attainment status throughout the life of the Project. There would be no increase in potential health effects or overexposure to environmental hazards. Impacts would be spread across the entirety of the Project area and would impact environmental justice communities the same as non-environmental justice communities. As such, the effects would not be considered to be disproportionate and adverse to environmental justice communities. **No disproportionate and adverse effects to environmental justice communities are anticipated.**

Resource Topic	Environmental Consequences
Transportation (**Section 3.9**)	Operations and maintenance activities along the planned Project ROW that would impact transportation would include vehicles, drones, and helicopters used for inspections, repairs, and vegetation management. All applicable EPMs listed in **Appendix 2.4** would be followed during operations and maintenance activities. If large-scale maintenance becomes necessary during Project operation, a localized Traffic Management Plan would be prepared and followed. There would be no increase in potential health effects or overexposure to traffic safety impacts concentrated in the environmental justice communities identified. Impacts would be spread across the entirety of the Project area and would impact environmental justice communities the same as non-environmental justice communities. As such, the effects would not be considered to be disproportionate and adverse to environmental justice communities. **No disproportionate and adverse effects to environmental justice communities are anticipated.**
Noise (**Section 3.13**)	Operational noise from the HVDC converter stations at the closest noise-sensitive land uses is predicted to range from 46 to 49 dBA, L_{dn}. Combined with the existing noise environment, future operation of the HVDC converter stations would result in an overall noise exposure increase of 4 to 6 dBA at noise-sensitive land uses. Noise levels associated with operation of the Project would not exceed the EPA guidance threshold of 55 dBA. The noise impacts due to maintenance activities would be transient and intermittent, as in that they would only occur where and when maintenance is needed and would be limited to the duration of the maintenance activity. There would be no increase in potential health effects or overexposure to environmental hazards. Impacts would be spread across the entirety of the Project area and would impact environmental justice communities the same as non-environmental justice communities. As such, the effects would not be considered to be disproportionate and adverse to environmental justice communities. **No disproportionate and adverse effects to environmental justice communities are anticipated.**

dBA: A-weighted decibel, EPA: U.S. Environmental Protection Agency

3.15.4.5 Decommissioning

Site decommissioning would be performed at the end of the service life of the Project in accordance with a Decommissioning Plan. Activities during decommissioning would likely have similar impacts to environmental justice as those during construction. Temporary and localized impacts could include increases in vehicle emissions, increases in noise levels, and socioeconomic changes from an increase in demand for services and health care by construction workers. Impacts to environmental justice communities would likely be the same as non-environmental justice communities. As such, the impacts would not be considered disproportionate and adverse to environmental justice communities.

3.16 Public Health and Safety

3.16.1 Issues for Analysis

Based on NEPA statutory and CEQ/DOE regulatory requirements; input from federal, state, and local agencies and tribal governments; and comments received during scoping, the public health and safety analysis addresses the following:

- Human health impacts from exposure to hazardous materials or contaminated soils;
- Human health impacts and safety risks from EMF and interference;
- Potential health and safety issues posed by interference with communications and other electric devices;
- Safety issues regarding currents and shocks from transmission lines;
- Risk of wildfire from Project infrastructure or activities and risk to Project infrastructure from wildfires;
- Impacts from severe weather;
- Impacts from lightning striking the transmission lines;
- Accidents and intentional destructive acts; and
- Worker safety during construction, operations and maintenance, and decommissioning activities.

Scoping comments also identified concerns related to the risk of aircraft collisions. The potential impacts to airspace are discussed in **Section 3.9**.

Worker safety in construction and industrial settings is regulated by the OSHA. The Project would be subject to OSHA standards during construction (e.g., OSHA General Industry Standards [29 CFR Part 1910] and the OSHA Construction Industry Standards [29 CFR Part 1926]). The OSHA standards are designed to protect workers from potential construction and industrial accidents, as well as to minimize exposure to workplace hazards (e.g., noise, chemicals). Since workers safety is regulated by OSHA and a number of safety practices would be implemented to comply with OSHA standards, impacts to worker safety are not discussed further.

Discussion of the No Action Alternative is presented in **Section 3.1**.

3.16.2 Analysis Area

The public health and safety analysis area for contaminated soils and hazardous materials, wildfire, and worker safety is the Project area. The public health and safety analysis area for EMF hazards and interference (EMF analysis area) is a 150-foot buffer of the centerlines for the HVDC Line, Ford County Interconnect, and Tiger Connector (300 feet total) and within the fence line of the converter stations. The public health and safety analysis areas were chosen because these are where impacts to workers and public health and safety could occur during construction, operations and maintenance, and decommissioning of the Project. The total acreage for the public health and safety analysis area is 21,234 acres.

3.16.3 Affected Environment

3.16.3.1 Contaminated Soils and Hazardous Materials

The public health and safety analysis area primarily contains rural agricultural land. Due to historical and ongoing agricultural use, soil contamination within the analysis area may exist from pesticides, unauthorized dumping, or historical unreported hazardous materials spills. The Project was sited to avoid developed areas, which have a higher potential likelihood for environmental contamination from commercial or industrial activities. A review of EPA's Facility Registry Service database found no potential sources of contamination in the analysis area for hazardous materials (EPA 2023). Phase 1 Environmental Site Assessments conducted for the converter station sites found no evidence of recognized environmental conditions in connection with the subject properties (SWCA 2022a, 2022b).

3.16.3.2 Electric and Magnetic Fields

Electric and magnetic fields and their potential impacts to public health were raised as a concern during scoping. Existing sources of electrical effects are present within the public health and safety EMF analysis area. These effects include static and power-frequency fields, as well as radio frequency signals. Sources of these effects include existing power lines and communications equipment. Since the use of electricity is an integral part of modern lifestyle, these effects are commonly found in our everyday environment and, therefore, within the public health and safety EMF analysis area. Some existing transmission lines, shown on **Figures 3.10-1** through **3.10-4** in **Section 3.10**, already create electrical effects within the environment and would be intersected or paralleled by the planned Project ROW.

3.16.3.3 Wildfire and Severe Weather

Wildfire, an uncontrolled fire spreading through vegetative fuels, could occur at any point within the public health and safety analysis area. Areas in Kansas and Missouri represent wildfire hazards, given the climate and vegetative fuels present (**Section 3.5**). Wildfires can spread quickly through short and dry vegetation, such as grasslands, shrublands, or some agricultural crops. The largest wildfire to intersect the public health and safety analysis area was the December 2021 Four County Fire, which ignited due to downed AC transmission lines during a high-wind event and burned more than 400,000 acres in Ellis, Rooks, Russell, and Osborne Counties, Kansas. Most other wildfires in the vicinity of the public health and safety analysis area have burned fewer than 1,000 acres (National Interagency Fire Center 2022).

Fire response is provided by local and county first responders. The capabilities and availability of these local resources to respond to wildfire vary with staffing levels and availability, access to appropriate equipment, and distances to wildfires. There are approximately 55 fire stations located within 5 miles of the public health and safety analysis area (USGS 2020). Kansas and Missouri can be impacted by wide-ranging weather patterns due to a lack of geographic barriers. The winter season is dominated by cold, dry air, and the summer is typically characterized by either hot and dry continental air masses from the arid west and southwest or warm and moist air from the south. The average winter temperature (January to March) is 33.0°F in Kansas and 35.7°F in Missouri, while the average summer temperature (June to August) is 76.8°F in Kansas and 75.5°F in Missouri (Frankson et al. 2022a, 2022b). Severe thunderstorms are common in Kansas and Missouri during the summer months, producing periods of heavy rain, high winds, large hail, and tornadoes (Frankson et al. 2022a, 2022b). Tornado activity has become more variable in recent decades, with a decrease in the annual number of days with tornadoes and an increase in the number of tornadoes on these days (Hayhoe et al. 2018).

3.16.4 Environmental Consequences of Proposed Federal Action

3.16.4.1 Methods and Assumptions

The impacts to public health and safety from exposure to contaminated soils or hazardous materials, electrical and magnetic-related impacts, wildfire hazards, accidents and destructive acts, and worker safety are analyzed using the following factors:

- Potential for creating a hazard to the public through reasonably foreseeable accident conditions involving the release of hazardous materials into the environment or exposure to contaminated soil;
- Potential for creating a hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials;
- Potential for creating a hazard to the public through exposure to EMFs above recommended exposure limits;
- Potential for a lightning strike and associated wildfire hazard from Project facilities and to Project facilities from non-Project risks;
- Potential for impacts to public health and safety due to accidents and intentional destructive acts.

The analysis of impacts assumes that the EPMs listed in **Appendix 2.4** would be implemented to minimize impacts to public health and safety.

3.16.4.2 Construction

3.16.4.2.1 Contaminated Soils and Hazardous Materials

Although no contaminated sites were identified within the public health and safety analysis area, contaminated soils may be discovered during Project construction due to the number of agricultural lands that would be crossed. During surface-disturbing construction activities, the possibility exists of encountering contaminated soils or abandoned or unknown underground storage tanks within the disturbance area. Grading activities during construction could disrupt contaminated soil, creating potential health hazards. If contaminated soils are uncovered during construction, work would be stopped until the appropriate Project representatives could be consulted (see **Appendix 2.4**)

Construction of transmission facilities includes the use of hazardous materials such as fuels, oils, lubricants, coolants, cleaners, paints, and paint thinners. These materials would be stored in multi-use yards following OSHA and EPA guidelines. Herbicides may be used for vegetation management as described in **Section 2.1.1**. Project construction activities could result in leaks and accidental spills of these hazardous materials. As described in the EPMs provided in **Appendix 2.4**, a Spill Prevention and Response Plan would be developed to outline compliance with all applicable federal, state, and local regulations and would include spill prevention measures, notification procedures in the event of a spill, employee awareness training, and commitment of manpower, equipment, and materials to respond to spills, if they occur.

3.16.4.2.2 Electric and Magnetic Fields

There are no EMF hazards associated with construction of the Project because Project facilities would not be energized during construction. During construction, however, operating equipment and other construction efforts near existing energized (AC) power lines could increase risks to the health and safety of workers through inadvertent contact with energized overhead power lines and associated equipment or exposures above EMF guidelines. As described in the EPMs in **Appendix 2.4**, the Applicant would seek outages or clearances, if practicable, to minimize these risks. Safe practices may include grounding materials and equipment when working near other lines that are in operation and coordinating crossing procedures established for each line crossing during conductor stringing (e.g., outage of the energized line). Where work in the vicinity of energized transmission lines or other energized equipment is planned, safety measures specific to the immediate work area would be developed: only qualified personnel would perform the work, appropriate arc-flash practices and personal protective equipment would be employed, and arc-flash boundaries and approach boundaries to power lines would be identified within the electrical safety work plan and strictly followed.

3.16.4.2.3 Wildfire and Severe Weather

Wildfires could occur in the public health and safety analysis area during construction, which would cause risks to Project facilities, personnel, and the public. Fire hazards could result from Project-related activities such as hot-work, welding, smoking, implosive splicing, accidental ignition of flammable liquids, operating motorized construction equipment, refueling, electrical mishaps while energizing components, mechanical malfunction, and operating or parking recently running vehicles in areas with dry vegetation. Fire could also result from non-Project-related causes and could spread into the Project area. Once ignited, a wildfire could spread, causing injuries to workers or the public and causing damage to public property, existing infrastructure, Project facilities, construction equipment, and construction materials.

Wildfire risks in the form of dry conditions, dry brush, welding/grinding and other hot work, and windy conditions would be continuously assessed during Project work and frequently discussed as part of daily site safety briefings. It is possible that a wildfire could occur during Project construction, and it would be responded to per established safety and emergency response plans. **Section 3.8** contains information on wildfire impacts to the natural environment.

Impacts from extreme weather events may include damage to individual transmission structures, transmission wires (conductors), or converter stations during construction from severe weather, such as tornados, high winds, and flooding. These types of events may also damage or wash out roads and disrupt construction activities by blocking roadways and access points, damaging staging areas, or causing unsafe working conditions.

3.16.4.2.4 Accidents and Intentional Destructive Acts

Transmission lines and associated facilities are potential targets of intentional destructive acts, including theft, vandalism, and terrorism. During construction, the Project would use fencing and security lighting at converter station sites and multi-use yards to deter unauthorized access and theft, as detailed in Chapter 2. Converter station sites would have a temporary perimeter fence to prevent unauthorized access.

Accidents related to construction are regulated by OSHA and would not be expected to affect public health and safety.

3.16.4.3 Operations and Maintenance

3.16.4.3.1 Contaminated Soils and Hazardous Materials

Operation and maintenance activities would occur within the established ROW and result in limited temporary surface disturbance, though surface disturbance may be required for emergency repairs. Should it occur, it would likely occur in areas previously disturbed during Project construction. Therefore, no additional impacts related to contaminated soils would be expected to occur during operations and maintenance. Operations and maintenance activities could result in leaks and accidental spills of hazardous materials such as gasoline, diesel fuel, lubricants, and coolants used in equipment. Hazardous chemicals or materials used for routine maintenance activities may be stored at the converter stations where accidental releases could result in worker exposure. The EPMs described in **Appendix 2.4** would mitigate the potential impacts of releases of hazardous materials.

3.16.4.3.2 Electric and Magnetic Fields

The Project would introduce a new source of DC EMFs from the HVDC Line and converter stations and a new source of AC EMFs from the Ford County Interconnect and Tiger Connector. This section describes the potential impacts from both DC and AC electric and magnetic fields. Specifically, this section addresses public concerns about the health and safety risks posed by interference with communications devices, pacemakers, and other electronic equipment; currents and shocks; and the potential for creating exposure to electric and magnetic fields above recommended exposure limits.

DC EMF

HVDC transmission lines generate both electric and magnetic fields, together called EMF. Due to their static nature, the steady-state electric fields produced by HVDC lines interact with other objects less than AC electric fields do, and they generally do not affect people or equipment (ICNIRP 2022). A study related to HVDC lines analyzed the potential impacts of the EMF of HVDC transmission lines on the environment and concluded that the EMF of such lines does not result in harmful impacts to either animal or human populations (Bailey et al. 1997).

The ICNIRP develops and provides science-based guidance on limiting exposure to non-ionizing radiation, including recommendations for exposure limits to EMF. For the public, the ICNIRP recommends an instantaneous exposure limit to DC static magnetic fields of 4,000 mG (ICNIRP 2009). The magnetic field created by the HVDC Line is approximately 1,000 mG beneath the conductors and approximately 300 mG at the edge of the ROW. Magnetic fields associated with the HVDC Line would be far below limits for human exposure recommended by the ICNIRP and International Commission for Electromagnetic Safety (ICNIRP 2009, WHO 2007). The HVDC facilities are, therefore, not expected to adversely affect people, livestock, or equipment with potential EMF issues or exposure.

AC Magnetic Fields

Alternating current magnetic fields associated with AC transmission lines are far below limits for human exposure recommended by the ICNIRP and the International Commission for Electromagnetic Safety. The ICNIRP has identified a variable (AC) magnetic field instantaneous exposure level of less than 4,000 mG necessary to protect public health. The specific design limits for the AC conductor have a magnetic field of 200 mG at the edge of the planned Project ROW. Therefore, exposures related to the Project are expected to be well below the ICNIRP guidelines for AC fields.

AC Electric Fields

Public exposure to a 60-hertz AC electric field should be limited to 4.2 kilovolts per meter (kV/m) or less (with occupational exposure limited to the range of about 8 kV/m to 25 kV/m) (ICNIRP 1998). For occupational workers with implanted medical devices, a limit of 1 kV/m has been recommended.

The specific design limits for the AC conductor have an electric field of 2 kV/m at the edge of the planned Project ROW. Therefore, the AC electric fields at the edge of the planned Project ROW would be below the guidelines for public exposure. Given the proximity of the Tiger Connector and the Ford County Interconnect to residences and other habitable structures, the probability of electrical interference is low. Additional information on AC electric fields and potential interference with cardiac pacemakers, radio, television, communications or electric equipment, and currents and shocks is provided below.

Cardiac Pacemaker Interference. There are two broad classes of pacemakers: unipolar or bipolar, of which unipolar are far more susceptible to interference. The bipolar pacing system has been standard practice for quite some time and does not experience adverse impacts from electric and magnetic interference (Kersschot 1994). Many patients with pacemakers need them to correct acute irregularities, and few patients need them to be continuously setting pace (Bridges et al. 1978; Moss and Carstensen 1985). The precise coincidence of an individual being exposed to high electric fields within or immediately adjacent to an overhead transmission line, with a unipolar pacemaker, and a biological need for the full function of their pacemaker would appear, in general, to be a rare event (Bridges et al. 1978). Given the rarity of such exposure, it would be unlikely that the Project's electric field would cause harmful interference to the operations of cardiac pacemakers.

Radio, Television, Communications, or Electronic Equipment Interference. The EMFs from AC transmission lines occur at a frequency that is substantially below the frequency range of communications systems, and the Project would not interfere with cellular phone communication equipment (including GPS) from electric or magnetic fields.

Federal Communications Commission (FCC) regulations prohibit operators of any device from generating unwanted radio frequency signals that disrupt use of radio, television, or cordless phones. Under Part 15 of the FCC regulations (47 CFR 15.13), electric power utilities must remedy harmful interference with radio waves. Equipment sensitive to these signals is typically directly shielded from electric field interference. If the Tiger Connector or Ford County Interconnect affect broadcast television or radio signals, impacts are expected to be localized and incur slight interference such as noise or distorted picture.

In terms of interference with electronic equipment, typically buildings and walls would shield this equipment from electric fields generated by the Tiger Connector and Ford County Interconnect (ICNIRP 2022).

Currents and Shocks. Atmospheric electricity strikes the Earth at locations where a localized charge in a cloud and separation of charge on the surface cause a lightning strike to occur. A lightning strike usually hits the tallest, electrically conductive object within the immediate area; therefore, a transmission line protects the land near it from lightning, much as a lightning rod on top of a school protects the building beneath it, by providing the lightning a low-resistance path to the ground via an optical ground wire.

The amount of induced current that can flow is important to evaluate because of the potential for nuisance shocks to people and the possibility of other impacts, such as accidental ignition of fuel. The newly generated EMFs associated with the Tiger Connector and the Ford County Interconnect would have the potential to interact with conductive objects located near the public health and safety EMF analysis area. As the Applicant would control the space within the planned Project ROW, the primary concern is the potential for conductive objects located just outside the ROW. Potential for induced currents and shocks may be present where roads and other transmission and distribution lines would cross the public health and safety EMF analysis area and where agricultural practices (such as grazing and irrigation) intersect the public health and safety EMF analysis area. Permitted uses in the ROW are addressed in Chapter 2.

Static shocks can occur when a person touches a charged metallic surface or a charged person touches an uncharged surface. If a vehicle is parked under a transmission line, the vehicle can build up a charge because the tires are nonconductive, particularly if the car is parked on a nonconductive surface, such as asphalt. If a person touches a charged vehicle, they provide a path to ground and could receive a nuisance shock. Typical design of transmission line crossings establishes lines high enough that this shock is harmless (Leman and Schaerer 2012). The Ford County Interconnect and Tiger Connector would be designed to limit induced current to less than 5 milliampere (mA), the National Electrical Safety Code safety threshold. As discussed above, HVDC lines produce steady state EMF that generally does not affect people or the environment.

Electric currents can be induced by EMFs in conductive objects near AC transmission lines. Metallic roofs, vehicles, vineyard trellises, and fences are examples of objects that can develop a small electric charge in proximity to AC transmission lines. Object characteristics, degree of grounding, and electric field strength affect the amount of induced charge. An electric current can flow when an object has an induced charge and a path to ground is presented. The amount of current flow is determined by the impedance of the object to ground and the voltage induced between the object and ground. Long fences which parallel the AC transmission lines could present an induced-current situation, especially if the fence posts are non-metallic and insulate wires from ground. Additionally, irrigation systems often incorporate long runs of metallic pipes that could be subject to magnetic field induction when located parallel and close to transmission lines. Through micro-siting efforts conducted by the Applicant based on landowner feedback, transmission structures would avoid the paths of existing center-pivot irrigation systems to the extent practicable.

3.16.4.3.3 Wildfire and Severe Weather

The operations and maintenance of an active electric transmission line presents an inherent fire risk from both AC and DC transmission line facilities. The greatest potential would result from either uncontrolled growth of vegetation within the planned Project ROW under live wires or vegetation outside of the planned Project ROW that could fall into energized lines. The duration, intensity, and spatial extent of the impacts would vary according to the ambient conditions of local climate but would be the same as discussed in **Section 3.16.4.2.3**, and risk would be minimized from vegetation clearing as part of scheduled maintenance. Refer to **Section 3.5** for information on wildfire impacts to the natural environment.

Impacts from extreme weather events may include damage to individual transmission structures, transmission wires (conductors), or converter stations from severe weather, such as tornados, high winds, and flooding. These types of events may also block access to facilities and cause unsafe working conditions. These events could lead to increased need for maintenance of Project facilities and/or lead to a greater occurrence of service disruptions.

3.16.4.3.4 Accidents and Intentional Destructive Acts

Evaluating the risks of accidents and intentional destructive acts is difficult because there are numerous potential scenarios, and it is nearly impossible to predict the likelihood of an intentional attack.

Once operational, transmission facilities are potential targets of intentional destructive acts, including theft, vandalism, and terrorism. Converter station sites would include security systems, including cameras, lighting, and a permanent perimeter fence to prevent unauthorized access, as detailed in Chapter 2. Routine inspections of the entire Project would also be conducted.

Accidents related to daily operation of the Project are addressed through EPMs detailed in **Appendix 2.4**.

3.16.4.4 Decommissioning

Site decommissioning would be performed at the end of the service life of the Project in accordance with a Decommissioning Plan. Impacts to public health and safety resources from activities to remove Project facilities would likely be similar to impacts during construction, specifically with respect to electric and magnetic fields, wildfire, accidents and intentional destructive acts, and worker safety. Surface disturbance during decommissioning would likely occur in areas that had been disturbed during construction, and therefore, new adverse impacts related to contaminated soils and hazardous materials would not be expected to occur.

3.17 Network Upgrades and Kansas AC Collector System

3.17.1 Network Upgrades

Network upgrades are evaluated in this EIS as non-federal related actions that may result in indirect effects of the Proposed Action. Activities associated with network upgrades would consist of the following: upgrades at existing substations; upgrades of existing transmission lines, which may include the expansion of existing ROWs; and construction of new transmission lines and ROWs. The majority of these network upgrade activities would occur at existing facilities. Details of the construction, including exact locations (such as the locations of new transmission lines to be constructed, potential expansion of existing ROWs, or other additional disturbance that may be required), operations and maintenance, and decommissioning activities associated with the network upgrades, are not fully known (see **Appendix 2.1**). While the construction duration of each individual network upgrade is under development, it is anticipated that the overall network upgrades identified at this stage of the project development would occur over an 18-month timeframe.

All activities associated with the network upgrades will be managed by entities other than the Applicant and will be conducted in accordance with applicable local, state, and federal laws and regulations. These activities will be subject to environmental review and/or permitting based on each individual activity, as required by federal, state, and/or local regulatory/permitting agencies. Analysis of additional proposed network upgrades occurs once the need is identified and the preliminary design is completed. If additional network upgrades are identified prior to the FEIS, analysis and review of these upgrades will be incorporated into the sections below.

3.17.1.1 Air Quality, Greenhouse Gas Emissions, and Climate Change

Counties that overlap the proposed network upgrades were used as the network upgrades analysis area for potential impacts to air quality. Counties in the network upgrades analysis area are in attainment for all air pollutant standards (EPA 2023c). These counties would experience temporary impacts to air quality during construction from the following activities, if required: helicopter use, operation of heavy-duty construction equipment, light-duty construction vehicles commuting to and from the work site, fugitive dust from driving across and working in unpaved areas, operation of concrete batch plants, on-site cut and fill work, and vegetation clearing.

Individual projects would be subject to permitting requirements based on estimated emissions, which are not known at this time. If air emissions for the network upgrades are lower than the pollutant *de minimis* levels and would not cause an exceedance of NAAQS and would maintain each county's attainment status, minimal air quality impacts from construction would be expected. Based on the construction timelines for the known network upgrades, and that construction of the Project is more intensive than construction of each network upgrade, it is anticipated that the emissions associated with each individual network upgrade would be lower than the pollutant *de minimis* levels. Projects that are predicted to exceed *de minimis* levels or are predicted to cause an exceedance of NAAQS would be subject to mitigation as determined by the appropriate permitting agency.

GHG emissions from network upgrade construction activities could occur from off-road and on-road vehicles, helicopter use, and operation of concrete batch plants, if required. Grid operators did not indicate the level of use for vehicular travel associated with construction or for construction equipment, so the extent to which these may be employed is unknown. In some cases, such as for new transmission lines and ROW expansion, surface disturbance could add to the GHG impact by eliminating existing vegetation and disturbing soil organic matter that acts as a carbon sink for atmospheric CO_2. Activities required to rebuild and reconductor transmission lines and upgrade substations would result in minor or no surface disturbance and therefore would be expected to have, at most, negligible GHG impacts from the elimination of existing vegetation or soil organic matter.

Operations and maintenance activities at the network upgrades that would generate pollutant emissions include fugitive dust from use of off-road vehicles, helicopter use, and operation of on-road construction vehicles for routine inspections, repair activities, and vegetation management, if required. GHG emissions would occur from the combustion of vehicle fuel during operations and maintenance activities, which include worker commutes, inspections of the transmission line, routine and emergency repairs, vegetation management, and helicopter use. At existing infrastructure locations, operations and maintenance activities are ongoing, and there would likely be no changes to pollutant or GHG emissions relative to existing conditions. Construction of the network upgrades would also help reduce overall GHG emissions by allowing new renewable energy projects additional access to the electrical grid, providing additional power to expanding energy markets and/or replacing existing fossil-fuel power generation.

Site decommissioning would be performed at the end of the service life of the network upgrades in accordance with individual decommissioning plans. Activities during decommissioning would likely be similar to those during construction of the network upgrades, and therefore, impacts to air quality, GHG emissions, and climate trends would likely be similar to impacts during construction. Impacts may be reduced due to advancements in technology designed to reduce emissions.

3.17.1.2 Paleontology and Soils

A 0.25-mile buffer on either side of the known network upgrades centerlines (0.5-mile total) and a 0.25-mile buffer of substations were used as the network upgrades analysis area for potential impacts to paleontological and soil resource.

In Kansas and Missouri, Paleozoic dolomite, shale, mudstone, and sandstone bedrock overlay the Precambrian basement rock (Merriam 1963). These bedrock units were primarily formed when a shallow sea covered this region and contain echinoderms, corals, mollusks, arthropods, bryozoans, and the occasional fish or shark fossil.

There are 327 soil units that overlap the network upgrades analysis area. Approximately 94 percent of soils in the network upgrades analysis area are susceptible to moderate or severe water erosion. Approximately 90 percent of soils in the network upgrades analysis area are characterized as having minimal wind erosion potential with less than 1 percent susceptible to severe wind erosion. Approximately 55 percent of soils are somewhat poor, poor, or very poorly drained and thus susceptible to compaction, and 27 percent of soils are hydric. Within the network upgrades analysis area, 22 percent of soils are considered prime farmland or prime farmland if altered (e.g., drained), 25 percent of soils are considered farmland of statewide or local importance, and 53 percent are not considered prime farmland (Soil Survey Staff 2020a and 2020b).

During construction, permanent impacts to paleontological resources as a result of the network upgrades could occur if new surface disturbance (permanent or temporary) is proposed, such as for new transmission lines. Construction could result in damage or destruction of fossils or loss of valuable scientific information during surface-disturbing activities such as clearing, grading, excavation, or off-road travel. Erosion of fossil beds due to slope regrading and vegetation clearing or the unauthorized collection of scientifically important fossils could also occur. Network upgrades that do not require additional surface disturbance, such as some substation upgrades, would result in no impacts to paleontological resources. While some rebuilds associated with the network upgrades may require an expansion of the existing ROW, the rebuilds and reconductoring would principally be within existing ROWs.

During construction, impacts to soils resources as a result of the network upgrades could occur if new surface disturbance (permanent or temporary) is proposed. Construction that requires vegetation clearing, grading, or use of heavy equipment would result in impacts as described in **Section 3.3.4.2.2;** however, if BMPs and mitigation measures are implemented, impacts would be reduced. Network upgrades that do not require additional surface disturbance, such as some substation upgrades, would result in no impacts to soils resources. Any impacts to hydric soils, prime farmland, and terraced soils would vary depending on the individual network upgrade and the level of surface disturbance associated with that upgrade.

Potential operations and maintenance-related impacts on paleontological and soils resources would be similar to construction-related impacts (e.g., disturbance or loss of fossils, compaction or erosion of soils). However, overall activity during operations and maintenance would be localized, less intensive, and shorter in duration (up to several days in any location). At existing infrastructure locations, operations and maintenance activities are already occurring, and there would likely be no changes in impacts to paleontological or soils resources as a result of operations and maintenance.

Site decommissioning would be performed at the end of the service life of the network upgrades in accordance with individual decommissioning plans. The types of impacts on paleontology and soil resources from activities to remove facilities would likely be similar to impacts during construction, though the magnitude of impacts would be reduced due to resources present having likely already been affected during construction. Following decommissioning, demolition of aboveground facilities and removal of structure foundations would disencumber soil resources, including areas of prime farmland that were inaccessible during network upgrade operations. Reclamation could be necessary to restore soil productivity.

3.17.1.3 Water Resources

A 0.25-mile buffer of the known network upgrades was used as the network upgrades analysis area for potential impacts to water resources.

There are approximately 3,953 acres of wetlands, 279 miles of waterbodies, and 9,182 acres of floodplains that overlap the network upgrades analysis area (USFWS 2023; USGS 2017). During construction, impacts to water resources as a result of the network upgrades could occur if new surface disturbance (permanent or temporary) is proposed, such as for new transmission lines. Construction could result in wetland and waterbody degradation, altered hydrology, groundwater contamination, and/or sedimentation during surface-disturbing activities such as clearing, grading, excavation, or off-road travel. An increase in consumptive water use for dust control or dewatering would also impact groundwater resources.

Potential operations and maintenance-related impacts to water resources would be similar to construction-related impacts (e.g., temporary impacts to wetlands, waterbodies, and floodplains due to matting or operational equipment). However, overall activity during operations and maintenance would be localized, less intensive, and shorter in duration (up to several days in any location). At existing infrastructure locations, operations and maintenance activities are already occurring, and there would likely be no changes in impacts to water resources as a result of operations and maintenance.

Site decommissioning would be performed at the end of the service life of the network upgrades in accordance with individual decommissioning plans. Project decommissioning could affect water quality in localized areas due to temporary surface disturbance. Barring advances in construction technology, the surface disturbance footprint for decommissioning would likely be similar to the footprint used during construction. Decommissioning would require consumptive water use for dust control. The amount of water necessary for dust control would be similar to or higher than the quantities as construction activities.

3.17.1.4 Vegetation

A 300-foot buffer of the known network upgrades centerlines and a 300-foot buffer of substations were used as the network upgrades analysis area for potential impacts to vegetation.. The network upgrades analysis area consists of approximately 62 percent Agricultural and Developed Vegetation, 31 percent Forest and Woodland Vegetation, and 5 percent Shrub and Herb Vegetation (LANDFIRE 2020). The network upgrades analysis area overlaps the following Conservation Opportunity Areas in Missouri: Missouri-Grand Confluence/Lower Grand River Conservation Opportunity Area, Otter Slough Wetland Complex Conservation Opportunity Area, Missouri River Hills Expanded Boundary Conservation Opportunity Area, Mid-Missouri Riverlands Conservation Opportunity Area, and the Prairie Forks Conservation Opportunity Area. Three special status plant species, Mead's milkweed (*Ascelpias meadii*), Eastern prairie fringed orchid (*Platanthera leucophaea*), and pondberry (*Lindera melissifolia*), were identified as potentially occurring within the network upgrades analysis area (USFWS 2024a).

During construction, impacts to vegetation resources could occur if new surface disturbance (permanent or temporary) is proposed. Vegetation resources could be impacted through clearing and grading, crushing, soil compaction from vehicular traffic and construction equipment, herbicide treatment to control noxious weeds and incompatible vegetation, mowing, growth of opportunistic and early successional species, and the potential dilution of topsoil with subsoil when grading. The increase in vehicles, equipment, and people in vegetated areas could also increase the potential for spread of noxious weeds and wildfire ignitions. For new transmission lines and ROW expansions, vegetation may be permanently converted from Forest and Woodland Vegetation to Shrub and Herb Vegetation, resulting in the loss of that specific vegetation type. Where the ROW width is maintained or where there is work at existing substations, no new habitat conversion would be expected. Network upgrades that do not require additional surface disturbance, such as some substation upgrades, would result in no permanent impacts to vegetation resources.

Potential operations and maintenance-related impacts to vegetation resources would be similar to construction-related impacts (e.g., crushing, compaction of soils, spread of noxious weeds, risk of wildfire ignition). However, overall activity during operations and maintenance would be localized, less intensive, and shorter in duration (up to several days in any location). Maintenance to limit incompatible trees and shrubs within the new or expanded ROWs would result in a permanent impact to vegetation. At existing infrastructure locations, operations and maintenance activities are already occurring, and there would likely be no changes in impacts to vegetations resources as a result of continued operations and maintenance to the network upgrades.

Site decommissioning would be performed at the end of the service life of the network upgrades in accordance with individual decommissioning plans. Impacts to vegetation resources from activities to remove network upgrades would likely be similar to impacts during construction. The areas of disturbance associated with the network upgrades would take time to revegetate back to pre-construction conditions.

3.17.1.5 Cultural Resources and Native American Traditional Resources and Values

A 1.5-mile buffer of the known network upgrades centerlines (3 miles total) and a 1.5-mile buffer of substations were used as the network upgrades analysis area for potential impacts to cultural resources and Native American Traditional Resources and Values.. NRHP-listed properties in the network upgrades analysis area include Moniteau County Courthouse Square, Gray-Wood Buildings, Given Owens House, Old Barnhill Building, Old California City Hall and Fire Station, Moses U. Payne House, Richland Christian

Church, and Finke Opera House. NHTs in the network upgrades analysis area include the Lewis and Clark NHT. State-inventoried archaeological and historic resources and tribal resources may also be present in the analysis area, though exact locations are not known.

Indirect impacts to cultural and tribal resources may result from the construction, operations and maintenance, and decommissioning of the network upgrades. During construction activities, impacts similar to those described in **Section 3.6.4.2** could occur. Ground-disturbing activities associated with construction, including access roads and staging areas, could result in permanent physical impacts to resources such as destruction or alteration of archaeological sites, tribal resources, and the historic built environment. Increased human access to sensitive areas during construction of new transmission lines could result in vandalism, looting, and trampling of some resources. Construction activities could result in temporary visual and atmospheric impacts to some resources that require integrity of setting or feeling to convey their significance, such as some historic buildings and NHTs.

The physical presence of new infrastructure such as transmission lines could result in permanent visual impacts, including the addition of visual clutter, to some cultural resources located in the vicinity of the network upgrades. This would only be the case for those resources, typically built environment resources, where the historical integrity, feeling, or association of the surrounding setting is required for the resource to convey its significance. Upgrades to existing infrastructure with no new ground-disturbing activities and no major visual changes to the built environment would result in minor or no permanent adverse impacts due to the presence of existing similar infrastructure on the landscape. Operations and maintenance activities could result in temporary noise, dust, and visual impacts similar to those described for Project construction; however, operations and maintenance activities would be less intensive, more localized, and shorter in duration. At existing infrastructure locations, operations and maintenance activities are already occurring, and there would likely be no changes from existing conditions. Visual and atmospheric impacts to cultural resources from operations and maintenance activities would decrease with distance from the network upgrade activities.

Site decommissioning would be performed at the end of the service life of the network upgrades in accordance with individual decommissioning plans. Activities during decommissioning would likely be similar to those during construction, and therefore, impacts to cultural resources could include permanent physical impacts from ground-disturbing activities as well as temporary visual and atmospheric impacts to the setting of some resources.

3.17.1.6 Wildlife

A 1.5-mile buffer on either side of the known network upgrade centerlines and a 1.5-mile buffer for substations was used as the network upgrades analysis area for potential impacts to wildlife. .

The network upgrades analysis area consists of approximately 62 percent Agricultural and Developed Vegetation, 31 percent Forest and Woodland Vegetation, and 5 percent Shrub and Herb Vegetation that may be available for wildlife habitat (LANDFIRE 2020). Based on consultation with USFWS and MDC, 44 special-status species may occur within the network upgrades analysis area (**Table 3.17-1**; USFWS 2024a, MDC 2024).

Table 3.17-1. Special-Status Species with Potential to Occur within the Network Upgrade Analysis Area

Common Name	Scientific Name	Federal Listing Status [a]	Missouri Listing Status [a]
Mammals			
Plains spotted skunk	*Spilogale interrupta*	-	E

Common Name	Scientific Name	Federal Listing Status [a]	Missouri Listing Status [a]
Gray bat	*Myotis grisescens*	E	E
Indiana bat	*Myotis sodalis*	E	E
Northern long-eared bat	*Myotis septentrionalis*	E	-
Tricolored bat	*Perimyotis subflavus*	PE	-
Reptiles			
Alligator snapping turtle	*Macrochelys temminkii*	PT	-
Mississippi green watersnake	*Nerodia cyclopion*	-	E
Prairie massasauga	*Sistrurus tergeminus tergeminus*	-	E
Western chicken turtle	*Deirochelys reticularia miaria*	-	E
Yellow mud turtle	*Kinosternon flavescens*	-	E
Amphibians			
Eastern hellbender	*Cryptobranchus alleganiensis*	E	E
Birds			
American bittern	*Botaurus lentiginosus*	-	E
Bald eagle	*Haliaeetus leucocephalus*	BGEPA; DL	-
Bachman’s sparrow	*Peucaea aestivalis*	-	E
Eastern black rail	*Laterallus jamaicensis* spp. *Jamaicensis*	T	-
Golden eagle	*Aquila chrysaetos*	BGEPA	-
Greater prairie-chicken	*Tympanuchus cupido*	-	E
Northern harrier	*Circus hudsonius*	-	E
Piping plover	*Charadrius melodus*	T	-
Rufa red knot	*Calidris canutus rufa*	T	-
Fish			
Flathead chub	*Platygobio gracilis*	-	E
Crystal darter	*Crystallaria asprella*	-	E
Cypress minnow	*Hybognathus hayi*	-	E
Goldstripe darter	*Etheostoma parvipinne*	-	E
Harlequin darter	*Etheostoma histrio*	-	E
Lake sturgeon	*Acipenser fulvescens*	-	E
Mountain madtom	*Noturus eleutherus*	-	E
Niangua darter	*Etheostama nianguae*	T	E
Pallid sturgeon	*Scaphirhynchus albus*	E	E
Sabine shiner	*Notropsis sabinae*	-	E
Spring cavefish	*Forbesichthys agassizi*	-	E
Swamp darter	*Etheostoma fusiforme*	-	E
Taillight shiner	*Notropis maculatus*	-	E
Topeka shiner	*Notropsis topeka*	E	E
Insects			
Monarch butterfly	*Danaus plexippus*	PT	-
Western regal fritillary	*Argynnis idalia occidentalis*	PT	-
Mussels			
Curtis pearlymussel	*Epioblasma lorentina curtisii*	E	-
Ebonyshell	*Fusconaia ebena*	-	E
Elephantear	*Elliptio crassidens*	-	E

Common Name	Scientific Name	Federal Listing Status [a]	Missouri Listing Status [a]
Higgins eye (pearlymussel)	*Lampsilis higginsii*	E	-
Pink mucket (pearlymussel)	*Lampsilis abrupta*	E	E
Scaleshell mussel	*Leptodea leptodon*	E	E
Spectaclecase (mussel)	*Cumberlandia monodonta*	E	-
Western fanshell	*Cyprogenia aberti*	T	-

[a] BGEPA: Bald and Golden Eagle Protection Act, C: Federal Candidate, DL: Delisted, E: Endangered, PE: Proposed Endangered, T: Threatened.

Construction impacts of the network upgrades on wildlife habitat and general wildlife would be similar to those described for the Project (**Section 3.8.4.2**). In some cases, such as for new transmission lines, construction would result in permanent habitat loss where new permanent facilities are installed. The extent of permanent disturbance is not known. The construction of network upgrades could also result in functional habitat loss if species avoid construction areas due to noise, vibration, and visual disruption. Furthermore, species may be directly injured or killed by construction equipment.

New facilities could create a range of potential impacts to general wildlife and habitat, including the risk of collision, habitat loss, creation of edge effects and movement corridors, depending on the proximity of the various network upgrades to wildlife or their habitat. Overall activity during operations and maintenance would be localized and shorter in duration and could result in temporary functional habitat loss due to noise, vibration, and visual disruption. Rebuilt and reconductored transmission lines and upgraded substations would result in limited to no permanent impacts during operations and maintenance, beyond existing conditions, due to the presence of existing infrastructure.

Of the special-status species identified within the analysis area, eastern hellbender, Niangua darter, Topeka shiner, Curtis pearlymussel, Higgins eye, pink mucket, scaleshell mussel, spectaclecase, ebonyshell, elephantear, western fanshell, flathead chub, crystal darter, cypress minnow, goldstripe darter, harlequin darter, lake sturgeon, pallid sturgeon, mountain madtom, Sabine shiner, spring cavefish, swamp darter, and taillight shiner are aquatic species (MDC 2024; USFWS 2018c; USFWS 2024e USFWS 2018d; USFWS 2021b; USFWS 2004; USFWS 2019c; USFWS 2023d; USFWS 2021c; USFWS 2022f, USFWS 2021d). Impacts to aquatic species during construction of the network upgrades could include direct disturbance (e.g., clearing of habitat for road crossings or culvert installation) and a reduction in habitat quality (e.g., temporary increase in erosion, sedimentation, and turbidity following soil disturbance, exposure to hazardous materials). Operations and maintenance activities would be unlikely to cause recurring permanent impacts to aquatic species.

The network upgrades would likely introduce new habitat disturbance adjacent or within suitable habitat for special-status bat species. Bats may roost in proximity to the network upgrades and could experience impacts similar to construction noise or human activity impacts described for the Project. According to information received from Ameren and AECI, some of the network upgrade activities are expected to involve vegetation clearing and could cause the permanent removal of suitable summer habitat for bats. Whether this habitat is occupied by bats is not known given available information. The amount of any habitat loss caused by network upgrades is not discernable from available information, including whether trees would be cleared outside of the roosting season. If habitat is removed, impacts to special-status bats would be similar to those described for the Project.

The plains spotted skunk has a high potential to occupy prairies, brush areas, and cultivated land in the network upgrades analysis area; therefore, the disturbance of Shrub and Herb Vegetation and Agricultural and Developed Vegetation from new construction and expanded ROWs could affect this species. Other impacts to the plains spotted skunk, such as direct injury or mortality, are anticipated to be similar to those described for eastern spotted skunk for the Project.

The Mississippi green watersnake and western chicken turtle both occur in the swamps and lowlands in the Missouri bootheel (MDC 2024). The prairie massasauga is a medium-sized rattlesnake associated with bottomland prairie habitats in north-central and northwestern Missouri. The yellow mud turtle occurs in open, sandy ridges close to wetlands along the Missouri River in the network upgrades analysis area. Individuals in the construction areas would experience impacts similar to those described for general wildlife. The construction of the network upgrades may have impacts to habitat if temporary infrastructure such as access roads or laydown yards were located in Mississippi green watersnake, western chicken turtle, prairie massasauga, or yellow mud turtle habitat. Western chicken turtles overwinter underground in open forests and would thus be susceptible to mortality during periods of construction in forest habitat outside of the typical active season. Due to the presence of existing infrastructure, no permanent impacts during operations and maintenance beyond existing conditions are anticipated for existing lines.

The alligator snapping turtle is an aquatic turtle that occurs in large rivers, sloughs, and oxbow lakes of southern, southeastern, and eastern Missouri. Although this turtle spends a majority of its life in water, nesting females and eggs may experience impacts similar to other reptiles as described above.

The American bittern is an uncommon migrant that occurs in marshes, wet meadows, and marshy shorelines of lakes and ponds throughout Missouri. Bachman's sparrow occurs in grassy and shrubby glades, old fields, and new pastures in recently cleared forest with a scattered regrowth of trees in southern and eastern Missouri. The eastern black rail occurs in dense herbaceous wetlands; sightings are concentrated in the Cape Girardeau region of southern Missouri. The rufa red knot and piping plover are long-distant migrants that may occur in Missouri during migration stopovers. In the past 10 years, sightings of rufa red knots have occurred at the Eagle Bluffs Conservation Area located outside of Columbia, Missouri and in several locations near St. Louis. Piping plovers have been observed in locations in central Missouri, including at the Swan Lake National Wildlife Refuge. Missouri's remaining greater prairie-chickens live on native prairies and in properly managed nonnative grasslands with wide open sweeps of permanent, diverse grassland (MDC 2024). Construction and operations and maintenance impacts of the network upgrades on special-status birds would be similar to those described for wildlife habitat and general wildlife. Additionally, an increase in the functional loss of greater prairie-chicken habitat could occur if new or taller transmission line structures are built for the network upgrades in proximity to occupied prairie-chicken habitat.

Construction of network upgrades is likely to cause at least temporary loss of monarch butterfly suitable habitat and potentially loss to western regal fritillary habitat. If performed at a time of year when monarch butterflies are migrating through the network upgrades analysis area or when butterflies are feeding or egg-laying on plants in existing ROWs, some butterflies, eggs, or larvae could be killed. Some network upgrades include vegetation removal that may convert forested and wooded habitat to open habitats. This vegetation conversion could provide localized benefits to butterflies by creating suitable habitat. However, the amount of any habitat loss, habitat degradation, or habitat creation caused by the network upgrades is not known. Rebuilt and reconductored transmission lines and upgraded substations would result in limited to no permanent impacts during operations and maintenance, beyond existing conditions, due to the presence of existing infrastructure.

Construction of network upgrades may impact foraging and breeding eagles if forested habitat is removed or converted to open habitats or if nests are removed. Additionally, if construction occurs in proximity to nests during the breeding season, bald eagles could abandon eggs or young due to noise or the presence of humans. During operations and maintenance, eagles could collide with new transmission lines, resulting in injury or mortality. Rebuilt and reconductored transmission lines would result in limited to no permanent impacts during operations and maintenance, beyond existing conditions, due to the presence of existing infrastructure.

Golden eagles are an uncommon-to-rare migratory transient and winter visitor in the network upgrades analysis area. Impacts to golden eagle habitat are not anticipated but could occur if stopover habitat is disturbed, such as along the Missouri River. Impacts to golden eagle nests are not anticipated because they are not known to nest in the network upgrades analysis area.

Site decommissioning would be performed at the end of the service life of the network upgrades in accordance with individual decommissioning plans. Impacts to wildlife resources from activities to remove network upgrades would likely be similar to impacts during construction. The wildlife habitat removed during construction of the network upgrades would take time to revegetate back to pre-construction conditions.

3.17.1.7 Transportation

A 5-mile buffer of the known network upgrades centerlines and substations (10 miles total) was used as the network upgrades analysis area for potential impacts to transportation. Major roads in the network upgrades analysis area include I-70, I-172, US 61, US 62, US 63, US 65, US 54, US 67, US 24, US 50, US 160, SR 5, SR 11, SR 19, SR 28, S 89, SR 52, SR 133, SR 22, SR 161, SR 47, SR 179, SR 98, SR 87, SR 53, SR 168, and SR 131.

Indirect impacts to transportation resources may result from the construction, operation and maintenance, and decommissioning of the network upgrades. During construction, workers commuting to worksites, and the delivery of materials, supplies, and equipment would generate traffic on existing roadways within the network upgrades analysis area. The total number of additional vehicle trips would depend on the type and extent of individual network upgrades and would be influenced by the number of workers, supplies and materials needed, and the amount of equipment needed to complete the network upgrades. The impacts from additional traffic would be greatest for roadways that have the smallest volume of daily traffic. Traffic delays, road closure, rail line, and air transportation impacts would be similar to those described in **Section 3.9.4.2** and would depend on the total number of crossings required for each network upgrade project.

The majority of the network upgrades would occur at existing facilities, and therefore would not result in impacts to transportation during operations and maintenance beyond existing conditions. Impacts from new transmission lines during operations and maintenance as a result of traffic, delays and road closures, rail lines, and air transportation would be similar to those described in **Section 3.9.4.3.**

Site decommissioning would be performed at the end of the service life of the network upgrades in accordance with individual decommissioning plans. Impacts to transportation resources from activities to remove network upgrades would likely be similar to impacts during construction but likely with fewer passenger vehicles and equipment vehicles. Temporary road closures, similar to those needed for construction, would likely be needed for decommissioning.

3.17.1.8 Land Use

A 1-mile buffer of the known network upgrade centerlines (2 miles total) and a 1-mile buffer of substations were used as the network upgrades analysis area for potential impacts to land use. . Major land cover types in the analysis area include cultivated crops (29 percent), pasture/hay (28 percent), and deciduous forest (26 percent) (Dewitz 2021).

Impacts to land use may result from the construction, operations and maintenance, and decommissioning of the network upgrades. During construction, impacts to agricultural operations could consist of short-term interference with movement of machinery, equipment, and irrigation implements; introduction of weeds and other pests; and livestock relocation. After construction is complete, agricultural activities could generally resume. Because the majority of network upgrades are existing facilities, impacts to community and residential developments and conservation easements (if present) are expected to be minimal. New transmission lines would likely be sited to avoid schools, cemeteries, places of worship, residences, and conservation easements, thus avoiding potential impacts. Current land use pertaining to community or residential development, such as use of gates, outbuildings, or other structures, could be disrupted during construction activities, and the duration and intensity of disruption would be variable depending on the individual project and the proximity to such developments.

The majority of the network upgrades would occur at existing facilities and therefore would not result in impacts to land use during operations and maintenance beyond existing conditions. For new transmission lines, impacts from operations may include limited restrictions on land use and interference with farming activities. Maintenance activities may have the same types of impacts to land uses as those discussed for construction, though the impacts would be transient, temporary, and intermittent, much shorter in duration than construction activities, and would occur on an as-needed basis.

Site decommissioning would be performed at the end of the service life of the network upgrades in accordance with individual decommissioning plans. Impacts to land use resources from activities during decommissioning would likely be similar to those that would occur during construction. There would be disruption of use of land as workspaces and interference with the movement of machinery. The impacts would be roughly the same duration as construction impacts. Following decommissioning, it is assumed that land use could revert to pre-development conditions for a majority of the impacted areas.

3.17.1.9 Recreation

A 1-mile buffer of the known network upgrades centerlines and a 1-mile buffer of substations were used as the network upgrades analysis area for potential impacts to recreation. Public lands and recreational resources in the network upgrades analysis area include national wildlife refugia, recreation areas, national forests, local parks, research natural areas, and conservation areas, including Swan Lake National Wildlife Refuge, Big Muddy National Fish and Wildlife Refuge, Mark Twain National Forest, Long Branch Lake, State Park, and Recreation Area, California City Park, Railroad Park, Smith-Burke Park, Smith Park, Atkins Park, Strawn Park, Ringo Ford Access, Meta Towersite, Moreau 50 Access, Katy Trail, Overton Bottoms Conservation Area, Thomas Hill Reservoir, Atlanta Conservation Area, Eagle Bluffs Conservation Area, Little Dixie Lake Conservation Area, Rocheport Cave Conservation Area, Three Creeks Conservation Area, Whetstone Creek Conservation Area, Yellow Creek Conservation, Natural, and Research Natural Area, Schnabel Woods Natural Area (USGS 2022.

Recreation sites located in the vicinity of the network upgrade construction activities would experience temporary impacts from noise or dust, or visual presence of construction activities. Increased construction-related traffic would impact visitors, and temporary road or lane closures for the network upgrade construction activities, if required, may result in the temporary displacement or disruption of visitors. Impacts to recreation sites would decrease with increased distance from the network upgrade activities.

In some cases, such as for new transmission lines, recreation sites located in the vicinity of the network upgrades would experience permanent visual impacts due to the physical presence of new infrastructure. Rebuilt and reconductored transmission lines and upgraded substations would result in minor or no permanent visual impacts due to the presence of existing similar infrastructure on the landscape. Operations and maintenance activities would result in temporary noise, dust, and visual impacts similar to those described for construction; however, operations and maintenance activities would be less intensive, more localized, and shorter in duration. At existing infrastructure locations, operations and maintenance activities are already occurring, and there would likely be no changes to recreation from existing conditions. Impacts to recreation sites from operations and maintenance activities would decrease with distance from the network upgrade activities.

Site decommissioning would be performed at the end of the service life of the network upgrades in accordance with individual decommissioning plans. Activities during decommissioning would likely be similar to those during construction, and therefore, impacts to recreational resources from noise, dust, and visual presence of decommissioning activities would likely be similar to impacts during construction. Some temporary displacement of recreational activities may occur due to impacts to the setting or access.

3.17.1.10 Visual Resources

A 1.5-mile buffer of the known network upgrades centerlines and a 1.5-mile buffer of substations were used as the network upgrades analysis area for potential impacts to visual resources.. The landscape in the network upgrades analysis area consists of the Ozark Highlands, Central Irregular Plains, Western Corn Belt Plains, Interior River Valleys and Hills, Mississippi Alluvial Plain, and Mississippi Valley Loess Plains Level III Ecoregions (EPA 2024). There are a number of NRHP-listed properties, as described in **Section 3.17.1.5**, as well as the Lewis and Clark. Scenic byways in the network upgrades analysis area include Crowley's Ridge Parkway National Scenic Byway and Great River Road National Scenic Byway. Public lands and recreational resources in the network upgrades analysis area include wildlife management areas, national wildlife refugia, recreation areas, national forests, city parks, and conservation areas (USGS 2022.

The majority of the network upgrades will consist of upgrades to existing infrastructure and will therefore result in temporary impacts. During construction, temporary impacts to landscape character, properties of historic significance, designated scenic resources, public lands and recreational resources, and transportations corridors, towns, and rural residences would be similar to those described in **Section 3.12.4.2**.

In some cases, such as for new transmission lines, impacts to visual resources would occur as a result of new physical features that would be introduced to the visual environment. New facilities would create a range of potential visual impacts, depending on the proximity of the various network upgrades to sensitive views and viewers. Rebuilt and reconductored transmission lines and upgraded substations would result in minor or no permanent changes to visual resources, including impacts to the character of the NRHP-listed sites, due to the presence of existing similar infrastructure on the landscape.

Site decommissioning would be performed at the end of the service life of the network upgrades in accordance with individual decommissioning plans. Impacts to visual resources from activities to remove network upgrades would likely be similar to impacts during construction. The areas of disturbance associated with the network upgrades would take time to revegetate, becoming less noticeable over time as they gradually blend into the surrounding environment.

3.17.1.11 Noise

The network upgrades primarily occur in sparsely populated rural settings, similar to the Project. Noise-sensitive land uses in proximity to the network upgrades would primarily include residences, schools, places of worship, hospitals, cemeteries; other sensitive land uses may also occur in proximity to the network upgrades. However, proximity of any sensitive land use to any particular network upgrade is unknown.

During construction, short-term impacts from noise would occur similar to those described for the Project (**Section 3.13.4.2**). Use of ground-based heavy construction equipment and machinery, such as graders, dozers, drill rigs, and cranes, would impact nearby noise-sensitive receptors. Noise levels would vary throughout construction, depending on the number and locations of operating equipment, distance to the noise-sensitive receptor from the equipment, time of day, atmospheric conditions, and intervening topography or barriers. If helicopters are proposed, they could cause additional noise impacts to noise-sensitive receptors from warm-up, take-off, and landing.

Maintenance activities for the network upgrades would likely include regular inspections, repairs, and vegetation management. These activities would result in short-term impacts to noise-sensitive receptors from noise generated by vehicles and equipment. Overall activity during operations and maintenance would be localized and short in duration (up to several days in any location). At existing infrastructure locations, operations and maintenance activities are already occurring, and there would likely be no changes in impacts from noise as a result of continued operations and maintenance.

Site decommissioning would be performed at the end of the service life of the network upgrades in accordance with individual decommissioning plans. Noise impacts from activities to remove network upgrades would likely be similar to impacts during construction.

3.17.1.12 Social, Economic, and Community Resources

The counties where construction, operations and maintenance, and decommissioning of the network upgrades would occur was used as the network upgrades analysis area. The counties are Audrain, Boone, Butler, Callaway, Carroll, Chariton, Cole, Cooper, Dunklin, Johnson, Lincoln, Livingston, Macon, Moniteau, Montgomery, Osage, Randolph, Scott, and Warren counties, Missouri, and Adams County, Illinois.

During construction, potential impacts could occur to the supply of temporary housing and public services resulting from increased demand from an influx of non-local workers into the areas planned for these transmission and infrastructure upgrades; whether such impacts occur, and their magnitude, would depend on the construction workforce required for each upgrade. . Potential operations and maintenance-related impacts to socioeconomic resources within the network upgrades analysis areas would be unlikely due to the limited amount of maintenance workers and associated staff required for operation and maintenance activities for the planned network upgrades. Additionally, potential impacts to land use and property values as well as impacts to taxes and government revenues could occur; however, because the network upgrades would occur at primarily existing locations spread across a large geographic area in Missouri and Illinois, significant impacts to these taxes and revenues are not anticipated. At existing infrastructure locations, operations and maintenance activities are already occurring, and there would likely be no changes in impacts to socioeconomic resources as a result of continued operations and maintenance. Once in operation, the network upgrades would benefit the region by strengthening the reliability of the grid and thus the reliability of electric service overall.

Site decommissioning would be performed at the end of the service life of the network upgrades in accordance with individual decommissioning plans. Impacts to socioeconomic resources from activities to remove network upgrades would likely be similar to impacts during construction.

3.17.1.13 Environmental Justice

A 3-mile buffer on either side of the proposed network upgrade centerlines and a 3-mile buffer around the substations were used as the network upgrade analysis area for potential environmental justice impacts. The analysis area was reviewed based upon the CEJST designation of disadvantaged communities[1]. This mapping tool was used as it shows a wider indication of environmental justice burdens for the

[1] https://screeningtool.geoplatform.gov/en/#3/33.47/-97.5.

affected communities than minority or low-income indicators alone. The CEJST analysis indicated that 35 percent of census tracts in the network upgrades analysis area would be considered disadvantaged. In certain areas, such as the Jefferson City, Missouri area, there are no known disadvantaged areas identified near the network upgrades; however, in locations such as areas located south of I-44 in Missouri, the majority of the communities within the analysis area are identified as disadvantaged. Comparison to the EJScreen tool data for these areas indicates that there are no Superfund sites or other hazardous waste sites within at least 8 miles of the proposed network upgrades. In terms of socioeconomic indicators, the EJScreen tool shows that populations in these proposed network upgrade areas are reporting zero unemployment, and the majority of the population has at least a high-school education. According to the CEJST, the environmental burden indicators in the network upgrades analysis area that indicate that the population is disadvantaged include climate risk factors such as natural hazards, lack of access to energy and green spaces, and health factors including a high incidence of heart disease. Therefore, historical environmental and health factors in these communities are unlikely to be disproportionately impacted by the construction impacts from the network upgrades.

Construction-related impacts that could have adverse impacts to disadvantaged communities include air quality, greenhouse gas emissions, and climate change, transportation, cultural, noise, and social, economic, and community resources. However, construction would be spread across the entirety of the network upgrades analysis area and would likely impact environmental justice communities the same as non-environmental justice communities.

Long-term operations and maintenance-related impacts that could have adverse impacts to disadvantaged communities include air quality, greenhouse gas emissions, and climate change, transportation, and noise. Operations and maintenance activities would be spread across the entirety of the network upgrades analysis area and would be localized and short in duration. At existing infrastructure locations, operations and maintenance activities are already occurring, and there would likely be no changes in impacts to disadvantaged communities as a result of continued operations and maintenance. Operations and maintenance of the network upgrades would likely impact environmental justice communities the same as non-environmental justice communities.

Site decommissioning would be performed at the end of the service life of the network upgrades in accordance with individual decommissioning plans. Activities during decommissioning would likely have similar impacts to environmental justice as those during construction. Temporary and localized impacts could include increases in vehicle emissions, increases in noise levels, and socioeconomic changes from an increase in demand for services and healthcare by construction workers. Impacts to environmental justice communities would likely be the same as non-environmental justice communities. As such, the impacts would not be considered to be disproportionate and adverse to environmental justice communities.

3.17.1.14 Public Health and Safety

A 1.5-mile buffer of the known network upgrades centerlines and a 1.5-mile buffer of substations were used as the network upgrades analysis area for potential impacts to public health and safety. Impacts to public health and safety may result from the construction, operations and maintenance, and decommissioning of the network upgrades. In some cases, such as with new and rebuilt transmission lines, impacts to public health and safety could occur during construction activities as a result of surface disturbance. Surface disturbance, including grading activities, during construction could disrupt contaminated soil, creating potential health hazards for workers and the public in the immediate vicinity of the construction activities. Reconductored transmission lines and upgraded substations that have no associated new surface disturbance would result in no impacts to public health and safety as a result of contaminated soils. Other impacts to public health and safety from hazardous materials, EMFs, wildfires, accidents and intentional destructive acts, and worker health and safety during construction of the network upgrades would be similar to those described in **Section 3.16.4.2**.

The majority of the network upgrades would occur at existing facilities and therefore would not result in impacts to public health and safety during operations and maintenance beyond existing conditions. However, new transmission lines would introduce a new source of AC EMFs and impacts would be similar to those described for the Ford County Interconnect and Tiger Connector. Other impacts from new transmission lines to public health and safety from contaminated soils, hazardous materials, wildfires, accidents and intentional destructive acts, and worker health and safety during operations and maintenance of the network upgrades would be similar to those described in **Section 3.16.4.3**.

Site decommissioning would be performed at the end of the service life of the network upgrades in accordance with individual decommissioning plans. Impacts to public health and safety resources from activities to remove network upgrade facilities would likely be similar to impacts during construction, specifically with respect to EMFs, wildfire, accidents and intentional destructive acts, and worker safety. Surface disturbance during decommissioning would likely occur in areas that had been disturbed during construction, and, therefore, new adverse impacts related to contaminated soils and hazardous materials would not be expected to occur.

3.17.2 Kansas AC Collector System

The Meade-Dodge City and Bucklin-Dodge City routes for the Kansas AC Collector System were approved by the KCC on September 26, 2024 (**Appendix 2.1)**. Details of the construction, including the location of temporary and permanent disturbance, locations of construction workspaces, operations and maintenance, and decommissioning activities for the Kansas AC Collector System are under development and the design is not final (see **Appendix 2.1**).

Activities associated with the Kansas AC Collector System would likely be similar to those described in **Chapter 2**, and will be conducted in accordance with local, state, and federal laws and regulations. Analysis of the Kansas AC Collector System routes is ongoing and if additional information is identified prior to the Final EIS, analysis and review of that data will be will be incorporated into the sections below. The Applicant will be responsible for compliance with all applicable local, state, and federal laws and regulations, and completing applicable environmental review and permitting actions.

3.17.2.1 Air Quality, Greenhouse Gas Emissions, and Climate Change

Gray, Meade, and Ford counties, Kansas, where the Kansas AC Collector System is sited and which are used as the analysis area for impacts to air quality, greenhouse gas emissions, and climate change, are in attainment for all air pollutant standards. These counties would experience temporary impacts to air quality during construction from the following activities, if conducted: helicopter use, operation of heavy-duty construction equipment, light-duty construction vehicles commuting to and from the work site, fugitive dust from driving across and working in unpaved areas, operation of concrete batch plants, on-site cut and fill work, and vegetation clearing. The Kansas AC Collector System transmission lines would be subject to permitting requirements based on estimated emissions, which are not known at this time. Considering that construction of the Project is more intensive than construction of the Kansas AC Collector System, the emissions associated with the Kansas AC Collector System are likely to be lower than the pollutant *de minimis* levels. If air emissions for the Kansas AC Collector System are lower than the pollutant *de minimis* levels and would not cause an exceedance of NAAQS and would maintain each county's attainment status, minimal air quality impacts from construction would be expected. If the Kansas AC Collector System exceeds *de minimis* levels or would cause an exceedance of NAAQS, which is unlikely, it would be subject to mitigation as determined by the appropriate permitting agency.

Construction of the Kansas AC Collector System in Ford County is likely to overlap with construction of the Project, particularly within the construction timeline for the converter station in Ford County.

GHG emissions from the Kansas AC Collector System construction activities could occur from off-road and on-road vehicles, helicopter use, and operation of concrete batch plants, if required. Surface disturbance could also add to the GHG impact by eliminating existing vegetation and disturbing soil organic matter that acts as a carbon sink for atmospheric CO_2.

Operations and maintenance activities at the Kansas AC Collector System that, if required, would generate pollutant emissions include fugitive dust from off-road vehicles, helicopter use, and operation of on-road construction vehicles for routine inspections, repair activities, and vegetation management. GHG emissions would occur from the combustion of vehicle fuel during operations and maintenance activities, which include worker commutes, inspections of the transmission line, routine and emergency repairs, vegetation management, and helicopter use. Construction of the Kansas AC Collector System would also help reduce GHG emissions by the addition of renewable energy to the electric grid, providing additional power to growing markets and/or replacing existing fossil-fuel power generation.

Site decommissioning would be performed at the end of the service life of the Kansas AC Collector System in accordance with individual decommissioning plans. Activities during decommissioning would likely be similar to those during construction, and therefore, impacts to air quality, GHG emissions, and climate trends would likely be similar to impacts during construction. Impacts may be reduced due to advancements in technology designed to reduce emissions.

3.17.2.2 Paleontology and Soils

A 0.25-mile buffer on either side of the approved Kansas AC Collector System centerlines (0.5 miles total) was used as the Kansas AC Collector analysis area for potential impacts to paleontological and soil resources.

Shale, limestone, chalk, and sandstone from the early to late Cretaceous Period are exposed in Kansas. The Cretaceous environment was mostly cyclic, ranging from deeper marine to nearshore to terrestrial during periods of interior seaway transgressive and regressive cycles. Fossils from these deposits include marine reptiles, flying reptiles, dinosaurs, birds, fish, sharks, mollusks, crustaceans, and plants (Everhart 2017; Hattin 1977; Raymond et al. 1944).

There are 41 soil units that overlap the Kansas AC Collector System analysis area. Approximately 87 percent of soils in the Kansas AC Collector System analysis area are susceptible to moderate or severe water erosion. Approximately 87 percent of soils in the Kansas AC Collector System analysis area are characterized as having minimal wind erosion potential with less than 2 percent susceptible to severe wind erosion. Greater than 99 percent of soils are somewhat poor, poor, or very poorly drained and thus susceptible to compaction, and greater than 99 percent of soils are non-hydric. Within the Kansas AC Collector System analysis area, 86 percent of soils are considered prime farmland or prime farmland if altered (e.g., drained), 7 percent of soils are considered farmland of statewide importance, and 7 percent are not considered prime farmland.

Impacts to paleontological and soils resources may result from the construction, operations and maintenance, and decommissioning of the Kansas AC Collector System. During construction, permanent impacts on paleontological resources as a result of the Kansas AC Collector System could occur on areas of new surface disturbance (permanent or temporary). Construction could result in damage or destruction of fossils or loss of valuable scientific information during surface-disturbing activities such as clearing, grading, excavation, or off-road travel. Erosion of fossil beds due to slope regrading and vegetation clearing or the unauthorized collection of scientifically important fossils could also occur.

During construction, impacts on soils resources as a result of the Kansas AC Collector System would occur in areas of new surface disturbance (permanent or temporary). Construction that requires vegetation clearing, grading, or use of heavy equipment would result in impacts as described in **Section 3.3.4.2.2**. Any impacts to hydric soils, prime farmland, and terraced soils would vary depending on the final project design.

Site decommissioning would be performed at the end of the service life of the Kansas AC Collector System in accordance with a decommissioning plan. The types of impacts on paleontology and soil resources from activities to remove facilities would likely be similar to impacts during construction, though the magnitude of impacts would be reduced due to resources present having likely already been affected during construction Following decommissioning, demolition of aboveground facilities and removal of structure foundations would disencumber soil resources, including areas of prime farmland that were inaccessible during network upgrade operations. Reclamation could be necessary to restore soil productivity.

3.17.2.3 Water Resources

A 0.25-mile buffer of the approved Kansas AC Collector System centerlines was used as the Kansas AC Collector System analysis area for potential impacts to water resources. There are approximately 164 acres of wetlands, 54 miles of waterbodies, and 653 acres of floodplain that overlap the Kansas AC Collector System analysis area (USFWS 2023; USGS 2017).

During construction, permanent impacts to water resources as a result of the Kansas AC Collector System could occur in areas of new surface disturbance (permanent or temporary). Construction could result in wetland, waterbody, or floodplain degradation, altered hydrology, groundwater contamination, and/or sedimentation during surface-disturbing activities such as clearing, grading, excavation, or off-road travel. An increase in consumptive water use for dust control or dewatering would also impact groundwater resources.

Potential operations and maintenance-related impacts to water resources would be similar to construction-related impacts (e.g., temporary impacts to wetlands, waterbodies, and floodplains due to matting or operational equipment). However, overall activity during operations and maintenance would be localized, less intensive, and shorter in duration (up to several days in any location).

Site decommissioning would be performed at the end of the service life of the Kansas AC Collector System in accordance with individual decommissioning plans. Project decommissioning could affect water quality in localized areas due to temporary surface disturbance. Barring advances in construction technology, the surface-disturbance footprint for decommissioning would likely be similar to the footprint during construction. Decommissioning would require consumptive water use for dust control. The amount of water necessary for dust control would be similar to or higher than the quantities used for construction activities.

3.17.2.4 Vegetation

A 300-foot buffer of the approved Kansas AC Collector System centerlines was used as the Kansas AC Collector System analysis area for potential impacts to vegetation. The Kansas AC Collector System analysis area consists of approximately 65 percent Agricultural and Developed Vegetation, 22 percent Shrub and Herb Vegetation, and 1 percent Forest and Woodland Vegetation (LANDFIRE 2020). The Kansas AC Collector System analysis area overlaps the Playa Landscape and the Red Hill Ecological Focus Areas. There were no special-status plant species identified within the Kansas AC Collector System vegetation analysis area (DOE LPO 2024).

During construction, temporary and permanent impacts to vegetation resources would be similar for each vegetation type as described in **Section 3.5.4.2**. Due to the overall lack of Forest and Woodland Vegetation underlying the planned transmission routes, the Kansas AC Collector System would be unlikely to require a significant amount of tree clearing.

During operations and maintenance, potential impacts to vegetation would be similar for each vegetation type as those described in **Section 3.5.4.3**.

Site decommissioning would be performed at the end of the service life of the Kansas AC Collector System in accordance with individual decommissioning plans. Impacts to vegetation resources from activities to remove the Kansas AC Collector System would likely be similar to impacts during construction. The areas of disturbance associated with the Kansas AC Collector System would take time to revegetate back to pre-project conditions.

3.17.2.5 Cultural Resources and Native American Traditional Resources and Values

A 1.5-mile buffer of the approved Kansas AC Collector System centerlines (3 miles total) was used as the Kansas AC Collector System analysis area for potential impacts to cultural resources and Native American traditional resources and values.. No NRHP-listed properties are located in the analysis area. State-inventoried archaeological resources include five previously documented resource locations; however, only small portions of the analysis area have been subjected to previous cultural resources surveys and additional resources may be found through future inventories (Kansas Historical Society 2024a). Previously documented historic built environment resources in the analysis area include the following farmsteads: Taylor Farmstead, Taylor Homestead Ranch, Jones Farmstead, Mason Farmstead, Wetmore Farm, and Merkle Farm (Kansas Historical Society 2024b). NHTs in the analysis area include the Santa Fe National Historic Trail Cimarron Route. Tribal resources may also be present in the analysis area, though locations are not known at this time.

Impacts to cultural and tribal resources may result from the construction, operations and maintenance, and decommissioning of the Kansas AC Collector System. Construction of the Kansas AC Collector System could result in impacts like those described in **Section 3.6.4.2.** Ground-disturbing activities associated with construction of the collector system, including access roads and staging areas, could result in permanent physical impacts to resources such as destruction or alteration of archaeological sites, tribal resources, and the historic built environment. Increased human access to sensitive areas during construction of new transmission lines could result in vandalism, looting, and trampling of some resources. Construction activities could result in temporary visual and atmospheric impacts to some resources where setting is important to conveying a resource’s significance, such as some historic buildings and NHTs.

Cultural resources that require historical integrity of their setting to convey their significance, such as some historic built environment resources, could experience permanent visual impacts from the physical presence of new infrastructure associated with the Kansas AC Collector System. Operations and maintenance activities would result in temporary noise, dust, and visual impacts similar to those described for construction; however, operations and maintenance activities would be less intensive, more localized, and shorter in duration. Visual and atmospheric impacts to cultural resources from operations and maintenance activities would decrease with distance from the Kansas AC Collector System activities.

Site decommissioning would be performed at the end of the service life of the Kansas AC Collector System in accordance with individual decommissioning plans. Activities during decommissioning would likely be similar to those during construction, and therefore, impacts to cultural resources could include permanent physical impacts from ground-disturbing activities as well as temporary visual and atmospheric impacts to the setting of some resources.

3.17.2.6 Wildlife

A 1.5-mile buffer on either side of the approved Kansas AC Collector System centerlines (3 miles total) was used as the Kansas AC Collector System analysis area for potential impacts to wildlife. The Kansas AC Collector System is located at the western terminus of the Project and, therefore, is likely to impact similar wildlife and wildlife habitat as the western end of the Project. The Kansas AC Collector System analysis area consists of approximately 80 percent Agricultural and Developed Vegetation, 17 percent Shrub and Herb Vegetation, and less than 1 percent Forest and Woodland Vegetation that may be available for wildlife habitat (LANDFIRE 2020).

Based on consultation with USFWS and KDWP, 13 special-status species may occur within the Kansas AC Collector System analysis area (**Table 3.17-2**; USFWS 2024a, KDWP 2022).

Table 3.17-2. Special-Status Species with Potential to Occur within the Kansas AC Collector System Analysis Area

Common Name	Scientific Name	Federal Listing Status [a]	Kansas Listing Status [a]
Mammals			
Tricolored bat	*Perimyotis subflavus*	PE	-
Reptiles			
New Mexico threadsnake	*Rena dissecta*	-	T
Birds			
Bald eagle	*Haliaeetus leucocephalus*	BGEPA; DL	-
Golden eagle	*Aquila chrysaetos*	BGEPA	-
Lesser prairie-chicken (Northern Distinct Population Segment)	*Tympanuchus pallidicinctus*	T	-
Whooping crane	*Grus americana*	E	E
Fish			
Arkansas River shiner	*Notropis girardi*	T	E
Plains minnow	Hybognathus placitus	-	T
Peppered chub	*Macrhybopsis tetranema*	E	E
Insects			
Monarch butterfly	*Danaus plexippus*	C	-

[a] BGEPA: Bald and Golden Eagle Protection Act, C: Federal Candidate, DL: Delisted, E: Endangered, PE: Proposed Endangered, T: Threatened.

Construction impacts of the Kansas AC Collector System on wildlife habitat and general wildlife would be similar to those described for the Project, though impacts would be less because the Kansas AC Collector System is a much smaller project (**Section 3.8.4.2**). Construction would result in permanent habitat loss where new permanent facilities are installed, though the extent of permanent disturbance is not known. The construction of the Kansas AC Collector System could also result in functional habitat loss as species avoid construction areas due to noise, vibration, and visual disruption. Furthermore, species may be directly injured or killed by construction equipment.

New facilities could create a range of potential impacts to general wildlife and habitat, including the risk of collision, creation of edge effects, and movement corridors depending on the proximity of the Kansas AC Collector System to wildlife or their habitat. Overall activity during operations and maintenance would be localized and shorter in duration than construction activities and could result in temporary functional habitat loss due to noise, vibration, and visual disruption.

The Arkansas River shiner and the peppered chub are not anticipated to be impacted by the Kansas AC Collector System. The Arkansas River shiner only occurs in Kansas in the Cimmaron River, and the peppered chub only occurs in Kansas in the Ninnescah and Arkansas rivers. Neither river would be crossed by the Kansas AC Collector System (USFWS 2020a; USFWS 2018b. Additionally, the Kansas AC Collector System analysis area overlaps the range of tricolored bat but does not overlap suitable habitat deemed likely to be occupied by the tricolored bat (USFWS 2024d). Therefore, no impacts to tricolored bat habitat are anticipated.

The New Mexico threadsnake is a small species of snake that lives in prairies and sandy deserts in Kansas along the Oklahoma border. Construction and operations and maintenance impacts of the Kansas AC Collector System on New Mexico threadsnakes would be similar to those described for wildlife habitat and general wildlife.

The Kansas AC Collector System analysis area overlaps lesser prairie-chicken estimated occupied range. However, suitable habitat within the analysis area has not yet been delineated so the extent of and effects to lesser prairie-chicken suitable habitat is unknown. If the Kansas AC Collector System overlaps areas where lesser prairie-chickens are known or likely to occur, the construction and operation and maintenance of the Kansas AC Collector System could result in loss and degradation of lesser prairie-chicken habitat in such areas. These effects could lead to complete or partial avoidance of the certain areas by lesser prairie-chickens. In areas of overlap with the estimated occupied range, the routes generally parallel existing infrastructure, which would minimize functional habitat loss. Coordination with USFWS is ongoing and additional data on the lesser prairie chicken within the Kansas AC Collector System analysis area will be incorporated into the Final EIS.

The analysis area for the Kansas AC Collector System is within the migration corridor of the Aransas-Wood Buffalo population of the whooping crane (Pearse, Rabbe, Bidwell et al. 2018). Despite multiple monitoring efforts including telemetry of individual cranes, only one observation of a whooping crane, recorded in 2012, has been reported within the Kansas AC Collector System analysis area, which was 0.5 mile from the Meade-Dodge City line (Pearse et al. 2020; USFWS 2022a). Additionally, although the amount of suitable stopover habitat within the 1.25-mile “zone of influence” of the Kansas AC Collector System transmission lines has yet to be determined, the small number of recorded whooping crane observations within the Kansas AC Collector System analysis area suggests that the amount of suitable stopover habitat in this area that would be affected is also small. Therefore, impacts from construction noise and the physical presence of the Kansas AC Collector System are anticipated to be minimal. Coordination with USFWS is ongoing and additional data on whooping crane within the Kansas AC Collector System analysis area will be incorporated into the FEIS.

The Kansas AC Collector System overlaps designated critical habitat for the plains minnow in Crooked Creek in Meade County, Kansas (KDWP 2024. Construction of the Kansas AC Collector System could impact the minnow by introducing sediment or other pollutants into Crooked Creek. Operations and maintenance activities would be unlikely to cause recurring permanent impacts to this species.

Because fewer acres would be subject to disturbance, the impacts to monarch butterflies would be much smaller in magnitude but similar in type to those described for the Project.

Bald and golden eagles likely occur within the Kansas AC Collector System analysis area. Construction of the Kansas AC Collector System may impact foraging and breeding bald eagles if forested habitat is removed or converted to open habitats. Construction of the Kansas AC Collector System may impact foraging golden eagles if open habitats are converted to permanent disturbance. Breeding golden eagles could be impacted if native grasslands are converted to permanent disturbance. Additionally, if construction occurs in proximity to nests during the breeding season, eagles could abandon eggs or young due to noise or the presence of humans. During operations and maintenance, eagles could collide with new transmission lines, resulting in injury or mortality.

Site decommissioning would be performed at the end of the service life of the Kansas AC Collector System in accordance with approved decommissioning plans. Impacts to wildlife resources from activities to remove the Kansas AC Collector System would likely be similar to impacts during construction. The wildlife habitat removed during construction of the Kansas AC Collector System would take time to revegetate back to pre-construction conditions.

3.17.2.7 Transportation

, A 5-mile buffer of the approved Kansas AC Collector System centerlines (10 miles total) was used as the Kansas AC Collector System analysis area for potential impacts to transportation. Major roads in the Kansas AC Collector System analysis area include US 56, US 283, US 400, US 54, K-34, and K-23.

During construction, workers commuting to worksites, and the delivery of materials, supplies, and equipment would generate traffic on existing roadways within the Kansas AC Collector System analysis area. The total number of additional vehicle trips would be influenced by the number of workers, supplies and materials, and the amount of equipment needed to complete the Kansas AC Collector System, which are still unknown at this time. The impacts from additional traffic would be greatest for roadways that have the smallest volume of daily traffic, such as state routes and local roads. Traffic delays, road closure, rail line, and air transportation impacts would be similar to, but lesser in magnitude than, those described in **Section 3.9.4.2**. Construction of the Kansas AC Collector System in Ford County is likely to overlap with construction of the Project, particularly within the construction timeline for the converter station in Ford County, which could increase the impacts of additional traffic and/or traffic delays. One railroad crossing and several road crossings (US 400, US 283, and K-23) are currently proposed. No water crossings are proposed; therefore, no impacts to water transportation are anticipated.

Impacts from the Kansas AC Collector System during operations and maintenance as a result of traffic, delays and road closures, rail lines, and air transportation would be similar to, but lesser in magnitude than, those described in **Section 3.9.4.3**.

Site decommissioning would be performed at the end of the service life of the Kansas AC Collector System in accordance with individual decommissioning plans. Impacts to transportation resources from activities to remove the Kansas AC Collector System would likely be similar to impacts during construction, but likely with fewer passenger vehicles and equipment vehicles. Temporary road closures, similar to those needed for construction, would likely be needed for decommissioning.

3.17.2.8 Land Use

A 1-mile buffer of the approved Kansas AC Collector System centerlines (2 miles total) was used as the Kansas AC Collector System analysis area for potential impacts to land use. Major land cover types in the analysis area include cultivated crops (74 percent) and grassland/herbaceous (17 percent) (Dewitz 2021).

Impacts to land use may result from the construction, operations and maintenance, and decommissioning of the Kansas AC Collector System. During construction, impacts to agricultural operations could consist of short-term interference with movement of machinery, equipment, and irrigation implements; introduction of weeds and other pests; and relocation of livestock. After construction is complete, agricultural activities could generally resume. The Kansas AC Collector System has been sited to avoid schools, cemeteries, places of worship, and residences,, thus avoiding potential impacts. Current land use pertaining to community or residential development such as use of gates, outbuildings, or other structures could be disrupted during construction activities, and the duration and intensity of disruption would be variable. If facilities are sited on lands with conservation easements, the impacts would be similar to those described for the Project. The Kansas AC Collector System could impair the lands in meeting conservation objectives or require lands to be removed from their respective program, which may require reimbursement of payment to the agencies involved.

Impacts from operations may include limited restrictions on land use and interference with farming activities. Maintenance activities may have the same types of impacts to land uses as those discussed for construction, though the impacts would be transient, temporary, and intermittent; would be much shorter in duration than construction activities; and would occur on an as-needed basis.

Site decommissioning would be performed at the end of the service life of the Kansas AC Collector System in accordance with individual decommissioning plans. Impacts to land use resources from activities during decommissioning would likely be similar to those that would occur during construction. There would be disruption of use of land as decommissioning could interfere with the movement of agricultural machinery. Following decommissioning, it is assumed that land use could revert to pre-development conditions for a majority of the impacted areas.

3.17.2.9 Recreation

A 1-mile buffer of approved Kansas AC Collector System centerlines was used as the Kansas AC Collector System analysis area for potential impacts to recreation. No recreation sites are located within the Kansas AC Collector System analysis area (USGS 2022).

3.17.2.10 Visual Resources

A 1.5-mile buffer of the approved Kansas AC Collector System centerlines was used as the Kansas AC Collector System analysis area for potential impacts to visual resources. The landscape in the Kansas AC Collector System analysis area consists of the High Plains, the Southwestern Tablelands, and the Central Great Plains level III Ecoregions, (EPA 2024). One NHT overlaps the Kansas AC Collector System analysis area: the Santa Fe National Historic Trail Cimarron Route. No NRHP-registered properties, scenic byways, or recreational resources were identified within the Kansas AC Collector System analysis area (USGS 2022).

During construction, temporary impacts to landscape character, properties of historic significance, and transportations corridors, towns, and rural residences would be similar to those as described in **Section 3.12.4.2**.

When operational, potential impacts to visual resources would occur as a result of the physical features that would be introduced to the visual environment. New facilities would have a range of potential visual impacts, depending on their proximity to sensitive viewers.

Site decommissioning would be performed at the end of the service life of the Kansas AC Collector System in accordance with individual decommissioning plans. Impacts to visual resources from activities to remove the Kansas AC Collector System would likely be similar to impacts during construction. The areas of disturbance associated with the Kansas AC Collector System would take time to revegetate, becoming less noticeable over time as they gradually blend into the surrounding environment.

3.17.2.11 Noise

A 0.9-mile buffer of the approved Kansas AC Collector System centerlines was used as the Kansas AC Collector System analysis area for potential impacts to noise. The Kansas AC Collector System occurs in a sparsely populated, rural setting, and noise-sensitive receptors include rural residences. While the exact proximity to noise-sensitive receptors to the Kansas AC Collector System is unknown, no residences occur within 150 feet of the proposed centerlines.

During construction, short-term impacts from noise would occur similar to those described for the Project (**Section 3.13.4.2**). Use of ground-based heavy construction equipment and machinery, such as graders, dozers, drill rigs, and cranes, would impact nearby noise-sensitive receptors. Noise levels would vary throughout construction depending on the number and locations of operating equipment, distance to the noise-sensitive receptor from the equipment, time of day, atmospheric conditions, and intervening topography or barriers. If helicopters are used, they would cause additional noise impacts to noise-sensitive receptors from warm-up, take-off, and landing.

Maintenance activities for the Kansas AC Collector System would likely include regular inspections and repairs. These activities would result in short-term impacts to noise-sensitive receptors from noise generated by vehicles and equipment. Overall activity during operations and maintenance would be localized and short in duration (up to several days in any location).

Site decommissioning would be performed at the end of the service life of the Kansas AC Collector System in accordance with individual decommissioning plans. Noise impacts from activities to remove the Kansas AC Collector System would likely be similar to impacts during construction.

3.17.2.12 Social, Economic, and Community Resources

, The counties where the Kansas AC Collector System is proposed to occur—Ford, Meade, and Gray counties, Kansas—were used as the Kansas AC Collector System analysis area for potential impacts to social, economic, and community resources.

The Kansas AC Collector System is expected to be located within daily commuting distance of Dodge City, Kansas. Based on this proximity, it is anticipated that most construction workers temporarily relocating to the area would seek temporary accommodation in Dodge City and the surrounding area. Ford County had a total estimated population of 33,980 in 2023, with much of this total (80 percent) residing in Dodge City (**Table 3.14-1**). As discussed in Section 3.14, Ford County had an estimated 337 housing units available for rent in 2022, with an estimated total of 524 temporary lodging units (hotel/motel rooms and RV/camp spaces) normally vacant and available for rent (see **Tables 3.14-4** and **3.14-5**). As a result, there should be adequate temporary housing resources available to accommodate potential demand from incoming construction workers. Although workforce estimates are not available for the Kansas AC Collector System construction, the incoming workforce is likely to represent a relatively small share of the existing populations and would not be expected to substantially increase demand for local public services. Construction would also support jobs, income, and economic activity elsewhere in the local economy, as well as generate additional tax revenues for the affected local governments.

Workforce requirements for operations and maintenance would primarily be for annual inspections and routine vegetation management and maintenance work. This type of activity would be infrequent and would not be anticipated to impact population, housing, or public services. Impacts to property values would be unlikely due to the rural setting of the Kansas AC Collector System. During the Kansas AC Collector lifespan, property taxes would be paid to local counties. However, this would not be expected to substantially increase local revenues.

Site decommissioning would be performed at the end of the service life of the Kansas AC Collector System in accordance with individual decommissioning plans. Impacts to socioeconomic resources from activities to remove the Kansas AC Collector System would likely be similar to impacts during construction.

3.17.2.13 Environmental Justice

A 3-mile buffer on either side of the proposed Kansas AC Collector System centerlines was used as the Kansas AC Collector System analysis area for potential environmental justice impacts. A review of the

EJScreen tool data for the affected block groups in Ford, Meade, and Gray Counties did identify any census block groups meeting the environmental justice minority or low-income thresholds. The analysis area was also reviewed based upon the CEJST designation of disadvantaged communities.[2] This mapping tool shows a wider indication of environmental justice burdens for the affected communities. No disadvantaged communities were identified in the mapping of the affected census tracts using the CEJST tool. Based upon a review of the area using both tools, no disadvantaged communities are located in the Kansas AC Collector System analysis area; therefore, no environmental justice impacts are anticipated as part of the development of the Kansas AC Collector System.

3.17.2.14 Public Health and Safety

A 1.5-mile buffer of the approved Kansas AC Collector System centerlines was used as the Kansas AC Collector System analysis area for potential impacts to public health and safety. Indirect impacts to public health and safety may result from the construction, operations and maintenance, and decommissioning of the Kansas AC Collector System. During construction of the Kansas AC Collector System, surface disturbance, including grading activities, could disrupt contaminated soil, creating potential health hazards. Other impacts to public health and safety from hazardous materials, EMFs, wildfires, accidents and intentional destructive acts, and worker health and safety during construction of the Kansas AC Collector System would be similar in type to those described in **Section 3.16.4.2** for the Ford County Interconnect and Tiger Connector.

The new transmission lines associated with the Kansas AC Collector System would introduce a new source of AC EMFs, and impacts would be similar in type to those described for the Ford County Interconnect and Tiger Connector in **Section 3.16.4.3.2**. Other impacts to public health and safety from contaminated soils, hazardous materials, wildfires, accidents and intentional destructive acts, and worker health and safety during operations and maintenance of the Kansas AC Collector System would be similar in type to those described in **Section 3.16.4.3**.

Site decommissioning would be performed at the end of the service life of the Kansas AC Collector System in accordance with individual decommissioning plans. Impacts to public health and safety resources from activities to remove the Kansas AC Collector System would likely be similar to impacts during construction, specifically with respect to EMFs, wildfire, accidents and intentional destructive acts, and worker safety. Surface disturbance during decommissioning would likely occur in areas that had been disturbed during construction, and, therefore, new adverse impacts related to contaminated soils and hazardous materials would not be expected to occur.

[2] https://screeningtool.geoplatform.gov/en/#3/33.47/-97.5

4. CUMULATIVE EFFECTS

4.1 Introduction

Chapter 4 provides an analysis of cumulative effects from the Project combined with the effects of past, present, and reasonably foreseeable future actions. The CEQ NEPA implementing regulations define cumulative effects as "effects on the environment that result from the incremental effects of the [proposed federal] action when added to the effects of past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative effects can result from actions with individually minor but collectively significant effects taking place over a period of time" (40 CFR 1508.1(i)(3)). The term reasonably foreseeable is subsequently defined in 40 CFR 1508.1(ii) as "sufficiently likely to occur such that a person of ordinary prudence would take it into account in reaching a decision."

This cumulative effects analysis follows CEQ NEPA implementing regulations (40 CFR 1500-1508) and DOE NEPA implementing procedures (10 CFR 1021). This analysis also was informed by guidance provided in the CEQ *Guidance on the Consideration of Past Actions in Cumulative Effects Analysis* (CEQ 2005) and DOE *Recommendations for the Preparation of Environmental Assessments and Environmental Impact Statements, Second Edition* (DOE 2004). Where appropriate, regulations applicable to specific resources (e.g., the Clean Water Act requirements for water resources and Clean Air Act requirements for air quality) were also considered in this analysis.

4.2 Approach to Analysis

4.2.1 Past and Existing Projects or Actions

The CEQ guidance states that cumulative effects analysis should be forward-looking and should not require an exhaustive list of past actions; "agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions" (CEQ 2005). Past projects or actions and their cumulative effects are accounted for in the description of the existing environment (see **Chapter 3**) and make up the baseline conditions for this cumulative effects analysis. Existing projects or actions, similar to past projects or actions, contribute to the existing environment and baseline conditions and are also generally accounted for in the description of the affected environment (e.g., agricultural activities). However, some existing projects or actions may involve non-routine activities that could also contribute to cumulative effects, such as vegetation and facility maintenance. Therefore, some existing projects or actions are included in this cumulative effects analysis that could result in cumulative impacts when combined with impacts from the Project. It is assumed that all past and present actions included in the analysis have been and are being conducted in accordance with local, state, and federal laws and regulations, as well as BMPs and standards associated with such regulations.

4.2.2 Reasonably Foreseeable Future Projects or Actions

Reasonably foreseeable future actions incorporated in this cumulative effects analysis include projects or actions where there is an existing decision (e.g., decision record or issued permit), a commitment of resources or funding, or a publicly available formal proposal or planning document (e.g., a permit application). It is assumed that all reasonably foreseeable future actions included in the analysis would be conducted in accordance with local, state, and federal laws and regulations, and BMPs and standards associated with such regulations. Speculative future developments (such as those that are not formally proposed or do not have enough project details to inform the analysis) are not included in this cumulative effects analysis. Reasonably foreseeable future actions were identified through review of publicly available data on relevant websites, including:

- Federal entities, such as the NRCS, EIA, USFWS, NPS, Bureau of Reclamation, and USACE;
- Tribes;
- State agencies;
- Local county planning commissions;
- Trade groups, such as the American Farm Bureau Federation; and
- Energy developers, for information on private actions and trends.

4.2.3 Cumulative Effects Analysis Area

The geographic scope for the cumulative effects analysis (referred to as the cumulative effects analysis area) is resource-specific and is defined for each resource in **Section 4.4**. The cumulative effects analysis area for each resource is based on the area where effects would be expected to occur from construction, operations and maintenance, and decommissioning of the Project as defined in **Sections 3.2** through **3.16**. The cumulative effects analysis includes reasonably foreseeable future actions or projects located within the cumulative effects analysis area for each resource and considers if those actions would occur within the same timeframe as the Project. The analysis considers whether the anticipated overlap in time and space would occur during the construction phase (short-term, see **Section 2.3.2.11**)), operations and maintenance phase (long-term), or during decommissioning (short-term) for the Project.

4.3 Actions Included in the Cumulative Effects Analysis (Cumulative Actions)

The following sections describe the categories of existing and reasonably foreseeable future projects or actions (together referred to as cumulative actions) within the cumulative effects analysis area that may result in cumulative effects on resources when combined with effects of the Project. Specific cumulative actions included in this cumulative effects analysis are listed in **Appendix 4** and are shown on **Figure 4-1**.

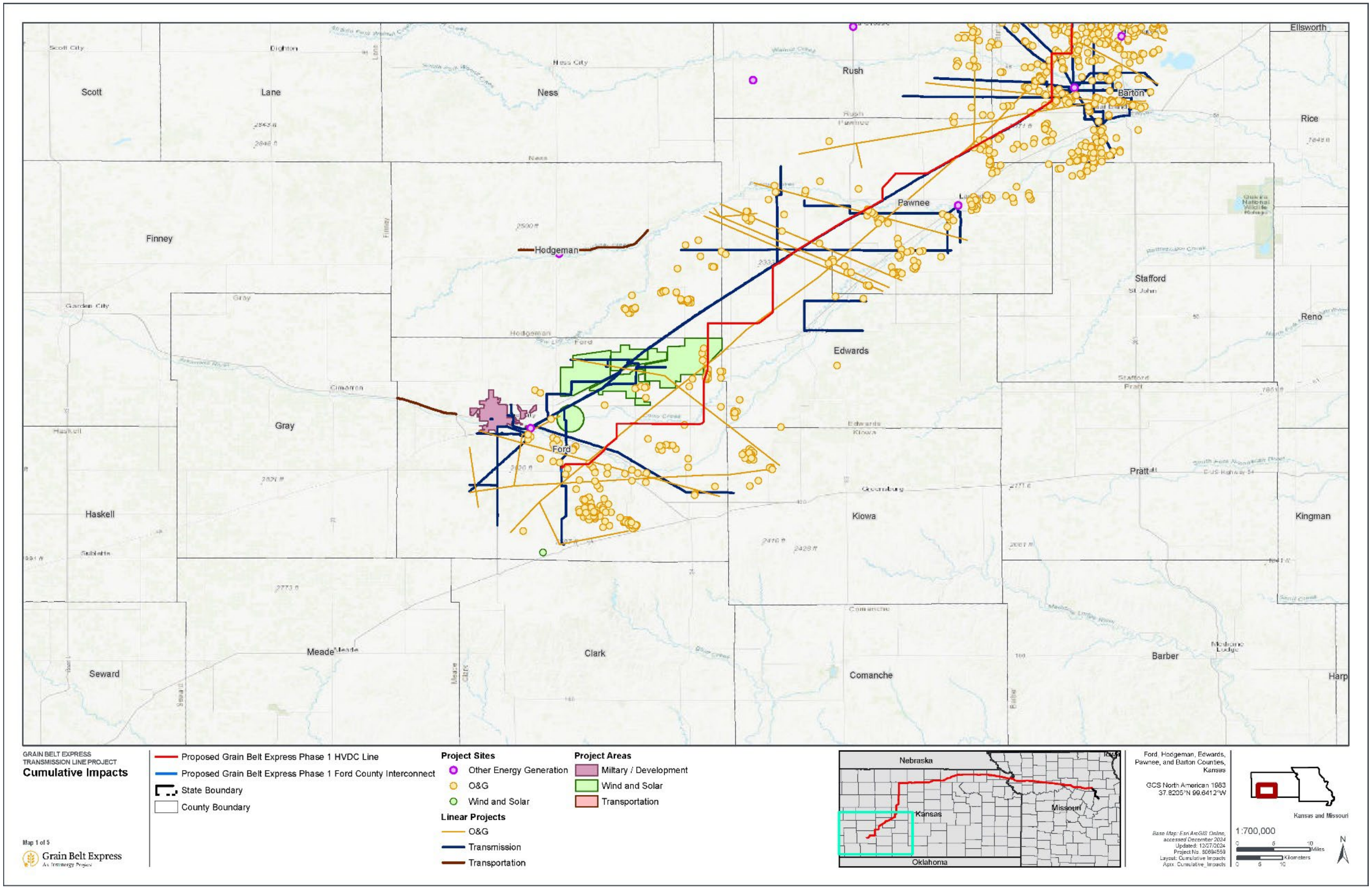

Figure 4-1. Projects Included in the Cumulative Effects Analysis Area (1 of 5)

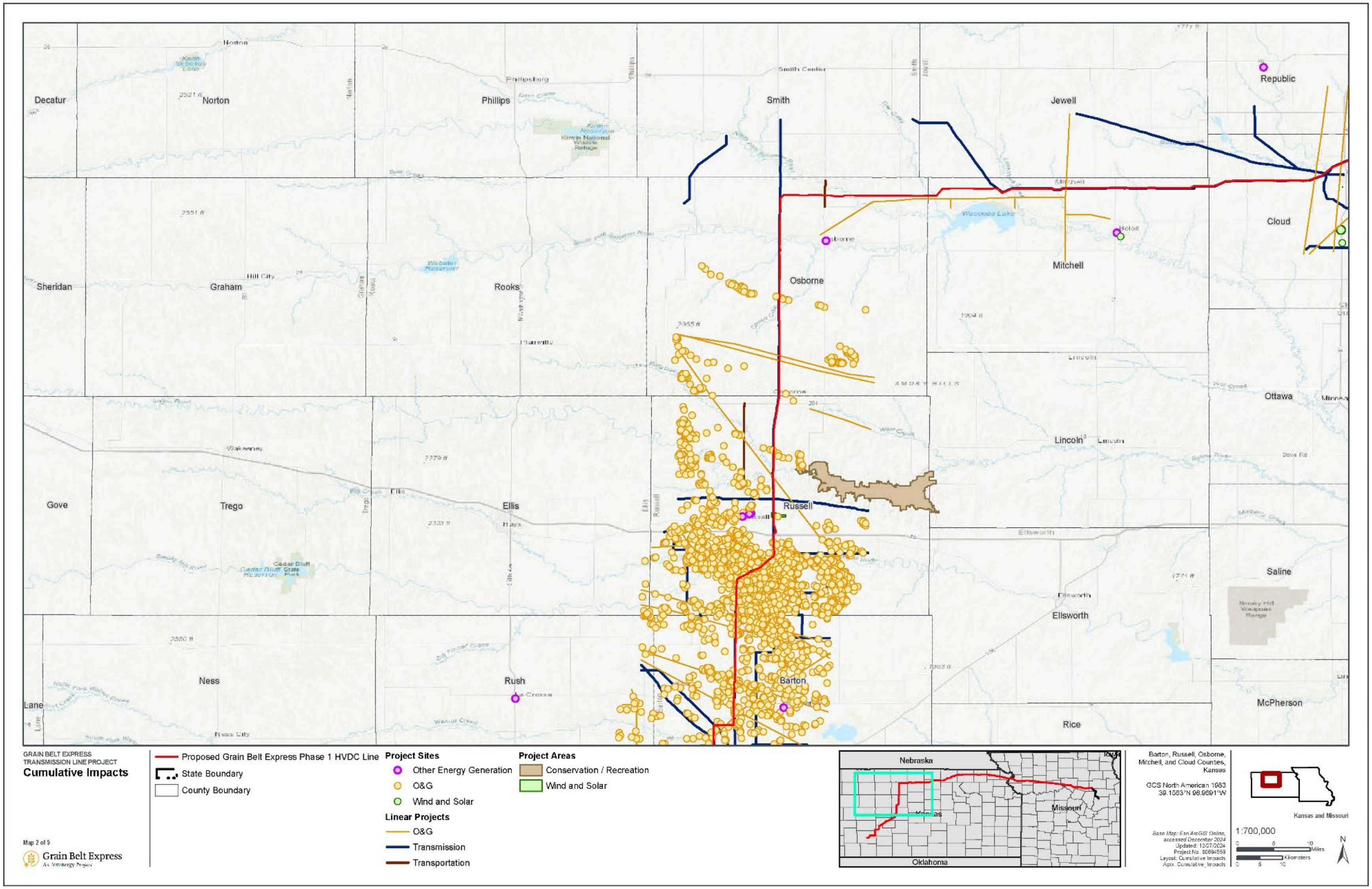

Figure 4-1. Projects Included in the Cumulative Effects Analysis Area (2 of 5)

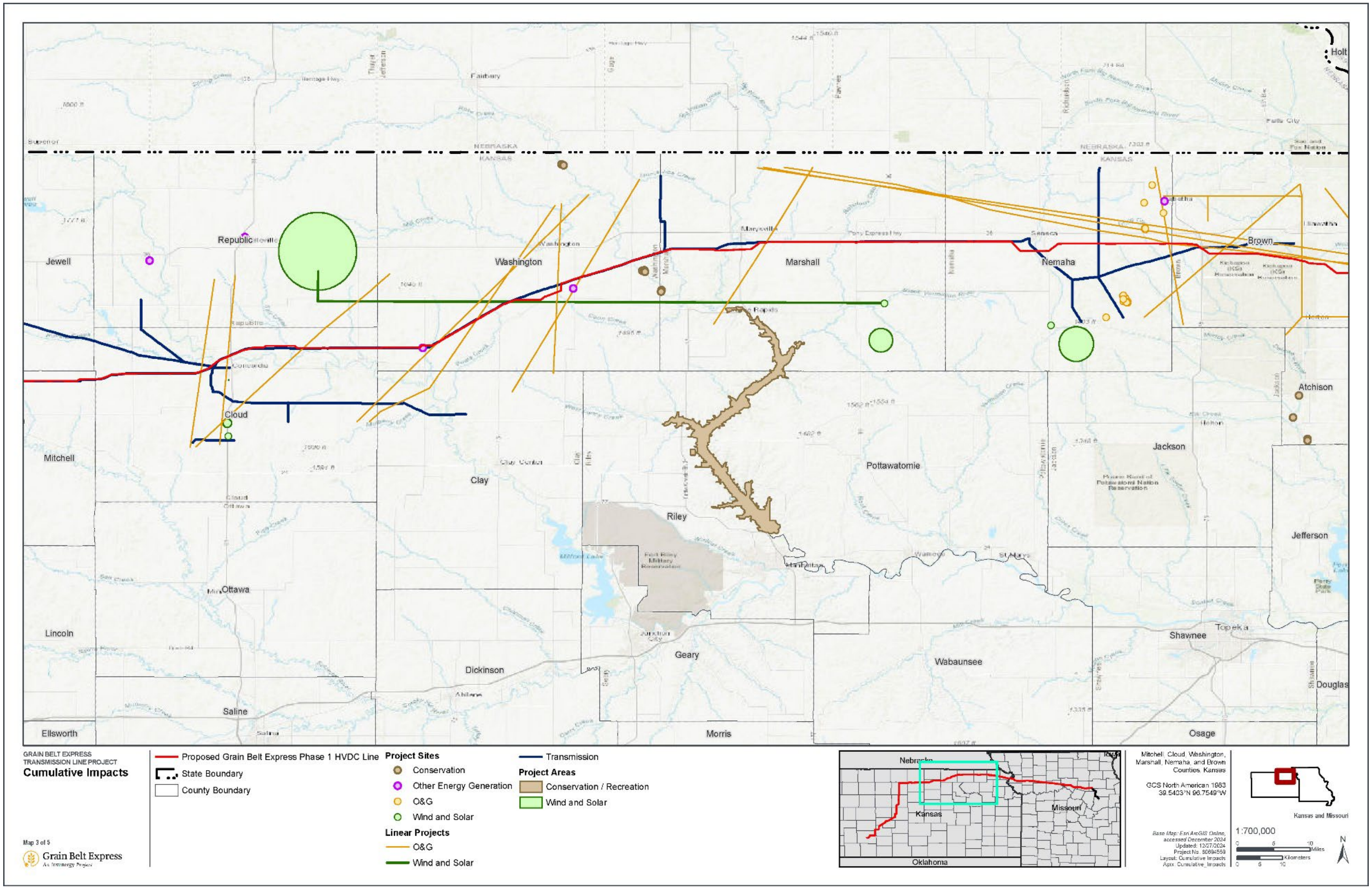

Figure 4-1. Projects Included in the Cumulative Effects Analysis Area (3 of 5)

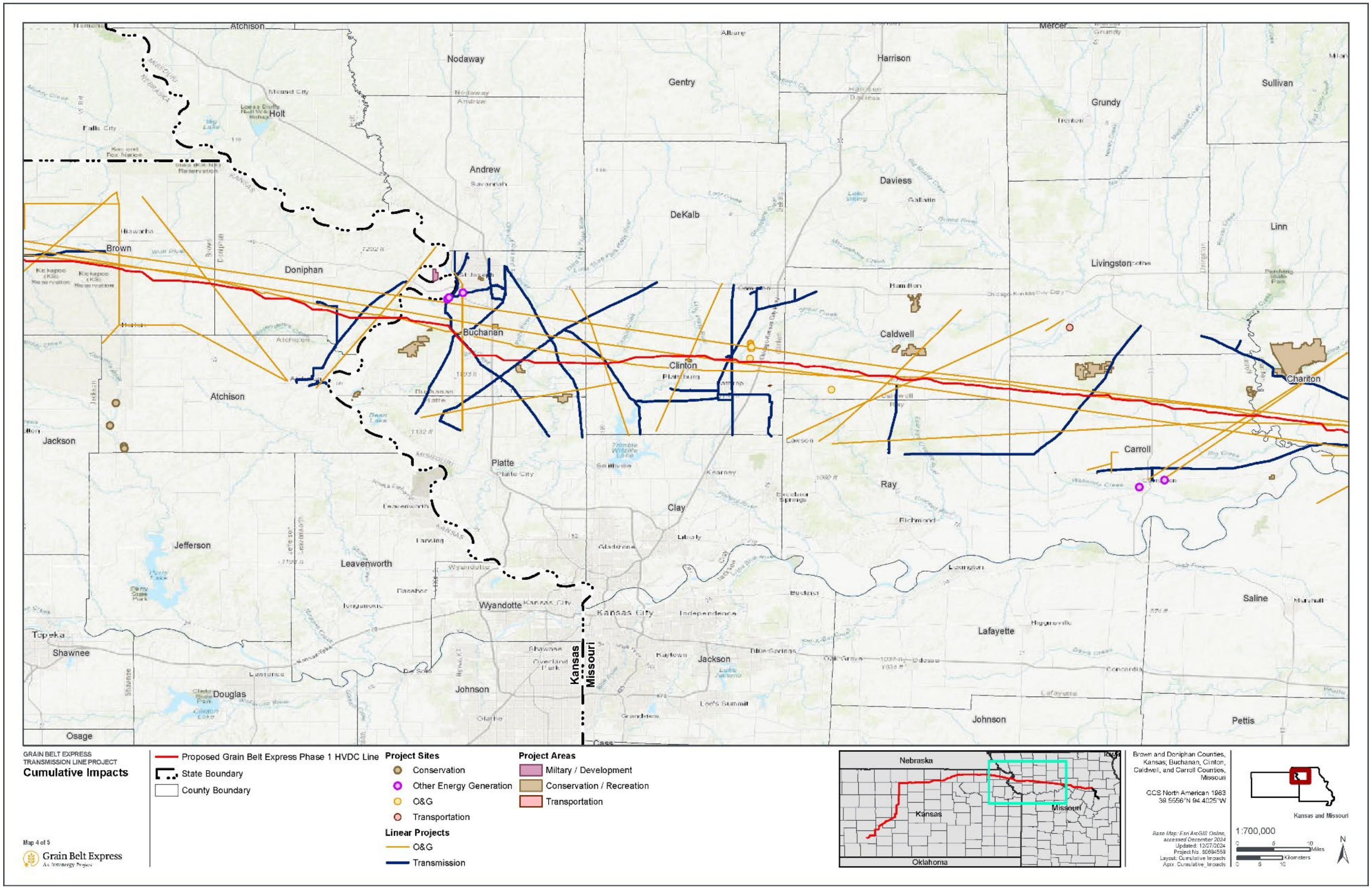

Figure 4-1. Projects Included in the Cumulative Effects Analysis Area (4 of 5)

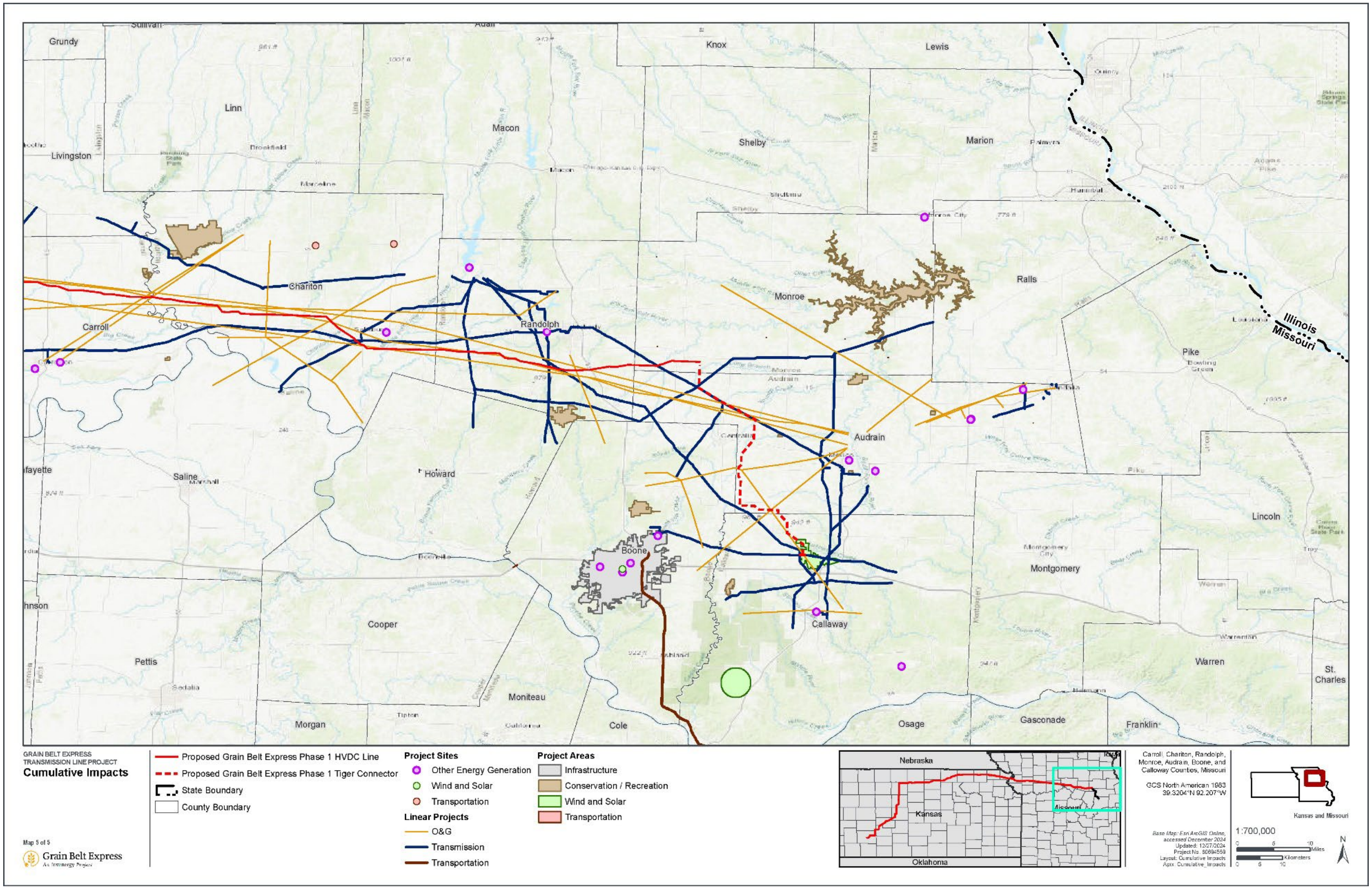

Figure 4-1. Projects Included in the Cumulative Effects Analysis Area (5 of 5)

4.3.1 Existing Projects or Actions

4.3.1.1 Transmission Lines

Existing high-voltage electric transmission lines undergo the same periodic vegetation and component maintenance actions that would occur for the Project. Additionally, transmission lines pose an ongoing collision and electrocution risk for avian species, as well as a wildfire risk. Transmission lines also contribute to visual impacts to sensitive views and viewers. Therefore, transmission facilities that are located within the cumulative effects analysis area are included as actions that could contribute to cumulative effects. Existing transmission lines included in the cumulative effects analysis are shown on **Figure 4-1** and in **Appendix 4**.

4.3.1.2 Wind and Solar Generation Facilities

Existing commercial- or utility-scale wind and solar generation facilities undergo similar periodic vegetation and component maintenance activities as would occur for the Project. Additionally, wind energy facilities pose an ongoing collision risk for avian and bat species. Therefore, such facilities that are located within the cumulative effects analysis area are included as actions that could contribute to cumulative effects. Existing wind and solar generation facilities included in the cumulative effects analysis are shown on **Figure 4-1** and listed in **Table 4-1** and **Appendix 4**.

Table 4-1. Existing Wind and Solar Generation Facilities Included in the Cumulative Effects Analysis

State	County	Project
Kansas	Middle	Beloit Solar Farm
Kansas	Cloud	Meridian Way Wind Farm
Kansas	Washington	High Banks Wind Project
Kansas	Marshall	Irish Creek Wind Farm
Kansas	Nemaha	Soldier Creek Wind Farm

4.3.1.3 Other Energy Generation Facilities

Other existing energy generation facilities include existing resource extraction (oil and gas wells), oil and gas transport pipelines, processing plants, and power generation plants. Such facilities undergo similar periodic vegetation and facility maintenance actions as would the Project, or they may have air or noise emissions that would contribute to cumulative effects when combined with effects of the Project. Therefore, these existing energy generation facilities located within the cumulative effects analysis area are included as actions that could contribute to cumulative effects. Other existing energy or transport facilities included in the cumulative effects analysis are shown on **Figure 4-1** and listed in **Table 4-2** and **Appendix 4**.

Table 4-2. Existing Energy Generation Facilities Included in the Cumulative Effects Analysis

State	County	Project
Kansas	Multiple	Existing oil and gas wells
Kansas	Multiple	Existing oil and gas pipeline infrastructure
Missouri	Chariton	City of Salisbury Plant
Missouri	Randolph	Thomas Hill Energy Center
Missouri	Randolph	Moberly Power Plant
Missouri	Multiple	Existing oil and gas pipeline infrastructure

4.3.1.4 Transportation Facilities

Existing transportation facilities considered for this analysis include interstate highways, U.S. highways, state highways, and county roads. These facilities undergo periodic maintenance that may result in increased traffic congestion on local roadways and construction-related emissions, similar to impacts that would occur during construction of the Project, and that would contribute to cumulative effects when combined with the effects of the Project. Therefore, existing transportation facilities located within the cumulative effects analysis area are included as actions that could contribute to cumulative effects. Existing transportation facilities included in the cumulative effects analysis are shown on **Figure 4-1** and listed in **Table 4-3** and **Appendix 4**.

Table 4-3. Existing Transportation Facilities Included in the Cumulative Effects Analysis

State	County	Project [1]
Kansas	Hodgeman	K-156 Roadway Work
Missouri	Buchanan	Route Y Bee Creek Bridge Replacement
Missouri	Clinton	US Route 69 and Route 116 Intersection Improvement Project
Missouri	Carroll	Carroll County Route E Bridge Replacements
Missouri	Monroe	Bridge improvements over Brush Creek
Missouri	Monroe	Bridge improvements over Milligan Creek
Missouri	Monroe	Bridge improvements over Middle Fork Salt River
Missouri	Monroe	Bridge improvements over South Fork Salt River
Missouri	Monroe	Bridge improvements over Bee Creek

[1] Some projects in Appendix 4 are listed as both present and reasonably foreseeable; those projects are discussed below in Section 4.3.2.

4.3.1.5 Other Developments

Other developments include commercial, industrial, municipal, and large residential developments currently under construction. Such developments could have impacts similar to the Project's construction impacts and may contribute to cumulative effects when combined with the effects of the Project. Therefore, other ongoing developments located within the cumulative effects analysis area are included as actions that could contribute to cumulative effects. Other developments that are included in the cumulative effects analysis are shown on **Figure 4-1** and listed in **Table 4-4** and **Appendix 4**.

Table 4-4. Other Existing Developments Included in the Cumulative Effects Analysis

State	County	Project
Kansas	Ford	Hilmar Cheese Company production facility

4.3.1.6 Recreation and Conservation Efforts

Ongoing activities related to recreation and conservation considered in the cumulative effects analysis include management of natural resources (such as streambank stabilization and vegetation/habitat planting and control), protection of natural resources (such as from the effects of erosion and invasive plants), and renovation of recreational facilities (such as trails). Such actions could have impacts similar to those of the Project and may contribute to cumulative effects when combined with the effects of the Project. Therefore, ongoing recreation and conservation management actions located within the cumulative effects analysis area are included as actions that could contribute to cumulative effects. Ongoing recreation and conservation management actions that are included in the cumulative effects analysis are shown on **Figure 4-1** and listed in **Table 4-5** and **Appendix 4**.

Table 4-5. Existing Recreation and Conservation Efforts Included in the Cumulative Effects Analysis

State	County	Project [1]
Missouri	Buchannan	Campground renovation at Lewis and Clark State Park
Missouri	Carroll	2013 Bunch Hollow Conservation Area Management Plan

1 Some projects in Appendix 4 are listed as both present and reasonably foreseeable; those projects are discussed below in Section 4.3.2.

4.3.2 Reasonably Foreseeable Future Projects or Actions

4.3.2.1 Transmission Lines

The Applicant has announced the potential for a future Phase 2 of the Grain Belt Express Transmission Project that would deliver approximately 2,500 MW of power from southwest Kansas to the PJM Interconnection LLC power market. Phase 2 would include an approximately 280-mile-long extension of the Project HVDC Line from the proposed HVDC converter station in Monroe County, Missouri (constructed as part of Phase 1 of the Project) to a new HVDC converter station site in Clark County, Illinois. A double-circuit 345-kV AC transmission line would extend from the HVDC converter station site in Clark County, Illinois, to the existing Sullivan Substation in Sullivan County, Indiana.

The permanent disturbance associated with infrastructure to support Phase 2 would be entirely within the HVDC converter station parcel areas planned for Phase 1. Therefore, any potential disturbance associated with Phase 2 at the converter station sites in Ford County, Kansas, and Monroe County, Missouri, is accounted for in the analysis of the Project in Chapter 3.The westernmost portion of the Phase 2 HVDC Line within Monroe County, Missouri, would be within the cumulative effects analysis area and is included in this analysis; however, the routing of the transmission line and other details are currently not developed to a point that potential impacts can be quantified. Phase 2 construction activities would occur at an undetermined date following completion of Phase 1, and there would be no overlap of short-term construction-related impacts.

The development of renewable technologies described in **Section 4.3.2.2** will result in the need to develop supporting electric distribution and transmission lines to connect the wind or solar farms to the electric power grid. However, other than Phase 2 of the Grain Belt Express Transmission Project, no other new proposed or planned electric transmission lines were identified that meet the criteria to be reasonably foreseeable in the cumulative effects analysis area.

4.3.2.2 Wind and Solar Generation Facilities

The cumulative effects analysis area is in a region that is expected to experience an increase in electric power demand. In its report, *Annual Energy Outlook 2023*, the EIA reports stable growth in United States' electric power demand through 2050 due to increasing electrification and ongoing economic growth (EIA 2023). The EIA estimates demand for electricity will increase by as much as 15 percent by 2050 across the United States (EIA 2023). The EIA predicts that renewable generating capacity will grow in all regions of the United States, specifically generation from wind power, with 40–60 percent of renewable power capacity in the Midwest (including Kansas and Missouri) coming from wind by 2050.

While the Project technology has bidirectional capability, power can only move along the line in one direction at a time, and capacity on the line is finite. The western end of the Project is proximate to a superior renewable energy resource and has very limited load; thus, it is reasonably foreseeable that new wind and solar generation projects would be developed on the western end of the Project and deliver power eastward under normal operating conditions. Power would flow westward only under emergency operating conditions. It is anticipated that approximately 3,000 MW of generation projects would need to both execute interconnection agreements and secure offtake to fully use the Phase 1 Project capacity and meet the requirement to deliver 2,500 MW to the points of interconnection in Missouri. To date, the Applicant has received 14 requests for interconnection, totaling 10.6 gigawatts of renewable energy. While this exceeds the capacity of the Project, it demonstrates the resource potential in the region. However, interconnection agreements and details of potential projects or actions that would be associated with Project interconnects have not been developed to a point that any actions are considered reasonably foreseeable; therefore, these potential interconnections are not included in the cumulative effects analysis.

In addition to the potential yet unknown Projects discussed above, four reasonably foreseeable wind energy generation facilities and three reasonably foreseeable solar energy generation facilities were identified within the analysis area and are included in this cumulative effects analysis (**Figure 4-1, Table 4-6** and **Appendix 4**).

Table 4-6. Planned Wind and Solar Generation Facilities Included in the Cumulative Effects Analysis

State	County	Planned Action
Kansas	Ford	Pioneer Creek Wind Farm
Kansas	Russell	Sunflower Electric Solar
Kansas	Osborne	Rolling Prairie Wind
Kansas	Cloud	Skyview Wind Farm
Kansas	Nemaha	Pony Express Wind Energy Center
Missouri	Ralls/Audrain	Huck Finn Solar Farm
Missouri	Callaway	Guthrie Solar Project
Missouri	Callaway	Ranger Power Show Me State Solar

Sources: SWCA and Invenergy 2023; Sunflower Electric Power Corporation 2023; NextEra Energy Resources, LLC 2023.

4.3.2.3 Other Energy Generation Facilities

As described above for wind and solar generation facilities, the cumulative effects analysis area is in a region that is expected to experience an increase in electric power demand. It is possible that some future electric power demand could be met by new or expanded traditional generation facilities. However, no proposed or planned new power plants or oil and gas generation facilities that meet the criteria to be reasonably foreseeable were identified in the cumulative effects analysis area.

4.3.2.4 Transportation Facilities

Regional and local commercial and residential growth may result in periodic construction of new or expanded transportation facilities. Potential new transportation facilities considered for this analysis include interstate highways, U.S. highways, state highways, and county roads that could result in increased traffic congestion and construction-related emissions, similar to impacts that would occur during construction of the Project. Identified proposed or planned new transportation facilities within the cumulative effects analysis area consist of improvements to existing roadways and bridges (**Figure 4-1, Table 4-7** and **Appendix 4**).

Table 4-7. Planned Transportation Facilities Included in the Cumulative Effects Analysis

State	County	Planned Transportation Action
Kansas	Ford	Reconstruct US 50/US 400 to a 4-lane expressway

State	County	Planned Transportation Action
Kansas	Russell	US 281 improvements
Kansas	Osborne	Reconstruct roadway, and bridge replacements on US 281
Missouri	Audrain	Bridge improvements over Hickory Creek
Missouri	Callaway	Holts Summit Road improvements for Pro Foods Systems Expansions
Missouri	Callaway	US Route 54/Old Jefferson City Road intersection improvements
Missouri	Callaway	US Route 54 improvements in North Jefferson City
Missouri	Montgomery	Route 19 and I-70 interchange improvements in Montgomery
Missouri	Montgomery	I-70 resurfacing
Missouri	Montgomery	Improve I-70 East
Missouri	Montgomery	Mineola Hill climbing lanes design-build

Source: SWCA and Invenergy, 2023; Boonslick Regional Planning Commission 2023; City of Fulton 2023; City of Holts Summit 2023. City of Jefferson 2023; City of Jonesburg 2023; City of Mokane 2023; Mid-MO Regional Planning Commission 2023; MoDOT 2023a, 2023b, 2023c, 2023d.

4.3.2.5 Other Developments

Other developments include commercial, industrial, municipal, and large residential developments identified through publicly available information that are reasonably foreseeable. Such developments could have impacts similar to the Project’s construction impacts and may contribute to cumulative effects when combined with the effects of the Project. Other planned developments included in the cumulative effects analysis are shown on **Figure 4-1** and listed in **Table 4-8** and **Appendix 4**.

Table 4-8. Other Planned Development Actions Included in the Cumulative Effects Analysis

State	County	Planned Development
Missouri	Buchanan	Missouri Air National Guard, 139th Airlift Wing, Rosecrans, Expansion
Missouri	Callaway	Dogwood Park Planned Unit Development
Missouri	Callaway	Holts Summit Inflow and Infiltration Mitigation
Missouri	Montgomery	City of Jonesburg Wastewater Project

Source: Boonslick Regional Planning Commission 2023; City of Fulton 2023; City of Holts Summit 2023; City of Jefferson 2023; City of Jonesburg 2023; City of Mokane 2023; Mid-MO Regional Planning Commission 2023

4.3.2.6 Recreation and Conservation Efforts

Reasonably foreseeable future activities related to recreation and conservation considered in the cumulative effects analysis include construction of new facilities or significant management activities identified in long-term management plans for recreation or conservation areas. Such actions could have similar impacts to those of the Project and may contribute to cumulative effects when combined with the effects of the Project. Reasonably foreseeable future actions related to recreation and conservation in the cumulative effects analysis area are shown on **Figure 4-1** and listed in **Table 4-9** and **Appendix 4**.

Table 4-9. Planned Recreation and Conservation Efforts Included in the Cumulative Effect Analysis

State	County	Recreation and Conservation Efforts
Kansas	Russell	Wilson Lake Master Plan
Kansas	Marshall	Tuttle Creek Lake Master Plan
Kansas	Marshall, Washington	Streambank Stabilization
Missouri	Buchannan	2015 Bluffwoods Conservation Area Management Plan
Missouri	Buchannan	2017 Belcher Branch Lake Conservation Area Management Plan
Missouri	Buchannan	2018 Mark Youngdahl Urban Conservation Area Management Plan
Missouri	Buchannan	2017 Pigeon Hill Conservation Area Management Plan

State	County	Recreation and Conservation Efforts
Missouri	Buchannan	2017 Anthony & Beatrice Kendzora Conservation Area Management Plan
Missouri	Clinton	2014 Ronald and Maude Hartell Conservation Area Management Plan
Missouri	Caldwell	2014 Bonanza Conservation Area Management Plan
Missouri	Caldwell	Little Otter Creek Lake Project
Missouri	Carroll	2017 McKinny Conservation Area Management Plan
Missouri	Carroll	2019 Little Compton Lake Conservation Area Management Plan
Missouri	Chariton	2018 Yellow Creek Conservation Area Management Plan
Missouri	Chariton	Swan Lake National Wildlife Refuge Administrative Headquarters and Visitor Facility
Missouri	Randolph	2019 Rudolf Bennitt Conservation Area Management Plan
Missouri	Monroe	Mark Twain Lake National Fish Habitat Partnership Funded Project
Missouri	Audrain	Lowe, Northcutt, and Sears Conservation Areas Fifteen-Year Area Management Plan
Missouri	Audrain, Monroe	Robert M. White II Conservation Area Management Plan
Missouri	Callaway	2015 Little Dixie Lake Conservation Area Management Plan (Updated 2019)
Missouri	Callaway	Little Dixie Lake Conservation Area Trail Improvements

4.4 Regional Energy Development

Although specific actions have not been identified, development of the Project would likely result in an increase in renewable energy development, particularly in southwest Kansas in the area surrounding the converter station and Kansas AC Collector System. These developments would have long-term, direct impacts on resources in the region. These impacts would be similar to those described below for wind and solar generation facilities. Wind and solar projects would be developed by third parties and would be subject to separate permitting processes.

4.5 Cumulative Effects Analysis

The following cumulative effects analysis is presented for each resource addressed in **Chapter 3**. Cumulative actions are analyzed to the extent they could have additive effects when combined with the impacts to resources from construction, operations, maintenance, and decommissioning of the Project. The duration, either short-term or long-term, of the potential effects on each resource is described. Because of the nature of the cumulative actions identified, available quantitative data on their potential environmental effects are limited. Therefore, qualitative evaluations of potential cumulative effects are presented in this section.

4.5.1 Air Quality, Greenhouse Gas Emissions, and Climate Change

The cumulative effects analysis area for air quality is all counties where Project construction, operations, maintenance, and decommissioning would occur. As detailed in **Section 3.2**, federal air quality attainment and nonattainment designations are tracked at the county level under the NAAQS. The NAAQS have been developed to protect human health and welfare and include primary and secondary standards that apply to criteria pollutants. Attainment of the NAAQS standards is measured for each criteria pollutant (generally by county) and includes emissions from past and present sources listed in **Section 4.3.1**. Currently, there are no nonattainment or maintenance areas (for NAAQS) in the air quality cumulative effects analysis area (EPA 2023).

The potential for changes in GHG emissions was considered in the same county-level analysis area, as these changes could contribute to state and national trends in such emissions. Climate change trends have been accounted for in **Section 3.2** and in **Section 4.3.3** and thus are not further described in this section. Actions analyzed are those listed in **Appendix 4** that are located within the cumulative effects analysis area for air quality and GHG emissions.

The categories of cumulative actions expected to contribute to cumulative effects on air quality and GHG emissions within the cumulative effects analysis area include transmission lines, wind and solar generation facilities, other energy generation, transportation facilities, other related developments, and recreation and conservation efforts. Typical activities for these other actions that may affect air quality, GHG emissions, and climate change are as follows:

- **Transmission Lines.** Construction of a new transmission line would result in short-term effects that would predominantly produce particulate matter (PM_{10} and $PM_{2.5}$) from the disturbance of land, as well as emit criteria pollutants and GHGs from equipment and vehicle exhaust. Operations and maintenance would produce minimal criteria pollutant and GHG emissions. Decommissioning would create similar short-term effects to those described for construction.
- **Wind and Solar Generation Facilities.** Construction of wind and solar generation facilities would result in short-term effects that would predominantly produce particulate matter (PM_{10} and $PM_{2.5}$) from the disturbance of land, as well as emit criteria pollutants and GHGs from equipment, vehicle exhaust, and concrete batch plants. Operations and maintenance of renewable energy projects would produce minimal criteria pollutant and GHG emissions, and over the long term, air could be improved if renewable energy provides some offset to emissions from fossil-fuel-generated energy sources. Decommissioning of planned actions would create similar short-term effects to those described for construction.
- **Other Energy Generation Facilities.** The existing power plants (in Randolph and Chariton counties in Missouri) and oil and gas wells across multiple counties within the cumulative effects analysis area contribute to the baseline air quality and GHG emissions. Ongoing operation and maintenance of these facilities is expected to contribute similar emissions in the future over the long term.
- **Transportation Facilities.** Construction of new facilities and maintenance and upgrades to existing roadways and bridges would result in short-term effects that would predominantly produce particulate matter (PM_{10} and $PM_{2.5}$) from the disturbance of land when those actions are not confined to existing roadway ROWs. Construction activities for transportation facilities would result in emissions of criteria pollutants and GHGs from equipment and vehicle exhaust. Operations and maintenance of transportation facilities may create increased criteria pollutant and GHG emissions from vehicles when the transportation action consists of the construction of a new transportation facility; however, these emissions would be reduced through BMPs in designing the new transportation facility and could be offset if the new facility reduces traffic congestion. Decommissioning of planned actions would create effects in the short term similar to those described for construction.
- **Other Developments.** Construction of other planned developments within the cumulative effects analysis area, would result in short-term effects that would predominantly produce particulate matter (PM_{10} and $PM_{2.5}$) from the disturbance of land as well as emit criteria pollutants and GHGs from equipment, vehicle exhaust, and concrete batch plants. Criteria pollutant and GHG emissions associated with the operations and maintenance of other planned developments are unknown. Decommissioning of the other planned developments would create effects in the short term similar to those described for construction.

- **Recreation and Conservation Efforts.** Recreation and conservation management actions could include managed burns and land-disturbance activities that would result in short-term effects from particulate matter (PM_{10} and $PM_{2.5}$), as well as from emission of criteria pollutants and GHGs from equipment and vehicle exhaust. Once implemented, there would be minimal, if any, long-term criteria pollutant and GHG emissions from the land conservation actions.

Cumulative effects on air quality, if any, would only occur if the Project construction or decommissioning occurred at the same time as any of the present or planned actions within the cumulative effects analysis area for air quality listed in **Appendix 4**. In that event, cumulative effects from the Project and other cumulative actions would occur, resulting in short-term effects on air quality in localized areas. Transportation projects could have short-term effects on air quality, although these actions would be expected to be minimal. The likelihood of causing non-attainment in any county would be low given current air quality trends (attainment), and none of the planned actions would involve long-term operations with notable emissions (as continued emissions from existing fossil-fuel generation facilities and oil and gas facilities were accounted for in the baseline conditions). Therefore, the Project combined with cumulative actions may incrementally increase effects on air quality; however, these impacts would be short-term.

Short-term GHG emissions from construction of the Project and other cumulative actions would result in cumulative effects on climate change. However, it is expected that operation of the Project could help reduce long-term GHG emissions by allowing additional renewable energy projects to access the electric grid, resulting in an incremental replacement of existing fossil-fuel power plants with renewable energy generation. It's estimated that development and use of wind and/or solar generation assets for the Project would represent a potential reduction or avoidance of between 2.8 to 3.1 million tons of GHG emissions annually (see additional discussion in **Section 3.2.4.3.2**).Therefore, the Project combined with cumulative actions may incrementally increase short-term GHG emissions and climate change during construction but would be expected to have a net positive impact on long-term GHG emissions and climate change.

4.5.2 Paleontology and Soils

The cumulative effects analysis area for paleontology and soils includes a 0.25-mile buffer surrounding the Project area (0.5 miles total). Cumulative actions analyzed are those listed in **Appendix 4**, identified as potentially having cumulative effects on paleontology and soils. The categories of cumulative actions that may impact paleontology and soils include new transmission lines, wind and solar generation, transportation, and recreation or conservation actions. Typical activities for these actions that may affect paleontology and soils are identified below.

4.5.2.1 Paleontology

The cumulative actions included in the analysis have the potential to affect paleontological resources in ways similar to those described for the Project (**Section 3.3**). These include crushing, breaking, disturbing, or removing fossils during surface disturbance associated with project construction. While these activities would occur only during construction, if a paleontological resource is affected, the impacts would be permanent. Typical activities that could affect paleontology are as follows:

- **Transmission Lines.** Construction of a new transmission line would require surface and subsurface disturbance similar to the proposed Project and could affect fossiliferous rock or sediments.
- **Wind and Solar Generation Facilities.** Construction of new wind and solar projects would require surface and subsurface disturbance and could affect fossiliferous rock or sediments.

- **Transportation Facilities.** The planned transportation actions included in the analysis may include bridge replacement. Depending on the planned construction activities for the bridge replacement (e.g., new bridge footings that require subsurface disturbance), permanent long-term effects to subsurface geology and the potential to encounter paleontological resources may occur.
- **Recreation and Conservation Efforts.** The two conservation actions in the paleontology cumulative effects analysis area discussed in **Appendix 4** may impact geologic units designated as having potential for fossils. The management strategies and goals for these conservation efforts include the removal of invasive vegetation, implementation of prescribed burns, and planting forage for wildlife. Minimal short-term effects to paleontological resources are anticipated from these actions, as little disturbance of geological units would be anticipated, and vegetation management would be expected to improve soil stabilization and limit subsequent erosion and potential exposure of fossils.

The potential for cumulative impacts to paleontological resources from the Project would depend on the amount and type of surface disturbance and the location relative to the fossil-bearing rock or sediments. Any land-disturbing activity can cause surface and subsurface physical disturbance that could result in the destruction or discovery/recovery of paleontological resources. If previously unrecorded paleontological resources are identified during planned actions, such activities may contribute cumulatively to an increase in the knowledge of paleontological data in the area, and new specimens may be collected. However, planned actions can also contribute to land disturbance that could lead to an increase in destruction or damage to fossil resources and irreversible damage to paleontological resources, precluding their future analysis. Once construction is complete, operations and maintenance and decommissioning activities would likely occur in the same disturbed area as construction and thus likely would not result in additional impacts to paleontological resources. The Project could result in an incremental cumulative impact on paleontological resources; however, because there would be limited overlap in disturbance areas between the Project and the cumulative actions, the potential for cumulative effects on paleontological resources would not be significant.

4.5.2.2 Soils

Construction activities cause surface, and potentially subsurface, physical disturbance that disrupts soil resources and may result in loss of valuable topsoil, including soils categorized as prime farmland or farmland of statewide importance, and soil productivity. In addition, vegetation removal activities potentially result in erosion and soil loss, and grading and excavation potentially result in soil resource mixing, greater soil compaction, and soil contamination from equipment leaks or spills. Depending on construction methods and BMPs employed, surface disturbances on soil resources in temporarily disturbed areas would likely be temporary and minor, and previous land use would generally be able to resume, including on agricultural lands. Placement of new permanent structures would result in permanent loss of soil, including if the structures are located on soils designated as prime farmland or farmland of statewide importance.

The categories of cumulative actions included in the cumulative effects analysis expected to affect soil resources within the cumulative effects analysis area include new transmission lines, wind and solar generation facilities, transportation facilities, and recreation and conservations efforts. Typical activities for these actions that would affect soils are as follows:

- **Transmission Lines.** Construction of a new transmission line would require surface and subsurface disturbance and would affect soils. Construction would require removing vegetation, increasing the potential for wind and water erosion, and cutting trees, which can alter soil moisture. Grading and other construction activities can also result in erosion, exposure of subsoils, soil mixing, soil compaction, and other effects similar to those described for the Project in **Section 3.3**. Placement of new facilities would result in permanent loss of soils from within the footprint of facility sites or structure foundations.

- **Wind and Solar Generation Facilities.** Construction of new wind and solar projects would require surface and subsurface disturbance and would affect soils. Construction would require removing vegetation, increasing the potential for wind and water erosion, and cutting trees, which can alter soil moisture. Grading and other construction activities can also result in erosion, exposure of subsoils, soil mixing, soil compaction, and other effects similar to those described for the Project in **Section 3.3**. Placement of new facilities would result in permanent loss of soils from within the footprint of facility sites or structure foundations.
- **Transportation Facilities.** Planned transportation actions in the cumulative impacts analysis area for soils could have short-term effects to soils from construction activities, including soil compaction and increased erosion potential to exposed soils. Some transportation actions could also result in expansion or modification of existing facilities that would result in new permanent disturbance as well.
- **Recreation and Conservation Efforts.** Potential activities for the recreation and conservation efforts included in the cumulative effects analysis include the removal of invasive vegetation, prescribed burns, and planting food crops for wildlife. Minimal short-term effects to soil resources are anticipated from these actions because vegetation management and the use of BMPs related to soils in most cases would improve soil stability and serve to limit subsequent soil erosion.

Constructing the Project and other actions included in the cumulative effects analysis would result in some incremental cumulative effects on soils. Most impacts would be short-term, as temporarily disturbed areas during construction and decommissioning activities would be restored and previous activities, including farming, would likely be allowed to resume. Some long-term cumulative loss of soil, including soils designated as prime farmland or farmland of statewide importance, would occur as a result of placement of new permanent facilities and foundations for transmission structures. Combined, the Project and other actions would incrementally increase the loss of soil resources, including soils designated as prime farmland or farmland of statewide importance.

Potential effects on soils would be managed through the implementation of EPMs (the Project) or assumed BMPs and measures required by permitting or agency review for the other actions. Combined, the Project and other actions may incrementally increase cumulative impacts to soils; however, cumulative impacts are expected to be minor.

4.5.3 Water Resources

The cumulative effects analysis area for water resources includes a 0.25-mile buffer surrounding the Project area (**Section 3.4**) (0.5 miles total), which represents the distance where concentrated water quality impacts could occur in surface water before a contaminant became diluted or was deposited on the streambed. The cumulative effects analysis area accounts for locations where past, present, or reasonably foreseeable future actions could cumulatively contribute to water resource impacts, such as consumptive water use, localized water quality degradation, obstruction of floodplains, and damage to riparian areas and wetlands. Other actions analyzed for the cumulative effects analysis are those actions listed in **Appendix 4** that are located within the cumulative effects analysis area for water resources.

The categories of other actions included in the cumulative effects analysis that could affect water resources within the cumulative effects analysis area for water resources include new transmission lines, wind and solar generation, transportation, and recreation or conservation actions. Typical water-related effects from these cumulative actions are as follows:

- **Transmission Lines**. Construction of a new transmission line could affect surface water quality from erosion, resulting in a localized decrease in water quality due to sedimentation during the construction period. Construction would also involve construction equipment with small quantities of fuels and chemicals on board that could affect water quality if spilled or improperly handled. It is reasonable to assume that a new transmission line would be constructed in accordance with local, state, and federal laws and regulations that would include standard measures for stormwater control and spill prevention that would help limit these types of effects.

  Some water use would also be required for construction of a new transmission line, similar to water use required during construction of the Project as described in **Section 3.4.4.2**. Construction of a new transmission line would also have the potential to affect wetland, riparian areas, and floodplains due to surface disturbance in the short term in localized areas.

- **Wind and Solar Generation Facilities**. Normal day-to-day operations and maintenance activities at the existing wind farms within the cumulative effects analysis area are unlikely to affect water quality, and wind farm operations typically have minor water requirements. However, long-term activities could include large-scale maintenance requiring cranes or heavy equipment, and such activities may cause short-term surface disturbance that could affect water quality.

  Construction of new solar and wind facilities could affect surface water quality from erosion, resulting in a localized decrease in water quality due to sedimentation during the construction period. Construction would also involve construction equipment with small quantities of fuels and chemicals on board that could affect water quality if spilled or improperly handled. It is reasonable to assume that new facilities would be constructed in accordance with local, state, and federal laws and regulations that would include standard measures for stormwater control and spill prevention that would help limit these types of effects.

  Some water use would also be required for construction of new wind and solar facilities. Given the relatively dry conditions in this part of central Kansas (relative to the rest of the cumulative effects analysis area), simultaneous groundwater or surface water withdrawals for the Project and new wind and solar facility construction could temporarily decrease the availability of already limited groundwater and surface water supplies. It is reasonable to assume these potential impacts would be reviewed by KDWR and regulated under the Kansas Water Appropriation Act, which is designed to protect both people’s right to water use and the state’s future supplies.

  Construction of new wind and solar facilities also has the potential to affect wetland, riparian areas, and floodplains due to surface disturbance in the short term in localized areas.

- **Transportation Facilities.** There are several planned transportation projects in the water resources cumulative effects analysis area. These projects mainly involve widening roadways or reconstructing and upgrading existing roads and bridges. Surface disturbance (temporary and permanent) from these projects has the potential to increase soil erosion, which could lead to increased sediment loads in nearby waterbodies. Upgraded or expanded roadways can also increase runoff volumes from the road surface. Roadway runoff would typically be directed to roadside ditches and swales to help preserve existing water quality.

The planned bridge improvements within the cumulative effects analysis area would involve work over water and within 100-year floodplains, which could affect wetlands and riparian areas. However, since the planned upgrades would generally involve replacing existing bridges, effects of the actions would likely be similar to the existing impacts, but could include a larger footprint of impact if a bridge is widened or redesigned in a way that includes additional supports. If bridge improvements did result in impacts to wetlands and waters of the U.S., it is reasonable to assume the impacts would be reviewed under the Section 404 permitting process, which could include mitigation for any resource loss.

- **Recreation and Conservation Efforts**. Based on management plans for conservation areas located in the cumulative effects analysis area for water resources, potential actions in the conservation areas that could affect water resources include:
  - Manage fields using prescribed fire, herbicides, and native plantings;
  - Monitor and treat exotic and noxious vegetation with herbicides, mechanical treatments, and/or prescribed fire;
  - Plant native aquatic vegetation for wetland habitat diversity;
  - Conduct stream bank stabilization, including in-water work; and
  - Apply herbicides to control aquatic nuisance species.

  Prescribed burns, mechanical treatment of vegetation, and streambank stabilization can affect surface water quality by removing ground cover and causing ground disturbance and increased erosion in localized areas; herbicide application can degrade water quality if performed too close to streams and ponds. However, overall, the management actions noted are expected to have a net beneficial effect on the conservation area ecosystem and would improve wetland health and habitat diversity.

The combined effect of the Project and the cumulative actions within the cumulative effects analysis area for water resources could have cumulative short-term and localized effects on ground water supplies, depending on timing of use for construction activities. In addition, the combined effect of the Project and cumulative actions could decrease water quality by increasing soil erosion and sedimentation in some areas, particularly where multiple new construction projects are planned during the same timeframe. In combination with the planned bridge replacements, the Project could also contribute to an increase in the potential cumulative loss of wetlands and riparian areas and an increase in the number of new structures built in floodplains. Some recreation and conservation efforts would include restoration of wetlands, such as at the Ronald and Maude Hartell Conservation Area in Missouri, which would result in a long-term beneficial impact.

Potential effects on water resources would be managed through the implementation of EPMs (the Project) or assumed BMPs and measures required by permitting for the other actions. For actions in Kansas, this would include permitting under the Kansas Water Appropriation Act, which is designed to protect both people’s right to water use and the state’s future supplies. Combined, the Project and other actions may incrementally increase cumulative impacts to water resources; however, cumulative impacts are expected to be minor.

4.5.4 Vegetation

The cumulative effects analysis area for vegetation includes a 300-foot buffer surrounding the Project area (600 feet total). The cumulative effects analysis area for vegetation accounts for locations where vegetation potentially would be cleared or modified and potential edge effects related to microclimate and invasive species arising from the creation of open corridors in woodlands (Bentrup 2008). Other actions analyzed for the cumulative effects analysis are those actions listed in **Appendix 4** that are located within the cumulative effects analysis area for vegetation.

The categories of actions expected to affect vegetation within the cumulative effects analysis area include transmission lines, wind and solar generation facilities, transportation facilities, other developments, and recreation and conservation efforts. Typical activities for these actions that would affect vegetation are as follows:

- **Transmission Lines.** Construction of a new transmission line within the cumulative effects analysis area could result in clearing of vegetation. This would be a short-term effect for any temporary construction sites that are allowed to revegetate following construction. A long-term conversion of vegetation type would occur within the new maintained ROW if the new transmission line crossed forested areas. Permanent facilities associated with a new transmission line, such as transmission towers, located in areas that are currently vegetated would result in long-term loss of vegetation.
- **Wind and Solar Generation Facilities.** Ongoing operations and management activities at existing wind farms could affect vegetation through mowing and other vegetation management activities. These actions would occur throughout the life of the wind project and would be local to the areas being managed. Solar energy actions typically convert much of the natural vegetation within a facility to a managed vegetation community, which would also result in an impact throughout the life of the facility. Permanent facilities associated with wind and solar generation projects, such as buildings and substations, would result in a long-term loss of vegetation.
- **Transportation Facilities.** Planned transportation actions within the cumulative effects analysis area for vegetation could temporarily affect vegetation in the construction area and any staging areas. Vegetation impacts in these areas would be short-term if they are revegetated following construction. Long-term impacts would result if vegetation is cleared for the permanent footprint of new transportation facilities.
- **Other Developments.** Construction of other planned developments within the cumulative effects analysis area could result in clearing of vegetation. This would be a short-term effect for any temporary construction sites that are allowed to revegetate following construction. Long-term impacts would result if vegetation is cleared for the permanent footprint of new developments.
- **Recreation and Conservation Efforts**. Based on management plans for conservation areas located in the cumulative effects analysis area for vegetation, potential actions in the conservation areas that could affect vegetation include:
  - Manage fields using prescribed fire, herbicides, and native plantings;
  - Monitor and treat exotic and noxious vegetation with herbicides, mechanical treatments, and/or prescribed fire;
  - Plant native aquatic vegetation for wetland habitat diversity;
  - Conduct stream bank stabilization, including in-water work; and
  - Apply herbicides to control aquatic nuisance species.

  Prescribed burns and mechanical and herbicide treatment of vegetation would be conducted to control invasive vegetation and encourage native plant cover. These management actions would be designed to have a net beneficial effect on vegetation communities.

Combined, the Project and other actions would have cumulative effects on vegetation. There would be an increase in the vegetation permanently lost through construction of permanent structures and other impervious surfaces. There would also likely be additional conversion of vegetation from forested areas to shrubs or managed vegetation. In addition, impacts to agricultural areas would occur, although vegetation in agricultural areas is already subject to regular modification, and the cumulative change would likely be unnoticeable across the vegetation cumulative effects analysis area.

The cumulative effects of the Project and other actions on vegetation would be long term in locations where vegetation is permanently lost or where there has been a permanent change in vegetation composition. During operations and maintenance, there could be additional short-term, localized cumulative effects during such activities as vegetation management. Decommissioning activities would likely occur in the same disturbed area as that of construction and would likely result in similar short-term environmental impacts, with no permanent impacts; therefore, over the long term, cumulative effects to vegetation, in combination with other actions, would be minimal.

4.5.5 Cultural Resources and Native American Traditional Resources and Values

The archeological resources cumulative effects analysis area consists of any area that would be directly impacted by ground disturbance from the Project; while the historic built environment resources and Native American traditional resources and values cumulative effects analysis area includes a 2-mile buffer surrounding the Project (4 miles total; refer to **Section 3.6** for the detailed rationale for establishing this area). Other actions included in the cumulative effects analysis are those actions listed in **Appendix 4** that are in the cumulative effects analysis area. This cumulative effects analysis relies on the findings of the cultural resources studies to date, which include the identification of known and previously identified archaeological resources, historic built environment, and resources with Native American traditional values.

Any of the planned actions within the cumulative effects analysis area as listed in **Appendix 4** that include ground-disturbing activities have the potential to affect archaeological resources. If the planned projects include preconstruction inventories of planned action areas, such inventories would be designed to identify archaeological resources and provide opportunities to avoid or minimize the impact of loss of resources from new construction activities.

The categories of actions that have potential to affect archaeological resources, historic built environment resources, and Native American traditional values within the cumulative effects analysis area include transmission lines, wind and solar generation facilities, transportation facilities, and recreation and conservation efforts. Typical activities for these actions that could affect cultural resources are as follows:

- **Transmission Lines.** Construction of a new transmission line would involve ground-disturbing activities during installation of transmission towers and converter station sites similar to impacts described for the Project in **Section 3.6.4**. While the physical disturbance within the cumulative effects analysis area would be relatively small, limiting the potential for physical effects on archaeological resources, historic resources, and Native American traditional resources and values, installation of new transmission towers would have potential for wider-ranging visual effects within the analysis area.
- **Wind and Solar Generation Facilities.** Wind energy development actions typically cause permanent or long-term surface disturbance at turbine locations and for access roads, electric lines, and small ancillary structures. Together, these facilities represent a very small proportion of the total land area of a wind energy development action. While the physical disturbance may be relatively small, limiting the physical effects on archaeological resources, historic resources, and Native American traditional resources and values, these actions have the potential for wide-

ranging visual effects. Solar energy development actions also could result in surface disturbance, causing physical effects to archaeological resources, as well as visual effects. Given the much lower profile of solar equipment, the potential for visual effects is significantly less than what could occur with wind energy development actions.

Specifically for wind generation, no known historic properties or locations associated with Native American traditional values occur in the part of the cumulative effects analysis area where the Western Plains Wind Farm is located in Ford County, Kansas; therefore, it would not contribute to cumulative effects on historic resources or Native American traditional values. The Rolling Prairie Wind farm is scheduled for construction in 2026 in Osborne County, Kansas; however, the location within the county is not currently known. There are no known historic properties or sites of Native American traditional values where setting, feeling, and/or association are known to be significant aspects of integrity in the cumulative effects analysis area in Osborne County. However, there is one area near North Fork Solomon Creek that may retain Native American traditional cultural values and is recommended by the Osage Nation as an area to be avoided. If the setting, feeling, and/or association of this location is determined to be significant, and if the Rolling Prairie Wind action is nearby, adverse effects on this area could occur. Potential effects from the Skyview Wind and Pony Express Wind Energy actions could also occur in the cumulative effects analysis area for cultural resources; however, the specific locations of these actions are not currently known.

Specifically for solar generation, the Sunflower Electric Solar Project is proposed for construction by 2025 in Russell County, Kansas. Although no information is available regarding any previous, ongoing, or planned cultural resource inventories for this planned action, there are no records of historic properties in proximity to this solar project in the cultural resources cumulative effects analysis area. No known sensitive areas (AOAs or AOIs, see **Section 3.6**) have been identified by the Osage Nation in these areas, and there are no other identified traditional cultural values. Additional consultation with Native American groups for these other actions within the cumulative effects analysis area would be necessary to confirm the presence or absence of traditional cultural resources and values.

- **Transportation Facilities.** Construction of and upgrades to existing transportation facilities would result in short-term impacts from surface disturbance of land when those actions are not confined to existing roadways; this could result in adverse effects on archaeological resources. Bridge replacements (**Appendix 4**) and upgrades could also lead to effects on historic resources. However, preconstruction surveys and evaluations of resources likely would be conducted to avoid or minimize such impacts. Operations and maintenance activities associated with planned transportation actions would be likely be minimal, given surface disturbance and visual changes would not be expected.
- **Recreation and Conservation Efforts.** One conservation area occurs within the cumulative effects analysis area. Ongoing and planned recreation and conservation actions within this conservation area could include ground-disturbing activities and therefore have the potential to affect archaeological resources.

Combined, the Project and cumulative actions within the cumulative effects analysis area are not known to impact archaeological resources. However, not all areas of disturbance for the Project and cumulative actions have been identified or surveyed for archaeological resources, and even after survey, it is possible that unanticipated finds and impacts could occur. Therefore, the Project and cumulative actions could incrementally contribute to cumulative effects related to archaeological resources. The Project would impact the Fort Lamed NHL . Combined, the Project and cumulative actions within the cumulative effects analysis area could change landscape character and affect views from properties of historic significance, including the NHL, and have localized effects on the settings of properties having historical significance, including through the introduction of visual clutter. Thus, the Project in combination with the other projects included in the cumulative effects analysis area, could contribute incrementally to cumulative effects through modification of the viewshed of an NRHP-listed or eligible resource. As a result, cumulative effects could result from the identified cumulative actions, and it is possible that other projects may occur in AOIs identified by the Osage Nation, contributing to impacts to those areas. After a project lifespan is complete, decommissioning high-visibility projects such as wind farms and transmission lines would lessen the long-term visual impacts to any historic resources or Native American traditional resources or values.

Potential effects on archaeological resources, historic built environment resources, and Native American traditional values would be managed through the implementation of EPMs (the Project) or assumed BMPs and measures required by permitting, agency reviews, and tribal consultation that are reasonably expected to be required for the other actions. Combined, the Project and other actions may incrementally increase cumulative impacts to archaeological resources, historic built environment resources, and Native American traditional values.

4.5.6 Special Designations

Special designation areas are managed by federal or state agencies for the protection and enhancement of specific resources that are unique to that area and require more intensive management emphasis compared to surrounding public lands. Special designation areas may be Congressionally or agency-designated and include national wildlife refuges, national monuments, wilderness areas, wilderness study areas, wild and scenic rivers, national conservation areas, national historic and scenic trails, and other similar management areas. The special designations cumulative effects analysis area encompasses the Project area plus a variable buffer between 0.5 and 2 miles of new aboveground infrastructure proposed for the Project (refer to **Section 3.7** for the detailed rationale for establishing this area). The Project could impact one type of special designation area, NHTs, specifically the Santa Fe NHT, the Oregon NHT, the California NHT, the Lewis and Clark NHT, and the Pony Express NHT (see **Section 3.7**). Other actions included in the cumulative effects analysis are those actions listed in **Appendix 4** that are in the cumulative effects analysis area.

Potential impacts to NHTs include impacts on cultural resources associated with a trail's designation, as well as effects on recreational use, including access, opportunities, and user experiences especially resulting from noise, visual intrusion, and air quality impacts, and impacts on wildlife and vegetation. The categories of actions that have potential to affect special designations in particular NHTs include transmission lines, wind and solar generation facilities, transportation facilities, and recreation and conservation efforts. Typical activities for these actions that could affect special designations are as follows:

- **Transmission Lines.** Construction of a new transmission line would involve ground-disturbing activities during installation of transmission towers and converter station sites, similar to impacts described for the Project in **Section 3.6.4**. While the physical disturbance within the cumulative effects analysis area would be relatively small, limiting the potential for physical effects on NHTs, installation of new transmission towers would have potential for more wide ranging visual effects within the analysis area.

- **Wind and Solar Generation Facilities.** Wind energy development actions typically cause permanent or long-term surface disturbance at turbine locations as well as access roads, electric lines, and small ancillary structures. Together, these facilities represent a very small proportion of the total land area of a wind energy development action. While the physical disturbance may be relatively small, limiting the physical effects on NHTs, these actions have the potential for wide-ranging visual effects. Solar energy development actions also could result in surface disturbance, causing physical effects to NHTs, as well as visual effects. Given the much lower profile of solar equipment, the potential for visual effects is significantly less than what could occur with wind energy development actions.

  Specifically for wind generation, the Western Plains Wind Farm in Ford County, Kansas has been developed near the Santa Fe NHT. However, because no extant segments of the Santa Fe NHT are known to be present in the cumulative effects analysis area, there are no cumulative effects on this NHT.

- **Transportation Facilities.** Construction of and upgrades to existing transportation facilities would result in short-term impacts from surface disturbance of land when those actions are not confined to existing roadways; this could result in adverse effects on cultural resources associated with NHTs. Bridge replacements (**Appendix 4**) and upgrades could also lead to effects on cultural resources associated with NHTs. However, preconstruction surveys and evaluations of resources likely would be conducted to avoid or minimize such impacts. Operations and maintenance activities associated with planned transportation actions would be likely be minimal, given surface disturbance and visual changes from existing conditions would not be expected.
- **Recreation and Conservation Efforts.** One conservation area occurs within the cumulative effects analysis area. Ongoing and planned recreation and conservation actions within this conservation area could include ground-disturbing activities and therefore have the potential to affect cultural resources.

Construction of the Project combined with construction of other actions could result in cumulative short-term effects on special designations, in particular NHTs, as a result of visual intrusion, noise, air emissions from construction equipment, or restrictions to public access if temporary construction activities of more than one action within the analysis area occur at the same time as the Project. During operation, the presence of aboveground structures and cleared and maintained Project right-of-way combined with other new aboveground facilities within the cumulative effects analysis area for special designations would alter landscape character and have a long-term cumulative effect on special designations. As a result, the Project combined with the other actions included in the cumulative effects analysis area could contribute incrementally to localized cumulative effects on the setting and viewshed of Special Designations.

4.5.7 Wildlife

The cumulative effects analysis area for wildlife includes a 1.5-mile buffer surrounding the Project area (3 miles total). This is the area where the Project would cause a change in the physical environment, add aboveground structures, and create the potential for impacts to wildlife. Other actions analyzed are those actions listed in **Appendix 4** that are located within the cumulative effects analysis area for wildlife.

The ways in which the Project would affect wildlife during construction, operations and maintenance, and decommissioning activities include habitat loss, degradation, and avoidance; injury and mortality (e.g., collision or electrocution); noise and visual disturbance (light during nighttime construction and operations and maintenance); and edge effects where the ROW crosses forested habitat, as described in **Section 3.8**.

The categories of other actions expected to affect wildlife within the cumulative effects analysis area include transmission lines, wind and solar generation facilities, transportation facilities, and recreation and conservation efforts. Typical activities for these actions that may affect wildlife and wildlife habitat are as follows:

- **Transmission Lines.** There are multiple existing transmission lines within the wildlife cumulative effects analysis area and considered in this cumulative effects analysis. Ongoing operations and maintenance activities along the transmission line ROWs could impact wildlife through vegetation management activities. Additionally, transmission lines pose an ongoing collision and electrocution risk for avian species, similar to those described for the Project in **Section 3.8**.

  Construction of a new transmission line would have short-term impacts to wildlife during construction, similar to those described for the Project in **Section 3.8**. Long-term impacts would occur from habitat conversion if the ROW crosses forested habitat that would be maintained as low shrub or herbaceous habitat during operations.

- **Wind and Solar Generation Facilities.** One currently in-operation renewable energy project overlaps the wildlife cumulative effects analysis area. The continued operation of this wind farm would have long-term, direct, adverse effects on wildlife due to mortality of bats and birds, including some special-status species, as a result of collisions with rotor turbines. Wildlife habitat may also be impacted through mowing and other vegetation management activities, as described in **Section 4.4.4**.

  Planned wind and solar projects would convert grassland vegetation to developed land with managed vegetation. The spatial scale of this conversion would be small compared with the extent of the wildlife cumulative effects analysis area, and this conversion would affect a habitat type that is relatively common in the wildlife cumulative effects analysis area. While the loss of grassland habitat would be an adverse effect to localized wildlife communities, it is expected that planned solar projects would not cause a detectable change in the abundance or distribution of general wildlife outside the boundary of the solar facility. During operation, the solar projects could also cause long-term, adverse effects on birds from collision with solar panels (Walston et al. 2016).

- **Transportation Facilities.** There is one planned transportation action within the cumulative effects analysis area for wildlife. Effects to terrestrial wildlife during construction would be similar to those described in **Section 3.8** but would occur in a much smaller area. Disruptions to aquatic wildlife would also occur due to planned construction in the waterway and potentially in riparian habitat and could include sedimentation, turbidity, and habitat loss or avoidance.

- **Recreation and Conservation Efforts.** The ongoing and planned recreation and conservation actions within the cumulative effects analysis area aim to enhance wildlife habitat and maintain healthy wildlife populations through such actions as removing invasive vegetation, conducting prescribed burns, managing timber stands, and planting forage species for wildlife. Together, these actions would have beneficial, short- to long-term effects on wildlife resources. The beneficial effects would be measurable and readily apparent to land managers, but local in extent (i.e., limited to certain areas on managed lands), and would generally require ongoing efforts to maintain.

Combined, the Project and other actions included in the cumulative effects analysis would increase adverse impacts to wildlife where the actions overlap. Cumulative effects would not substantially change the availability of habitats or the relative abundance or distribution of wildlife communities in the wildlife cumulative effects analysis area. Changes in land cover from natural vegetation or agricultural vegetation to developed land or managed grassland would be localized.

Combined, the construction and operation of the Project; the operation of existing and planned wind farms and existing and planned transmission lines; and the construction, operations and maintenance, and decommissioning of other planned actions would locally increase the risk of mortality for birds by collisions with solar panels (a particular risk for migrating waterfowl), wind turbines (bird and bat collisions), and power lines (bird collisions). There would also be increased risk of collision with vehicles during construction, operations and maintenance, and decommissioning activities. Potential for wildlife to collide with Project infrastructure would be minimized by implementing measures to reduce or avoid impacts, such as installing bird diverters and/or other appropriate avian deterrents on ground wires and/or conductors. The Project would be designed to meet the avian-safe design guidelines described in the Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006 (APLIC 2006). The sponsors of the cumulative actions could apply BMPs similarly to minimize wildlife collisions with construction vehicles, machinery, equipment, or infrastructure, or may be required to implement measures as a result of permit requirements.

Operations and maintenance activities for the Project and other actions included in the analysis that could have a recurring effect on wildlife habitats throughout the life of the cumulative actions would include routine mowing within ROWs and around solar panels or wind turbine structures, as well as vegetation maintenance around existing transmission structures and under transmission lines.

The cumulative effect of the Project and other actions to wildlife would be short-term and long-term, localized, and adverse. The potential effects would be localized to areas where construction, operations and maintenance, and decommissioning activities would occur, as well as at locations of structures, wind turbines, and solar panels. The cumulative effect would be adverse because some wildlife may be killed or injured as described in **Section 3.8**, or from collisions with wind turbines, existing transmission lines, or solar panels. Once in operation, most wildlife that was temporarily disturbed and had relocated during construction would be able to return with limited ongoing adverse effects. Bird and bat species would continue to be potentially affected from collision with wind turbines, solar panels, and transmission lines. Some species, such as the lesser prairie-chicken, would likely continue to avoid the area because of the tall transmission structures, as described in **Section 3.8**.

Potential effects on wildlife resources would be managed through the implementation of EPMs for the Project, as well as the assumed BMPs and measures required by permitting and agency reviews that are reasonably expected to be required for the other actions. Combined, the Project and other actions may incrementally increase cumulative impacts to wildlife resources.

4.5.8 Transportation

The cumulative effects analysis area for transportation includes a 5-mile buffer surrounding the Project (10 miles total), where transportation facilities could be impacted by Project construction, operations and maintenance, or decommissioning activities. Other actions analyzed in the cumulative effects analysis are those actions listed in **Appendix 4** that are located within this cumulative effects analysis area. This section assesses the potential for cumulative effects related to surface transportation, as well as water and air transportation and airspace use.

4.5.8.1 Surface Transportation

The Project effects on transportation facilities would primarily occur to surface transportation facilities during construction due to the transport of materials, equipment, and workers to the active construction sites, resulting in temporary and short-term access and travel delays on existing roadways. Additionally, traffic or travel delays along roadways would occur during the stringing of the conductor, where those roadways are crossed; these delays would be limited to minutes at a time. Operations and maintenance activities would not be expected to cause traffic or travel delay impacts.

The categories of other actions that may contribute to cumulative effects on surface transportation within the cumulative effects analysis area include transmission lines, wind and solar generation facilities, transportation facilities, and other development. Typical activities for these other actions that may affect surface transportation are as follows:

- **Transmission Lines.** Construction of a new transmission line would result in effects to surface transportation from the transport of materials, equipment, and workers to construction sites. These effects would be expected to be short term during active construction, resulting in potential access and travel delays similar to those described for the Project. Operations and maintenance would not be expected to generate access or travel delays. Decommissioning of these projects would create short-term effects similar to construction.
- **Wind and Solar Generation Facilities.** Construction of wind and solar generation facilities would result in effects to surface transportation from the transport of materials, equipment, and workers to construction sites. These effects would be expected to be short term during active construction, resulting in potential access and travel delays similar to those described for the Project Operations and maintenance would not be expected to generate access or travel delays. Decommissioning of these projects would create short-term effects similar to construction.
- **Transportation Facilities.** Construction of new surface transportation facilities and upgrades to existing surface transportation facilities would be anticipated to result in short-term localized traffic delays on local roadways during active construction. These impacts could occur during the implementation of the planned projects included in this analysis (**Appendix 4**) within the transportation cumulative effects analysis area. Periodic maintenance activities on surface roadways may also create short-term localized travel delays.
- **Other Development.** Construction of other planned development within the cumulative effects analysis area could generate short-term effects on surface roadways from the transport of materials, equipment, and workers to construction sites that may use common roadways. Similar to other actions, impacts would likely consist of localized traffic delays during construction.

The construction of planned surface transportation improvements would generate short-term increases of traffic on existing roadways. Cumulative impacts to surface transportation would only occur if these other actions occurred at the same time as active construction of the Project. Potential impacts would be reduced by coordinating with and obtaining permits from the appropriate state or local entity with roadway jurisdiction at each crossing location. These jurisdictions would be expected to implement traffic measures to reduce overall traffic effects. If construction for the Project occurred at the same time as construction of the other actions, there would be a short-term cumulative impact on traffic and surface transportation within the cumulative effects analysis area. No long-term cumulative effects on surface transportation would occur during operation of the Project in combination with other actions.

4.5.8.2 Water Transportation

The Missouri River is the only waterbody used for commercial transportation in the cumulative effects analysis area. There are no planned actions on the Missouri River within the cumulative effects analysis area, and there would be no short- or long-term cumulative effects from the Project in combination with other actions on water transportation from construction, operations and maintenance, or decommissioning activities.

4.5.8.3 Air Transportation and Airspace Use

The Project could affect air transportation and airspace use where temporary or permanent structures are taller than 200 feet and subject to FAA regulations and reviews pertaining to structures that may affect aviation and airspace safety. Additionally, any action that is in the vicinity of an airport would be required to conform with airport operations and plans. The use of two cranes and a helicopter during Project construction could encroach on flightpaths and airspace.

The categories of other actions that may contribute to cumulative effects on air transportation and airspace use within the cumulative effects analysis area include transmission lines and wind and solar generation facilities. Typical activities for these other actions that may affect air transportation and airspace use are as follows:

- **Transmission Lines.** There is one potential future transmission line and multiple existing transmission lines within the transportation cumulative effects analysis area. Construction of a new transmission line, and ongoing and expected future operations and maintenance activities along the existing transmission lines and potential new transmission line, could include temporary use of cranes that would be subject to FAA regulations and review relative to flight paths and/or airspace use.
- **Wind and Solar Generation Facilities.** There are three known present or planned wind energy projects in the cumulative effects analysis area for transportation (**Appendix 4**); other planned wind energy projects without specific location information also may be in the cumulative effects analysis area. Construction of wind and solar generation facilities may result in effects to flight paths or airspace use; for example, helicopters may be used during construction. Cranes taller than 200 feet may also be required during construction of the wind projects. These effects would be expected to be short-term and limited to the duration of construction. It is reasonable to expect that new wind generation facilities would be sited to avoid impacting flight paths for existing airports, and wind turbines taller than 200 feet would require FAA review and approval prior to construction. Operations and maintenance activities would not contribute to effects on air transportation or airspace use as described in **Section 3.9.4**. Decommissioning of wind and solar generation facilities would create short-term effects similar to construction.

The Project in combination with other planned actions within the cumulative effects analysis area may cause short-term cumulative effects during construction to air transportation and airspace use. Such short-term cumulative effects on air transportation and airspace use, if any, would only occur if the Project construction occurred at the same time as other planned actions within the cumulative effects action area, as listed in **Appendix 4**. Similar short-term effects could occur if decommissioning of the Project took place at the same time as decommissioning of the wind generation facilities or transmission line. Long-term cumulative effects on airspace could occur if the Project, present transmission lines, and planned wind energy facilities and transmission line were located near airports or airstrips, requiring changes to flight paths. No such locations have been identified as part of the cumulative effects analysis, and it is reasonable to assume that required review by the FAA during siting of new projects would likely avoid these scenarios.

4.5.9 Land Use

The cumulative effects analysis area for land use includes a 1-mile buffer on either side of the Project (2 miles total). This distance allows for consideration of direct impacts from construction and operation, as well as indirect impacts, such as visual or noise, that could extend beyond the areas of direct impact and potentially affect adjacent land use. Other actions included in the cumulative effects analysis are those actions that are listed in **Appendix 4** and located within the cumulative effects analysis area for land use.

As detailed in **Section 3.10**, agricultural lands dominate the land uses regionally and in the Project area. Other land uses within the cumulative effects analysis area include undeveloped land (areas with forests, woodlands, and herbaceous vegetation) and community and residential development. The ways in which the Project could affect land use during construction, operations and maintenance, and decommissioning activities include disturbance to agricultural lands, land use conversion, change in vegetative cover, disturbance and erosion of soils, and disruption to any type of existing or planned development. Impacts from operations may include the long-term presence of the overhead transmission line structures, interference with farming activities (such as interference with agricultural equipment and operations), limited restrictions on land use, and removal of lands from conservation programs.

The categories of other actions that may affect land use within the cumulative effects analysis area include transmission lines, wind and solar generation facilities, and transportation facilities. Typical activities for these actions that may affect land use are as follows:

- **Transmission Lines.** One potential new transmission line would be located within the cumulative effects analysis area for land use. Potential effects to land use would include short-term restrictions on land uses within the active construction site. Following construction, most land uses, including agriculture, could resume within the transmission line ROW. A permanent loss of current land use would occur where new permanent structures are installed. During operations, there could be disruptions of land use within the transmission line ROW as a result of periodic vegetation maintenance.
- **Wind and Solar Generation Facilities.** One planned solar generation facility overlaps the cumulative effects analysis area for land use. In addition, the ROW for one planned wind project would cross the planned Project. The exact locations of other planned wind and solar generation facilities listed in **Appendix 4** are not known, and it is possible that all or portions of these facilities could also be within the cumulative effects analysis area for land use. Potential effects to land use would include short-term restrictions on land uses in the respective project site during construction. Development of wind and solar generation facilities would most likely occur on agricultural land, given agriculture is the dominant land use, and siting facilities in this way would need to occur with agreement from the landowners. Where agricultural lands would be affected by planned actions, a total conversion of such lands to developed use could occur for solar energy development. For wind energy development, construction activities would require short-term restrictions on land uses in the active construction area. Following construction, agricultural uses could resume, with loss of agricultural land only in areas with permanent structures or facilities.
- **Transportation Facilities.** There is one planned transportation action in the cumulative effects analysis area for land use. This planned transportation action would occur along the existing

roadway corridor and does not involve a new transportation corridor; therefore, anticipated land use effects would be minimal. Other transportation actions within the cumulative effects analysis area for land use consist of maintenance and improvements to existing roadways and bridges, which would have only minor, if any, impact on land use in the short or long term.

Short-term cumulative effects on land use would result if active construction of the Project occurred at the same time as the present or planned actions described above and listed in **Appendix 4**. If construction took place at the same time, the combined effects of the Project with other present and planned actions would impact land use where temporary construction workspace is needed by restricting access to active construction sites in highly localized areas. Cumulative effects from periodic maintenance activities and from decommissioning could have similar short-term cumulative effects on land use if these activities from multiple projects occur at the same time.

Long-term cumulative effects on land use from the Project, when combined with the other actions that could affect land use, would result from conversion of mostly agricultural land to energy and transportation uses. The Project would contribute incrementally to the conversion of agricultural lands to non-agricultural use in the cumulative effects analysis area.

4.5.10 Recreation

The cumulative effects analysis area for recreation includes a 1-mile buffer surrounding the Project (2 miles total). This distance allows for consideration of direct impacts from construction and operation, as well as indirect impacts, such as potential restrictions on access to recreation areas or overall impacts to recreational experiences. Other actions included in the cumulative effects analysis are those actions listed in **Appendix 4** that are located within the recreation cumulative effects analysis area and would have a potential impact on recreation.

As described in **Section 3.11**, the Project have the potential to cause short-term construction impacts to the access and setting of recreation areas. Access to recreational areas could be impacted temporarily during Project construction if there are road closures or detours. Project construction activity could also temporarily affect the recreational setting for user experience by increasing noise levels, adding to local traffic volumes, and creating dust from ground disturbance. During operations the Project would not affect access to or use of recreational properties for their intended purpose; however, the presence of new transmission towers in the viewshed could affect the recreational setting. Periodic maintenance activities and decommissioning would occur in the same disturbed areas used for construction, producing similar or less environmental effects.

The categories of actions expected to impact recreation within the cumulative effects analysis area include transmission lines, wind and solar generation facilities, transportation facilities, and recreation or conservation efforts. Typical activities for these actions that would have the potential to affect recreation are as follows:

- **Transmission Lines.** One potential new transmission line would be within the cumulative effects analysis area for recreation. This action may temporarily or permanently alter the settings of recreational areas and alter user experiences.
- **Wind and Solar Generation Facilities.** One planned solar generation facility overlaps the cumulative effects analysis area for recreation. In addition, the ROW for one planned wind project would cross the proposed Project. The exact locations of other wind and solar generation facilities listed in **Appendix 4** are not known, and it is possible portions of these facilities could also be

within the cumulative effects analysis area for recreation. These actions may temporarily or permanently alter the settings of recreational areas and alter user experiences.

- **Transportation Facilities.** There is one planned transportation action. This planned transportation action would occur along the existing roadway corridor and does not involve a new transportation corridor; therefore, anticipated effects on recreation would be minimal. Other transportation actions within the cumulative effects analysis area for recreation consist of maintenance and improvements to existing roadways and bridges, which would have only minor, if any, impact on recreation in the short or long term.
- **Recreation and Conservation Efforts.** The ongoing and planned conservation and recreation efforts within the cumulative effects analysis area for recreation aim to enhance wildlife habitat through such actions as removing invasive vegetation, conducting prescribed burns, managing stands, and planting forage species for wildlife, as well as stocking lakes. Together, these activities would have beneficial, short- to long-term effects on wildlife and habitats. Three specific locations with Conservation Area Management Plans were identified in the cumulative effects analysis area for recreation and are included in the analysis. These actions could have temporary short-term effects on recreational use of areas during active management activities. The actions could have long-term positive effects on recreation related to wildlife viewing and/or fishing.

Short-term cumulative effects on recreation could result if active construction of the Project occurred at the same time as the present or planned actions described above. If construction took place at the same time, the combined effects of the Project and other present and planned actions could impact recreation by restricting access to areas used for recreation. Cumulative effects from periodic maintenance activities and from decommissioning could have similar short-term cumulative effects on recreation if these activities from multiple projects occur at the same time.

The Project would introduce new transmission towers into the landscape, which, when combined with other transmission and wind generation projects, would contribute incrementally to a long-term cumulative change in the visual landscape that would be noticeable to recreational users. However, such a change in the recreational setting would be expected to have only a minor, if any, effect on recreational use within the cumulative effects analysis area.

4.5.11 Visual Resources

The cumulative effects analysis area for visual resources includes a 1.5-mile buffer surrounding the Project (3 miles total). In addition, the visual resources analysis area was extended to a 3-mile buffer surrounding the Project at intersections with NHTs and near Fort Larned NHL (6 miles total) to ensure these sensitive areas were considered in the analysis. The visual resources analysis area incorporates the overall topography, the built environment, existing vegetation, and visually sensitive resources, and was established to capture where views of the landscape could be dominated or altered by the Project facilities.

As described in **Section 3.12**, the Project would introduce new, permanent visual elements, including the proposed transmission lines, other aboveground infrastructure, and tree removal where the ROW crosses wooded areas. These new visual elements could have effects on the setting of properties having historical significance, designated scenic resources, high-use public areas, public lands and recreational resources, and residential areas. Periodic maintenance activities and decommissioning activities would likely occur in the same disturbed area as that for construction and result in similar or less environmental effects. Once the Project is fully decommissioned, the transmission poles would be removed, removing these structures from the viewshed.

The category of actions expected to contribute to cumulative impacts to visual resources in the cumulative effects analysis area includes transmission lines, wind and solar generation facilities, transportation facilities, and recreation or conservation management activities. Typical activities or characteristics of these other actions that may affect visual resources are as follows:

- **Transmission Lines.** One potential new transmission line would be within the cumulative effects analysis area for visual resources. This planned future project would result in a change in viewshed due to the introduction of new transmission towers and cleared and maintained ROW corridor and could contribute to visual clutter in the landscape.
- **Wind and Solar Generation Facilities.** The visual resources cumulative effects analysis area has existing and planned wind and solar facilities that involve aboveground energy infrastructure. The planned future activities would result in a change in viewshed due to the new presence of aboveground structures and tree removal where the ROW crosses wooded areas.
- **Transportation Facilities.** Two planned transportation actions within the visual analysis area include bridge replacement that could result in visual impacts. Both actions would include temporary work on existing bridges along existing highways; therefore, the actions would be short-term and would not have long-term impacts on the existing visual setting.
- **Recreation and Conservation Efforts.** The ongoing and planned conservation and recreation management activities within the cumulative effects analysis area for visual resources aim to enhance wildlife habitat through such actions as removing invasive vegetation, conducting prescribed burns, managing timber stands, and planting forage species for wildlife. Three specific locations with Conservation Area Management Plans were identified in the cumulative effects analysis area for visual resources and are included in the analysis. Recreation and conservation management activities could have short-term visual impacts resulting from smoke from controlled burns and equipment presence during vegetation management. Recreation and conservation management activities would have beneficial, long-term effects on habitat and land cover, and may enhance viewsheds by restoring or maintaining natural land cover.

The Project combined with planned actions would result in cumulative short-term effects to visual resources if temporary construction activities of more than one action occur at the same time as the Project. Potential cumulative effects would include changes to landscape character and changes to views from properties of historic significance or other sensitive viewpoints. During operation, the presence of structures and cleared vegetated corridor related to the Project as well as a new transmission line and wind generation facilities within the cumulative effects analysis area for visual resources would alter landscape character and contribute to visual clutter and have a long-term cumulative effect on visual resources. New visual elements from these actions would have localized cumulative effects on the setting of properties having historical significance (including Fort Larned), NHTs, designated scenic resources, high-use public areas, public lands and recreational resources, and residential areas.

4.5.12 Noise

The cumulative effects analysis area for noise includes land within 4,695 feet (approximately 0.9 mile) of the Project actions. The cumulative effects analysis area was determined based on the distance from construction activities at which the greatest noise impacts associated with the Project would attenuate to background noise levels. Residential dwellings are commonly the primary concern for noise analyses, since occupants could be exposed to excessive noise for increased periods of time. As described in **Section 3.13**, the Project would generate noise primarily during construction activities. The principal noise concerns related to construction include the use of ground-based heavy construction equipment and machinery, such as graders, dozers, drill rigs, and cranes, and in some locations the use of helicopters. Upon completion of construction, those related noise effects will cease. Project operational noise would occur from the discharge of electrical energy along the transmission lines. Although electrical energy noise would be a permanent, long-term effect, the change in noise level would only be detectible directly under or within a few feet of the transmission line. The Project operational effects on noise at noise-sensitive receptors in the cumulative effects analysis area would be below the 55 dBA L_{dn} threshold, as described in **Section 3.13**. Maintenance and decommissioning activities would likely occur in the same area used during construction and result in similar or less environmental effects. Other actions included in the cumulative effects analysis are those actions listed in **Appendix 4** that are located within the noise cumulative effects analysis area and would have a potential impact on noise. The categories of actions expected to generate noise within the cumulative effects analysis area include transmission lines, wind and solar generation facilities, transportation facilities, and recreation and conservation management efforts. Typical activities from these other actions that would affect noise are as follows:

- **Transmission Lines.** There is one potential new transmission line within the cumulative effects analysis area for noise. During construction and operation, this project would have effects from noise similar to those described for the Project in **Section 3.13.4**.
- **Wind and Solar Generation Facilities.** There are two planned wind and solar generation facilities in the cumulative affects analysis area for noise. During construction, these projects would have short-term effects similar to those described for the Project in **Section 3.13.4**. Each of these developments would also be localized, permanent noise sources during operation. Wind turbines can generate periodic noise as the revolving rotor blades encounter turbulence in the passing air; solar generation facilities include transformers to convert power to distribute electricity to the local grid, and these transformers generate noise.
- **Transportation Facilities**. One planned transportation development is located in the cumulative affects analysis area for noise. Typical activities expected during construction of the transportation project that would generate noise and have the potential to affect sensitive receptors include increased road traffic; use of ground-based heavy construction equipment and machinery, such as graders, dozers, drill rigs, and cranes; and pile-driving associated with bridge replacements. During operation, this project would not result in new infrastructure, and traffic and related noise levels would return to pre-construction conditions.
- **Recreation and Conservation Efforts**. There are two conservation or recreation management actions in the cumulative affects analysis area for noise. Operational activities at these sites that have a potential to generate noise could include routine grass mowing, use of watercraft for fish stocking, and limited use of mechanical equipment for vegetation and fish enhancement efforts.

Short-term cumulative impacts from noise would occur if construction of the Project and the other actions included in the cumulative effects analysis would occur concurrently. Noise levels would vary throughout the duration and location of construction of any of these actions, depending on the number and locations of operating equipment, distance to the noise-sensitive land use from the equipment, time of day, atmospheric conditions, and intervening topography or barriers.

A long-term change in noise levels from the Project would be detectible only within a few feet of the transmission line; therefore, overlapping noise generated from the other actions is not anticipated. Further, as detailed in **Section 3.13**, the Project is not projected to exceed thresholds at noise-sensitive receptors. Therefore, when considered in combination with the other actions, the Project would not contribute to a long-term cumulative effect on noise.

4.5.13 Social, Economic, and Community Resources

The social, economic, and community resources cumulative effects analysis area is the extent of all counties where Project, operations and maintenance, and decommissioning would occur. As detailed in **Section 3.14**, this includes 14 counties in Kansas and 9 counties in Missouri. It is anticipated that socioeconomic impacts from the Project would be experienced primarily by the communities adjacent to the Project within these counties because these are the geographic locations where local workers and their families are most likely to reside and spend their wages, salary, and benefits on goods and services.

The effects of the Project on social, economic, and community resources were determined by assessing the potential effects to population and employment; accommodations and public services; land uses and property values; and taxes and government revenues.

Other actions included in the cumulative effects analysis are those actions listed in **Appendix 4** that are in the cumulative effects analysis area for social, economic, and community resources. The categories of other actions expected to affect social, economic, and community resources within the cumulative effects analysis area include wind and solar generation, other energy generation facilities, existing transmission lines, transportation facilities, other development, and recreation and conservation efforts. The following is a general description of these categories of present and planned actions and their potential for cumulative effects:

- **Wind and Solar Generation Facilities.** Present and planned energy generation actions include commercial scale wind and solar power facilities. Present actions currently operate in the cumulative effects analysis area in Kansas, and no such facilities are currently in operation in Missouri. Continued operation and maintenance of these facilities would occur in the same areas they are constructed. Planned wind and solar generation facilities are located in the cumulative effects analysis area in Kansas and Missouri. The primary impact on social, economic, and community resources from these projects would be during construction, when there could be effects on population levels, employment, accommodations, and public services, similar to effects from the Project. Construction of planned new wind and solar generation facilities is likely to rely on a mix of local and non-local workers; therefore, a large influx of construction-related workers and the associated impacts to social, economic, and community resources is unlikely to occur.
- **Other Energy Generation Facilities.** Other present energy generation actions include resource extraction (oil and gas wells), transportation (pipelines), processing, and power generation plants. Present actions currently operate in Kansas and Missouri. Continued operation and maintenance of these facilities would occur in the same areas in which they are constructed and would be supported by the existing local workforce. Therefore, impacts to social, economic, and community resources would be expected to be minimal. No planned energy actions were identified within the cumulative effects analysis area.
- **Transmission Lines.** During construction of the one planned transmission line in the cumulative effects analysis area, there could be effects on population levels, employment, accommodations, and public services similar to the effects from the Project. Continued maintenance activities of

existing transmission lines and future maintenance of the new transmission line would occur in the same areas they are constructed and would be supported by existing local workforce. Rebuild/upgrades of these facilities may require a temporary influx of additional work force to supplement the local workforce; however, impacts to social, economic, and community resources would be expected to be minimal.

- **Transportation Facilities.** Present transportation actions within the cumulative effects analysis area consist of maintenance to existing roadways, roadway intersections, and bridges. The potential for adverse effects to social, economic, and community resources would generally be limited to the duration of active construction. However, these actions are likely to rely on local workers; therefore, a large influx of construction-related workers and the associated impact on social, economic, and community resources is unlikely to occur. Planned transportation actions within the cumulative effects analysis area consist of improvements or upgrades to existing roadways, roadway intersections, and bridges in Ford, Russell, and Osborne Counties, Kansas, and in Audrain, Callaway and Montgomery Counties, Missouri. The potential for adverse effects to social, economic, and community resources would generally be limited to construction-related activities. These actions are likely to rely on local workers; therefore, a large influx of construction-related workers and the associated impacts to social, economic, and community resources is unlikely to occur.
- **Other Development.** The ongoing and planned other developments within the cumulative effects analysis area would include renovations and repair of existing facilities and the construction of new facilities. The potential for effects to social, economic, and community resources would generally be limited to the active construction phase when an influx of construction workers could be required depending on the scale of construction.
- **Recreation and Conservation Efforts.** The recreation and conservation management efforts within the cumulative effects analysis area are land-management actions specified in long-term habitat or park management plans. The potential for adverse effects to social, economic, and community resources would generally be limited to construction-related activities. These planned actions tend to engage a modest number of workers on a series of actions that are implemented over the course of many years and would be expected to be supported primarily by a local workforce. As such, large construction-related workforces and the associated impacts to social, economic, and community resources are not expected as a result of these actions.

If construction activities occurred during the same timeframe, the Project combined with other actions within the cumulative effects analysis area, could have a cumulative impact on the local population, employment, accommodations, public services, and land values. The timing of most planned actions within the cumulative effects analysis area is unknown or spans a broad range; therefore, it is difficult to predict if any such cumulative impacts would occur. If construction timing did overlap, the adverse or beneficial effects would be short-term, and upon completion of construction, the population, employment, accommodations, and any associated impact on public services would return to pre-construction conditions.

The Project is expected to have temporary impacts to agricultural land uses and property values from construction activities that would be minimized by providing fair compensation to landowners, restoring agricultural lands where practicable, and coordinating with landowners to schedule construction activities to minimize disturbances to farming operations. Regionally, the agricultural land impacted by the permanent Project facilities would represent a negligible proportion (less than 0.01 percent) of Kansas and Missouri's combined 8.9 million acres of farmland. The potential co-occurrence of construction activities for the Project and other actions included in this analysis could have a cumulative effect on short-term disruption of agricultural lands. In the long term, the placement of new permanent structures by the Project and other actions in agricultural lands would contribute incrementally to the conversion of agricultural lands to non-agricultural use. If other actions include similar minimization measures as proposed for the Project, the financial effect of this land conversion would be reduced. As a result, there would be little to no cumulative economic effect on the Kansas and Missouri agricultural sectors from the Project in combination with other planned actions.

During operations, maintenance activities for the Project and the planned transmission line and wind and solar generation projects would not require a large workforce and only minimal material purchases. However, during operations, the Project and planned wind and solar generation projects and other developments within the cumulative effects analysis area could provide an increase in local government revenues as a result of tax payments. As detailed in **Section 3.14**, operational benefits include an ongoing increase of annual property taxes. Because the operation of most of the planned renewable and energy actions would not require large workforces, the increased government revenue would generally not be accompanied by a commensurate increase in population, demand for accommodations, or demand for public services. This cumulative effect from increased tax revenue is likely to be a small but measurable benefit to the economy of the cumulative effects analysis area.

4.5.14 Environmental Justice

The environmental justice cumulative effects analysis area encompasses the 136 census block groups located within 3 miles of the Project. The cumulative effects analysis area represents the area where the Project could result in human health or environmental impacts that could affect local populations.

This cumulative effects analysis relies on the findings of environmental justice studies, which include the identification of low-income and minority populations and an initial analysis of effects of the Project and other actions on such populations.

As described in **Section 3.15**, the environmental justice analysis did not identify the potential for disproportionate adverse effects on environmental justice communities resulting from the Project. Specifically, impacts related to air quality, noise, and social, economic, and community resources would be spread across the entirety of the Project. These impacts would affect environmental justice communities the same as non-environmental justice communities. As such, the effects would not be considered disproportionately adverse to environmental justice communities. Therefore, the Project would not contribute to potential cumulative effects on environmental justice communities, and no other cumulative actions need to be considered.

4.5.15 Public Health and Safety

The cumulative effects analysis area for public health and safety includes a 150-foot buffer on either side of the Project centerline (300 feet total) and within the fence line of the converter stations for the Project. This is the area within which potential effects to public health and safety could occur. In this analysis, public health and safety concerns are divided into three topics: contaminated soils and hazardous materials, electric and magnetic field hazards and interference, and wildfire. Other actions analyzed are those actions listed in **Appendix 4** that are in the cumulative effects analysis area for public health and safety.

Essentially all work actions have some level of risk to workers and the public. Worker safety in construction and industrial settings is regulated by OSHA. As outlined in **Section 3.16**, the Project would be subject to OSHA standards during construction (e.g., OSHA General Industry Standards [29 CFR Part 1910] and the OSHA Construction Industry Standards [29 CFR Part 1926]). These regulations would also apply to other construction actions in the cumulative effects analysis area; therefore, worker health and safety is not further addressed in this section, and the discussion below is focused on public health and safety. Risks associated with accidents and intentional destructive acts are not evaluated in this section because the likelihood is not possible to predict.

4.5.15.1 Contaminated Soils and Hazardous Materials

As described in **Section 3.16**, the Project would have localized effects on public health and safety because of the small quantities of hazardous materials that would be used. Design features and implementation of EPMs for the Project (listed in **Chapter 2**) would minimize potential for spills or disturbance to contaminated soils.

The categories of other actions within the cumulative effects analysis area that could impact public health and safety based on potential exposure to contaminated soils and hazardous materials include transmission lines, wind and solar generation facilities, other energy generation and related facilities, and transportation facilities.

- **Transmission Lines.** Construction of the one planned transmission line in the cumulative effects analysis area would involve use of construction equipment with small quantities of fuels and chemicals on board that could cause soil contamination if spilled or improperly handled. Continued operation and maintenance activities for existing transmission lines and future operation and maintenance activities for the planned transmission line, including vegetation maintenance along ROWs, and rebuild/upgrades, could involve the storage or use of hazardous materials, such as lubricants, in minimal quantities. Any accidental releases of hazardous materials could result in adverse effects to public health and safety.
- **Wind and Solar Generation Facilities.** Construction, operations and maintenance, and decommissioning of wind and solar generation facilities could involve the storage or use of hazardous materials, such as lubricants, in minimal quantities. Any accidental releases of hazardous materials could result in adverse effects to public health and safety.
- **Other Energy Generation and Related Facilities.** The presence of existing oil and gas facilities (e.g., oil and gas wells and pipeline infrastructure) across multiple counties in both Kansas and Missouri presents ongoing risk of accidental release of hazardous materials that could consist of crude oil, petroleum products, and hydrocarbon gas liquids, which could result in adverse effects to public health and safety.
- **Transportation Facilities.** Construction activities associated with roadway upgrades and bridge replacements in Osborne County, Kansas would involve the use of heavy machinery and construction vehicles that could leak hazardous materials, such as gasoline and diesel fuel, engine oil, coolant, lubricants, and grease. Additionally, roadway reconstruction projects typically require grading that could disturb previously unidentified contaminated soil. Accidental releases of hazardous materials or excavation of contaminated soils from existing and planned actions could result in adverse local effects to public health and safety.

The present and planned actions in the cumulative effects analysis area are expected to operate under a similar regulatory environment as the Project and are therefore assumed to include similar BMPs or mitigation measures for hazardous materials. Federal and state regulations specific to oil and gas developments also stipulate design features and BMPs to minimize the potential for accidental releases.

Considering the small quantity of hazardous materials to be used and the implementation of Project EPMs and BMPs or mitigation measures for the other planned actions, the potential for hazardous materials releases is low. As a result, the potential cumulative impacts to public health and safety that could result from accidental releases from the Project in combination with present and planned actions would be minimal.

Once in operation, long-term impacts from contaminated soils and hazardous materials are not anticipated from the Project or other actions. Maintenance and decommissioning activities would likely occur in the same area used during construction and would likely result in similar or less environmental impacts; therefore, over the long-term, cumulative effects to public health and safety would not be expected.

4.5.15.2 Electric and Magnetic Field Hazards and Interference

The category of actions that could impact public health and safety within the cumulative effects analysis area based on risks from electric and magnetic field hazards includes transmission lines.

- **Transmission Lines.** Existing high-voltage transmission lines in the cumulative effects analysis area generate electromagnetic fields, electrical safety hazards, and interference along their respective paths. The one planned transmission line within the cumulative effects analysis area would also generate electromagnetic fields with similar impacts. However, electrical lines are designed to incorporate sag and sway so that lines maintain adequate distances from each other to prevent interference and can also be engineered with shielding or phasing so as not to increase electric and magnetic fields where they parallel other lines.

Section 3.10 contains figures that show where existing transmission line actions are parallel to or would be crossed by the Project. These locations are the focus of the operational cumulative effects analysis for electric and magnetic field hazards and interference. Because magnetic fields from both AC and DC lines decrease substantially as distance increases from the source, the cumulative effects analysis area is limited to 150 feet from the Project facilities, which generally includes only those existing or planned transmission lines that are within the same ROW or directly adjacent to the same ROW.

The Project corridor would cross and/or be adjacent to multiple energized transmission and distribution lines. While it is not anticipated that direct contact with energized lines would occur, the Applicant would work with utility owners to coordinate necessary outages to avoid interaction with energized lines. Additionally, grounding practices, guard structures, and matting to protect existing facilities and maintain worker safety would be employed.

The Project would introduce a new source of power line electric and magnetic field strength from the energized conductors with the potential for interference with electronic equipment. In designing the Project, there are requirements to comply with applicable Federal, state, and local environmental laws, orders, and regulations, including FCC Part 15 (47 CFR 15.13). For example, under FCC Part 15, good engineering practices in the design and operation of the Project to minimize the risk of harmful interference would be employed. Therefore, the potential for electric and magnetic field hazards and interference from the Project in combination with other transmission lines would be minimal.

4.5.15.3 Wildfire

The categories of actions that could impact public health and safety within the cumulative effects analysis area and contribute to wildfire risk include transmission lines and wind and solar generation facilities.

- **Wind and Solar Generation Facilities.** Operations and maintenance and decommissioning of wind and solar generation facilities could involve equipment and activities that could ignite fires, such as vehicle travel through dry grass or use of equipment (e.g., welding) near vegetation.
- **Transmission Lines.** One planned new transmission line has been identified within the public health and safety cumulative effects analysis area, and there are multiple existing transmission lines present in the public health and safety cumulative effects analysis area. Operations and maintenance of active transmission lines in the cumulative effects analysis area present a risk to public health and safety from fires.

Wildfires in the region are not uncommon and can spread quickly through short and dry vegetation, such as grasslands, shrublands, or some agricultural crops. The occurrence of wildfires in the region is also anticipated to increase as a result of changing climate. Wildfires in the cumulative effects analysis area resulting from human-caused accidental events may create risks to facilities, personnel, and the public. Fire response is provided by local and county first responders. The capabilities and availability of these local resources to respond to wildfire vary with staffing levels and availability, access to appropriate equipment, response times, and distances to wildland fires.

Present actions in the cumulative effects analysis area that have the potential to increase risk of the occurrence of wildfire are primarily the operation and maintenance of energy generation facilities (e.g., oil and gas wells and pipeline infrastructure), although any human industry can include activities that may spark wildfires. While not all wildfires are caused by human activity, the presence of development adds risk to public safety from human-caused fires. The Project could contribute incrementally to the potential for human-caused wildfires by introducing new transmission lines into the landscape that could spark wildfires, and by adding development that could add risk to public safety from any fire. Combined, the Project and other present and planned actions may incrementally increase the risk of human-caused wildland fire and associated impacts to public health and safety.

5. CONSULTATION AND COORDINATION

Consultation and coordination with federal, state, and local agencies, tribes, and the public is an important part of the NEPA process. This chapter provides a description of the consultation and coordination efforts that occurred prior to and during the preparation of this EIS, including public and agency outreach, formal consultation activities under Section 106 of the NHPA and Section 7 of the ESA, and consultation with tribal governments.

5.1 Public Involvement

DOE LPO has incorporated public involvement into the NEPA process to ensure that the public, agencies, tribes, and other government entities with an interest in the Project can view information and share input. The overarching goal of public involvement is to inform the public of the potential impacts of the proposed action, provide opportunities for the public to comment on those impacts, and ensure any significant issues or impacts identified are addressed in the EIS.

The primary methods for public involvement consist of virtual and in-person meetings during the scoping and Draft EIS comment periods, a website (https://EIS-GrainBeltExpress.com) with a virtual comment form that will be available throughout the development of the EIS, and mailed newsletters focused on the major milestones in EIS development.

5.1.1 Pre-NEPA Public Involvement

Prior to the initiation of NEPA, the Applicant engaged in public outreach as part of the various state siting, route selection, and development approvals for the Project that were obtained from the KCC and MPSC. The following is a summary of the public involvement for these state processes.

Outreach in Kansas for the HVDC Line (2013):

- Agency Coordination: The Applicant coordinated with federal and state agencies and local officials to gather critical information for initial route planning. Initial efforts focused on Project introductions, data collection, and discussions around permitting and consultation requirements. These discussions helped identify routing constraints and informed the development of initial routing guidelines.
- Community Leader Roundtables: In 2013, roundtables were held across 19 counties with over 300 leaders from 50 counties. Local officials and business leaders reviewed Project maps, identified sensitive areas, and proposed alternative routes. These insights were digitized to guide routing adjustments. The roundtables aimed to foster collaboration with leaders, including local and county officials, municipal leaders, government planners, business and economic development experts, local utilities, and federal and state agency representatives.
- Public Open Houses: From January to March 2013, open houses were held in 14 Kansas locations, attracting over 2,300 attendees. Outreach efforts included mailed notifications to 11,200 people, newspaper advertisements and website updates. Feedback from attendees helped create alternative routes, ultimately guiding the selection of a proposed route for submission to the KCC.
- Public Feedback: After the open houses, the Applicant reviewed the gathered input, revised the potential route network as needed, and compiled a series of 15 alternative routes for further analysis and comparison.

Outreach in Missouri for the HVDC Mainline (2014):

- Agency Coordination: The Applicant contacted numerous federal, state, and local agencies to gather information for route planning. Coordination efforts focused on introducing the Project, gathering data, and discussing anticipated permitting and consultation requirements. Agencies were also asked to review potential river crossing locations and provide insights to help in selecting a preferred crossing location for the Project.
- Community Leader Roundtables: Roundtables in 24 Missouri counties engaged over 250 local leaders, whose input on planning and route constraints contributed significantly to the routing process.
- Public Open Houses: Held in July, August, and December 2013 across 13 locations in Missouri, these events attracted over 1,200 attendees. Outreach included 11,500 mailed invitations and resulted in over 300 public comments.
- Local Business Meetings: Five meetings explored potential partnerships with Missouri businesses for Project development and maintenance.
- Public Feedback: Collected feedback was used to refine the alternative routes, ultimately leading to the selection of a single proposed route submitted for approval to the MPSC.

Outreach in Missouri for the Tiger Connector (2022):

- Agency Coordination: The Applicant contacted numerous federal, state, and local agencies to gather essential information for route planning. Coordination efforts focused on Project introductions, data collection, and discussions regarding anticipated permitting and consultation requirements.
- Public Open Houses: In July 2022, the Applicant held four public meetings in Audrain and Callaway counties. As Monroe County had fewer than 25 potentially affected landowners, a public meeting was not held there per regulatory requirements; however, these landowners were notified by letter about the meetings in Audrain and Callaway counties. Invitations and local newspaper advertisements informed all potentially affected landowners and other stakeholders. Over 275 people attended the in-person meetings, with an additional virtual meeting hosted on the Project website to expand access to materials and input opportunities.
- Supplier Informational: On July 11, 2022, the Applicant brought together potential suppliers for a Supplier Informational. Attendees included suppliers who offer various services and works, representing businesses with a regional presence. The Applicant educated suppliers on the scope, size, services, and resources needed to construct the Project and sent invitations to approximately 50 suppliers, of which about 40 individuals attended, representing 30 supplier companies.
- Public Feedback: Community members identified specific property constraints and opportunities, including locations of residences, barns, irrigation facilities, existing utilities, other infrastructure, and landscape features that could influence routing or structure placement. They also provided information on current land uses, such as agricultural areas, pastureland, and recreational zones. Similar feedback was gathered through the virtual meeting platform, resulting in a total of 93 public comments submitted to the Applicant.

5.1.2 Public Scoping

To begin the scoping process for this Draft EIS, DOE LPO published an NOI in the Federal Register (87 FR 77093) on December 16, 2022. Scoping for the Project continued until the end of the comment period on February 28, 2023. The NOI was followed by written notification to approximately 3,000 property owners along the Project alignment; local, regional, and state elected officials; and stakeholders and interest/advocacy groups. Following the publication of the NOI, DOE LPO held a series of virtual and in-person meetings in Kansas and Missouri in early 2023 to provide the public with the opportunity to learn about the Project, and to allow DOE LPO to solicit comments on the Project. DOE LPO requested comments from the public as detailed in the NOI and provided scoping outreach materials with instructions for submitting comments. The process of soliciting comments at this early stage in preparation of the EIS is required, as it frames the concerns of the public and informs the scope of the analyses in the EIS.

DOE LPO received approximately 150 individual comment letters during the scoping period. Commenters expressed concern for a wide range of environmental issues, including, but not limited to, land use, wildlife, vegetation, socioeconomics, geology, safety, air quality, and visual resources. Several comments focused on the range of alternatives and the purpose and need for the Project. A Scoping Engagement Summary Report was prepared to document the scoping process and summarize scoping comments and concerns.[1] Those comments have been considered in the development of this Draft EIS.

5.2 Agency Consultation

5.2.1 Cooperating Agencies

As defined by CEQ regulations (40 CFR 1501.8), a cooperating agency, or cooperator, is an agency (other than the lead agency) that has special expertise with respect to an environmental issue and/or has jurisdiction by law. The role of a cooperator is to participate in the process and provide leadership, expertise, guidance, and review, as well as to offer information related to the agency’s authority.

DOE LPO consulted with USACE, Bureau of Reclamation, NPS, USFWS, USEPA, KDWP, MDC, the Kansas SHPO, the Missouri SHPO between December 2022 and March 2023 to determine potential special expertise with respect to environmental, cultural, or recreational issues and/or jurisdiction by law. As the lead federal agency, DOE LPO will carry out consultations under ESA Section 7 and NHPA Section 106. Through these consultation efforts, USACE, NPS, and USEPA were identified as potential cooperating agencies on the preparation of this EIS.

DOE LPO offered the USACE cooperating agency status in association with its jurisdiction pursuant to Section 10 and Section 14 of the Rivers and Harbors Act, and Section 404 of the Clean Water Act. The construction of the Project would cross over three USACE civil works projects: Wilson Lake flowage easements, the Missouri River Bank Stabilization and Navigation Project, and federal levee R443-448. The Project would also be associated with wetland and stream impacts from the discharge of fill material, to include structures, in Waters of the U.S. regulated by USACE. On December 29, 2022, DOE LPO invited USACE to participate as a cooperating agency in the preparation of the EIS and distributed a draft Memorandum of Understanding (MOU). On February 23, 2023, USACE formally accepted cooperating agency status for the EIS and designated the Kansas City District of the USACE as the lead district for coordination of the EIS; although a signed MOU was not executed, the agencies agreed on the roles and responsibilities for coordination of the EIS.

DOE LPO offered the NPS cooperating agency status based on its special expertise in the following areas: cultural resource preservation, assessing and analyzing impacts to NHLs and interpreting

[1] The Scoping Engagement Summary Report and copies of information distributed to the public during scoping can be accessed at: https://eis-grainbeltexpress.com/scoping-meeting-materials/

responsibilities for managing NHLs under NHPA Section 110(f) (54 U.S.C. 306107), for administering NHTs and their associated resources as defined by and outlined in the National Trails System Act (P.L. 90-543, as amended through P.L. 116-9, March 12, 2019), and other land and resource management responsibilities for units within the National Park System. Specifically, NPS expertise for these areas relates to managing viewsheds, cultural landscapes, and visitor experiences and uses. On March 02, 2023, DOE LPO invited NPS to participate as a cooperating agency and distributed a draft MOU. On May 18, 2023, NPS formally accepted cooperating agency status and provided a signed MOU outlining the roles and responsibilities for preparation of the EIS. NPS's cooperating agency status will help with timely and efficient incorporation of design elements and other mitigations protective of NPS resources and will assist in the separate but parallel track of NHPA consultation.

DOE LPO offered the USEPA cooperating agency status based on its special expertise in NEPA reviews under the Clean Air Act Section 309. In March 2024, USEPA formally accepted cooperating agency status.

DOE LPO offered the USFWS cooperating agency status based on its special expertise in threatened and endangered species.

Quarterly Interagency Meetings were initiated in February 2023 with the entities that accepted cooperating agency status. A summary of agency meetings is included as **Table 5-1**.

Table 5-1 List of Agency Meeting Dates

Meeting	Participating Entities[1]	Dates[2]
Interagency Meeting	DOE LPO, DOE Office of the General Counsel, ICF, Galileo Project, USACE, NNPS, USFWS,EPA, Federal Permitting Improvement Steering Council, Department of Interior Office of the Solicitor, Advisory Council on Historic Preservation, KDWP, MDC, Invenergy, Tetra Tech, AECOM, Holland and Hart, SWCA Environmental Consultants	February 7, 2023 February 14, 2024 April 18, 2023 June 20, 2023 September 19, 2023 December 19, 2023 March 12, 2024 April 16, 2024 June 18, 2024 August 20, 2024 October 15, 2024 December 10, 2024
NPS Coordination	DOE LPO, ICF, Galileo Project, NPS, Invenergy, AECOM	December 15, 2022 March 10, 2023 May 5, 2023 June 29, 2023 August 6, 2024 September 11, 2024
USACE Coordination	DOE LPO, ICF, Galileo Project, USACE, Invenergy, Hanson, AECOM	December 1, 2022 December 8, 2022 March 10, 2023 May 5, 2023 June 23, 2023 January 11, 2024 July 26, 2024

Meeting	Participating Entities[1]	Dates[2]
USFWS Coordination	DOE LPO, ICF, Galileo Project, USFWS, Federal Permitting Improvement Steering Council, Invenergy, SWCA Environmental Consultants	November 4, 2024
KDWP Coordination	DOE LPO, ICF, Galileo Project, KDWP,USFWS, USACE, Invenergy, AECOM, SWCA Environmental Consultants	March 13, 2023 April 13, 2023
NRCS Farmland Protection Policy Act Compliance Meeting	DOE LPO, ICF, Galileo Project, NRCS, Invenergy, AECOM	April 3, 2023 October 4, 2024

[1] Not all of the participating entities listed have necessarily had a representative present for each meeting occurrence.

[2]The Applicant met with a number of agencies regarding permitting for the Project prior to DOE LPO's involvement. Those meetings are not included in this list.

5.2.2 Other Federal Agency Involvement

The Project enrolled in FAST-41 in 2024. FAST-41 established coordination and oversight procedures for infrastructure projects under review by multiple federal agencies with the aim of increasing transparency and accountability. The Coordinated Project Plan outlines a timeframe for each enrolled project for all federal authorizations and environmental reviews; the Project's schedule is discussed in **Chapter 1**.

5.2.2.1 Formal Consultations

5.2.2.1.1 Section 106 of the National Historic Preservation Act

Section 106 of the NHPA (54 USC 306108) and its implementing regulations (36 CFR Part 800) require federal agencies to consider the effects of their undertakings on historic properties listed in or eligible for listing in the NRHP, and to afford the ACHP an opportunity to comment on the undertaking. The goal of the Section 106 process is to identify and to consider historic properties that might be affected by an undertaking and to attempt to resolve any adverse effects through consultation. Section 106 consultation provides for participation by, where applicable, SHPOs; THPOs; tribal, state, and local governments; Indian tribes and Native Hawaiian organizations; applicants for Federal assistance, permits, or licenses; representatives from interested organizations; private citizens, and the public.

From December 2022 to March 2023, DOE LPO invited various entities to participate as consulting parties to the Section 106 process. The following federally recognized Tribes, government agencies, and preservation organizations accepted DOE LPO's invitation to consult:

- Delaware Nation, Oklahoma
- Iowa Tribe of Kansas and Nebraska
- Northern Arapaho Tribe of the Wind River Reservation, Wyoming
- Northern Cheyenne Tribe of the Northern Cheyenne Indian Reservation, Montana
- Pawnee Nation of Oklahoma
- Ponca Tribe of Indians of Oklahoma
- The Osage Nation

- Wichita and Affiliated Tribes (Wichita, Keechi, Waco and Tawakonie), Oklahoma
- U.S. Army Corps of Engineers
- U.S. National Park Service
- Fort Larned Old Guard
- Missouri Preservation
- Kansas State Historical Society (State Historic Preservation Office)
- Missouri State Historic Preservation Office
- Advisory Council on Historic Preservation

Table 5-2 provides a summary of the Section 106 process thus far.

Table 5-2. Section 106 Consultation Summary

Date	Description
December 28, 2022	Letters of Invitation to Consult mailed to federally recognized Tribes
December 29, 2022	Letters of Invitation to Consult e-mailed to federally recognized Tribes
January 12, 2023	Letters of Invitation to Consult mailed to ACHP and SHPOs
January 17, 2023	Letters of Invitation to Consult e-mailed to ACHP and SHPOs
January 17, 2023	E-mail from Kansas SHPO accepting the invitation to consult
February 10, 2023	E-mail and letter from Missouri SHPO accepting the invitation to consult
February 10, 2023	Letters of Invitation to Consult e-mailed to USACE
February 13, 2023	Letters of Invitation to Consult mailed to NPS
February 14, 2023	Letters of Invitation to Consult mailed to Certified Local Governments (CLGs) and Non-Governmental Organizations (NGOs)
February 15, 2023	Letters of Invitation to Consult e-mailed to NPS, CLGs, and NGOs
February 23, 2023	E-mail from Missouri Preservation accepting the invitation to consult
February 28, 2023	E-mail from USACE accepting the invitation to consult
March 9, 2023	E-mail and letter from Fort Larned Old Guard accepting the invitation to consult
March 10, 2023	E-mail and letter from NPS accepting the invitation to consult
March 21, 2023	Introductory virtual meeting for DOE LPO, ACHP, and SHPOs
March 29, 2023	Letter from City of Jefferson City, Missouri declining to consult unless the project is located within 5 miles of Jefferson City
April 28, 2023	Section 106 Consulting Parties Meeting #1, virtual meeting
May 19, 2023	Section 106 consultation with The Osage Nation, virtual meeting
December 8, 2023	Electronic transmittal of Kansas and Missouri Converter Station Cultural Resource Survey Reports to all Consulting Parties for 30-day review and comment
December 20, 2023	Section 106 Consulting Parties Meeting #2, virtual meeting
January 2, 2024	E-mail from Kansas SHPO providing concurrence with Kansas Converter Station survey reports
January 5, 2024	E-mail from Missouri SHPO providing concurrence with Missouri Converter Station survey reports
March 28, 2024	Electronic transmittal of Preliminary Draft Programmatic Agreement to all Consulting Parties for 45-day review and comment
April 23, 2024	In-person, government-to-government consultation meeting with The Osage Nation in Pawhuska, Oklahoma; also attended by ACHP, Kansas SHPO, Missouri SHPO, NPS, and USACE
May 1, 2024	Section 106 Consulting Parties Meeting #3, virtual meeting
May 6, 2024	E-mail from The Osage Nation providing comments on Preliminary Draft Programmatic Agreement

Date	Description
May 13, 2024	E-mails from ACHP, Kansas SHPO, NPS, and Northern Cheyenne Tribe providing comments on Preliminary Draft Programmatic Agreement
July 8, 2024	Electronic transmittal of Draft Programmatic Agreement v.1 to all Consulting Parties for 45-day review and comment
July 25, 2024	Section 106 Consulting Parties Meeting #4, virtual meeting
October 10, 2024	Electronic transmittal of Draft Programmatic Agreement v.2 to all Consulting Parties for 30-day review and comment
October 22, 2024	Section 106 Consulting Parties Meeting #5, virtual meeting
October 30, 2024	E-mail from DOE LPO to all Consulting Parties extending review and comment period for Draft Programmatic Agreement v.2 to 45 days
November 12, 2024	Section 106 Consulting Parties Meeting #5 follow-up, virtual meeting
November 21, 2024	E-mail from ACHP with formal determination to participate in consultation

5.2.2.1.2 Section 7 of the Endangered Species Act

ESA Section 7 (16 USC 1536) requires any federal agency authorizing, funding, or carrying out any action to ensure that the action is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of critical habitat of such species. Beginning in 2020, when the Project was acquired by the Applicant and prior to pursuing a loan guarantee, the Applicant coordinated directly with the USFWS. Coordination consisted of providing the USFWS Project details; survey plans, methods, and results; and meetings to discuss USFWS feedback and guidance on the project.

DOE LPO has been coordinating with the USFWS since the Applicant decided to pursue a loan guarantee from the Loan Program Office. Per the FAST-41 Coordinated Project Plan, the DOE LPO will submit a biological assessment in January 2025. DOE LPO anticipates conclusion of formal consultation with USFWS in September 2025, per the FAST-41 Coordinated Project Plan.

5.2.2.1.3 Section 110(f) of the National Historic Preservation Act

NHPA Section 110(f) requires that, prior to the approval of any Federal undertaking that may directly and adversely affect any NHL, agencies must, to the maximum extent possible, undertake such planning and actions as may be necessary to minimize harm to the landmark and afford the ACHP a reasonable opportunity to comment with regard to the undertaking. The National Historic Preservation Act (16 U.S.C. 470) requires all federal agencies to establish their own historic preservation programs for the identification, evaluation, and protection of historic properties (NPS 2024). This ensures that historic preservation is fully integrated into the ongoing programs of all federal agencies. Each federal agency must consult with the Secretary of the Interior in establishing its preservation programs (NPS 2024). Consultation to determine the extent of impacts to NHLs, including Fort Larned, is ongoing.

5.2.2.2 Other Regulatory Authorizations

Other federal agencies, such as the FAA and the U.S. Coast Guard, will be engaged as regulations require. The Applicant is also coordinating with state and local agencies, as required. Appendix 1.1 contains a comprehensive list of the Federal, State, and local permits and authorizations anticipated for the Project.

5.3 Tribal Consultation

Records of the Project prior to its acquisition by Invenergy Transmission LLC indicate that there was limited correspondence with the Tribes during the Project’s route selection process. The Applicant under

Invenergy Transmission LLC ownership began engaging with the Tribes in June 2021. The Applicant conferred with USACE archaeological staff, the Kansas and Missouri SHPOs, and NPS to identify the Tribes with potential interest in the Project area. The Applicant invited 22 Tribes to engage on the Project and hosted an August 2021 introduction meeting that three Tribes attended (Wichita and Affiliated Tribes, Iowa Tribe of Kansas and Nebraska, and The Osage Nation). Pawnee Nation could not attend the meeting but requested Project information. During this meeting, and in follow-up correspondence, the Applicant requested that the Tribes review Project information and design and provide input regarding tribal interests, including THPO records and AOIs in the vicinity of the Project corridor. In response to this request, the Osage Nation provided several AOIs and AOAs, and Pawnee Nation provided AOIs. No specific AOIs or AOAs were received from other Tribes.

The Applicant invited all Tribes to take part in cultural resources field surveys. Representatives from two Tribes (Iowa Tribe of Kansas and Nebraska and the Kiowa Indian Tribe of Oklahoma) assisted in the 2021 archaeological field survey. The Applicant extended an invitation to Tribes when re-initiating field survey in 2022; however, none of the tribes had availability and/or expressed interest.

On December 28, 2022, DOE LPO issued consultation letters to 34 federally recognized Tribes notifying them of the Project and providing the opportunity to participate in the NEPA process and NHPA Section 106 consultation process, as well as engage DOE LPO in formal government-to-government consultation. The following eight federally recognized Tribes accepted DOE LPO's invitation to consult: Delaware Nation, Oklahoma; Iowa Tribe of Kansas and Nebraska; Northern Arapaho Tribe of the Wind River Reservation, Wyoming; Northern Cheyenne Tribe of the Northern Cheyenne Indian Reservation, Montana; Pawnee Nation of Oklahoma; Ponca Tribe of Indians of Oklahoma; The Osage Nation; and Wichita and Affiliated Tribes (Wichita, Keechi, Waco and Tawakonie), Oklahoma.

In February 2024, the Applicant initiated outreach to the eight Tribes that are consulting on the Project for the purpose of seeking information about AOIs and AOAs within the proposed Tiger Connector corridor and associated property parcels. Four Tribes responded to the request. The Iowa Tribe of Kansas and Nebraska noted that any known resources of interest to the Tribe in that geography would be included in the Missouri SHPO records. The Northern Cheyenne Tribe and Pawnee Nation both indicated that the Tiger Connector is outside of their cultural landscape. The Osage Nation identified an AOI. No AOAs were identified for the Tiger Connector.

In March 2024, the Applicant initiated outreach to the eight Tribes that are consulting on the Project for the purpose of sharing locations of contemplated laydown and material yards in Kansas and Missouri and to identify if any of the contemplated yards intersect tribal AOIs and AOAs. Four Tribes (Iowa Tribe of Kansas and Nebraska, Northern Cheyenne Tribe of the Northern Cheyenne Indian Reservation, Pawnee Nation, and The Osage Nation) responded to the request. The Pawnee Nation and The Osage Nation identified AOIs that intersect with contemplated yards and requested that the Applicant conduct archaeological surveys if continuing to consider those yards. None of the Tribes identified AOAs that intersect the contemplated yards. The Applicant will continue to reach out to Tribes as the Project design progresses.

In April 2024, the Northern Cheyenne Tribe of the Northern Cheyenne Indian Reservation expressed interest in taking part in the Project's archaeological field survey in Kansas, and the Applicant continues to follow up with the Tribe to coordinate logistics and schedule before the tribal members engage in survey. The Osage Nation is monitoring archaeological surveys within its identified AOIs (approximately 45 percent of the Project). The Osage Nation monitoring activities have been ongoing since October 2023. At the request of The Osage Nation, the Applicant, together with DOE LPO, developed archaeological survey methods for areas outside of Osage Nation AOIs that are memorialized in a work plan that was reviewed and approved by The Osage Nation.

Correspondence and meetings with consulting Tribes are summarized in **Table 5-3**.

Table 5-3. Correspondence and Meetings with Consulting Tribes

Date	Description
December 28–29, 2022	Letters of Invitation to Consult mailed and e-mailed to 34 federally recognized Tribes
January 3, 2023	E-mail response from Delaware Tribe of Indians declining to consult but requesting notification in the event of inadvertent discoveries during construction
January 23, 2023	E-mail response from The Osage Nation accepting the invitation to consult and requesting government-to-government consultation
January 30, 2023	E-mail response from Delaware Nation, Oklahoma accepting the invitation to consult
January 30, 2023	E-mail response from Northern Cheyenne Tribe of the Northern Cheyenne Indian Reservation, Montana accepting the invitation to consult
February 8, 2023	E-mail response from Caddo Nation declining to consult but requesting notification in the event of inadvertent discoveries during construction
February 8, 2023	Virtual meeting with The Osage Nation to introduce the Project, agency personnel, and discuss archaeological field methods
February 15–17, 2023	Follow-up phone calls to invited Tribes regarding invitation to consult
February 15, 2023	Phone response from Northern Arapaho Tribe of the Wind River Reservation, Wyoming accepting the invitation to consult
February 15, 2023	Phone response from Pawnee Nation of Oklahoma accepting the invitation to consult
February 15, 2023	Phone response from Ponca Tribe of Indians of Oklahoma accepting the invitation to consult
February 24, 2023	Follow-up Letters of Invitation to Consult e-mailed to invited Tribes
February 27, 2023	DOE LPO letter e-mailed to The Osage Nation regarding government-to-government consultation communication protocol
March 1, 2023	Response from Miami Tribe of Oklahoma requesting additional information and maps
March 2, 2023	Follow-up Letters of Invitation to Consult mailed to Tribes with no e-mail address available
March 22, 2023	E-mail to Miami Tribe of Oklahoma providing Project maps for requested Missouri counties
April 14, 2023	E-mail to Consulting Tribes inviting requests to schedule individual consultation meetings in addition to Consulting Party Meeting #1
April 28, 2023	Section 106 Consulting Parties Meeting #1, virtual meeting
May 8, 2023	Follow-up e-mail to Consulting Tribes inviting requests to schedule individual consultation meetings in addition to Consulting Party Meeting #1
May 19, 2023	Individual Section 106 consultation with The Osage Nation, virtual meeting
June 1, 2023	Response from Shawnee Tribe declining the invitation to consult
July 28, 2023	Follow-up e-mails sent to three tribes (Iowa Tribe of Kansas and Nebraska, Miami Tribe of Oklahoma, Wichita and Affiliated Tribes) to verify response to the invitation to consult
July 28, 2023	E-mail response from Wichita and Affiliated Tribes accepting the invitation to consult
August 2, 2023	E-mail response from Iowa Tribe of Kansas and Nebraska accepting the invitation to consult
August 23, 2023	DOE LPO government-to-government letter to The Osage Nation inviting to participate in the Section 106 Programmatic Agreement as an Invited Signatory

Date	Description
November 9, 2023	E-mail to Consulting Tribes inviting requests to schedule individual consultation meetings in addition to Consulting Party Meeting #2
December 8, 2023	Electronic transmittal of Cultural Resource Survey Reports – Converter Stations to all Consulting Parties including Consulting Tribes for 30-day review and comment
December 13, 2023	Comment letter on survey reports e-mailed from Iowa Tribe of Kansas and Nebraska
December 20, 2023	Section 106 Consulting Parties Meeting #2, virtual meeting
December 22, 2023	Comment letter on survey reports e-mailed from The Osage Nation
January 8, 2024	Follow-up e-mail to Consulting Tribes inviting requests to schedule individual consultation meetings in addition to Consulting Party Meeting #2
March 28, 2024	Electronic transmittal of Preliminary Draft PA to all Consulting Parties including Consulting Tribes for 45-day review and comment
April 23, 2024	In-person, government-to-government consultation meeting with The Osage Nation in Pawhuska, Oklahoma
May 1, 2024	Section 106 Consulting Parties Meeting #3, virtual meeting
May 6, 2024	E-mail from The Osage Nation providing comments on Preliminary Draft Programmatic Agreement
May 10, 2024	Follow-up e-mail to Consulting Tribes inviting requests to schedule individual consultation meetings in addition to Consulting Party Meeting #3
May 13, 2024	E-mail from The Osage Nation providing comments on Preliminary Draft Programmatic Agreement
July 8, 2024	Electronic transmittal of Draft Programmatic Agreement v.1 to all Consulting Parties including Consulting Tribes for 45-day review and comment
July 25, 2024	Section 106 Consulting Parties Meeting #4, virtual meeting
October 10, 2024	Electronic transmittal of Draft PA v.2 to all Consulting Parties for 30-day review and comment
October 22, 2024	Section 106 Consulting Parties Meeting #5, virtual meeting
October 30, 2024	E-mail from DOE LPO to all Consulting Parties extending review and comment period for Draft Programmatic Agreement v.2 to 45 days
November 12, 2024	Section 106 Consulting Parties Meeting #5 follow-up, virtual meeting

6. LIST OF PREPARERS

The individuals listed in Table 6-1 were involved in the preparation of the EIS.

Table 6-1. List of Preparers

Name	Role	Years of Experience	Education
DOE LPO			
Angela Ryan	Physical Scientist	17	MS, Sustainability BA, Environmental Studies, Policy, and Planning
Todd Stribley	Director of Environmental Compliance	28	MS, Environmental Science and Policy BS, Biology
Sarah Glasgow	Senior Environmental Planner	13	BS, Integrated Science and Technology
David Birnbaum	Senior Archaeologist	13	MA, Anthropology BA, Anthropology
Karin Olsen	Principal Environmental Planner	24	MS, Environmental Science and Policy MS, Marine Sciences BS, Geology
Jean Stoll	Senior Historic Preservation Planner	8	MS, Historic Preservation BA, Anthropology
David Johnson	Principal Environmental Planner	27	BS, Biology
Tetra Tech			
Jack Middleton	Project Manager	19	MS, Environmental Science & Policy BS, Natural Resources
John Scott	NEPA Advisor, Cumulative Impacts	36	MS, Wildlife and Fisheries Science BS, Natural Resource Management
Jen Sojka	Deputy Project Manager, Land Use, Recreation	9	MS, Biological Sciences BA, Biology
Taylor Michel	Deputy Project Manager	7	MS, Environmental Science MPA, Environmental Management BA, Environmental Studies
Jeff Harrington	Air Quality, Greenhouse Gas Emissions, and Climate Change	29	MS, Civil Engineering BS, Chemical Engineering
Chris Williams	Air Quality, Greenhouse Gas Emissions, and Climate Change	22	BS, Chemical Engineering
Rachel Miller	Soils and Paleontology, Public Health and Safety	24	MS, Water Resources Science BS, Geology
Peter Dillon	Topography and Geology	37	MS, Geology (Geochemistry) BS, Geology
Chandler Dangle	Water Resources	4	MS, Forestry BS, Forest Resources

Name	Role	Years of Experience	Education
Marijke Maxwell	Water Resources	15	MS, Environmental Science and Policy BS, Wildlife Ecology and Conservation
John Crookston	Vegetation, Wildlife	27	MS, Ecology BS, Biology
Berenika Byszewski	Cultural Resources and Native American Traditional Values	22	MA, American Studies with Certificate in Historic Preservation BA, Anthropology and Biology
Matt Dadswell	Transportation and Access, Social, Economic, and Community Resources & Environmental Justice	29	PhD, Candidate, Economic Geography MA, Economic Geography BA, Economics and Geography
Aaron English	Visual Resources	30	BS, Wildlife Biology
Kevin Fowler	Noise	16	BA, Audio and Acoustics AA, Business
Dorney Burgdorf	Social, Economic, and Community Resources & Environmental Justice	30	MS, International Environmental Policy BS, Environmental Studies
Jake Engelman	GIS/Data Management	11	BS, Geography-Professional
David Gravender	Technical Editor	22	PhD, English MA, English BA, English
Miranda Logan	Technical Editor	20	MS, Environmental Science and Engineering, Site Characterization and Remediation BS, Environmental Science
Dawn Nelson	Senior Desktop Publisher	33	

AA: Associate of Arts
BA: Bachelor of Arts
BS: Bachelor of Science
MA: Master of Arts
MS: Master of Science
PhD: Doctor of Philosophy

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Section 5

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