

7.0 TRANSMISSION LINE MACRO-CORRIDOR ANALYSIS

7.1 INTRODUCTION

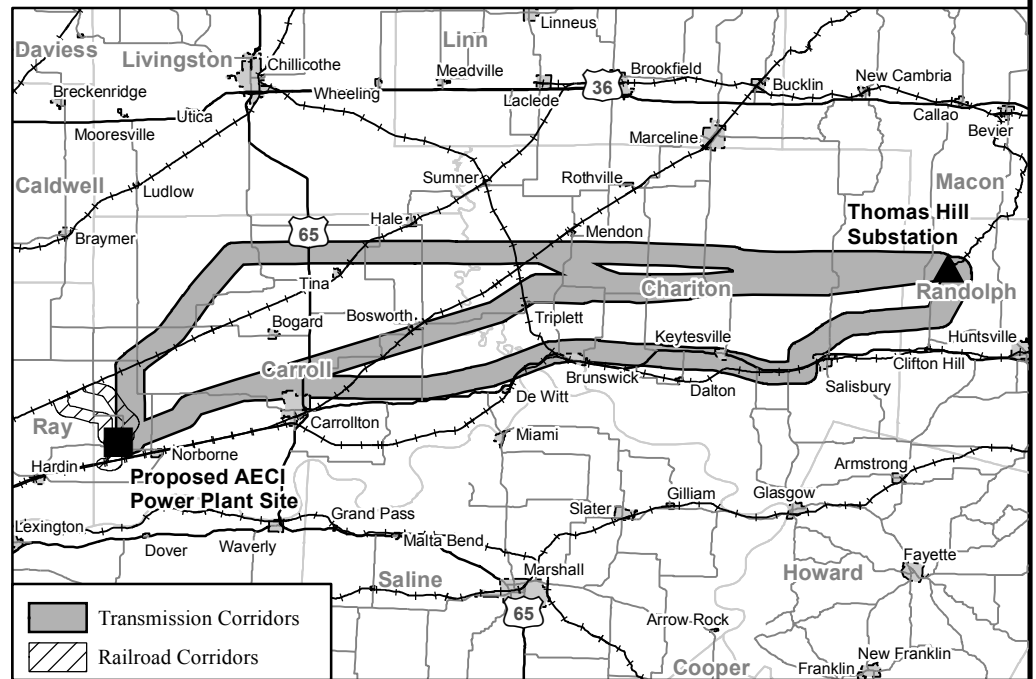
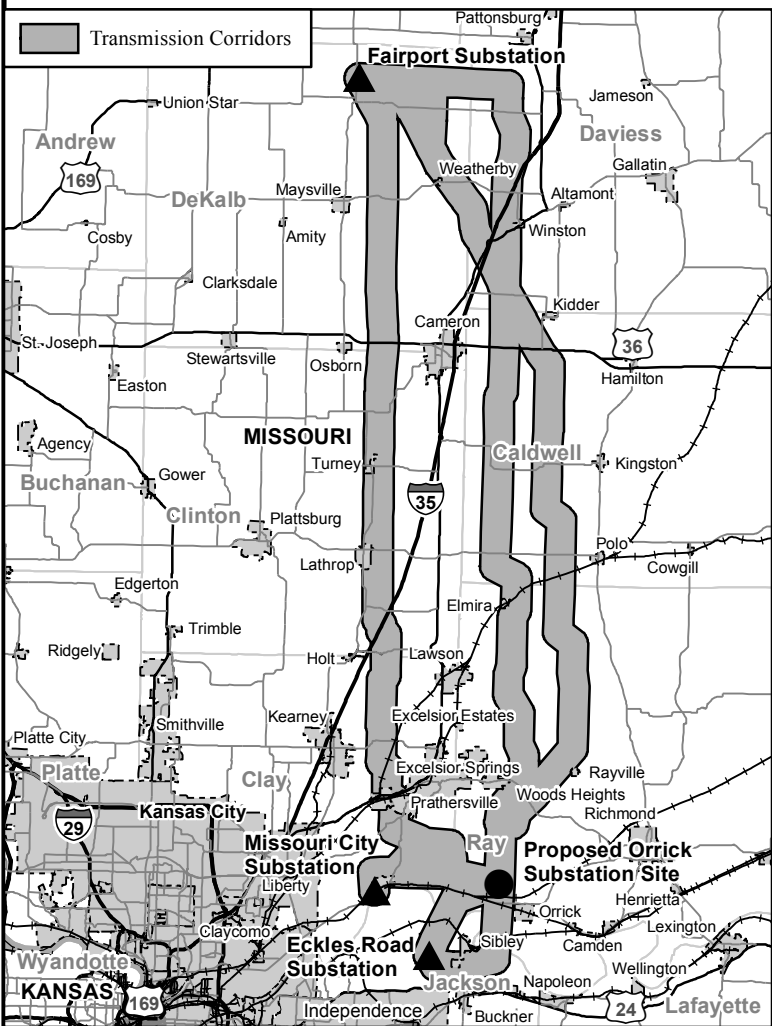
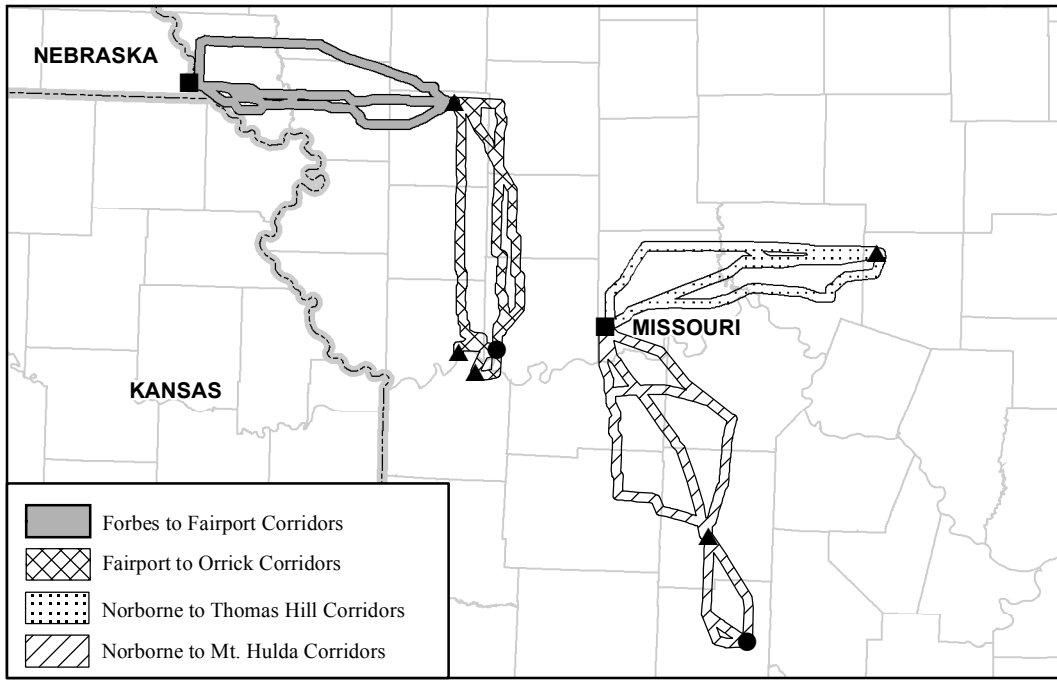
Associated Electric Cooperative, Inc. (AECI) is proposing to construct a new coal-fired power plant either in Carroll County near Norborne, Missouri (Norborne Site) or in Holt County southwest of Big Lake, Missouri (Forbes Site). For power generated from the new power plant to reach AECI's growing member loads, new 345 kV and 161 kV transmission facilities will be needed. Four transmission line study areas and two to three alternative corridors within each study area were identified. Figure 7-1 shows a broad overview of the entire project and the proposed study areas and transmission corridors for each power plant site, which are described in more detail in the following sections. The study areas are: Norborne to Thomas Hill, Norborne to Sedalia / Mt. Hulda, Forbes to Fairport, and Fairport to Orrick / Missouri City / Eckles Road.

For the Norborne Plant, AECI determined that two 345 kV transmission lines and related new and upgraded substation facilities would be required to provide adequate outlet capacity for the plant. First, a line from the Norborne Substation (located east of the proposed plant site) to the Thomas Hill Substation in Randolph County would be built (Figure 7-2). A second 345 kV line would be built from Norborne to Central Electric Power Cooperative's (Central) Sedalia Substation in Pettis County and then to the Mt. Hulda Substation in Benton County. Transformers (345/161 kV) and related switching, safety and control equipment would be added to one or both of these substations.

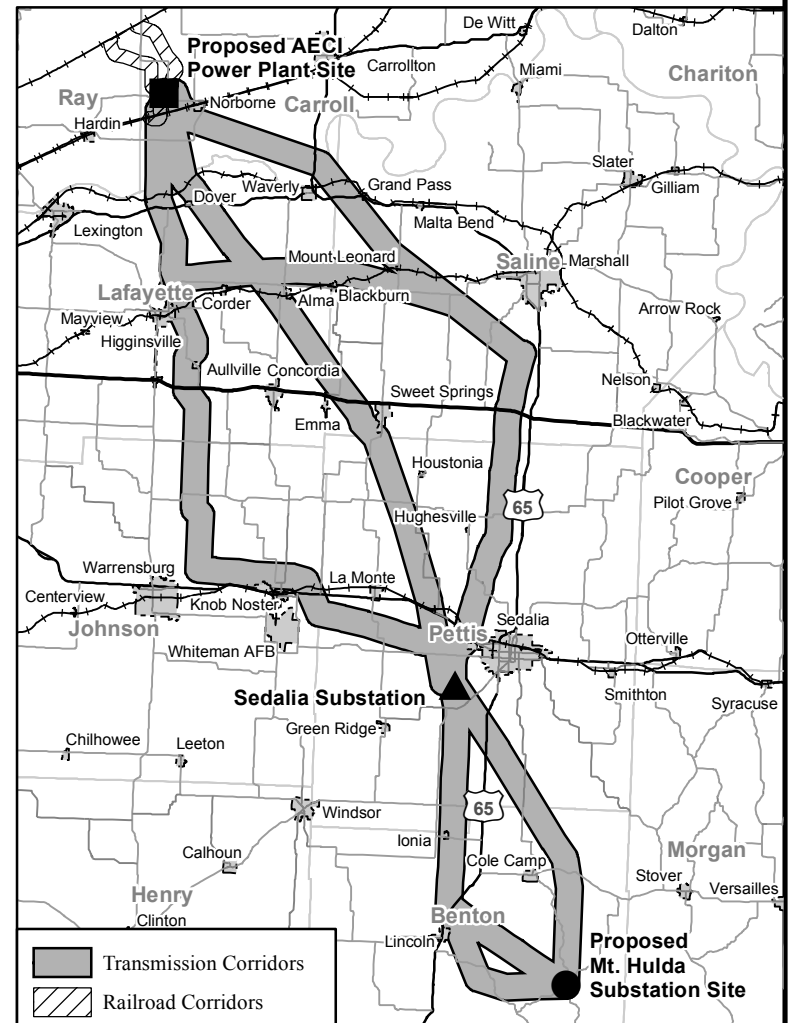
Adequate outlet capacity in the area will be provided by the 69, 138 and 161 kV sub-transmission system. This system will consist of existing facilities as well as new and upgraded facilities that are in various stages of planning. All will be in place prior to the planned 2011 startup of the Norborne Plant.

To provide adequate outlet capacity for the Forbes Plant, a new double-circuit 345 kV transmission line would be needed from the site to the existing Fairport Substation north of Fairport, Missouri, in DeKalb County (Figure 7-3). This will provide a connection to the Missouri-Iowa-Nebraska Transmission (MINT) 345 kV line. Additionally, a single-circuit 345 kV transmission line would be needed south from the Fairport Substation to a new

Project Overview



Norborne Power Plant Site



Forbes Power Plant Site

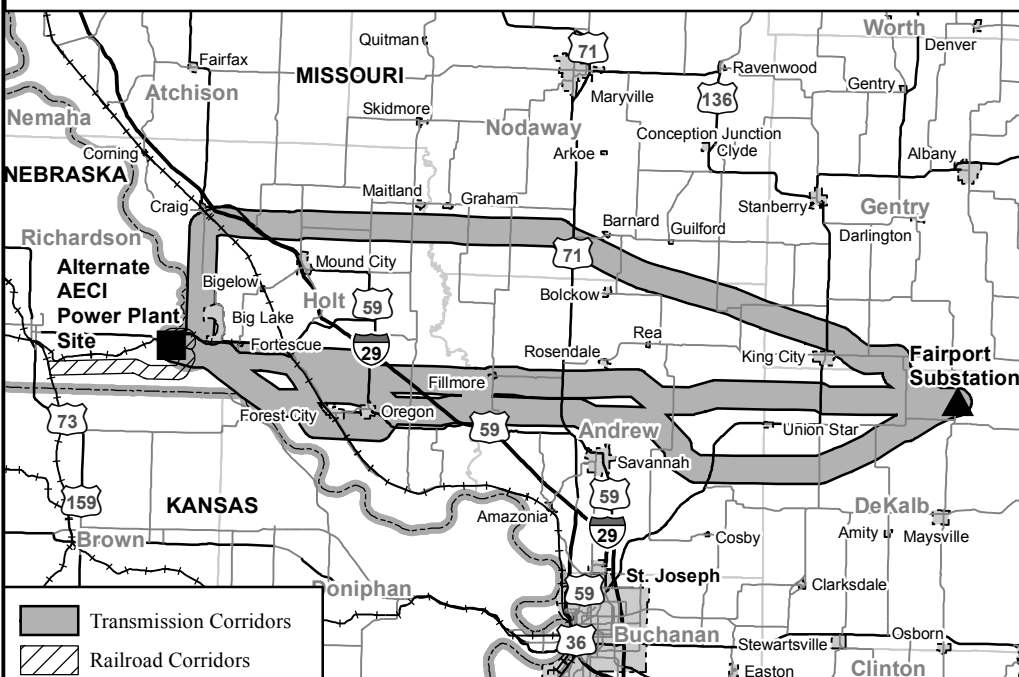
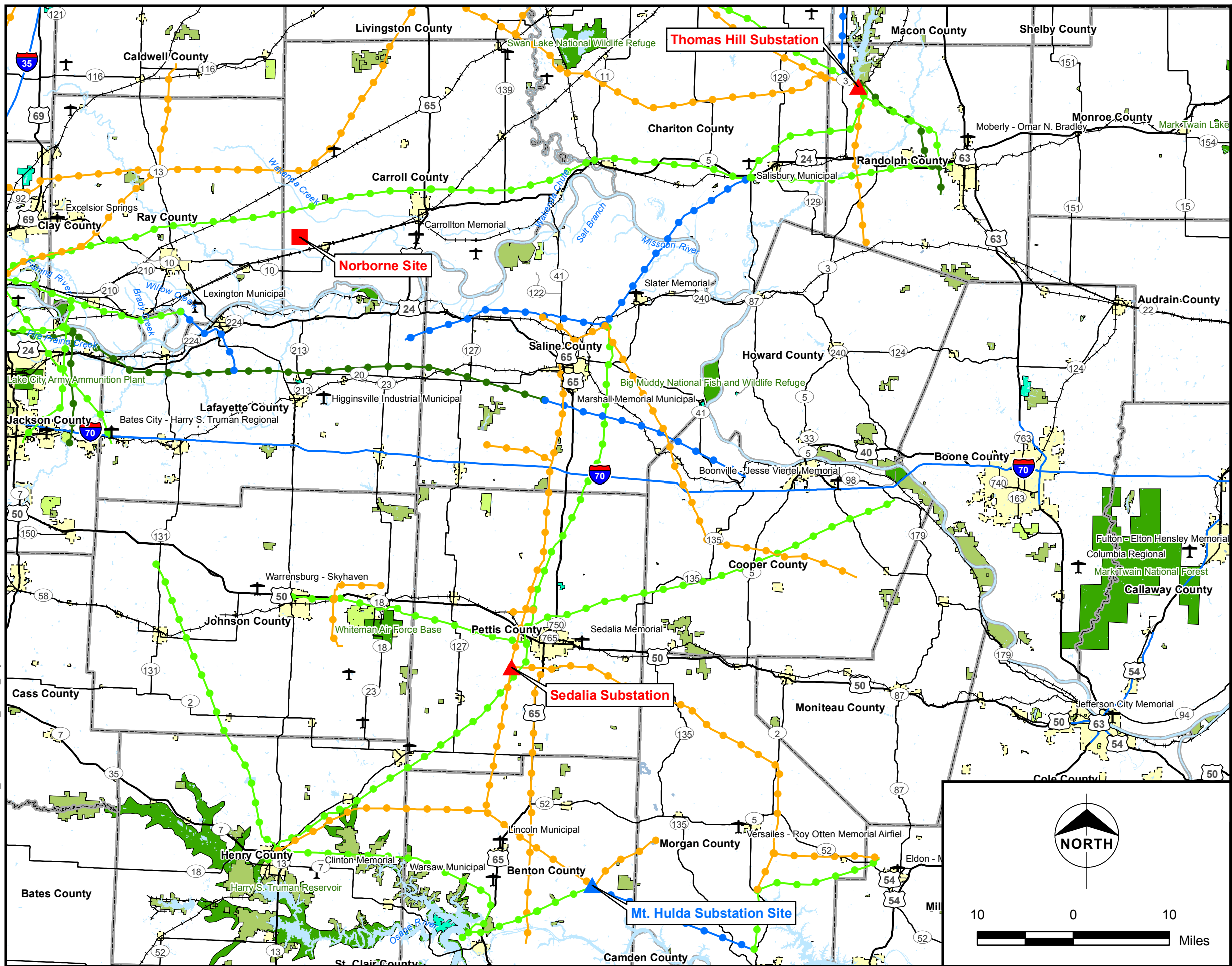


Figure 7-1
 Associated Electric Cooperative, Inc.
 660 MW Coal-Based Power Plant
 Project Overview Maps



Disclaimer: Existing transmission lines are shown to the extent they could be verified within the project study areas using aerial photography, topographic maps, and NW and Central Cooperative's system planning maps. They are not necessarily complete or represent all existing transmission lines in the area.

LEGEND

- Power Plant Site
- ▲ Existing Substations
- ▲ Future Substations

Existing Transmission Lines

- 345-kV
- 161-kV
- 69-kV
- Voltage Unknown

- Federal Lands
- Department of Conservation Lands
- Missouri DNR Parks
- Parks (Local)
- Municipality
- County Boundary
- ✈ Airports / Airstrips

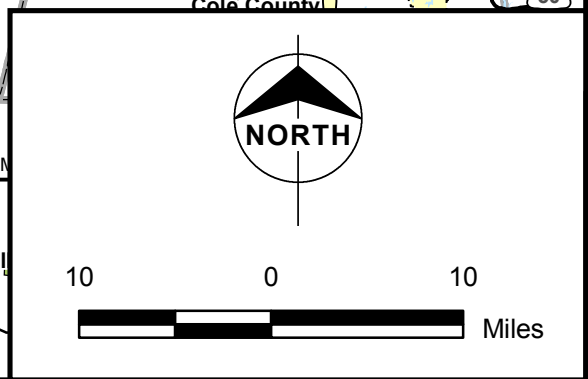


Figure 7-2
 Associated Electric Cooperative, Inc.
 660 MW Coal-Based Power Plant
 Norborne Site
 Interconnection Points

345/161 kV substation located near the town of Orrick in Ray County. From Orrick, two new 161 kV transmission lines would need to extend to the Missouri City Plant on the west side of Missouri City (in Clay County) and to the existing Eckles Road Substation located west of Sibley in Jackson County.

To identify the potential locations for these new transmission line and related facilities, Burns & McDonnell conducted an investigation of the existing human and natural resources within the study areas identified for these new facilities. This investigation centered on identifying those resources within the areas between the Norborne and Forbes Sites and the interconnections described above that would present issues or concerns for the routing of new transmission facilities. This study also sought to identify opportunities within the study area that would provide a potential corridor or alignment for new transmission lines. The goal of the investigation was to identify and define macro-corridors, areas approximately two miles wide, extending between the desired end-points, within which the proposed transmission lines could be constructed.

7.2 STUDY AREAS FOR TRANSMISSION FACILITIES

Separate study areas were developed for the proposed transmission facilities for the Norborne Site and for the Forbes Site. Areas of sufficient size to incorporate the desired end-points and provide feasible potential corridors for the location of the new transmission lines were established. The study areas for the Norborne Site encompassed the Norborne Plant and Substation Sites, the Thomas Hill Plant, the Sedalia Substation and the proposed site for a new Mt. Hulda Substation, as well as substantial lands between these points. The overall Norborne study area, which consists of portions of eight counties in Missouri, was subdivided into two smaller study areas: Norborne to Thomas Hill and Norborne to Sedalia / Mt. Hulda. The study area for the Forbes Site encompasses the proposed Forbes Plant Site, the Fairport Substation, the proposed Orrick Substation site, the Missouri City Substation and Plant, and the Eckles Road Substation. The Forbes study area incorporates portions of eleven Missouri counties and it too was subdivided into two smaller study areas: Forbes to Fairport and Fairport to Orrick / Missouri City / Eckles Road. Subdividing the overall Norborne and Forbes study areas facilitated the evaluation of opportunities and constraints for the various interconnections needed for each site.

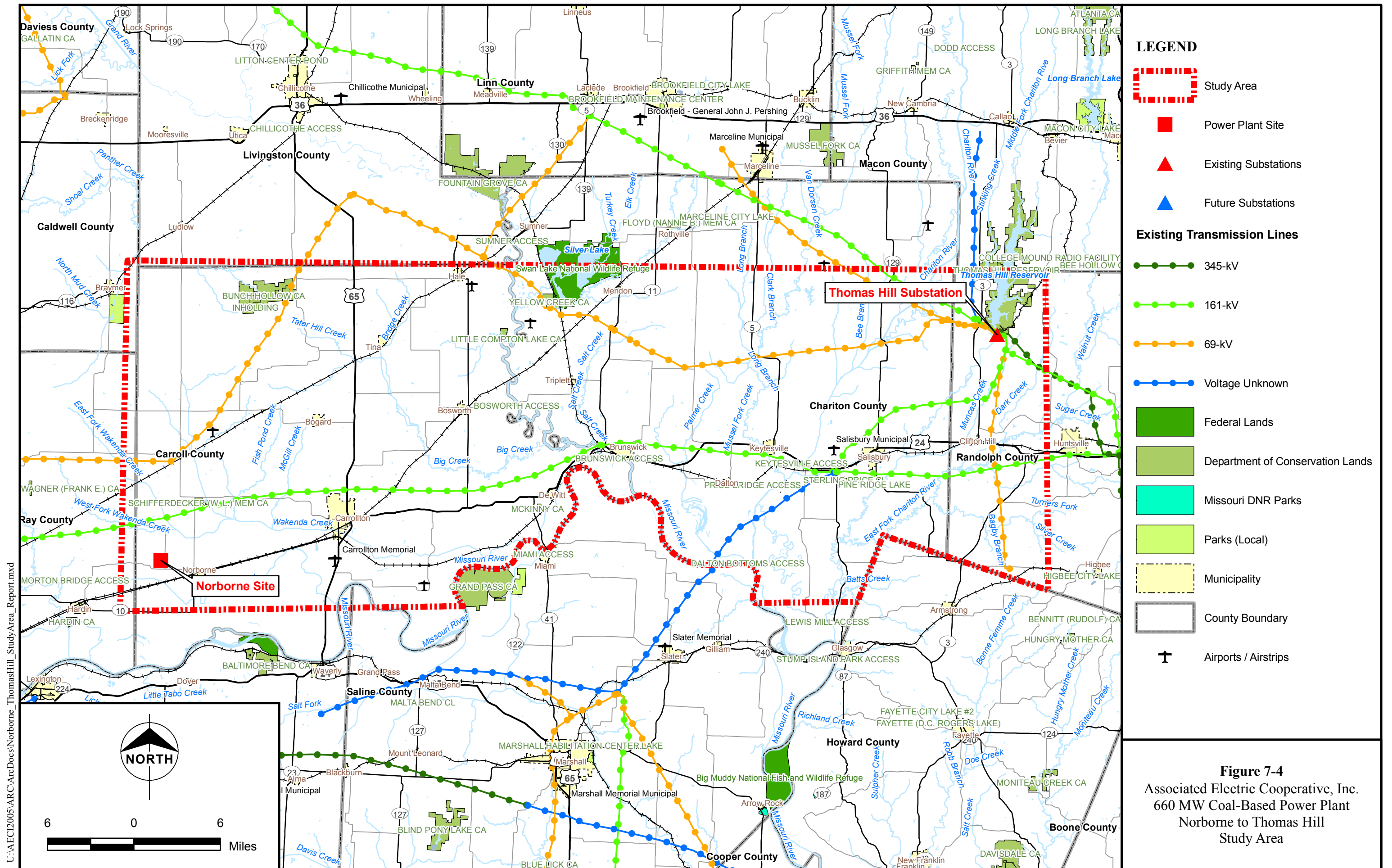
The following sections include a description of the study areas and identify the macro-corridors identified within each for further investigation.

7.2.1 NORBORNE SITE

Two study areas were identified for the Norborne Site: Norborne to Thomas Hill and Norborne to Sedalia / Mt. Hulda (refer to Figure 7-1 for an overview). A transmission line would be needed for both of these study areas, one heading east to Thomas Hill and one heading south to Sedalia and Mt. Hulda, should the Norborne site be the site selected for the proposed power plant. Each of these transmission lines would originate at the proposed Norborne Substation Site, which is located approximately 2.5 miles northwest of the town of Norborne and about 11 miles northeast of Lexington, on the northeast corner of State Highways JJ and DD. The transmission line within the Norborne to Thomas Hill study area would terminate at the Thomas Hill Substation northwest of Moberly. The transmission line within the Norborne to Sedalia / Mt. Hulda study area would first connect to the Sedalia Substation and then continue to and terminate at a new substation near the existing Mt. Hulda Substation, south of the town of Cole Camp.

7.2.1.1 Norborne to Thomas Hill Study Area

The Norborne to Thomas Hill study area extends eastward from the proposed site of the Norborne Power Plant approximately 60 miles to the Thomas Hill Plant (Figure 7-4). This area includes Carroll County, Chariton County, and the western portion of Randolph County. Saline and Howard counties were excluded from the study area because corridors through these counties would require two crossings of the Missouri River, substantially increasing the environmental impact of the proposed project. Including these counties in the study area would also unnecessarily increase the amount of public involvement activities and oversight into the project. The Thomas Hill Plant is located on the south side of the Thomas Hill Reservoir between State Highway 3 and State Highway F, approximately eight miles northwest of Huntsville and 15 miles southwest of Macon. The most dominant features in the area between the Norborne Site and the Thomas Hill Plant include Swan Lake National Wildlife Refuge (NWR), the Missouri River, the Grand River, the Chariton River, and the Thomas Hill Reservoir. Highway 24 connects the towns of Carrollton, DeWitt, Brunswick,



LEGEND

- Study Area
- Power Plant Site
- Existing Substations
- Future Substations

Existing Transmission Lines

- 345-kV
- 161-kV
- 69-kV
- Voltage Unknown

- Federal Lands
- Department of Conservation Lands
- Missouri DNR Parks
- Parks (Local)
- Municipality
- County Boundary
- Airports / Airstrips

Figure 7-4
 Associated Electric Cooperative, Inc.
 660 MW Coal-Based Power Plant
 Norborne to Thomas Hill
 Study Area

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Keytesville, Salisbury, and Clifton Hill along the southern portion of the study area. Some other towns within the study area include Norborne, Bosworth, Triplett, Hale, and Bogard. In addition, a Norfolk Southern (NS) line generally parallels Highway 24 across the central portion of the study area and two Burlington Northern Santa Fe (BNSF) lines extend from southwest to northeast through the western half of the study area.

7.2.1.1.1 Human Resources

Land Use: The Norborne to Thomas Hill study area contains primarily undeveloped, rural lands. Specific land use information was not available from any of the three counties in the study area. However, based on recent aerial photography and ground surveillance, crop production appears to be the dominant land use throughout the study area. Soybeans are the dominant crop grown in the study area, but corn, wheat and other grains are grown as well (U.S. Department of Agriculture, 2002). Rural residences associated with large tracts of agricultural land occur throughout the study area in addition to scattered small towns and communities.

Population: Of the three counties within the study area, Carroll and Chariton counties showed a negative population change from the census years 1990 to 2000. All counties experienced considerably less growth than the state average (U.S. Census Bureau, 2000a). General population data for these counties are included in Table 7-1. Larger communities such as the City of Carrollton, in Carroll County contain concentrated areas of residential and commercial land use surrounded by agricultural land.

Table 7-1 Population for Norborne to Thomas Hill by County

County	Population 1990	Population 2000	Population Estimate 2003	Population % Change (1990 – 2000)
Missouri	5,117,073	5,595,211	5,704,484	9.3
Carroll	10,748	10,285	10,149	-4.3
Chariton	9,202	8,438	8,251	-8.3
Randolph	24,370	24,663	25,045	1.2

Source: U.S. Census Bureau, 2000a

Several communities are located within the study area, including Norborne, Carrollton, Bogard, Braymer, Bosworth, Tina and DeWitt in Carroll County; Triplett, Brunswick,

Dalton, Keytesville and Salisbury in Chariton County; and Clifton Hill in Randolph County. None of these communities had 2000 populations greater than 5,000 people (Table 7-2). Carrollton, located at the intersection of U.S. Highway 65 and U.S. Highway 24 is the largest community in the study area, followed by Salisbury, which is located on U.S. Highway 24 at State Highway 29 in Chariton County. All other towns and communities in the study area had populations of less than 1,000 people in 2000. Norborne, Braymer, and Brunswick are the largest of the communities with less than 1,000 people. The populations of most of the towns within the study area stayed the same or declined between 1990 and 2000, including the bigger towns of Carrollton and Salisbury (U.S. Census Bureau, 2000c).

Table 7-2 Population by Size for Norborne to Thomas Hill Towns

Town	2000 Population
1,000 to 5,000	
Carrollton	4,122
Salisbury	1,726

Source: U.S. Census Bureau, 2000

Employment Statistics: The agricultural influence on the study area is evident in the percentage of people that rely on agriculture or closely related fields as their primary source of income. According to the 2000 Census, the percentage of the working population of Carroll, Chariton, and Randolph counties that report the agriculture industry (agriculture, forestry, fishing and hunting, and mining) as their source of employment is significantly higher than the statewide percentage. The employment statistics for the three counties reflect a variety of occupations and industries. Overall, the majority of people living in the study area are employed in the “education, health and social services” and “manufacturing” industries (U.S. Census Bureau, 2000b). Table 7-3 lists the employment statistics by category for the counties in the study area, and for the state of Missouri for comparison.

Recreational Facilities: Recreational opportunities may be found at the Swan Lake NWR, which is located in the northwestern portion of the study area in Chariton County. The 10,795-acre refuge was established in 1937 along the Grand River near its confluence with the Missouri River. The U.S. Fish and Wildlife Service (USFWS) uses wetland restoration, grassland management and cooperative farming to provide habitat for migratory waterfowl

and other birds including bald eagles. Bird watching is a major attraction at Swan Lake NWR. The refuge is visited by approximately 18,000 people each year (U.S. Fish and Wildlife Service, 2005a). The Thomas Hill Reservoir in northern Randolph County is a dominant outdoor recreation feature in

Table 7-3 Percent Employment by Industry for Norborne to Thomas Hill Counties

Industry	Missouri	Chariton	Randolph	Carroll
Agriculture, forestry, fishing and hunting, and mining	2.2	12.0	2.6	12.9
Construction	6.9	7.9	5.1	7.1
Manufacturing	14.8	16.1	19.4	17.3
Wholesale trade	3.7	2.8	3.7	3.7
Retail trade	11.9	9.4	12.4	8.8
Transportation and warehousing, and utilities	5.7	7.0	7.2	7.3
Information	3.0	4.3	1.4	2.6
Finance, insurance, real estate, and rental and leasing	6.7	5.5	6.6	4.3
Professional, scientific, management, administrative, and waste management services	7.5	2.3	3.5	4.6
Educational, health and social services	20.4	20.8	20.5	19.9
Arts, entertainment, recreation, accommodation and food services	7.8	2.7	6.6	2.4
Other services (except public administration)	5.0	4.7	4.4	4.8
Public administration	4.6	4.5	6.4	4.3

Source: U.S. Census Bureau, 2000b Census Data

the region. The southern half of the reservoir is within the study area. The facilities at the reservoir that are within the study area include two boat docks (one accessible), four boat ramps, and primitive camping areas. Activities available at Thomas Hill include fishing, camping, and hunting.

The Missouri Department of Conservation (MDC) manages the 3,294-acre Bunch Hollow Conservation Area (CA) in Carroll County. The Bunch Hollow CA has 4.5 miles of multi-use trails for horseback riding, bicycling and hiking; other activities include hunting, fishing

and camping. The MDC manages the 620-acre Yellow Creek CA in Chariton County, which offers hunting, fishing, camping, and hiking trails (Missouri Department of Conservation, 2005c). There are numerous other smaller conservation areas, river accesses and local parks throughout the study area.

Transportation and Utilities: A variety of roads, airstrips and airports, and transmission lines occur throughout the study area (Figure 7-4).

- **Roads** - The primary roadway in the study area is U.S. Highway 24. Other roadways include U.S. Highway 65 and numerous state highways and county roads. U.S. Highway 24 extends east to west through the southern portion of the study area from Carrollton on the west side of the study area to Clifton Hill on the east side. U.S. Highway 65 runs north/south through Carrollton. The site of the proposed Norborne power plant is accessed from State Highway 10, east of Carrollton; the Thomas Hill substation site is accessed by State Highway 3, north from Clifton Hill (DeLorme, 1998).
- **Airports** - There are several airstrips and airports located in the study area, including the Carrollton Memorial Airport, south of Carrollton; and the Salisbury Memorial Airport, west of Salisbury. Other airstrips in the study area are primarily small private facilities (AirNav, LLC, 2005). Three rail lines cross the study area, two of which are BNSF lines that cross the area from southwest to northeast. These rail lines provide service to agricultural customers in the region and coal delivery to the Thomas Hill Power Plant. A Norfolk Southern line is parallel to the BNSF line from Norborne to Carrollton where it splits from the BNSF line and generally follows U.S. Highway 24 to Clifton Hill.
- **Transmission Lines** - Several existing transmission lines occur within the study area. A 69 kV line crosses the northern portion of the study area, leaves the area west of Swan Lake and enters again to cross the northwest corner. One 161 kV line crosses the northeast corner of the study area, while another crosses the study area from the northeast portion to the south-central portion. Another 161 kV line crosses the study area generally along Highway 24 from east to west. A 345 kV line crosses a small part of the study area east of Thomas Hill Reservoir. Numerous other sub-

transmission and distribution lines are located along area roadways providing electrical service to local residents and commercial and industrial customers.

7.2.1.1.2 Natural Resources

Photographs representative of the typical vegetation and terrain of the area are included at the end of this section for reference.

Physiography and Topography: The Norborne to Thomas Hill study area is located in the Central Dissected Till Plains physiographic region. The topography in the area is generally flat in the floodplains with steep to rolling hills above the floodplain. Two major rivers and numerous smaller rivers and streams flow through the study area. Drainage is generally toward the Missouri River, which forms the boundary of a portion of the southern edge of the study area between Carroll County and Saline County. The Grand River forms the line between Carroll and Chariton counties in the central part of the study area. The Grand River joins the Missouri River south of the town of Brunswick. The floodplains of these rivers form the flat topography described above. The Chariton River crosses the eastern part of the study area and joins the Missouri River south of Keytesville. The middle fork of the Little Chariton River, which is the source of water for the Thomas Hill Reservoir, crosses the northeast part of the study area (DeLorme, 1998).

Vegetation: Vegetation throughout the study area is a combination of cultivated crops and native plants. The fertile soils in the broad floodplains are well suited for crop production. Almost all of the land in the Norborne to Thomas Hill study area is considered prime farmland, prime farmland if drained or not flooded, or farmland of statewide importance. Typically, impacts from transmission lines to prime farmland are minimal. All of the agricultural land crossed by the line, with the exception of where the pole is placed and where possible guy wires are anchored, can remain in agricultural production. Most flat land in the study area has long been cleared for agricultural use. Flat land left uncultivated for crops can support such native grass species as big and little bluestem, Indian grass and switchgrass. Cottonwood, sycamore, American elm, honey locust and black walnut are common bottom land tree species, whereas oak and hickory species are better adapted to upland hills and steep slopes.

Wetlands: There are three categories of wetlands found in the study area. These three types are included in the broad category of palustrine wetlands. The Palustrine System includes all non-tidal, vegetated wetlands. Palustrine wetlands are further defined by the plant types that dominate them, such as trees, shrubs and emergents (herbaceous plants) (Cowardin et al. 1979). The study area contains wetlands from all three main groups of palustrine wetlands: emergent, forested, and scrub-shrub. Small isolated emergent and scrub-shrub wetlands are randomly scattered throughout the study area. Larger areas of forested wetlands are primarily associated with rivers, streams and lakes. Small wetlands that can be spanned by a transmission line typically do not present a serious routing constraint. In the event a final route would cross wetlands that are too big to span or would require clearing of vegetation, a wetland permit from the U.S. Army Corps of Engineers (COE) and the Missouri Department of Natural Resources (MDNR) may need to be acquired prior to construction.

Wildlife: Swan Lake NWR, in the north part of the study area, contains vegetative communities representative of the entire study area. The refuge is managed to provide habitat for migratory birds and resident wildlife and has open water, wetlands, native grass, woodlands and cultivated crop fields. Common wildlife species at Swan Lake include white-tailed deer, coyote, raccoon, beaver, muskrat, opossum, fox squirrels, and cottontail rabbits. Common bird species include Canada geese, mallards and other waterfowl, bob-white quail, red-tailed hawk and harrier. The proximity of the Swan Lake NWR to the study area and similarity of habitat types make it likely that the wildlife common to the refuge are representative of those found in the study area (U.S. Fish and Wildlife Service, 2005a).

Threatened and Endangered Species: A preliminary search of USFWS and MDC data identified two federally-listed and six state-listed species as potentially occurring in Carroll, Chariton and Randolph counties. The federally threatened bald eagle is likely to roost in large trees along the Missouri River and around Thomas Hill Reservoir and Swan Lake NWR. The federally endangered Indiana bat prefers forested habitat with loose-barked tree species such as shagbark hickory. Such habitat is found throughout the study area on steep slopes above the floodplain. Table 7-4 provides a complete list of the threatened and endangered species found in the study area counties. Some of these species may not occur in the actual study area but in portions of the county outside the study area.

**Table 7-4 Threatened and Endangered Species – Norborne to Thomas Hill
by County**

Common Name	Scientific Name	State Status	Federal Status	Counties		
				Carroll	Chariton	Randolph
Bald Eagle	<i>Haliaeetus leucocephalus</i>	E	T	✓	✓	
Indiana Bat	<i>Myotis sodalis</i>	E	E	✓	✓	
Eastern Massasauga	<i>Sistrurus catenatus</i>	E			✓	
Lake Sturgeon	<i>Acipenser fulvenscens</i>	E			✓	
Northern Harrier	<i>Circus cyaneus</i>	E		✓		
Greater Prairie Chicken	<i>Tympanuchus cupido</i>	E		✓		

Source: Missouri Department of Conservation, 2005b. United States Fish and Wildlife Service, 2005b
E – Endangered; T – Threatened

Cultural Resources: A preliminary search of records at the Archaeological Survey of Missouri (ASM) in Columbia, Missouri and the National Park Service web site of National Register of Historic Places (NRHP) was conducted for each study area. From the preliminary investigation the following assessment of conditions was made for each of the transmission line study areas.

- The Missouri River flood plain and the bluffs overlooking the Missouri River contain a high density of potentially significant prehistoric and historic archaeological sites. This conclusion is based upon the density of sites where archaeological surveys have been completed and where sites have been recorded by amateurs. The majority of the proposed project near the Missouri River has not been investigated by professional or amateur archaeologists.
- The tributaries to the Missouri River have the same potential for producing prehistoric and historic archaeological sites as along the Missouri River. This too is based upon the density of sites where archaeological surveys have been completed. As with the Missouri River, the majority of the proposed project area has not been investigated by a professional or amateur archaeologist.

- The upland areas, along the proposed project corridor(s), away from the tributaries and other permanent water sources, appear to have the lowest potential for containing significant prehistoric archaeological sites and yet have the highest potential for containing historic sites such as farmsteads that are over 50 years old. Few of the upland areas have been surveyed by a professional archaeologist and few sites have been recorded by amateur archaeologists.
- The listed NRHP properties are essentially confined to towns and cities along the proposed corridors. A few farmsteads and archaeological sites are also on the NRHP listing, but it does not appear that any of the NRHP properties would be adversely affected by the proposed project. The limited NRHP listings reflect the fact that few surveys have been conducted to identify historic buildings and the surveys that have been conducted were focused upon the cities and towns. It is also possible that remnants of the Santa Fe or Oregon Trails may be present near or in the proposed corridor(s).
- The areas along the Missouri River through central and western Missouri are known to contain many examples of historic farmsteads dating from approximately 1830 to 1860. In the 1820s and 1830s, an influx of settlers from Kentucky and Tennessee, who brought their southern lifestyle, including their slaves, with them, arrived in the Missouri river valley. This influx was so pervasive in central and western Missouri along the Missouri river that the area became known historically and later archaeologically as “Little Dixie”. The early settlement, transplanting of the southern lifestyle, and the presence of slaves are contributing factors when evaluating the architectural significance of the historic farmsteads and make the area more likely to be determined eligible for the NRHP.
- It is unknown if the project will affect any Traditional Cultural Properties (TCP) but at least one of the corridors abuts the Sac and Fox-Iowa Indian Reservation. TCP’s can be located anywhere within the traditional areas that have been occupied by Indian tribes and the tribes should be consulted prior to any ground disturbing activities in such areas.

7.2.1.2 Norborne to Sedalia / Mt. Hulda Study Area

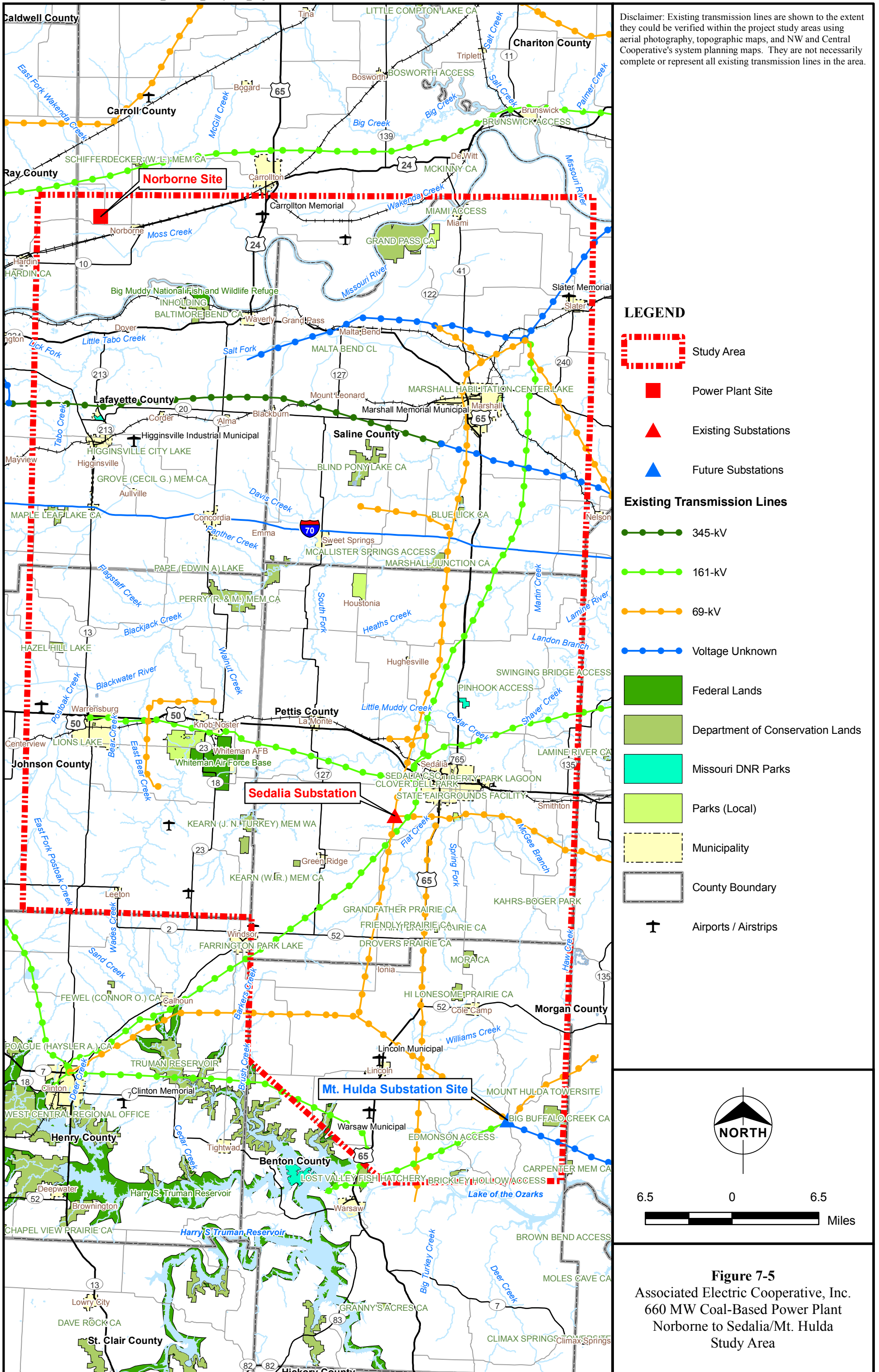
The Norborne to Sedalia / Mt. Hulda study area first extends southeast from the proposed Norborne Substation Site in Carroll County, Missouri approximately 50 miles to Central's Sedalia Substation in Pettis County (Figure 7-5). The Sedalia Substation is located approximately 2.5 miles southwest of Sedalia, about three miles west of U.S. Highway 65 between State Highways Y and B. An additional two acres of land may need to be acquired to expand the existing substation. The general transmission pathway then continues southeast approximately 24 miles to the Mt. Hulda area, where a new substation would be constructed in the vicinity of Central's existing Mt. Hulda Substation, which is located in Benton County near the intersection of State Highways B and W. Approximately two acres of land would be required for the fenced portion of the new Mt. Hulda substation. A total of about 15 acres would be purchased around the fenced substation.

The Norborne to Sedalia / Mt. Hulda area encompasses all or a portion of six Missouri counties: Carroll, Lafayette, Saline, Johnson, Pettis and Benton. The most dominant features in the study area include the Missouri River, the Big Muddy NWR, Whiteman Air Force Base (AFB), and Knob Noster State Park. Cities include Higginsville, Marshall, Waverly, Warrensburg, Knob Noster, Sedalia, Concordia, Sweet Springs and a small portion of Windsor. A variety of relatively large conservation areas including Blind Pony Lake CA, Perry Memorial CA, Marshall Junction CA, and Kearn Memorial Wildlife Area are also located throughout the study area.

7.2.1.2.1 Human Resources

Land Use: Land use in the study area consists of large areas of timber and open grasslands with scattered cities and towns. The northern and central portions of the study area are generally flat to rolling with large areas of open grassland. The southern portion, near the Mt. Hulda Substation, is dominated by woodlands. Residential and commercial development is generally sparse throughout the less-developed parts of the study area and more concentrated within and near incorporated communities.

Population: The Norborne to Sedalia / Mt. Hulda study area includes southern Carroll, eastern Lafayette and Johnson, western Saline and Pettis, and northwest Benton counties.



Carroll, Lafayette, Saline, and Pettis counties experienced negative or no population growth and were less than the state average. Johnson and Benton counties experienced a population growth greater than the state average between 2000 and 2003 (U.S. Census Bureau, 2000a). General population information about these counties is presented in Table 7-5. The most developed areas of the study area include the community of Norborne in Carroll County, Higginsville and Concordia in Lafayette County, Marshall and Sweet Springs in Saline County, Warrensburg and Knob Noster in Johnson County, La Monte and Sedalia in Pettis County, Windsor in Henry and Pettis counties, and Lincoln and Cole Camp in Benton County. The 2000 population for the larger cities is shown in Table 7-6. There are no towns with populations between 5,000 and 10,000 people (DeLorme, 2002).

Table 7-5 Population for Norborne to Sedalia / Mt. Hulda by County

County	Population 1990	Population 2000	Population Estimate 2003	Population % change 1990 - 2000
Missouri	5,117,073	5,595,211	5,704,484	9.3
Carroll	10,748	10,285	10,149	-4.3
Lafayette	31,107	32,960	32,951	6.0
Saline	23,523	23,756	22,887	1.0
Johnson	42,514	48,258	50,262	13.5
Pettis	35,437	39,403	39,344	11.2
Benton	13,859	17,180	18,076	24.0

Source: U.S. Census Bureau, 2000a

Sedalia, which is the county seat of Pettis County, is the largest community in the study area. It was founded as a railroad town in the late 1800's. Today the town is the home of the Missouri State Fair, one of the largest state fairs in the U.S. Sedalia is crossed by U.S. Highway 50 from west to east and from north to south by U.S. Highway 65. Sedalia's business district is concentrated at the intersection of these two major roadways (City of Sedalia, 2005).

The town of Warrensburg is located in the west central part of the study area approximately 15 miles west of Sedalia and 50 miles east of Kansas City. Warrensburg is the second most populated community in the study area (U.S. Census Bureau, 2000c). U.S. Highway 50

Table 7-6 Population by Size for Norborne to Sedalia / Mt. Hulda Towns

Town	2000 Population
> 20,000	
Sedalia	20,339
10,000 to 20,000	
Warrensburg	16,340
Marshall	12,433
1,000 to 5,000	
Higginsville	4,682
Whiteman AFB	3,814
Windsor	3,087 (97 in Pettis County)
Knob Noster	2,462
Concordia	2,360
Slater	2,083
Sweet Springs	1,628
Cole Camp	1,028
Lincoln	1,026

Source: U.S. Census Bureau, 2000c

crosses the north side of town from east to west and State Highway 13 crosses through the center of town from north to south. Warrensburg is the county seat of Johnson County and the home of Central Missouri State University (CMSU). The main business district, including the County Courthouse, is located downtown. Other commercial development is located along highways 50 and 13.

Marshall, the third most populated community in the study area, is located in the northeast part of the study area in Saline County, approximately 25 miles north of Sedalia on U.S. Highway 65. Marshall is the home of Missouri Valley College (City of Marshall, 2005).

Quite a few other towns with populations greater than 1,000 people are located throughout the study area. Higginsville, which is located on State Highway 13, north of Warrensburg and Interstate 70, is in Lafayette County, as is Concordia, which is located in the north central portion of the study area along Interstate 70. Knob Noster is located in Johnson County, between Warrensburg and Sedalia, and adjacent to Whiteman AFB. Slater and Sweet Springs are located in Saline County. Slater is located at the eastern edge of the study area and Sweet Springs is located in the southern part of the county along Interstate 70. The

town of Windsor is located primarily outside the study area in northeast Henry County and northwest Pettis County, while Lincoln and Cole Camp are located in the southwestern portion of the study area in Benton County. About half the larger towns in the study area experienced growth between the 1990 and 2000 census, including Concordia, LaMonte, Knob Noster, Lincoln, Sedalia, Sweet Springs, Warrensburg, and Windsor (U.S. Census Bureau, 2000c).

Many other smaller communities are dispersed throughout the study area, including Waverly, Alma, Blackburn, Corder, Dover, Emma, Green Ridge, Houstonia, Hughesville, Leeton, Malta Bend, Miami City, Mount Leonard, Norborne, Smithton, Aullville, and Ionia, all with 2000 populations less than 1,000. Most of these smaller communities experienced negative growth between 1990 and 2000 (U.S. Census Bureau, 2000c).

A small Amish community is located near the town of Windsor, in the southern part of the study area. There have been Amish settlements in Missouri since the 1850's, but all those established prior to 1930 are no longer in existence. Missouri has several Amish communities, and at one time had the fastest growing Amish population by percentage in the U.S. The Amish in Missouri primarily make their living from farming - a way of life that helps to create the sense of community that is fundamental to their religious way of life. The Amish community in Windsor consists of several homes, two sawmill operations, a general store, and a country store that sell foods and craft items to visitors from outside the community (Missouri Life Magazine, 2000).

Employment Statistics: The employment statistics for the six counties in the study area reflect a variety of occupations and industries. Overall, the majority of people living the study area are employed in the “educational, health and social services” and “manufacturing” industries. General employment information for these counties is presented in Table 7-7.

Recreational Facilities: The study area has numerous opportunities for recreation and entertainment including state and local parks, wildlife areas and an historic site. The Katy Trail State Park, managed by the Missouri State Parks and Historic Sites, is a 225-mile gravel-surfaced bicycle and walking trail, which crosses the center of Missouri from Clinton to St. Charles. The trail crosses the southern part of the study area from Windsor through

Table 7-7 Percent Employment by Industry for Norborne to Sedalia / Mt. Hulda Counties

Industry	Missouril	Carroll	Lafayette	Saline	Johnson	Pettis	Benton
Agriculture, forestry, fishing and hunting, and mining	2.2	12.9	3.9	6.4	2.9	3.6	8.0
Construction	6.9	7.1	9.7	5.8	7.1	7.1	11.9
Manufacturing	14.8	17.3	15.3	19.6	15.6	23.5	15.7
Wholesale trade	3.7	3.7	3.7	2.6	1.7	3.6	2.2
Retail trade	11.9	8.8	12.9	10.7	12.1	12.2	13.2
Transportation and warehousing, and utilities	5.7	7.3	6.5	5.2	3.9	4.6	3.9
Information	3.0	2.6	2.5	1.8	2.3	2.3	1.7
Finance, insurance, real estate, and rental and leasing	6.7	4.3	5.1	3.2	4.1	3.6	4.3
Professional, scientific, management, administrative, and waste management services	7.5	4.6	4.5	3.7	4.2	3.8	3.6
Educational, health and social services	20.4	19.9	19.8	25.7	25.9	19.0	18.7
Arts, entertainment, recreation, accommodation and food services	7.8	2.4	6.2	6.9	9.5	7.3	6.6
Other services (except public administration)	5.0	4.8	5.1	3.8	4.7	5.4	5.4
Public administration	4.6	4.3	4.9	4.7	6.1	4.0	4.6

Source: U.S. Census Bureau, 2000b

Sedalia and continues east. The majority of the Katy Trail is built on the former rail bed of the Missouri-Kansas-Texas (MKT) Railroad, better known as Katy. A 30-mile section of trail from Clinton to Sedalia is on rail bed donated by the Union Pacific Railroad (Missouri Department of Natural Resources, 2005a).

In 1994, following extensive flooding of the Missouri River in the summer of 1993, the USFWS established the Big Muddy NWR. This wildlife area was created to restore portions of the Missouri River floodplain to its pre-settlement condition. Since its establishment, the Big Muddy NWR has grown to include eight units along the Missouri River from Kansas City to St. Louis. The Baltimore Bend portion of the Big Muddy is located on 1,490 acres of land in the Missouri River floodplain adjacent to the MDC Baltimore Bend CA.

Recreational opportunities at the Big Muddy NWR include fishing, hunting, hiking and wildlife watching (U.S. Fish and Wildlife Service, 2005d).

A number of MDC-managed areas are located throughout the study area, including Baltimore Bend, Blind Pony Lake, Perry, Blue Lick and Marshall Junction CAs in the northern portion of the study area and Kearn, Hi Lonesome Prairie, Mora, Grandfather Prairie, and Paint Brush Prairie in the south. The Baltimore Bend CA is located in the Missouri River floodplain in north Lafayette County. Approximately 80 percent of the 1,192-acre conservation area is forested. The area is managed for wildlife habitat. Recreational opportunities include hunting, fishing, hiking, and primitive camping (Missouri Department of Conservation, 2005a).

The Blind Pony Lake CA is a 2,207 acre multiple-use area, which includes a lake, warm-water fish hatchery, and 1,800 acres of land devoted to wildlife. Activities available at the Blind Pony Lake CA include hunting, fishing, hiking, bird watching, photography, picnicking, and frogging.

The 4,094 acre Perry Memorial CA is located in Johnson, Pettis, and Saline Counties. The area has over 800 acres of wetlands, 1,708 acres of forest land, and 700 acres of grass and cropland. Recreational activities include hunting, trapping, and fishing. The 773-acre Marshall Junction CA, located in southern Saline County is located on the Blackwater River and offers fishing, camping, hunting, and canoeing. The Blue Lick CA consists of 390 acres primarily for hunting and fishing.

In the southern portion of the study area, the 1,674-acre Kearn Memorial Wildlife Area, located in Johnson County, south of Warrensburg, provides recreational opportunities such as hunting, fishing, and bird watching. The Mora CA is a 320-acre area in Benton County managed as open grassland and old fields for doves, and includes opportunities for hunting, fishing and hiking. The Grandfather Prairie, Paint Brush Prairie, Drovers Prairie, Friendly Prairie and Hi Lonesome Prairie areas are tall-grass prairie remnants in Pettis and Benton counties, on which people can view prairie wildflowers in the spring, summer, and fall, as well as hunt and fish on some of the area's lands. The Hi Lonesome Prairie is the largest of

the three areas, at 627 acres. Grandfather, Drovers, Paint Brush, and Friendly Prairies are considerably smaller (all are 80 acres or less).

Other recreational opportunities in the study area include the Confederate Memorial State Historic Site north of Higginsville; and numerous other small conservation areas and local parks. Higginsville City Lake, east of Higginsville, offers opportunities to fish, picnic, hike, hunt, and observe wildlife. Facilities associated with the lake include picnic areas and tables, restrooms, a fishing pier, and boat ramps. A privately owned golf course is located adjacent to the lake, as is the Higginsville Industrial Municipal Airport.

Knob Noster State Park is located between the towns of Warrensburg and Sedalia, in the center of the study area. The 3,567 acre state park includes public and group camping facilities as well as opportunities for fishing, horseback riding and hiking.

As previously mentioned, Sedalia is home to the Missouri State Fair. For 10 days each August, the state fair offers a wide variety of entertainment and educational opportunities. The state fair grounds are also used for concerts, stock car racing and livestock exhibits throughout the year (City of Sedalia, 2005).

Transportation and Utilities: The Norborne to Sedalia / Mt. Hulda study area contains an extensive network of roadways, both paved and unpaved, railroads, airports, and transmission lines (Figure 7-5).

- **Roads** - Interstate Highway 70 runs east/west across the north part of the area. U.S. Highway 65 runs north/south down the east side of the area through the communities of Marshall and Sedalia. U.S. Highway 50 runs east/west through the center of the study area past Warrensburg, Knob Noster and through Sedalia.
- **Railroads** - The Union Pacific Railroad runs east/west through the center of the study area through the communities of Warrensburg and Sedalia. In addition to carrying freight, agricultural products and coal, this railroad provides Amtrak service from Kansas City to St. Louis. A second Union Pacific line crosses the northern part of the study area from east to west through Marshall. A third rail line operated by Kansas City Southern Railroad (formerly Gateway Western Railroad) also crosses the north part of the study area through Higginsville and Marshall (DeLorme, 1998).

- Airports - Whiteman AFB is located between Warrensburg and Sedalia, just south of the town of Knob Noster. The base was established in 1942 as a training facility for glider pilots and has been the site of various Strategic Air Command (SAC) wings. From the early 1960's to 1995, it was the site of SAC's Fourth Minute Man Missile Wing. Whiteman AFB is currently home base for the B-2 Bomber. The area surrounding Whiteman presents potential transmission line routing constraints. At a minimum, the approach surface of the base's runways would require an unrestricted glide path of 50:1 for a distance of 50,000 feet from the end of each runway. A 100-foot transmission line pole could not be within 5,000 feet of the runway end, or nearly one mile. Other zoning and security issues or other associated military facilities, such as VOR sites (air navigational radio aids), may need to be addressed to route a transmission line near this military installation (509th Bomb Wing Public Affairs, 2005).

A number of small airports and airfields were identified within the study corridor. The Marshall Memorial Airport is located between U.S. Highway 65 and Business 65 south of Marshall. The Higginsville Industrial Municipal Airport is located on State Route AA, 1.5 miles east of the town of Higginsville. The Sedalia Memorial Airport is located north of U.S. Highway 50 on the east side of Sedalia. The Skyhaven (Max Swisher) Airport is located on U.S. Highway 50 about two miles west of Warrensburg. The Windsor Municipal Airport is located on the north side of Windsor off of State Route B. Restricted areas of varying dimensions, depending on the airport facilities and capabilities, extend beyond the property boundaries for each of these airports as defined by 14 CFR, Part 77 of the FAA Regulations. In addition to these airfields, a number of small, private landing strips may also be scattered throughout the area (AirNav LLC, 2005).

- Transmission Lines - Several transmission lines cross the study area operated by Aquila, KCPL, and NW and Central Electric Cooperatives. A 345 kV line runs west to east through the northern portion of the study area. 161 kV lines criss-cross the study area. One 161 kV line angles from near Marshall southwest to Sedalia; another enters the study area from Cooper County, heads into Sedalia, and then continues southwest to Clinton, and one runs between Warrensburg and Sedalia, generally

parallel to Highway 50. A 69 kV line crosses the study area from Marshall south to Sedalia and beyond, where it splits to head toward Clinton and the Mt. Hulda area. Another 69 kV line runs west to east, on the south side of Sedalia. A 69 kV line also heads almost due south from Sedalia, eventually crossing an arm of Lake of the Ozarks. Numerous other sub-transmission and distribution lines are located along area roadways and elsewhere providing electrical service to local residents and commercial and industrial customers.

7.2.1.2.2 Natural Resources

Photographs representative of the typical vegetation and terrain of the area are included at the end of this section for reference.

Physiography and Topography: The northern part of the Norborne to Sedalia/Mt. Hulda study area, which includes Carroll, Lafayette and Saline counties, is located in the Central Dissected Till Plains physiographic region. The topography in this portion of the study area is generally flat on the north side of the Missouri River, with rolling hills south of the river. Johnson, western Pettis, and northern Benton counties are in the Osage Plains region. This is Missouri's prairie region, which is characterized by plains and gently rolling hills. The extreme southern part of the study area in Benton County is in the Ozark Highlands Region. The topography in this region changes to steeper hills with narrow valleys.

Numerous small rivers and streams flow through the study area. Drainage is generally toward the Missouri River, which crosses the northern part of study area, forming the south boundary of Carroll County and the north boundary of Saline County. The Blackwater River runs north of Warrensburg, across southern Saline County. Truman Reservoir, the largest flood control lake in Missouri, consisting of approximately 166,000 acres of public land and water, and Lake of the Ozarks, with a shoreline of more than 1,150 miles, are located at the southernmost edge of the study area. Most of the features of these two lakes are located outside the Norborne to Sedalia/Mt. Hulda study area. Numerous other creeks and streams are scattered throughout the study area.

Vegetation: Vegetation throughout the study area is a combination of cultivated crops and native plants. In the northern part of the study area, the Missouri River floodplain is well

suiting for crop production. The central portion of the area is dominated by open grasslands dissected by wooded hillsides and stream banks. Prior to settlement, much of this region supported prairie grass species. Today, land left uncultivated for crops can support such native grass species as big and little blue stem, Indian grass and switch grass. Cottonwood, sycamore, American elm, honey locust and black walnut are common tree species along stream banks. The southern portion of the study area that falls within the Ozark Highlands Physiographic Region is dominated by oak and hickory species, which are well adapted to upland hills and steep slopes.

Almost all of the land in the Norborne to Sedalia / Mt. Hulda study area is considered prime farmland, prime farmland if drained or not flooded, or farmland of statewide importance. Typically, impacts from transmission lines to prime farmland are minimal. All of the agricultural land crossed by the line, with the exception of where the pole is placed and where possible guy wires are anchored, can remain in agricultural production.

Wetlands: Wetlands are found scattered over the entire Norborne to Mt. Hulda study area. Wetlands in the study area include numerous small isolated wetlands associated with farm ponds and larger communities associated with rivers, streams and lakes.

Wildlife: The varied landscapes within the study area provide habitat for a wide variety of wildlife species. Canada geese, mallard ducks and other waterfowl are common bird species in the crop fields and wetlands along the Missouri River. Bird species such as red-tailed hawks and bob-white quail and mammals such as cottontail rabbits are common in the open grasslands of the central study area. Mammals such as raccoon, opossum, white-tailed deer, striped skunk and coyote are likely found throughout the entire study area.

Threatened and Endangered Species: The natural history database of the MDC and USFWS county distribution list of Missouri's federally-listed species were searched for the six counties in the study area. Preliminary investigation identified four federally-listed endangered species that could occur in the study area. The Topeka Shiner is listed by the USFWS as possibly occurring in small prairie streams in Pettis County. The pallid sturgeon is listed by the USFWS as possibly occurring in the Missouri River in Saline and Lafayette counties. The gray bat is listed by the MDC and the USFWS as possibly occurring in caves

in Benton County. The Indiana bat is listed by the USFWS as possibly occurring in wooded areas of Carroll and Benton counties. The preliminary search also identified two federally-threatened species and eleven state-endangered species as potentially occurring in the study area. Table 7-8 provides a complete list of the protected species found in the study area counties. Some of these species may not occur in the actual study area, but rather in areas within the counties beyond the study area boundaries.

Table 7-8 Threatened and Endangered Wildlife Species – Norborne to Sedalia / Mt. Hulda by County

Common Name	Scientific Name	State Status	Federal Status	Counties					
				Carroll	Lafayette	Saline	Johnson	Pettis	Benton
American Bittern	<i>Botaurus lentiginosus</i>	E	--		✓	✓			
Bald Eagle	<i>Haliaeetus leucociphalus</i>	E	T	✓		✓			✓
Barn Owl	<i>Tyto alba</i>	E	--			✓			
Black-Tailed Jackrabbit	<i>Lepus californicus</i>	E	--					✓	✓
Greater Prairie-Chicken	<i>Tympanuchus cupido</i>	E	--	✓			✓	✓	✓
Gray Bat	<i>Myotis grisescens</i>	E	E						✓
Indiana Bat	<i>Myotis sodalis</i>	--	E	✓	✓				
King Rail	<i>Rallus elegans</i>	E	--			✓			
Lake Sturgeon	<i>Acipenser fulvescens</i>	E	--	✓		✓			
Niangua Darter	<i>Etheostoma nianguae</i>	E	T						✓
Northern Harrier	<i>Circus cyaneus</i>	E	--	✓				✓	
Pallid Sturgeon	<i>Scaphirhynchus albus</i>	--	E		✓	✓			
Topeka Shiner	<i>Notropis topeka</i>	E	E					✓	

Source: Missouri Department of Conservation, 2005b. United States Fish and Wildlife Service, 2005b
 E – Endangered; T – Threatened

Cultural Resources: In general, the study area has the potential to contain an abundance of cultural and archaeological resources, primarily along the floodplain and bluffs overlooking

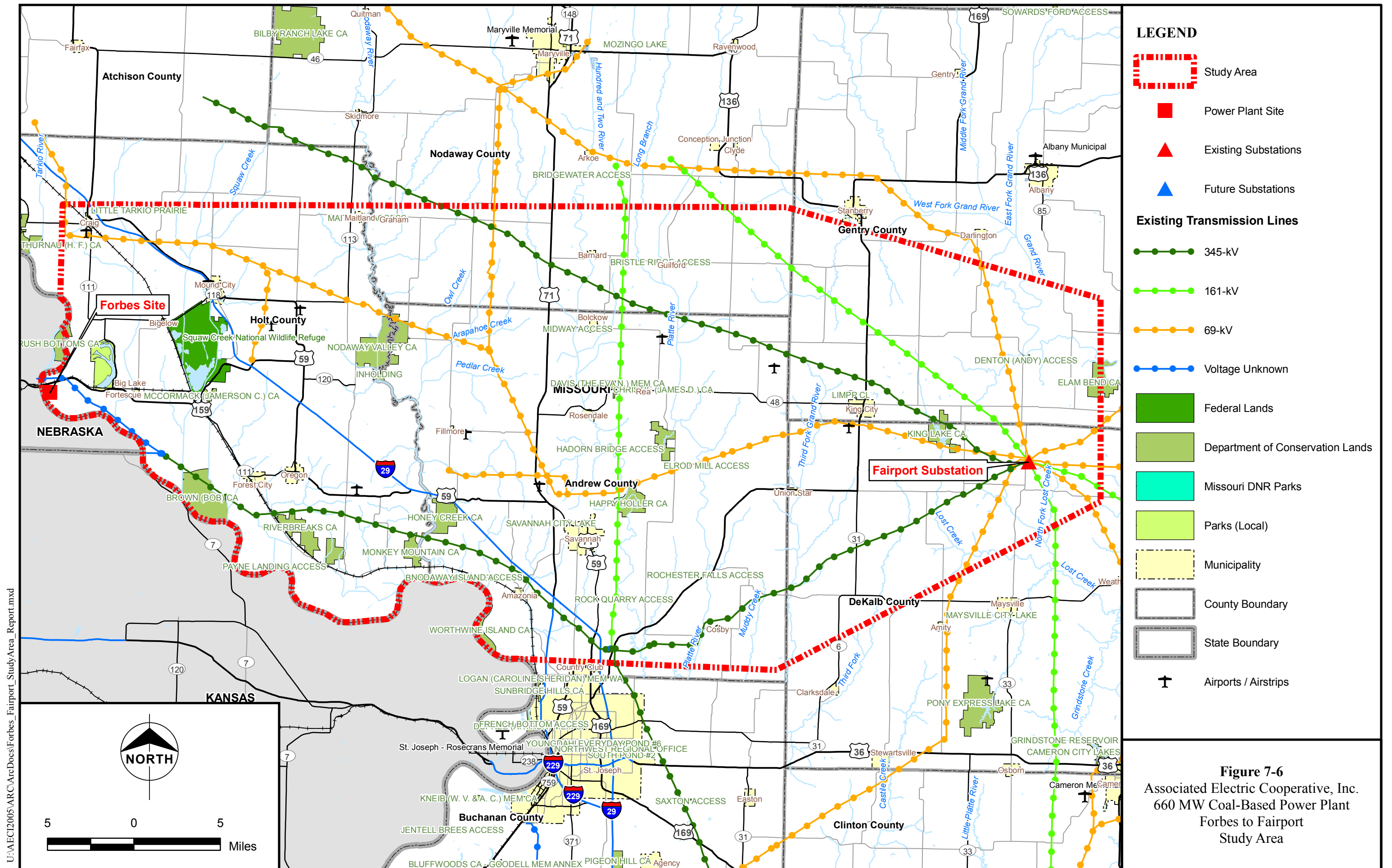
the Missouri River and its tributaries. See Section 7.2.1.1.3, Norborne to Thomas Hill, for a description of the potential cultural resources in the study area.

7.2.2 FORBES SITE

Two transmission study areas were identified for the Forbes Site: Forbes to Fairport and Fairport to Orrick / Missouri City / Eckles Road (refer to Figure 7-1 for an overview). A transmission line would be required for each of these study areas, one heading generally east to Fairport and one heading generally south from Fairport to Orrick, should the Forbes site be chosen as the site of the proposed power plant. The Forbes to Fairport section of the proposed transmission corridors originates at the Forbes site, which is located in Holt County on the east side of the Missouri River, about three miles west of Big Lake, Missouri and 0.5 mile east of Rulo, Nebraska. The site is located just south of U.S. Highway 159. The Fairport Substation is located in DeKalb County off State Highway A, about halfway between State Highways E and Z. The Fairport to Orrick / Missouri City / Eckles Road section begins at the Fairport Substation, the terminus for the Forbes to Fairport section, and continues to a new Orrick Substation near the town of Orrick. From Orrick the line would continue west to the Missouri City Substation and southwest to the Eckles Road Substation.

7.2.2.1 Forbes to Fairport Study Area

The Forbes to Fairport study area extends east approximately 57 miles from the proposed Forbes Site in Holt County to NW's Fairport Substation in DeKalb County (Figure 7-6). The study area crosses five counties, including Holt, Nodaway, Andrew, Gentry, and DeKalb. As described previously, the Fairport Substation is located off State Highway A between State Highways Z and E, approximately 18 miles northwest of Cameron, Missouri. Primary features within this study area include Squaw Creek NWR, Big Lake State Park, and a variety of relatively large conservation areas, including Nodaway Valley CA, Brown CA, Happy Holler CA, and King Lake CA. The Platte River, One Hundred and Two River, and Nodaway River are major bodies of water that cross the study area. Major towns within the study area include Mound City, Oregon, Forest City, Savannah, and King City.



- LEGEND**
- Study Area
 - Power Plant Site
 - Existing Substations
 - Future Substations
- Existing Transmission Lines**
- 345-kV
 - 161-kV
 - 69-kV
 - Voltage Unknown
- Federal Lands
 - Department of Conservation Lands
 - Missouri DNR Parks
 - Parks (Local)
 - Municipality
 - County Boundary
 - State Boundary
 - Airports / Airstrips

Figure 7-6
 Associated Electric Cooperative, Inc.
 660 MW Coal-Based Power Plant
 Forbes to Fairport
 Study Area

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7.2.2.1.1 Human Resources

Land Use: The Forbes to Fairport study area extends from west to east across northwest Missouri and includes Holt, Andrew, southern Nodaway, southwest Gentry and northwest DeKalb counties. The western portion of the study area in Holt County is located in the Missouri River floodplain. This area is rural in nature and land use is primarily agricultural. This portion of the study area is well suited for crop production and the majority of the usable land has long been cleared and cultivated for this purpose. This portion of the study area consists primarily of large cultivated crop fields separated by gravel county roadways. Crops such as soybeans and corn are the dominant crops grown in this part of the study area. Center pivot irrigation systems are used extensively in this area, which is likely due to sandy soils with poor water-retention qualities. These irrigation systems are less common in crop fields located further east of the Missouri River floodplain. Center pivot irrigation systems consist of a series of water pipes with spray heads, mounted on a motor driven wheel assembly connected to a well head. The entire system rotates in a circular motion around the well head. The system will not function properly if there are obstacles in the path of the moving pipe. To avoid interference with crop production, fields using center pivot irrigation systems are considered a prohibitive constraint and efforts would be made to identify routes along the tangent of the center pivot systems. Land use in the eastern portion of the study area is also rural and primarily agricultural. Crop fields in the eastern portion of the area are smaller than those in the floodplain and shaped to fit the uneven terrain.

Population: General population information about the study area counties is presented in Table 7-9. Holt County was the only county to experience a population decline between 1990 and 2000, but Nodaway and Gentry counties experienced only a slight increase, much less than the state average. Andrew and DeKalb counties experienced a growth greater than the Missouri average (U.S. Census Bureau, 2002a).

Residential and commercial development is generally sparse throughout the entire study area. Rural residences and farmsteads are associated with areas of agriculture and small- to medium- sized communities are located in and around the study area. The overall population of the study area is low. Table 7-10 lists the towns in the study area with populations greater than 1,000 people. No cities with 2000 populations over 5,000 people are located in the

Table 7-9 Population for Forbes to Fairport by County

County	Population 1990	Population 2000	Population 2003	Population % Change 1990 - 2000
Missouri	5,117,073	5,595,211	5,704,484	9.3
Holt	6,034	5,351	5,145	-11.3
Andrew	14,632	16,492	16,813	12.7
Nodaway	21,709	21,912	21,743	0.9
Gentry	6,848	6,861	6,566	0.1
DeKalb	9,967	11,597*	13,063	16.4

Source: U.S. Census Bureau, 2000a

*The Missouri Office of Administration, which sites the U.S. Census as their source, reports the 2000 population of DeKalb County as 13,073.

Table 7-10 Population by Size for Forbes to Fairport Towns

Town	2000 Population
1,000 to 5,000	
Savannah	4,762
Mound City	1,193
King City	1,012

Source: U.S. Census Bureau, 2000c

study area. According to the 2000 U.S. Census, the largest town in the study area is Savannah, which is located in Andrew County in the south central part of the study area. Mound City in Holt County and King City in Gentry Country were the only other towns with populations over 1,000. All other towns in the study area, such as Oregon, Forest City, Amazonia, Barnard, Big Lake, Cosby, Craig, Fillmore, Fortescue, Graham, Guilford, Maitland, Rea, Rosendale, Bolckow, and Union Star had 2000 populations under 1,000 people. Most of the communities in the study area declined or remained generally the same in population between 1990 and 2000 (U.S. Census Bureau, 2002c).

Employment Statistics: The employment statistics for the five counties in the study area reflect a variety of occupations and industries. Overall, the majority of people living the study area are employed in the area of education, or health and social services. The percentage of people employed in agricultural- related industries exceeds the average for the State of Missouri and reflects the general rural nature of the study area. General employment information for these counties is presented in Table 7-11.

Table 7-11 Percent Employment by Industry for Forbes to Fairport Counties

Industry	MISSOURI	Holt	Andrew	Nodaway	Gentry	DeKalb
Agriculture, forestry, fishing and hunting, and mining	2.2	12.9	4.7	7.1	10.5	7.0
Construction	6.9	8.4	9.9	4.6	6.0	8.7
Manufacturing	14.8	12.1	16.1	19.1	11.6	12.4
Wholesale trade	3.7	3.8	3.0	1.4	4.4	2.6
Retail trade	11.9	12.1	8.8	11.2	11.7	9.9
Transportation and warehousing, and utilities	5.7	5.3	7.4	2.2	5.2	7.4
Information	3.0	1.2	1.4	2.0	1.7	2.1
Finance, insurance, real estate, and rental and leasing	6.7	4.7	6.4	3.2	4.8	6.3
Professional, scientific, management, administrative, and waste management services	7.5	3.2	4.5	3.5	2.7	3.4
Educational, health and social services	20.4	19.8	22.4	27.4	27.6	18.5
Arts, entertainment, recreation, accommodation and food services	7.8	7.7	5.4	9.9	3.7	6.4
Other services (except public administration)	5.0	3.6	5.2	4.5	4.0	5.8
Public administration	4.6	5.1	4.8	3.8	6.2	9.5

Source: U.S. Census Bureau, 2000b

Recreational Facilities: Opportunities for recreation and entertainment in the study area generally include state and local parks, wildlife areas, and historic sites. Squaw Creek NWR is the dominant recreational feature in the study area. The refuge is managed by the USFWS and is located in Holt County, east of Interstate Highway 29 in the Missouri River floodplain. The 7,350-acre refuge was established in 1935 by Franklin D. Roosevelt to provide habitat for migratory birds and other wildlife species. Vegetation and water levels in wetland areas are maintained to benefit migratory birds during spring and fall. Crops such as corn, wheat and soybeans are planted to provide food for waterfowl, deer and upland birds. Grasslands on the refuge are managed to encourage native prairie species. Recreational opportunities at

Squaw Creek include bird and wildlife watching, hiking and picnicking (U.S. Fish and Wildlife Service, 2005d).

Big Lake State Park is located east of Interstate Highway 29 in Holt County. The 435-acre park provides picnic areas, a swimming pool, boat launch, fishing, bird watching, dining facilities and facilities for lodging and camping. The park is located on Missouri's largest oxbow lake, which was formed by the Missouri River before its course was controlled by canalization. Because of the park's proximity to Squaw Creek NWR, the area is a major feeding and resting place for birds and migratory waterfowl (Missouri Department of Natural Resources, 2005b).

The MDC manages several conservation areas in the study area. The Nodaway Valley CA in Andrew and Holt counties is 3,813 acres and offers hunting, fishing, camping, canoeing, hiking and bird watching. The 2,207-acre Happy Holler CA in Andrew County offers canoeing on the One Hundred and Two River, fishing, and hunting. The Bob Brown CA in Holt County is managed for waterfowl and pheasant hunting with over 1,300 acres of wetlands and nearly 2,000 acres of grassland and old fields. The 1,148-acre Honey Creek CA in Andrew County has 13 miles of multi-use trails in addition to camping, fishing, and hunting. Other relatively large conservation areas include Monkey Mountain CA (787 acres) just west of the Nodaway River in Holt and Andrew counties, Davis and Christie CAs (204 acres) in Andrew County, King Lake (1,273 acres, including a 186-acre fishing lake) in DeKalb and Gentry counties, Riverbreaks CA (2,306 acres) in Holt County, Rush Bottoms CA (811 acres) along the Missouri River in Holt County, McCormack CA (227 acres, including the McCormack Loess Mound Natural Area) in Holt County and Limpp Lake (29 acres) in Gentry County. Conservation areas such as these typically offer opportunities for hunting, fishing, hiking and occasionally camping, biking, and horseback riding. The Riverbreaks CA also has an un-staffed shooting range on site.

Additional recreational facilities include other small conservation areas and local parks near towns. The City of Savannah has a golf course and other park facilities.

Transportation and Utilities: The Forbes to Fairport study area contains a network of roadways that includes major interstates, state and county highways, and both paved and

unpaved roads, railroads, small airports, and a network of existing transmission lines (Figure 7-6).

- Roads - Interstate Highway 29 runs diagonally across the west end of the study area from southwest Andrew County to northwest Holt County. U.S. Highway 71 crosses the study area from Savannah to central Nodaway County. U.S. Highway 59 winds through the southwest corner of the study area from Savannah to Mound City. U.S. Highway 169 crosses the eastern part of the study area.
- Railroads - The BNSF line runs along the western edge of the study area through the Missouri River floodplain, parallel to Interstate 29.
- Airports - Several small airfields were identified within the study corridor. All of these are private airstrips and do not provide general passenger service. They include the Crop Care Airport, located near Mound City; the Simerly Airport, located near Filmore; the Market Air Strip near Oregon; the Worth Airport north of Savannah; the Hannah Airport near Blockow; and the Fairbanks and Fizzle Ridge Airports near King City. The Worth Airport has a paved runway and the Crop Care Airport's runway is gravel. The remaining fields have grass runways (AirNav LLC, 2005). Due to the rural nature of the study area, it is possible that other private airstrips exist that have not yet been identified.
- Transmission Lines - Several transmission lines cross the Forbes to Fairport study area, and a number of lines extend into and out of the Fairport Substation. Two 345 kV lines, one heading northwest and one heading southwest, angle out of the Fairport Substation. One 161 kV line heads to the Fairport Substation from the northwest, while two other 161 kV lines connect to the Fairport Substation from the south and southeast. Six 69 kV lines terminate at the Fairport Substation, from the north, south, east and west. A 161 kV line extends north to south through the center of the study area, while a 345 kV line angles from the southeast along the western edge of the study area. There are also several other 69 kV lines that converge from the northwest, north, east, and southeast in the center of the study area. Numerous other sub-transmission and distribution lines are located along area roadways providing electrical service to local residents and commercial and industrial customers.

7.2.2.1.2 Natural Resources

Photographs representative of the typical vegetation and terrain of the area are included at the end of this section for reference.

Physiography and Topography: The study area is located in the Central Dissected Till Plains physiographic region. The topography in the western portion of the study area is generally flat in the Missouri River floodplain. The terrain becomes steep at the eastern edge of the floodplain. Rolling hills with flat valleys are found in the central and eastern portions of the study area. The study area includes one major river and numerous small rivers and streams. The Missouri River is located at the western end of the study area and forms the western boundary of Holt County. The Nodaway River crosses the study area from north to south creating the boundary between Holt and Andrew counties and drains into the Missouri River. The One Hundred and Two River and the Platte River cross the study area from north to south through eastern Nodaway and Andrew counties. The far eastern portion of the study area drains easterly toward the Grand River, which is outside the study area. Numerous small streams and creeks join to form these rivers, which eventually extend to the Missouri River (DeLorme, 1998).

Vegetation: Vegetation throughout the study area is a combination of cultivated crops and native plants. Cultivated crops are the dominant vegetation in the portion of the study within the Missouri River floodplain. Bottom land tree species such as cottonwood, sycamore and elms can also be found along creeks and drainages. At the edge of the floodplain, the study area features steep slopes that support hard wood species such as oaks and hickories. The loess hill formations in the central and eastern parts of the study area contain small areas of native prairie. These areas also support cottonwood, sycamore, American elm, honey locust and black walnut tree species along stream banks (U.S. Department of Agriculture, 1981).

Almost all of the land in the Forbes to Fairport study area is considered prime farmland, prime farmland if drained or not flooded, or farmland of statewide importance. Typically, impacts from transmission lines to prime farmland are minimal. All of the agricultural land crossed by the line, with the exception of where the pole is placed and where possible guy wires are anchored, can remain in agricultural production.

Wetlands: Wetlands are located throughout the study area and are typically associated with rivers, streams and lakes. Two major wetland complexes are found in the eastern portion of the study area. The largest one is in Squaw Creek NWR. Nearly the entire area of Squaw Creek is a series of small islands of upland surrounded by a combination of emergent, scrub-shrub and forested wetlands. The north end of Big Lake, in Big Lake State Park is also a large complex of different wetland types. Both of these areas are a representation of the local pre-settlement landscape. Wetlands such as these provide high quality habitat for migratory birds and other wildlife and are considered a major constraint when routing a transmission line.

Wildlife: The varied landscapes within the study area provide habitat for a wide variety of wildlife species. Canada geese, mallard ducks and other waterfowl are common bird species in the wetlands and crop fields along the Missouri River. Bald eagles are common winter visitors around Squaw Creek NWR. Bird species such as red-tailed hawks and bob-white quail are common in upland areas. Wild turkey are found throughout the study area, particularly where crop fields are surrounded by wooded areas. Pheasant, although not as common as wild turkey, are also found in crop fields throughout the study area. Mammal species common to the study area include cottontail rabbits, raccoon, opossum, white-tailed deer, striped skunk and coyote.

The natural history database of the MDC and USFWS county distribution list of Missouri's federally-listed species were searched for the seven counties in the study area. Our investigation identified two federally-listed endangered species that could occur in the study area: the Indiana bat and the pallid sturgeon. The search also identified one federally-threatened species and eleven state-endangered species as potentially occurring in the study area. Table 7-12 provides a complete list of the threatened and endangered species found in the study area counties. Some of these species could occur in the counties, but outside this project's study area.

In general, the study area has the potential to contain an abundance of cultural and archaeological resources, primarily along the Missouri River floodplain and bluffs. See

Section 7.2.1.1.3, Norborne to Thomas Hill, for a description of the potential cultural resources in the study area.

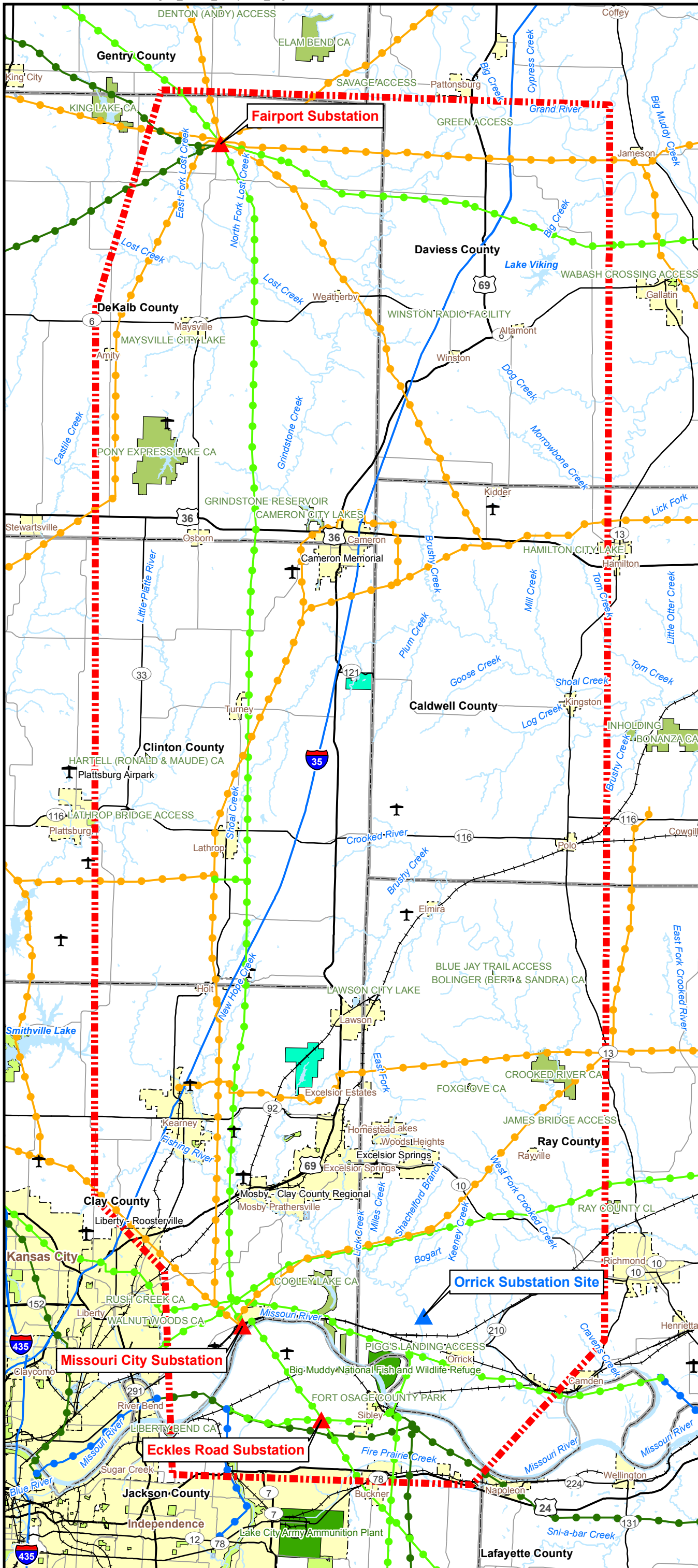
Table 7-12 Threatened and Endangered Species – Forbes to Fairport by County

Common Name	Scientific Name	State Status	Federal Status	Counties				
				Holt	Andrew	Nodaway	Gentry	DeKalb
American Bittern	<i>Botaurus lentiginosus</i>	E		✓			✓	
Bald Eagle	<i>Haliaeetus leucocephalus</i>	E	T	✓	✓			
Blanding’s Turtle	<i>Emydoidea blandingii</i>	E	—	✓				
Barn Owl	<i>Tyto alba</i>	E						✓
Eastern Massasauga	<i>Sistrurus catenatus</i>	E	—	✓				
Flathead Chub	<i>Platanthera praeclara</i>	E	—	✓	✓			
Greater Prairie Chicken	<i>Tympanuchus cupido</i>	E	—			✓		
Indiana Bat	<i>Myotis sodalis</i>	E	E	✓	✓	✓	✓	✓
Northern Harrier	<i>Circus cyaneus</i>	E	—					✓
Pallid Sturgeon	<i>Scaphirhynchus albus</i>	E	E	✓	✓			
Western Fox Snake	<i>Elephe vulpina</i>	E	—	✓			✓	
Western prairie fringed orchid	<i>Platanthera praeclara</i>	E	T	✓				

Source: Missouri Department of Conservation, 2005b. United States Fish and Wildlife Service, 2005b
 E – Endangered; T – Threatened

7.2.2.2 Fairport to Orrick / Missouri City / Eckles Road Study Area

The Fairport to Orrick / Missouri City / Eckles Road study area continues south approximately 53 miles from the Fairport Substation in DeKalb County to a proposed substation located approximately 1.5 miles northwest of the town of Orrick, Missouri in Ray County (Figure 7-7). The proposed Orrick Substation (approximately two to five acres in size) would be located between State Highway O and State Highway 210. The study area also includes 161 kV transmission alternatives from the new Orrick Substation west about eight miles to the Missouri City Plant in Clay County and from Orrick southwest about seven



Disclaimer: Existing transmission lines are shown to the extent they could be verified within the project study areas using aerial photography, topographic maps, and NW and Central Cooperative's system planning maps. They are not necessarily complete or represent all existing transmission lines in the area.

LEGEND













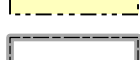
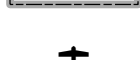

-  Study Area
-  Power Plant Site
-  Existing Substations
-  Future Substations
- Existing Transmission Lines**
-  345-kV
-  161-kV
-  69-kV
-  Voltage Unknown
-  Federal Lands
-  Department of Conservation Lands
-  Missouri DNR Parks
-  Parks (Local)
-  Municipality
-  County Boundary
-  Airports / Airstrips



Figure 7-7
 Associated Electric Cooperative, Inc.
 660 MW Coal-Based Power Plant
 Fairport to Orrick/Missouri City/Eckles Rd
 Study Area

miles to NW's existing Eckles Road Substation in Jackson County. The Missouri City Plant and Substation are located on the southwest edge of Missouri City, between State Highway 210 and the Missouri River. The existing Eckles Road Substation is located approximately two miles west of Sibley and two miles north of Independence on Eckles Road. The study area encompasses portions of seven Missouri counties, including DeKalb, Daviess, Clinton, Caldwell, Clay, Ray, and Jackson. Dominant features within this study area include Interstate 35 (which angles from southwest to northeast through the study area), the Watkins Woolen Mill State Park and Historic Site, Wallace State Park, the Big Muddy NWR, several conservation areas, and the cities of Maysville, Lathrop, Cameron, Lawson, Kearney, Excelsior Springs, Mosby, Prathersville, Woods Heights, Orrick, Missouri City, and Sibley. A Union Pacific Railroad extends between Liberty, Mosby, Lawson, and Polo within the study area. Most of these features are found in the southern portion of the study area.

7.2.2.2.1 Human Resources

Land Use: The Fairport to Orrick/Missouri City/Eckles Road study area includes portions of DeKalb, Daviess, Clinton, Caldwell, Clay, Ray, and extreme northern Jackson counties. The study area contains both undeveloped and rural lands and developed towns and communities. Land use in the area is a combination of agricultural land with rural residents, and developed residential and commercial areas located in and around the larger cities and towns. In the southern portion of the study area, in southern Ray and Clay counties and northern Jackson County, the area is dominated by the Missouri River floodplain. The portions of the floodplain that have not been set aside for conservation are used for crop production. A few center-pivot irrigation systems are used in the southern portion of this study area. The majority of the undeveloped portions of the study area is dominated by agricultural land, including pastureland, hayland and cropland, surrounded by wooded areas mostly occurring in low areas along creeks, streams and rivers, which are generally unfit for agricultural uses.

Population: General population data for the study area counties is included in Table 7-13. All the study area counties experienced growth between 1990 and 2000, but DeKalb, Clinton, and Clay experienced growth greater than the state average. Jackson is the most populated county in the study area and Clay is the second most populated. The greater Kansas City metropolitan area is located in Jackson and Clay counties just outside the southwest portion

of the study area. Kansas City and the surrounding suburbs account for much of the population for both of these counties (U.S. Census Bureau, 2000c). This area around Kansas City, which includes the cities of Liberty in Clay County and Independence in Jackson County, was purposefully excluded from the study area to avoid crossing high-density residential and commercial areas.

Table 7-13 Population for Fairport to Orrick/Missouri City/Eckles Road by County

County	Population 1990	Population 2000	Population 2003	Population % Change 1990-2000
Missouri	5,117,073	5,595,211	5,704,484	9.3
DeKalb	9,967	11,597*	13,063	16.4
Daviess	7,865	8,016	8,004	1.9
Clinton	16,595	18,979	20,140	14.4
Caldwell	8,380	8,969	9,159	7.0
Clay	153,411	184,006	194,247	19.9
Ray	21,971	23,354	23,926	6.3
Jackson	633,232	654,880	659,723	3.4

Source: U.S. Census Bureau, 2000a

*The Missouri Office of Administration, which sites the U.S. Census as their source, reports the 2000 population of DeKalb County as 13,073.

The larger communities within the study area include: the greater Excelsior Springs area (which has been defined to include Excelsior Springs, as well as adjacent Mosby, Prathersville, Homestead, Crystal Lakes, and Woods Heights municipalities), Kearney, Cameron, Lathrop, Lawson, and Maysville. Table 7-14 presents the population data for communities in the study area with 2000 populations greater than 1,000 people, arranged by size. The community of Excelsior Springs is located on the eastern edge of Clay County and western Ray County in the south-central part of the study area. Excelsior Springs was formed in the late 1880’s around the discovery of a mineral water spring. The mineral water springs and supporting businesses that made Excelsior Springs a popular destination in the 1880’s remain a part of the local economy today (City of Excelsior Springs, 2005). The 2000 population of Excelsior Springs itself was 10,847, making it the most populated community in the study area. Excelsior Springs is adjacent to several other smaller municipalities, including Mosby, Prathersville, Excelsior Estates, Homestead, Crystal Lakes, and Woods

Heights, which increases the overall size of the greater Excelsior Springs area. This area experienced over a five percent growth rate between 1990 and 2000 (U.S. Census Bureau, 2000c).

Table 7-14 Population by Size for Fairport to Orrick / Missouri City / Eckles Road Towns

Town	2000 Population
10,000 to 20,000	
Greater Excelsior Springs area (including Excelsior Springs, Mosby, Prathersville, Excelsior Estates, Homestead, Crystal Lakes, and Woods Heights)	12,769
5,000 to 10,000	
Cameron	8,312
Kearney	5,472
1,000 to 5,000	
Lawson	2,336
Lathrop	2,092
Maysville	1,212

Source: U.S. Census Bureau, 2000c

The town of Cameron in northeast Clinton County is the second most populated community in the study area. Cameron experienced a tremendous growth rate between 1990 and 2000 of over 70 percent, from 4,831 people in 1990 to 8,312 in 2000, according to the U.S. Census (U.S. Census Bureau, 2000c). This population increase was due in large part to prison construction (the city population includes inmates). The medium-security Western Missouri Correctional Center and maximum- security Crossroads Correctional Center are located in Cameron. Cameron was founded in the 1830’s and soon became an important railroad town with the construction of the Hannibal & St. Joseph Railroad. A second rail line, the Chicago, Rock Island and Pacific, extended a line to Cameron in the 1870’s. Industries such as concrete, insulation and wood gun stocks have all been an important part of the local economy to Cameron (City of Cameron, 2005).

The town of Kearney, located in Clay County, grew approximately 205 percent between 1990 (1,790 people) and 2000 (U.S. Census Bureau, 2000c). Kearney began in the 1850’s as

a rural farming community. Today, Kearney includes modern residential and commercial developments, while maintaining a feel for its rural past.

Lathrop is located in the west-central portion of the study area in Clinton County. In World War One, Lathrop was the site of the largest pack mule production farm in the world. It is the home of the Clinton County Fairgrounds. Lawson is located north of Excelsior Springs in Clay and Ray counties. Maysville is located in the northwestern portion of the study area, just south of the Fairport Substation, and is the county seat of DeKalb County. Each of these communities grew between 1990 and 2000 (U.S. Census Bureau, 2000c).

Other communities within the study area, including Weatherby, Winston, Altamont, Amity, Camden, Turney, Kidder, Osborn, Elmira, Kingston, Holt, Polo, Rayville, Missouri City, Orrick and Sibley, had 2000 populations less than 1,000 people. About an equal number of these smaller towns stayed the same or declined in population as those that increased between 1990 and 2000 (U.S. Census Bureau, 2000c).

Employment Statistics: Employment data for the counties comprising the study area is in Table 7-15. Like most of the other sections described, the primary trade employed by residents in this study area is educational, health, and social services, followed by manufacturing and retail trade. In all except Clay and Jackson counties, which consist largely of the greater metropolitan Kansas City area, the agricultural trade was practiced more than the average for Missouri, again reflecting the overall agricultural nature of the study area.

Recreational Facilities: Recreational opportunities may be found in the many parks and conservation areas found throughout the study area. Watkins Mill State Park is located in Clay County near the town of Lawson. The park features a restored 1870's woolen mill, which is a National Historic Landmark. The park has public camping facilities, a fishing lake and a 3.75-mile paved bicycle path. Wallace State Park is located near Cameron, in Caldwell County. The 500-acre park offers such recreational opportunities as hiking, fishing and public camping.

Table 7-15 Percent Employment by Industry for Fairport to Orrick / Missouri City / Eckles Road Counties

Industry	Missouri	DeKalb	Daviess	Clinton	Caldwell	Clay	Ray	Jackson
Agriculture, forestry, fishing and hunting, and mining	2.2	7.0	12.3	3.4	7.8	0.6	4.0	0.3
Construction	6.9	8.7	9.5	9.6	10.0	6.2	8.3	6.6
Manufacturing	14.8	12.4	12.1	13.2	15.1	12.0	19.4	11.1
Wholesale trade	3.7	2.6	2.7	3.3	3.2	5.5	4.2	3.8
Retail trade	11.9	9.9	11.8	12.4	12.1	11.9	11.4	11.3
Transportation and warehousing, and utilities	5.7	7.4	6.0	8.6	6.0	8.0	7.5	5.4
Information	3.0	2.1	2.0	1.7	2.0	3.9	2.3	5.3
Finance, insurance, real estate, and rental and leasing	6.7	6.3	4.5	5.4	6.0	8.8	5.8	8.8
Professional, scientific, management, administrative, and waste management services	7.5	3.4	3.0	4.6	2.6	9.6	4.5	9.6
Educational, health and social services	20.4	18.5	18.1	19.6	17.9	16.0	17.4	18.6
Arts, entertainment, recreation, accommodation and food services	7.8	6.4	5.1	7.5	4.4	8.2	6.9	8.5
Other services (except public administration)	5.0	5.8	4.3	4.9	5.1	4.6	4.8	5.5
Public administration	4.6	9.5	8.4	5.7	7.8	4.5	3.4	5.3

Source: U.S. Census Bureau, 2000b

In 1994, following extensive flooding of the Missouri River in the summer of 1993, the USFWS established the Big Muddy NWR. This wildlife area was created to restore portions of the Missouri River floodplain to its pre-settlement condition. Since its establishment, the Big Muddy NWR has grown to include eight units along the Missouri River from Kansas City to St. Louis. The portion of the Big Muddy NWR in the Fairport to Orrick/Missouri City/Eckles Road study area is located on the north bank of the Missouri River across from Sibley. Recreational uses of this area include fishing, hunting, hiking and wildlife watching (U.S. Fish and Wildlife Service, 2005c).

The Fort Osage National Historic Site is located across the Missouri River from the Big Muddy NWR in the town of Sibley in Jackson County. Fort Osage is a reconstructed 1800's military fort. The fort was originally established in 1808 to help preserve peace in the Louisiana Purchase. Fort Osage served as a trading post for settlers and local Osage Indians until it was abandoned in the late 1920's. Annual events are held at Fort Osage to offer visitors a chance to see what life was like for a U.S. soldier during this time period (Fort Osage, 2005).

Other recreational opportunities in the study area include several MDC-managed areas with facilities for fishing, hunting and wildlife watching, and local community parks, such as the Mouth of the Little Blue County Park. The larger conservation areas within the study area include Crooked River, Pony Express Lake, and Cooley Lake CA's and Cameron City Lakes. The Crooked River CA is a 1,420-acre area in Ray County near the eastern border of the study area. The area contains an oxbow lake, but offers no hiking trails, a few primitive camping sites, and some hunting and fishing opportunities. Much of the area is managed for doves. Pony Express Lake is one of the larger lakes in the region at 240 acres with a maximum depth of 29 feet. The lake sits on the Pony Express CA which covers over 3,000 acres. The area contains a few short hiking trails, and also offers camping, picnicking, boating, hunting, and fishing opportunities. Cooley Lake CA is 1,348 acres consisting of an oxbow lake and associated wetlands. The Cooley Lake CA is located in Clay County just north of the Missouri River. The area offers viewings from a deck or tower of migrating waterfowl and bald eagles, as well as some hunting. The Cameron City Lakes consist of three reservoirs, all located in DeKalb County north of Cameron. Cameron Lake #3 is the largest at 96 acres. It provides the drinking water for the city of Cameron. Other than fishing and archery hunting, there are no recreational opportunities in the 186 acres of forestland around the lake. Just west of the Cameron City Lakes is the Cameron Grindstone Reservoir, a 180-acre lake offering fishing and archery hunting as well. The Bolinger CA is an 80-acre area that has been donated to the MDC (Missouri Department of Conservation, 2005a).

Transportation and Utilities: Numerous roads, railroads, airports, and utilities are located within the study area (Figure 7-7).

- Roads - Major roads in the study area include Interstate 35, which crosses through the center of the study area from north to south; U.S. Highway 69, which also runs north to south through the study area, crossing through the communities of Cameron and Excelsior Springs; and U.S. Highway 36, which crosses the northern part of the study area from east to west, also crossing through Cameron. Numerous other state highways and local roads cross the study area including Missouri Highway 210, which crosses the south part of the study area from Liberty to Orrick.
- Railroads - Several rail lines owned and operated by BNSF; Union Pacific; Norfolk Southern; and Iowa, Chicago, and Eastern cross the study area. The majority of these are located in the southern portion of the study area near the Missouri River (DeLorme, 1998).
- Airports - There are numerous airports in the study area ranging from public airports with paved runways to small private airfields with grass runways. The Clay County Regional Airport located in Mosby is the largest public airport in the study area. The Cameron Memorial Airport and the Excelsior Springs Memorial Airport are both public airports with paved runway surfaces. Other airfields in the study area include the Cayton Pony Express Airport in Maysfield, the Mays Homestead Airport in Polo, the Northwood Airport and Block Air Village Airport in Holt, and the Peterson Farm Airport in Kearney. All of these are private airfields with turf or dirt runway surfaces. Restricted-use areas for each airport, as defined by FAA Part 17 Regulations, will be determined to ensure the lines are not located where they would obstruct the normal operations of the airports or airstrips (AirNav LLC, 2005).
- Transmission Lines - Electrical transmission lines operated by NW, KCPL, and Aquila are located throughout the study area. A 161 kV line extends southward the entire length of the study area from the Fairport Substation to the Missouri City Substation. 69 kV lines also run from the Missouri City Substation, north to southeastern DeKalb County and eastward, from Missouri City to Orrick and beyond, east out of Kearney, from the Fairport Substation southwest through DeKalb and Clinton counties and from Fairport to the southeast a few miles. In the southern portion of the study area, a variety of mostly 161 kV lines head into and out of the

Missouri City Plant and the Sibley Plant and associated substations, and the Eckles Road Substation. A 345 kV line runs south of Sibley into Kansas City.

7.2.2.2.2 Natural Resources

Photographs representative of the typical vegetation and terrain of the area are included at the end of this section for reference.

Physiography and Topography: The Fairport to Orrick/Missouri City/Eckles Road study area is located in the Central Dissected Till Plains physiographic region. Topography varies from nearly level in floodplains to moderately steep in the uplands. Numerous streams and creeks are found throughout the study area. Drainage is generally toward the south to the Missouri River. The study area is divided into two land resource areas. The northern part of the area is in the Iowa and Missouri Heavy Till Plain. This resource area is defined by slopes that are mostly rolling to hilly with broad ridge tops that are nearly level. The southern part of the study area is within the Iowa and Missouri Deep Loess Hills land resource area. The topography ranges from nearly flat along the Missouri River floodplain to steep high ridge tops outside the floodplain (U.S. Department of Agriculture, 2005).

Vegetation: Vegetation and wildlife in the study area are similar to that described previously for the Forbes to Fairport study area. Much of the study area that once supported native prairie species has long been cleared and cultivated for farming. Steep hillsides support hardwood species such as oaks and hickories and deep valleys and creek banks support cottonwood, sycamore, elm and other riparian species.

Almost all of the land in the Fairport to Orrick/Missouri City/Eckles Road study area is considered prime farmland, prime farmland if drained or not flooded, or farmland of statewide importance. Typically, impacts from transmission lines to prime farmland are minimal. All of the agricultural land crossed by the line, with the exception of where the pole is placed and where possible guy wires are anchored, can remain in agricultural production.

Wildlife: Common wildlife species include white-tailed deer, raccoon, coyote, red fox cottontail rabbit and gray and fox squirrels. The Missouri River valley in the south part of

the study area supports a variety of resident and migratory waterfowl as well as numerous other bird species.

Threatened and Endangered Species: Several state and federal threatened and endangered species are listed in the counties within the Fairport to Orrick/Missouri City/Eckles Road study area. The federally-endangered pallid sturgeon has been known to occur in portions of the Missouri River near Clay, Jackson, and Ray Counties. The federally-threatened bald eagle is also known to frequent the forested area along the Missouri River in these counties during the winter months. Table 7-16 provides a complete list of the threatened and endangered species found in the study area counties. Some of these species may not occur in the actual study area.

Table 7-16 Threatened and Endangered Species – Orrick / Missouri City / Eckles Road by County

Common Name	Scientific Name	State Status	Fed. Status	Counties						
				DeKalb	Daviess	Clinton	Caldwell	Clay	Ray	Jackson
Northern Harrier	<i>Circus cyaneus</i>	E	-	✓				✓		
Barn Owl	<i>Tyto alba</i>	E	-	✓						✓
Indiana Bat	<i>Myotis sodalis</i>	E	E	✓	✓	✓		✓	✓	
Topeka Shiner	<i>Notropis topeka</i>	E	E		✓					
Pallid Sturgeon	<i>Scaphirhynchus albus</i>	E	E					✓	✓	✓
Plains Spotted Skunk	<i>Spilogale putorius</i>	E	-					✓		
Peregrine Falcon	<i>Falco peregrinus</i>	E	-							✓
Bald Eagle	<i>Haliaeetus leucocephalus</i>	T	T			✓	✓	✓	✓	✓

Source: Missouri Department of Conservation, 2005b. United States Fish and Wildlife Service, 2005b
 E – Endangered; T – Threatened

Cultural Resources: In general, the study area has the potential to contain an abundance of cultural and archaeological resources, mostly along the Missouri River floodplain and bluffs. See Section 7.2.1.1.3, Norborne to Thomas Hill, for a description of the potential cultural resources in the study area.

7.3 MACRO-CORRIDORS

Prior to identifying alternative corridors for each proposed plant site and interconnection, several steps were undertaken, which were discussed earlier in this section:

- Needed transmission interconnections were determined
- Study areas for each proposed power plant site and interconnection were identified
- Locations of natural and human resources were identified and mapped
- Natural and human resources classified as macro-level constraints or opportunities for co-location with other utilities within each study area

Using the above information, two to three two-mile-wide corridors were established for each study area and interconnection which minimize potential environmental impacts to existing natural and human resources, and make use of potential opportunity areas, where practicable. Ultimately, more specific route alignments will be identified within these macro-corridors using the data collected for the macro-corridor development as well as other more detailed information.

7.3.1 NORBORNE SITE

To facilitate the identification of feasible corridors for transmission lines to interconnect with the proposed Norborne Site, the study area was subdivided into two sections: Norborne to Thomas Hill and Norborne to Sedalia / Mt. Hulda, as described previously. Following is a description of the macro-corridors identified for each sub-area and the rationale for the development of these particular corridors.

7.3.1.1 Norborne to Thomas Hill Macro-Corridors

Macro-corridors identified between the proposed Norborne Plant switchyard site and the Thomas Hill Plant substation ranged from 61.8 to 69.4 miles in length. The primary considerations in developing the macro-corridors are listed below:

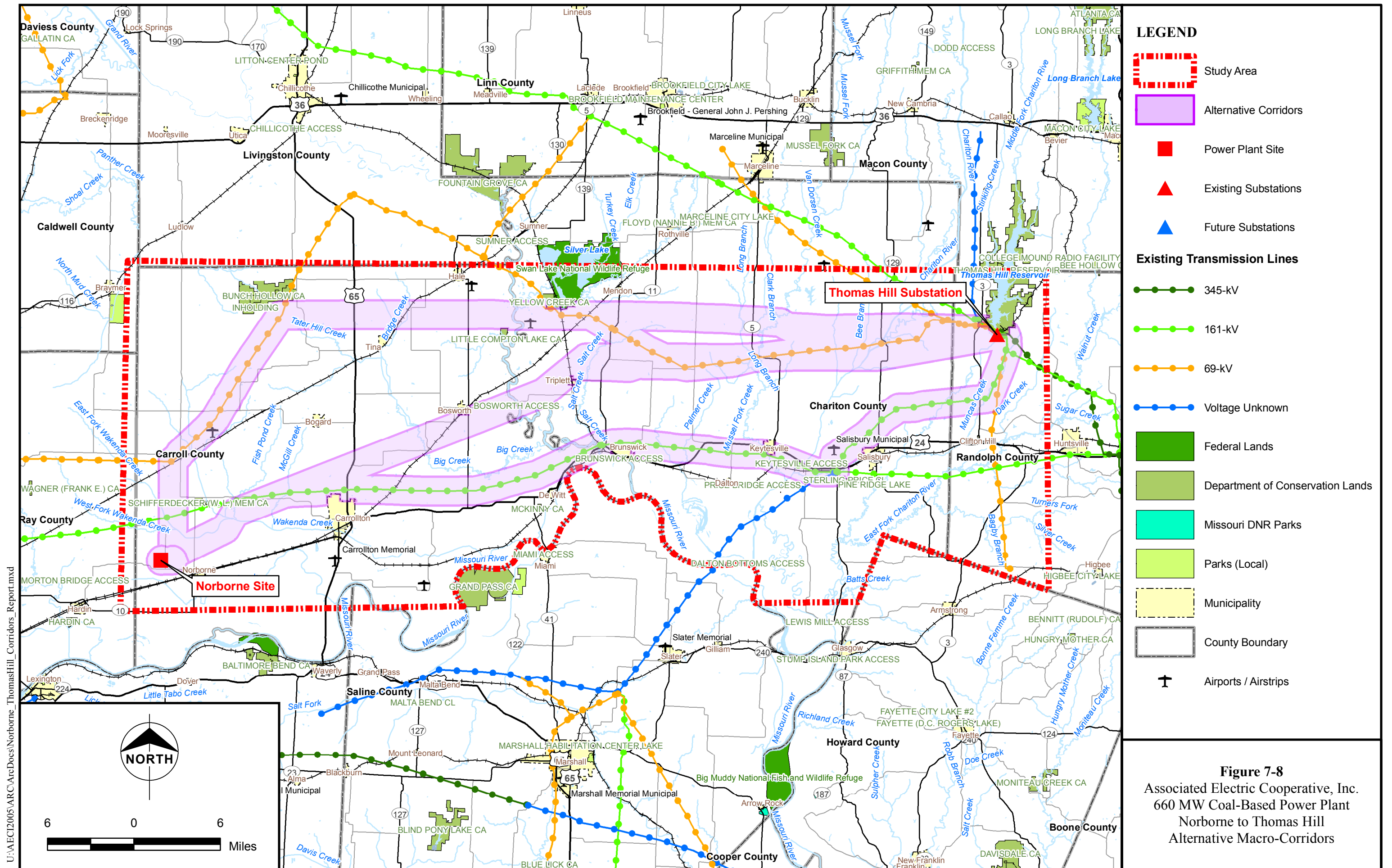
- The presence of two existing transmission lines, one extending west to east, north of the Norborne site and south of the Thomas Hill Plant, generally parallel to U.S. Highway 24, and the other running northeast from this line to the Thomas Hill Plant
- Communities of Carrolton, Brunswick, Keytesville, and Salisbury along U.S. Highway 24;
- Swan Lake NWR and Bunch Hollow CA
- Crossings of the Missouri River, Grand River, and Chariton River

Three macro-corridors were identified for the Norborne to Thomas Hill section of the project (Figure 7-8). In general, opportunities to follow existing transmission lines in the area were utilized as much as possible. One macro-corridor follows existing lines almost all the way from Norborne to Thomas Hill. The other corridors make use of existing lines that travel in the same general direction for some of their lengths. The intent for these corridors would be to parallel the existing lines as much as possible, except where residences or other constraints are present adjacent to the existing line. The two-mile-wide corridors allow for ample area should a deviation from the alignment of the existing lines be necessary.

While most of the towns in the study area are relatively small, an effort was made to avoid encroaching into their municipal boundaries. Most of the towns that fall within an identified two-mile wide corridor occur along U.S. Highway 24, where the corridor parallels an existing transmission line. Corridors that did not completely avoid towns were modified to exclude the municipal boundaries so that no specific routes would be proposed within the town boundaries. Similarly, conservation areas that were not completely avoided by the two-mile-wide corridors were excluded from the corridor boundaries, resulting in corridor constriction points near these resources. These points are most evident at the Yellow Creek CA and Swan Lake NWR, the Little Compton Lake CA, Thomas Hill Reservoir, and the Sterling Price CA. The Bunch Hollow CA was completely avoided during the development of macro-corridors.

Typically, transmission lines are not considered compatible uses within conservation areas, parks, and refuges managed for resource conservation. Routing the transmission line through these lands could create potentially greater adverse environmental impacts, additional permitting requirements, and project delays.

The Missouri River presented an obstacle to developing corridors that headed due east out of Norborne. Approximately 28 miles east of the Norborne site, the Missouri River, which until this point was heading generally east, turns to the north for several miles before returning to an easterly and then eventually southerly flow. Corridors heading due east out of the Norborne site would cross the Missouri River a minimum of two times, crossing into Saline County. A crossing of the Missouri River presents several concerns, including the potential



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Disclaimer: Existing transmission lines are shown to the extent they could be verified within the project study areas using aerial photography, topographic maps, and NW and Central Cooperative's system planning maps. They are not necessarily complete or represent all existing transmission lines in the area.

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for impacts to threatened and endangered species found along the river, such as the bald eagle, a likely increase in the occurrence of Native American archeological artifacts along the river and the associated floodplain, and impacts to wetlands, the floodplain, and visual quality. The availability of other corridor alternatives for this section that would not cross the Missouri River made such crossings unnecessary. The study area was adjusted to indicate the avoidance of these river crossings by excluding Saline County.

Unlike the Missouri River, where alternatives could be identified that would avoid a crossing, the Grand River could not be avoided by any corridor developed for this section. The presence of numerous wetlands and accessibility along the Grand River were considerations in the development of corridors. Many locations along the river would either be inaccessible or involve construction within wetlands, both of which would increase the adverse environmental impacts, complexity, and cost of the project. The most accessible crossings of the Grand River within the study area are at Highway M or U.S. Highway 24, where corridors were developed. Accessibility was not as critical for the crossing of the Chariton River, but locations with few wetlands were identified for the proposed macro-corridors. The BNSF railroad is another potential corridor opportunity that was investigated, but the railroad is less accessible than roads, and it crosses the Grand River where there is a significantly large wetland complex. The railroad also travels through the towns of Bosworth and Carrolton.

One of the three corridors (the south corridor) extends along the existing 161 kV transmission line that is located north of the Norborne site, heading east (Figure 7-8). The existing line is near U.S. Highway 24 for much of its length in the study area, and as a result, approaches the municipal boundaries of several towns, including Carrolton, Brunswick, and Keytesville. West of the town of Salisbury, the corridor turns to follow an existing 161 kV transmission line that heads directly to the Thomas Hill Plant. This line is in the vicinity of the town of Salisbury. The macro-corridor was modified from the normal two-mile width where it crosses the boundaries of these towns to restrict the location of routes to be identified within the corridors.

A second macro-corridor (the central corridor) would generally angle northeast across the study area to the point where State Highway M crosses the Grand River, then continue almost due east to the Thomas Hill Plant. A portion of this corridor includes the option of following an existing 69 kV transmission line about 16 miles toward the Thomas Hill Plant. A connecting corridor was developed that would follow the same 69 kV line between the northernmost corridor (see below) and this central corridor. The Chariton River could be crossed at the same location as the existing line to minimize cumulative impacts to the river.

A third corridor (the northern corridor) begins by heading north to an existing 69 kV transmission line running northeast, which the proposed corridor would follow for approximately 13 miles. Near the Bunch Hollow CA, the proposed corridor would turn east, heading nearly due east all the way to the Thomas Hill Plant. The corridor would cross the Grand River just south of the Swan Lake NWR and Yellow Creek CA, where there are significant wetlands. More defined routes would not be identified within the Refuge or conservation area boundaries. The corridor crosses the Chariton River where there are no existing roads or transmission lines.

7.3.1.2 Norborne to Sedalia / Mt. Hulda Macro-Corridors

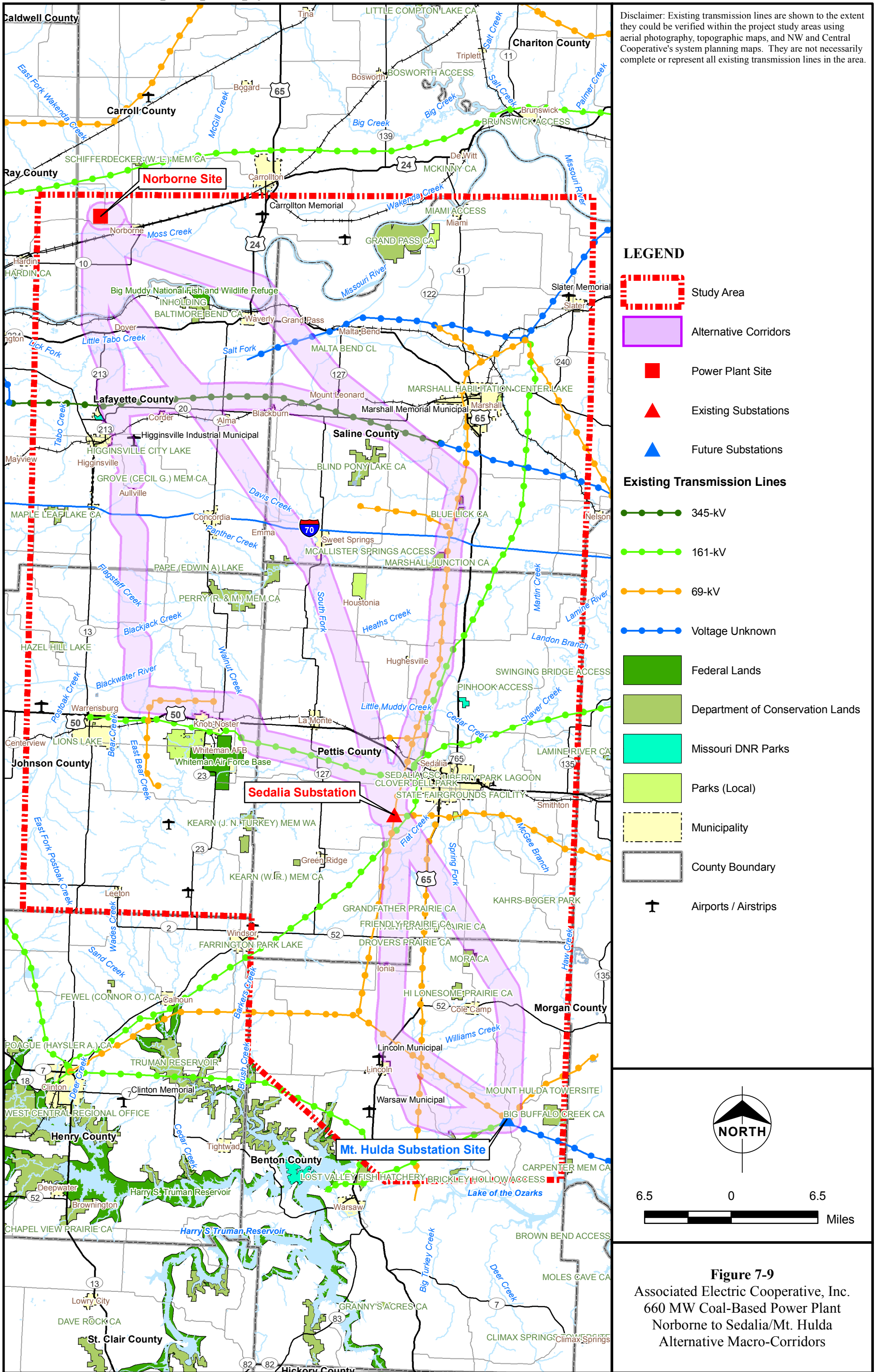
Corridor lengths for this section of the project ranged between 76.2 and 90.4 miles. These widely-ranging lengths were due in large part to the presence of numerous constraints in the study area. There were several considerations involved in defining the corridor alternatives for the Norborne to Sedalia / Mt. Hulda section of the project. These considerations include:

- The need to connect to the Sedalia Substation before continuing to the Mt. Hulda Substation
- Crossing of the Missouri River
- Big Muddy NWR
- Cities of Waverly, Higginsville, Marshall, Warrensburg, Knob Noster, and Sedalia, and other smaller communities in the area
- Whiteman AFB
- Knob Noster State Park
- Scattered, variably-sized conservation areas, including Perry CA, Blind Pony Lake CA, Baltimore Bend CA, and Marshall Junction CA

The proposed line needs to connect to the Sedalia Substation before continuing southward to the proposed Mt. Hulda Substation. As a result, three corridors were identified that connect Norborne to the Sedalia Substation, and two primary corridors were identified that connect the Sedalia Substation to the proposed Mt. Hulda Substation (Figure 7-9). This constraint limited the variability of alternatives west of Warrensburg and east of Sedalia because such corridors would add significant, unnecessary length to the proposed project, thereby increasing environmental and social impacts, and project cost.

Once the interconnections were established, macro-corridors were developed which avoided known constraints and which made use of opportunities to co-locate the line with existing linear facilities. No existing transmission facilities extend the entire length from the proposed Norborne site to the Sedalia Substation or from Sedalia to the Mt. Hulda Substation. Portions of four corridors developed between Norborne, Sedalia and Mt. Hulda parallel existing corridors when practicable. Most of these are 69 kV or 161 kV lines owned by various utilities. When developing more specific routes, the intent would be to parallel the existing lines as much as possible, using the flexibility of the two-mile-wide corridor where there are unavoidable constraints along the existing lines.

For this section of the project, a crossing of the Missouri River was unavoidable because the Norborne site is located north of the river and the Sedalia and Mt. Hulda Substations are located to the south. The only existing crossing of the Missouri River in the vicinity is at the Highway 65 bridge north of Waverly. An alternative parallel to the bridge was not identified because the line would have to extend into the city limits of Waverly, resulting in significantly greater social impacts than other alternative crossings. Because a new crossing was necessary, locations were identified that could minimize impacts to wetlands, according to the information available from the USFWS, and where there was relatively little steep terrain, which would make the proposed line difficult to access and construct. Avoidance of the Big Muddy NWR and the contiguous Baltimore Bend CA further limited the identification of corridors for this section. Regardless of the crossing identified, there could be floodplain, threatened and endangered species, archeological, and visual impacts associated with the river crossing. The transmission line would be designed to span the river, with the lines strung between two poles located on opposite sides of the river bank. No poles



would be placed within the river. In some cases, it may be necessary to install poles within the floodplain along the river.

The cities of Higginsville, Marshall, Warrensburg, Knob Noster, and Sedalia presented some of the most obvious constraints to the development of corridors between the Norborne site and the Sedalia Substation. The Knob Noster area was particularly restrictive because of Whiteman AFB, including the associated flight restrictions surrounding the base, and Knob Noster State Park, located west of Whiteman AFB and south of the town of Knob Noster. The greater Knob Noster area and Sedalia are located almost due east of Warrensburg along U.S. Highway 50. Approximately 11.5 miles separate Whiteman AFB and Sedalia, while only four miles separate Warrensburg and Knob Noster State Park. A two-mile-wide corridor could be identified between Warrensburg and the State Park, but this alternative would have to head south of the AFB before turning east to reach the Sedalia Substation. Such a corridor would also have to split the distance between the southern boundary of Whiteman AFB and Kearn Memorial Wildlife Area (WA), between which is a distance of about two miles. In contrast, there is ample space north of Knob Noster for a new corridor, and there is an existing 161 kV transmission line that could be followed for about 9.5 miles into the Sedalia Substation. This corridor was determined to be preferable to an alternative that would weave between Warrensburg, Knob Noster State Park, Whiteman AFB, and the Kearn WA.

Similarly, because Higginsville and Warrensburg are almost directly south of the Norborne site, a southerly corridor had to angle somewhat east to avoid these towns. The Higginsville Industrial Municipal Airport and Higginsville City Lake, located at the eastern edge of the macro-corridor, will further constrain the identification of more specific routes within the westernmost macro-corridor. Development has occurred beyond the official city limits for many of the towns in the study area, effectively extending the area to be avoided by the macro-corridors. For instance, there is considerable commercial development south of Sedalia along Highway 65, making alternatives leaving the Sedalia Substation directly east undesirable.

Another set of constraints is formed by a line beginning at Warrensburg at the southwest end; continuing to the northeast to Perry Memorial CA, the towns of Sweet Springs, Concordia, and Emma, and Blind Pony Lake CA; and ending at Marshall. In addition, there are numerous riparian wetlands along the Blackwater River, which connects Warrensburg, Perry CA, Sweet Springs and then Marshall Junction CA to the east. Corridors were developed that entirely avoided most of these constraints. Where some of these features could not be avoided by the two-mile width or more, the macro-corridors were modified to exclude their boundaries to encourage the development of routes outside the CA or city limits. These exclusion areas are most evident around the towns of Norborne, Sweet Springs, Higginsville, Knob Noster, Aullville, Ionia, and Lincoln and the Marshall Junction, Blue Lick, Mora, and Grandfather Prairie CAs.

In contrast, there are relatively few major constraints between Sedalia and Mt. Hulda. The primary consideration for corridors developed between Sedalia and Mt. Hulda was length. Corridors that extended further west than the Sedalia Substation or further east than the proposed site for the Mt. Hulda Substation would result in added length, which was unnecessary given the availability of shorter, more direct alternatives. With the exception of a few conservation areas, such as Paint Brush Prairie, Mora, and Hi Lonesome Prairie, and the towns of Cole Camp and Lincoln, which eliminated a direct corridor alternative between the Sedalia Substation and the proposed Mt. Hulda Substation, most constraints in the southern half of the study area are relatively small on a macro-corridor level. They will feature more prominently during the next phase of more specific routing.

Another consideration in the development of corridors for this section was the Katy Trail. The Sedalia Substation is located only about a tenth of a mile north of the Katy Trail. While one crossing of the trail is unavoidable to reach the Mt. Hulda Substation, it was determined that it would be best crossed near the existing substation, which is also close to Sedalia, where the views from the trail are not likely to be as pristine as views from other sections of the trail with less development.

A number of strip mines and gravel quarries are scattered throughout the study area between Norborne and Mt. Hulda. Most of these operations are not large enough to be considered at

the macro-corridor level, but will need to be addressed during the identification of more defined routes. Because of the large machinery that is used to excavate quarries and landfills, these areas are typically considered constraints to the location of a transmission line, due to height restrictions near the line. In addition, land adjacent to the quarries may be acquired and/or excavated in the future, making the location of the line along the excavated perimeters risky. On the other hand, because of the visual intrusion already present, locating the transmission line near these sites, while avoiding the potentially excavated areas, could be considered an opportunity for co-location.

Essentially three macro-corridors were identified between the Norborne site and the Sedalia Substation, with a connector running west to east between them. Two primary macro-corridors were identified between the Sedalia Substation and the proposed Mt. Hulda Substation (Figure 7-9).

One of the corridors from Norborne to Sedalia, the eastern alternative, would head generally southeast out of the proposed Norborne site, cross the Missouri River east of Waverly, and continue southeast to an existing 69 kV transmission line. The corridor would then turn south, following the existing line toward Sedalia to reach the Sedalia Substation.

The other two corridors (western and central alternatives) would extend south out of the Norborne site. The western corridor would extend southward approximately 36 miles, avoiding Higginsville, and then turn east before reaching Warrensburg. The corridor would turn southeast, north of Knob Noster, to meet and follow an existing 161 kV transmission line for several miles. About 3.5 miles north of the Sedalia Substation, the corridor would join the central corridor (see below) and head south/southeast into the substation.

After heading south out of the Norborne site for about six miles, the central corridor would angle to the southeast on a nearly direct alignment between Norborne and the Sedalia Substation, skirting the town of Sweet Springs and a tract of the Perry Memorial CA.

A connector corridor was identified running west to east between the western, central and eastern macro-corridors, along an existing transmission line approximately 14 miles south of the Norborne site. This corridor would enable the use of any of the initial corridors leaving

the Norborne site in combination with any of the more southern corridors developed to the Sedalia Substation.

From Sedalia to the proposed Mt. Hulda Substation, there are two basic corridors. One heads due south from the Sedalia Substation, then either meets and follows an existing 69 kV transmission line that heads southeast toward the existing Mt. Hulda Substation, or continues southeast by the town of Lincoln, and then turns east to the proposed substation site. More defined routes within the corridors will eventually be identified which avoid the town of Ionia, and the Drover's Prairie, Friendly Prairie, and Grandfather Prairie CA's, which were located within the two-mile-wide corridor. The eastern alternative would head southeast out of the Sedalia Substation for approximately 16 miles, then turn south about nine miles north of the Mt. Hulda Substation site. The Mora CA and Spring Fork Lake are the only major constraints which may constrict the location of a route within this identified macro-corridor.

7.3.2 FORBES SITE

To facilitate the identification of feasible corridors for transmission lines to interconnect with the proposed Forbes Site, the study area was subdivided into two sections: Forbes to Fairport and Fairport to Orrick / Missouri City / Eckles Road. Following is a description of the macro-corridors identified for each sub-area and the rationale for the development of these particular corridors.

7.3.2.1 Forbes to Fairport Macro-Corridors

The macro-corridors identified between Forbes and Fairport ranged from 57.6 to 68.4 miles in length (Figure 7-10). The primary considerations which featured prominently in the development of the corridors include:

- The Missouri River, and crossings of the Nodaway, Platte and One Hundred and Two rivers
- Big Lake State Park and surrounding community
- Communities of Mound City, Forest City, Oregon, Savannah, Rosendale, Belckow, and King City

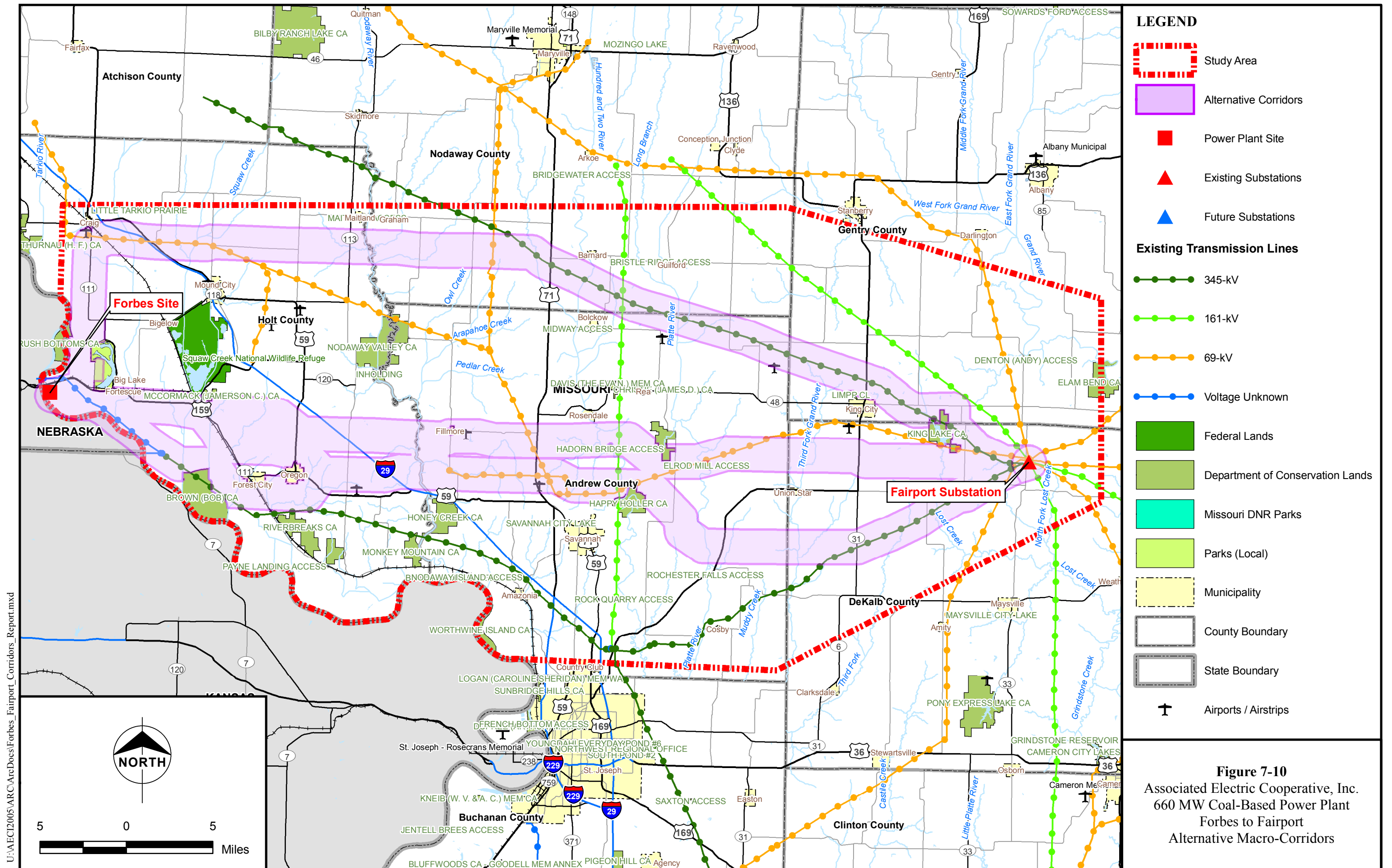


Figure 7-10
 Associated Electric Cooperative, Inc.
 660 MW Coal-Based Power Plant
 Forbes to Fairport
 Alternative Macro-Corridors

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Disclaimer: Existing transmission lines are shown to the extent they could be verified within the project study areas using aerial photography, topographic maps, and NW and Central Cooperative's system planning maps. They are not necessarily complete or represent all existing transmission lines in the area.

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- Numerous, scattered conservation areas, including Rush Bottom, Brown, McCormack, Riverbreaks, Nodaway Valley, Honey Creek, Monkey Mountain, Happy Holler, and King Lake CAs

Constraint Considerations Near The Forbes Site: The fact that the Forbes site is located immediately adjacent to and is partly surrounded by the Missouri River is somewhat limiting for the development of macro-corridors out of the Forbes site. Missouri River crossings were considered unacceptable for this section of the project. Two crossings would be required, which would unnecessarily compound the environmental impacts of the project. There would also be additional oversight into the approval process for the project from other states (Nebraska and/or Kansas).

In addition, the presence of center-pivot irrigation systems throughout the floodplain in this area will further limit the location of routes within the identified macro-corridors. Two-mile-wide macro-corridors could not be identified that completely avoided center-pivot irrigation systems. An existing transmission line that angles southeast near the Forbes site could provide an opportunity for minimizing impacts to irrigation in the vicinity, but the line runs through the Brown CA and then quickly heads too far south to be useful for much of the length of the proposed project.

Big Lake State Park, Squaw Creek NWR, and Rush Bottoms CA further limit corridor alternatives near the Forbes site. The intent was to avoid any transmission line routes through these state and federal lands.

Constraint Considerations to the South: Feasible corridors heading south and east from the Forbes site are restricted by the Missouri River, Brown CA, Riverbreaks CA, Honey Creek CA, Monkey Mountain CA, and the towns of Forest City and Oregon. Alternatives heading southeast from the Forbes site become angular to avoid these features. A distance of approximately four miles separates the Squaw Creek NWR and McCormack CA to the north from the Brown CA and the towns of Forest City and Oregon to the south. All corridors heading south and east out of the Forbes site must be located within this four-mile-wide area, so the macro-corridor was widened to allow for additional flexibility in developing more specific routes in this area.

Constraint Considerations in the Central Portion of the Study Area: In the central portion of the study area, a line of constraints is formed by the town of Savannah, two separate tracts of the Happy Holler CA, the Hadorn Bridge Access land, the towns of Rosendale, Rea, and Belckow, and the Davis and Christie Memorial CAs. All of these features, with the exception of Savannah, are bounded by the One Hundred and Two River to the west and the Platte River to the east, both of which run generally north/south. Though there do not appear to be large wetland complexes associated with these rivers according to NWI data, care was taken to identify corridors that would avoid multiple crossings of the rivers where they meander. Attempts were also made to identify corridor crossings of these rivers where there was relatively flat terrain, for ease of accessibility. Where practicable, existing transmission line crossings were incorporated into the macro-corridors to help minimize impacts at the river crossings. Similar considerations were given the Nodaway River crossing.

Terrain and scattered private airstrips may also be considerations during the later development of specific routes within the macro-corridors. The terrain abruptly changes from flat floodplain to rolling hills demarcated by Highway 111 to the south and Interstate 29 to the north. Several private airstrips have also been identified throughout the study area, and more are likely to be revealed as additional information is acquired for routing.

Opportunities for Co-Location: Interstate 29 is a prominent feature in the western portion of the study area, but it did not figure prominently in the development of corridors because it angles away from the Forbes and Fairport sites and because there is relatively little development along the Interstate in this area. Crossing locations were not a major concern.

In addition to the existing transmission line near Forbes, several other lines cross portions of the study area and provide opportunities for co-location, at least for a portion of this section. One of these lines, a 345 kV line, enters the study area from the northwest about halfway between Forbes and Fairport. Approximately 31 miles of this existing line are followed by one of the corridors. Portions of three other existing transmission lines that travel generally toward the Fairport Substation are also followed for seven to 12 miles.

Essentially three different corridors were identified from the Forbes site to the Fairport Substation (Figure 7-10). One corridor heads north from the Forbes site, heading between the Rush Bottoms CA and Big Lake State Park, for approximately 10 miles to an existing 69 kV transmission line. The corridor follows this existing line for approximately 7 miles, then continues east after the existing line turns southward. After about 18 miles heading east, the northern corridor meets a 345 kV line, which it follows for about 31 miles to the Fairport Substation. Where the existing line traverses the King Lake CA, the proposed macro-corridor deviates from the existing line to avoid crossing the CA. Otherwise, the intent would be to parallel the existing line as much as possible.

The other two corridors identified for the Forbes to Fairport section initially extend east from the Forbes site. The central corridor, which runs south of the Squaw Creek NWR, continues basically east all the way to the Fairport Substation, with a few southerly jogs to avoid the town of Fillmore and a portion of the Happy Holler CA. Approximately six miles of an existing 69 kV transmission line could be followed by the corridor, but otherwise, the corridor parallels no other existing infrastructure.

The southernmost alternative corridor follows an existing 345 kV transmission line to the southeast for about seven miles, through fields containing center-pivot irrigation systems, and then turns east and south between the Brown and Riverbreaks CAs, and the towns of Forest City and Oregon. The corridor would continue east for about 19 miles, following portions of an existing 69 kV line. Near the Happy Holler CA, the corridor turns southeast and then east, partly to provide geographical diversity from the central corridor (the corridors conjoin between the two separate tracts of the Happy Holler CA), and partly to meet and follow an existing AECI-owned 345 kV line into the Fairport Substation. The corridor follows the existing line for approximately 12 miles.

7.3.2.2 Fairport to Orrick / Missouri City / Eckles Road Macro-Corridors

Corridors for this section were identified between the Fairport Substation and a proposed Orrick Substation, and then from the proposed Orrick Substation site to the existing Missouri City Substation, and from the proposed Orrick Substation site to the existing Eckles Road Substation. The Fairport to Orrick corridors ranged from 58.4 to 66.4 miles in length. The

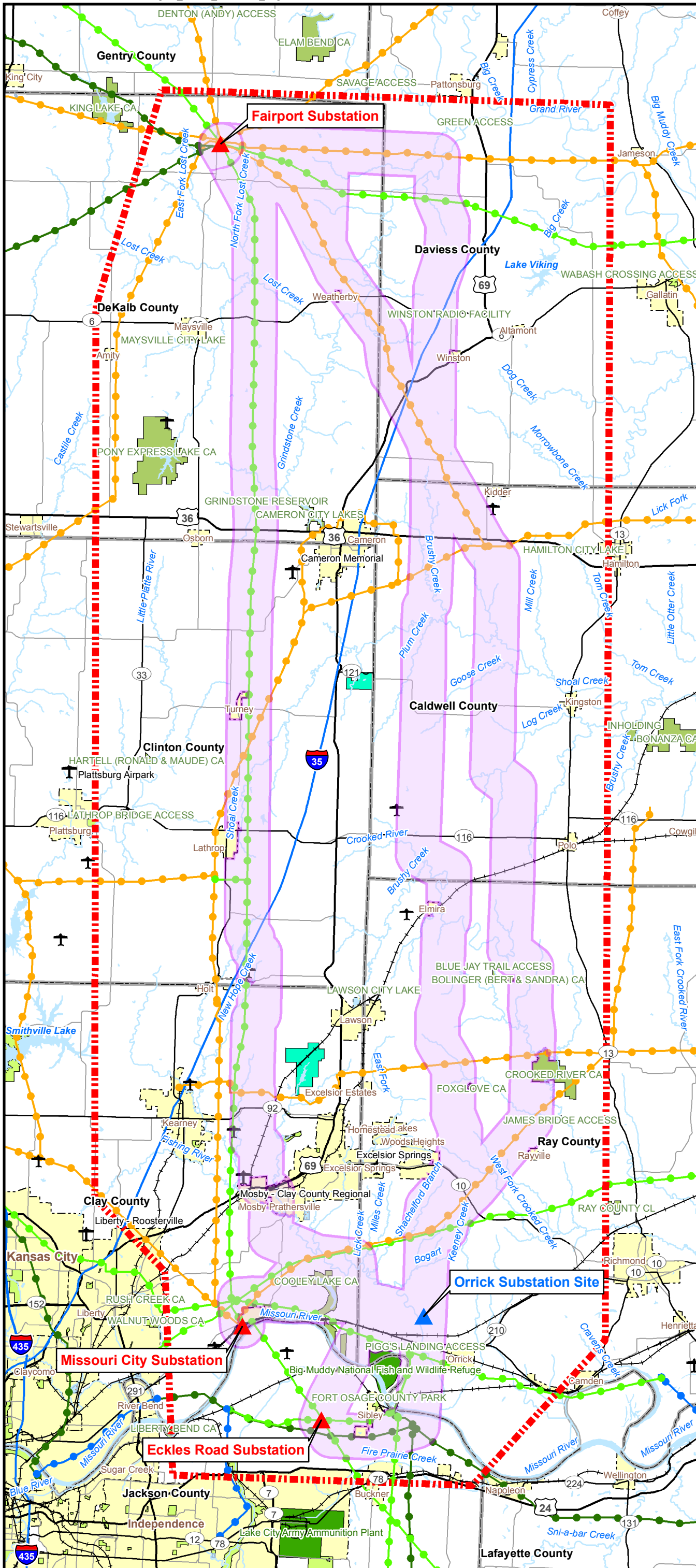
Orrick to Missouri City corridors ranged from 9.6 to 12.4 miles, and the Orrick to Eckles Road alternatives ranged from 7.1 to 9.7 miles in length (Figure 7-11). There were numerous features to be avoided within this section of the project, including:

- Scattered towns and cities throughout the study area, including Cameron, Osborne, Maysville, Lathrop, Lawson, Missouri City, Orrick, and Sibley
- Extensive urban development around Kearney and greater Excelsior Springs (including Mosby, Prathersville, Woods Heights, Crystal Lakes, and Homestead)
- Watkins Mill State Park and Historical Site, and Wallace State Park
- Big Muddy NWR
- Crooked River CA, Cooley Lake CA, Pony Express Lake CA, and Cameron City Lakes
- Numerous private and public airstrips and airports
- Presence of an existing 161 kV transmission line running between the Fairport Substation and Missouri City, and other existing transmission lines heading into and out of the Fairport Substation

Fairport Substation to Proposed Orrick Substation Site

While Interstate 35, U.S. Highway 69, and U.S. Highway 36 bisect the study area, they were not elements that featured prominently in the development of macro-corridors. Paralleling these highways was not feasible because none of them extend in the same general direction needed for this project. Their locations relative to Fairport and Orrick necessitate a crossing somewhere along their lengths. Each corridor crosses these highways only once, in relatively undeveloped locations, with the exception of the corridor that follows the existing 161 kV line. Just north of Interstate 35, the existing line crosses through the Arrowhead Lake residential community. The new line, should it parallel this existing line, would also extend through this residential area near Interstate 35.

Many of the features constraining the development of corridors for this section of the project are located in the southern half of the area. The only major constraints located in the northern half are the city of Cameron and its associated Cameron City Lakes and Municipal Airport, Pony Express Lake CA, and the towns of Maysville and Osborne. Maysville, Pony



Disclaimer: Existing transmission lines are shown to the extent they could be verified within the project study areas using aerial photography, topographic maps, and NW and Central Cooperative's system planning maps. They are not necessarily complete or represent all existing transmission lines in the area.

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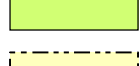
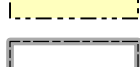


-  Study Area
-  Alternative Corridors
- Existing Transmission Lines**
-  345-kV
-  161-kV
-  69-kV
-  Voltage Unknown
-  Power Plant Site
-  Existing Substations
-  Future Substations
-  Federal Lands
-  Department of Conservation Lands
-  Missouri DNR Parks
-  Parks (Local)
-  Municipality
-  County Boundary
-  Airports / Airstrips



Figure 7-11
 Associated Electric Cooperative, Inc.
 660 MW Coal-Based Power Plant
 Fairport to Orrick/Missouri City/Eckles Rd
 Alternative Macro-Corridors

Express Lake, and Osborne form a line directly south of the Fairport Substation that serves to limit alternative corridors heading due south or southwest from Fairport, which is not particularly troublesome since the Orrick Substation site is located to the southeast.

Corridors heading southwest from Fairport would have an excessive length compared to other more direct alternatives, and would be further constrained in the south half of the study area by Kearney and the greater Excelsior Springs area.

Two existing 69 kV lines provide opportunities for co-location out of the Fairport Substation. One of the lines heads due east from the substation, while the other line heads southeast to the vicinity of the town of Kidder, where it taps into another existing 69 kV line that changes direction and as a result becomes undesirable as a corridor opportunity.

Cameron, Lawson and Wallace State Park in the north and the greater Excelsior Springs area and Watkins Mill State Park and Historical Site in the south, form a line down the approximate center of the study area that restrict the most direct alternatives between Fairport and Orrick. The existing 161 kV transmission line running north/south at the western edge of the study area was the only potential opportunity that could be identified west of Excelsior Springs. A review of aerial photography from 2002 indicates that there may be room for a new line parallel to the existing right-of-way, at least for the majority of the corridor. The primary constraints along the existing line are Lake Arrowhead (see earlier discussion) and development in and around the towns of Holt, Mosby and Prathersville. While all other cities and towns were excluded from the corridors, Mosby and Prathersville had to remain because the only possible alternative for a route in this area would be through their municipal jurisdictions (in relatively undeveloped locations) due to excessive development near the existing line, where it runs west of the towns. It is possible that additional development could occur in Mosby and Prathersville that would make this alternative corridor undesirable in the near future. Another constraint to be considered during the development of specific routes within this corridor will be the Clay County Regional Airport and other private airstrips that are currently within the two-mile corridor width. In addition, south of the greater Excelsior Springs area, the Fishing River and Cooley Lake CA further constrain options available within the westernmost corridor to reach the proposed Orrick Substation site.

Fewer, smaller constraints are located east of Cameron and Excelsior Springs, making the eastern portion of the study area the most feasible location for proposed corridors. Lake Viking and the towns of Winston, Altamont, and Kidder constrained corridors north of U.S. Highway 36. The Crooked River CA, a couple of much smaller CAs, and the towns of Kingston, Polo, Elmira, and Rayville were the only macro-constraints to be avoided south of U.S. Highway 36, in the eastern portion of the study area. Most of these constraints were spaced far enough apart that feasible two-mile-wide corridors were readily identifiable, though the corridors that were developed were somewhat angular to avoid some of these features. Several private airstrips could later have an impact on the identification of specific routes within the macro-corridors. Project length constrained the identification of alternatives further east than the Crooked River CA because there would be considerable backtracking to reach the proposed Orrick Substation site from corridors further east. Excessive length results in additional costs and a greater likelihood of environmental and social impacts.

At the south end near the proposed Orrick Substation site, the only co-location opportunity that was identified was a portion of an existing 69 kV line running between the Crooked River CA and the Missouri City Plant, on the west side of Missouri City.

For the Fairport Substation to proposed Orrick Substation section, three basic corridors were developed (Figure 7-11). The western corridor follows an existing 161 kV transmission line out of the Fairport Substation south for approximately 36 miles, at which point the proposed corridor angles slightly east to avoid development near the cities of Holt, Kearney, and Excelsior Springs, as well as a couple of private airstrips and the Clay County Regional Airport located near the existing line. The corridor extends through the towns of Mosby and Prathersville, and then turns southeast for 10 miles, generally following the Fishing River to reach the proposed Orrick Substation site approximately 10 miles south of Mosby. The last seven miles of this corridor doubles as an alternative corridor for the section between Orrick and Missouri City.

Two options are available leaving the Fairport Substation to the east. One option follows an existing 69 kV transmission line due east for approximately 10 miles, then turns south from

the existing line for approximately 13 miles before meeting the other option, which follows another 69 kV transmission line heading southeast from the substation for approximately 15 miles. These options in turn lead to two other corridor options than continue south to the Orrick Substation site. The central option heads almost due south for approximately 42 miles, skirting the towns of Elmira and Woods Heights to reach the proposed site of the Orrick Substation. The eastern option continues southeast along a 69 kV line for about seven miles, then turns south for approximately 26 miles, skirting the Bolinger and Crooked River CA's. At this point, the corridor meets another existing 69 kV transmission line right-of-way and follows it southwest for approximately seven miles before turning south to terminate at the proposed Orrick Substation site after about four more miles.

Proposed Orrick Substation to Missouri City Substation

Only about eight miles separate the proposed site of the Orrick Substation and the Missouri City Substation. Alternative corridors between these two points were longer than eight miles to avoid several large constraints. The Missouri City Substation is located west of the Orrick Substation site on the west side of Missouri City, and at the edge of the Missouri River at the river's northernmost point in the vicinity. To avoid the majority of the development in and around Missouri City, corridors would have to approach from the north, south, or west. Corridors from the west were not practical because the Orrick Substation site is east of the Missouri City Substation. Alternatives approaching Missouri City from the south would result in two crossings of the Missouri River, which would be unnecessary given the availability of northern corridors that would require no river crossings. Because the river crossings result in additional environmental impacts and construction challenges, and could be avoided, no southern corridor alternatives were developed.

Similar to the western corridor identified between the Fairport Substation and Orrick, the Orrick to Missouri City section also involves the Cooley Lake CA, which is spread out in several tracts along the edge of the Missouri River. The largest tract is a horseshoe-shaped area, once a Missouri River oxbow, which extends north from the Missouri River about 2.5 miles. One of the corridors identified for this section would be longer, but could completely avoid the Cooley Lake CA (Figure 7-11). This corridor would extend west from the Orrick Substation, angle north to miss the CA, and then angle back southwest to the Missouri City

Substation. Two existing lines, one 69 kV line and one 161 kV line, extend in the same general direction and are within the two-mile-wide corridor. Further investigation is required to determine if co-location of the proposed project along these lines is feasible. Specific routes developed within this corridor would also need to avoid multiple crossings of the Fishing River, which meanders within the corridor just north of Cooley Lake. This corridor is the same alternative identified for part of the Fairport to Orrick section.

The other alternative corridor identified between Orrick and Missouri City would extend west out of the Orrick site, and cross the Cooley Lake CA on a more direct path to the Missouri City Substation. A 161 kV transmission line, coming up from the southeast, crosses part of the Cooley Lake CA, and is within the two-mile-wide proposed corridor for this project. To minimize impacts to the CA, routes could be developed which cross the CA parallel to the existing right-of-way.

Proposed Orrick Substation to Eckles Road Substation

Two corridors were developed for the proposed Orrick Substation to Eckles Road Substation section of the project (Figure 7-11). Because the Eckles Road Substation is located on the opposite side of the Missouri River from the proposed Orrick Substation site, a crossing of the Missouri River is unavoidable. Crossing locations and potential corridors were restricted by Cooley Lake CA, the Mouth of the Little Blue County Park, and the Big Muddy NWR along the Missouri River, and the towns of Orrick and Sibley. The Big Muddy NWR, Fort Osage County Park, and Sibley prohibit the option of a direct corridor between the proposed Orrick site and the Eckles Road Substation.

One corridor was developed which would head south from the Orrick Substation site, cross the Missouri River, and then extend east along an existing 345 kV line right-of-way to the Eckles Road Substation, crossing the Missouri River between the Cooley Lake CA and the Big Muddy NWR. Routes developed within this corridor would avoid the town limits of Sibley, resulting in a slightly greater overall length than a more direct alternative.

The other corridor would head west from the Orrick site, then angle southwest to the Eckles Road Substation. Routes within this corridor could be designed to avoid the Cooley Lake CA and the Big Muddy NWR, but the Mouth of the Little Blue County Park, which extends

about four miles along the river, would be crossed. This park could not be reasonably avoided without impacting either the Cooley Lake CA or the Big Muddy NWR.

7.4 MACRO-CORRIDOR STUDY CONCLUSIONS

The selection of the preferred transmission solution for this project largely depends on the power plant site selected, as well as specific route alignments identified within the corridors. Once the public has had an opportunity to comment on the proposed corridors, more detailed constraint information will be collected and more specific route alignments will be identified. A more definitive comparison of impacts will be made for each route identified for each section and a preferred route will be selected based on this analysis of alternatives.