ALTERNATIVES REPORT
Hugo 2 Project

Prepared for the

Rural Utilites Service

Texas 121
Oklahoma 32

October 2004

ALTERNATIVES REPORT

Prepared for:

Rural Utilities Service

Prepared by:

Burns & McDonnell Engineering Company, Inc.

Engineers-Architects-Consultants

Kansas City, Missouri

36855

OCTOBER 2004

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 EXECUTIVE SUMMARY

Western Farmers Electric Cooperative (WFEC), a generation and transmission cooperative headquartered in Anadarko, Oklahoma, proposes to develop a new 750 megawatt (MW) base-load coal-fired generation unit with an in-service date of 2010. The unit would be an addition to the existing 450 MW Hugo Generating Station, which is owned by WFEC and located in Choctaw County, Oklahoma, about 12 miles east of the City of Hugo. The addition of the new unit to the existing Hugo Generating Station is one of the nine alternative sites evaluated in this Alternatives Report.

The project is being developed in conjunction with Brazos Electric Power Cooperative (Brazos Electric). WFEC and Brazos Electric will jointly share the equity in the new unit, with WFEC owning 250 MW and Brazos Electric owning 500 MW. WFEC will be the operator, and a joint operating committee and joint fuel committee are proposed to develop and implement operational, maintenance and fuel strategies for the new unit. The benefits of a joint project relate to the economies of scale realized by using the existing infrastructure, the lower capital cost per kilowatt by utilizing a larger unit size (approximately 30 percent less), better staffing utilization, and avoidance of environmental impacts associated with the development of a new greenfield site.

WFEC provides electric service to 19 rural electric cooperatives, Altus Air Force Base and several communities in an approximately 50,000 square mile area of Oklahoma and small portions of Texas and Kansas.

WFEC's existing generation facilities consist of three gas-fired steam units totaling 320 MW at Mooreland, and three gas-fired steam units and 3 combined-cycle gas units totaling 331 MW at Anadarko, both powered by natural gas delivered through WFEC's pipeline system. The Hugo Plant consists of one 450 MW coal-fired unit.

Part of the WFEC's member power requirements are provided through a purchase power agreement with the Southwest Power Administration (SPA). In addition, through a recent 20-year agreement with Blue Canyon Windpower LLC, WFEC has agreed to purchase all of the electricity produced from a new 74.25 MW wind energy project located in the Slick Hills area of Oklahoma, northwest of Lawton.

WFEC has studied their respective load requirements and factored in projected load growth. The studies indicate that in 2009 WFEC would be capacity short based on the low- (1.2 percent), average- (1.6 percent), and high-load (2.2 percent) growth scenarios and the planned retirement of Anadarko Units 1, 2 and 3.

In 2001, WFEC solicited proposals to compare the alternatives of purchase power and equity ownership of alternative units. The results of this Request for Proposal (RFP) verified that the development of self-owned coal-fired generation was the best and most economical alternative for WFEC. WFEC used this information and developed sensitivities that were used in conjunction with the WFEC Financial Model to make the final decision on the capacity addition.

Brazos Electric, organized in 1941, is a generation and transmission cooperative, providing wholesale power to 17 member distribution cooperatives and three municipals located primarily in the north and north central portions of Texas. The 17 member cooperatives are full requirements customers of Brazos Electric with long term wholesale power contracts. The municipal power contracts last from two to three years. With headquarters in Waco, Texas, the service area of Brazos Electric encompasses 66 counties totaling about one fifth of the state (56,777 square miles). The territorial boundaries of the member cooperative systems are established by the Public Utility Commission of Texas (PUCT). In much of the service area of the cooperatives, the service area may be dually- or multiply-certified with other utilities.

Brazos Electric owns two conventional gas-fired generating plants (Miller and North Texas) with a total capacity of 686 MW. It has long-term contracts for the output of the Morris Sheppard hydroelectric plant (24 MW), the Whitney hydroelectric plant (30 MW), and the San Miguel Electric Cooperative lignite plant (195.5 MW). Another contract with Ponderosa Pine Energy Partners (formerly referred to as Tenaska) provides 240 MW from a natural gas-fired combined-cycle cogeneration plant. At the present time, construction is underway at the new Jack County Power Plant site, which will consist of a new gas-fired combined-cycle 600 MW unit to be completed in early 2006. In addition, Brazos Electric has short-term purchase agreements with

Calpine Energy Services, BP Energy, Constellation Energy, Bryan Texas Utilities, and Coral Power for a total of 950 MW.

Based on Brazos Electric's recent load forecast, it is expected that their loads will grow from 2,385 MW in 2004, to 4,776 MW in 2020. Brazos Electric's need for additional capacity is forecast to increase from approximately 1,600 MW in 2006 to over 3,500 MW in 2018.

Brazos is also in the process of evaluating other options for power purchases. In September 2004, a Request for Proposal was published in MW Daily, the Wall Street Journal, and USA Today. Once proposals are received, Brazos Electric will evaluate the options that are presented.

The results of the analysis to date indicates that the best solution to meeting WFEC's and Brazos Electric's load growth is to construct a 750 MW addition (Unit 2) at the Hugo Plant and build approximately 100-150 combined miles of new 345-kilovolt (kV) transmission lines. Interconnections with the Southwest Power Pool (SPP) will likely occur via two new lines from the Hugo Plant to the Pittsburg (60 miles) and/or Valliant (16 miles) Substations in Oklahoma, and/or the Lydia Substation (50 miles) in Texas. Interconnection to the Electric Reliability Council of Texas (ERCOT) system grid will likely be a line from the Hugo Plant to the Paris (30 miles) or Valley Substations (60 miles) in Texas. Additional transmission studies will be completed by SPP and ERCOT over the next few months to confirm the best locations for the new interconnections.

Because WFEC and Brazos Electric intend to finance the project through a guaranteed Federal Financing Bank loan, the project represents a major federal action that must be reviewed under the National Environmental Policy Act (NEPA). The agency with with responsibility to carry out the NEPA review is the Rural Utilities Service (RUS), formerly known as the Rural Electrification Administration (REA).

An Environmental Impact Statement (EIS) and Record of Decision were completed by the REA in 1978 on the Hugo Plant and its associated transmission lines. The ultimate site capacity evaluated in the original EIS included three separate units totaling 1,600 MW. In fact, Hugo 2 was projected to be needed within two years after the first unit was brought on-line.

Due to the length of time since the original EIS and the additional project components that are needed (i.e. the new transmission lines), RUS is required by its NEPA regulations to re-evaluate the environmental impacts of the project and prepare a new EIS and Record of Decision. This document is the first step in the NEPA process. It is intended to provide agencies and other interested parties enough background information on the project so that they can provide feedback to RUS and the applicants regarding issues that should be addressed in the EIS.

Specifically, this document presents the purpose and need for the project, identifies the various options the two utilities considered to meet that need including load management, renewable energy sources, distributed generation, re-powering existing units, participation in other company's projects, purchased power, and new fossil-fueled generation alternatives (gas, oil, coal). In addition, it presents the results of a site selection study to determine the best site for the new unit. Finally, it includes a macro-corridor study which examines the constraints and opportunities for new transmission lines that will allow the new unit to be connected to the existing electric grid in both Oklahoma and Texas.

2.0 INTRODUCTION

WFEC in conjunction with Brazos Electric proposes to develop a new base-load coal-fired generation unit. The new unit would be a 750-MW net generating unit to be in-service by 2nd Quarter 2010. The unit is proposed as an addition to the existing Hugo Plant, which is owned by WFEC and located in Choctaw County, Oklahoma, approximately 12 miles east of Hugo, Oklahoma.

WFEC and Brazos Electric will jointly own the equity in the new unit, with WFEC owning 250 MW and Brazos Electric owning 500 MW. WFEC will be the operator and a joint operating committee and joint fuel committee are proposed to develop and implement operational, maintenance and fuel strategies.

The benefits of a joint project relate to the economies of scale realized by using the existing infrastructure, the lower capital cost per kilowatt by utilizing a larger unit size (approximately 30 percent less), better staffing utilization, and avoidance of environmental impacts associated with the development of a new greenfield site.

The costs of developing and building the unit will be shared on the equity ownership basis. The projected cost of the plant and associated transmission interconnections is approximately $1.2 billion (includes owner's costs and interest during construction). Each equity owner intends to secure debt financing in proportion to its capacity share through a loan application to RUS for a guaranteed Federal Financing Bank loan. The WFEC share of the project is expected to be about $400,000,000, or $1,600 / kW net installed. The remaining $800,000,000 would be Brazos Electric's share.

This document is actually a combination of three separate studies: an alternatives analysis, a site selection study, and a macro-corridor study. The alternatives analysis is presented in Chapters 3, 4, and 5 and presents a profile of the applicants, an explanation of purpose and need for the project, and a discussion of the capacity alternatives that were considered. These alternatives included power purchases, load management, energy conservation, and various alternative electric generation technologies. The alternatives review includes descriptions of each technology, and its general advantages and disadvantages.

The site selection study is presented in Chapter 6. This chapter includes a review of previous siting studies completed by the two utilities, updated to include current information where appropriate. Chapter 7 is the macro-corridor study, which consists of a macro-level review of the alternative transmission corridors proposed for the project. Chapter 8 provides conclusions from the three studies (alternatives analysis, siting study and macro-corridor study), and Chapter 9 is a summary of the references used in compiling the report.

3.0 PROFILE OF APPLICANTS

3.1 WESTERN FARMERS

WFEC, a generation and transmission cooperative, serves 19 rural electric cooperatives, Altus Air Force Base and several communities in an approximately 50,000 square mile area. WFEC is headquartered in Anadarko, Oklahoma, and serves consumers in western and southeastern Oklahoma, plus small areas in Kansas and Texas. These areas are shown in Figure 3-1. In existence for over 60 years, WFEC has grown into Oklahoma's largest locally-owned power supply system.

WFEC was organized in 1941 when western Oklahoma rural electric distribution cooperatives were unable to secure an adequate power supply at rates the farmers and rural industrial developers could afford. Engineering studies made by those rural electric distribution cooperative pioneers indicated something could be done to solve their wholesale power supply dilemma.

On February 21, 1941, representatives of nine rural electric distribution cooperatives met in Oklahoma City's Biltmore Hotel and formed a generation and transmission cooperative to be owned by the cooperatives it served. The incorporators provided for individual rural electric distribution cooperatives to petition for membership. On April 25, 1941, the cooperative approved the membership of six cooperatives. These six members were joined by four other cooperatives later that year.

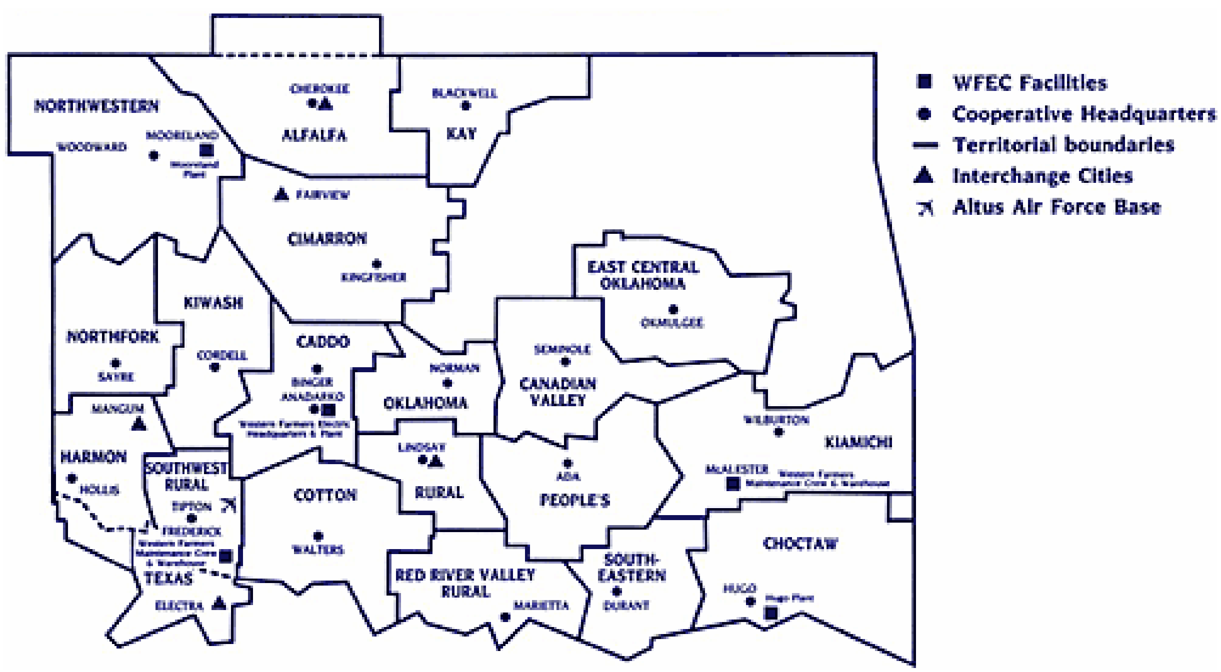
In April 1942, the decision was made to make Anadarko the main headquarters facility. Thirty acres of land were purchased just outside the northeastern city limits. Cooperating with the government, the Board of Trustees shut down construction at the start of World War II and released the newly acquired generators to be used in the war effort "to aid in the defense of our country." When the war ended, WFEC added an eleventh member. With new construction plans, WFEC started producing power in 1950.

Eight eastern Oklahoma rural electric distribution cooperatives joined WFEC in 1968, bringing the total number of member-owners to 19. A list of WFEC's member-owners is provided below. Figure 3-1 shows the location of each within the WFEC service area.

WFEC Member-Owners

Alfalfa EC	Caddo EC	Canadian EC	Cimarron EC
Choctaw EC	Cotton EC	East Central Oklahoma EC	Harmon EC
Kay EC	Kiwash EC	Kiamichi EC	Northfork EC
Northwestern EC	People's EC	Red River Valley Rural EC	Southeastern EC
Southwest Rural EC	Rural EC	Oklahoma EC	

Figure 3-1 WFEC Service Area



WFEC serves approximately 210,489 residential, four resale, 31,260 small commercial, 146 large commercial and 1,868 irrigation customers.

3.2 BRAZOS ELECTRIC

Brazos Electric, organized in 1941, is a generation and transmission cooperative, providing wholesale power to 17 member distribution cooperatives and three municipals located primarily in the north and north central portions of Texas. The 17 member cooperatives are full requirements customers of Brazos Electric with long term wholesale power contracts. The municipal power contracts last from two to three years. With headquarters in Waco, Texas, the service area of Brazos Electric encompasses 66 counties with an area equal to about one fifth of the state (56,777 square miles). The territorial boundaries of the member cooperative systems are established by the PUCT. In much of the service area of the member cooperatives, they may be dually- or multiply-certified with other utilities. Following is a list of the Brazos Electric member-owners. Figure 3-2 illustrates the Brazos Electric Service Area within which are located all of its member-owners.

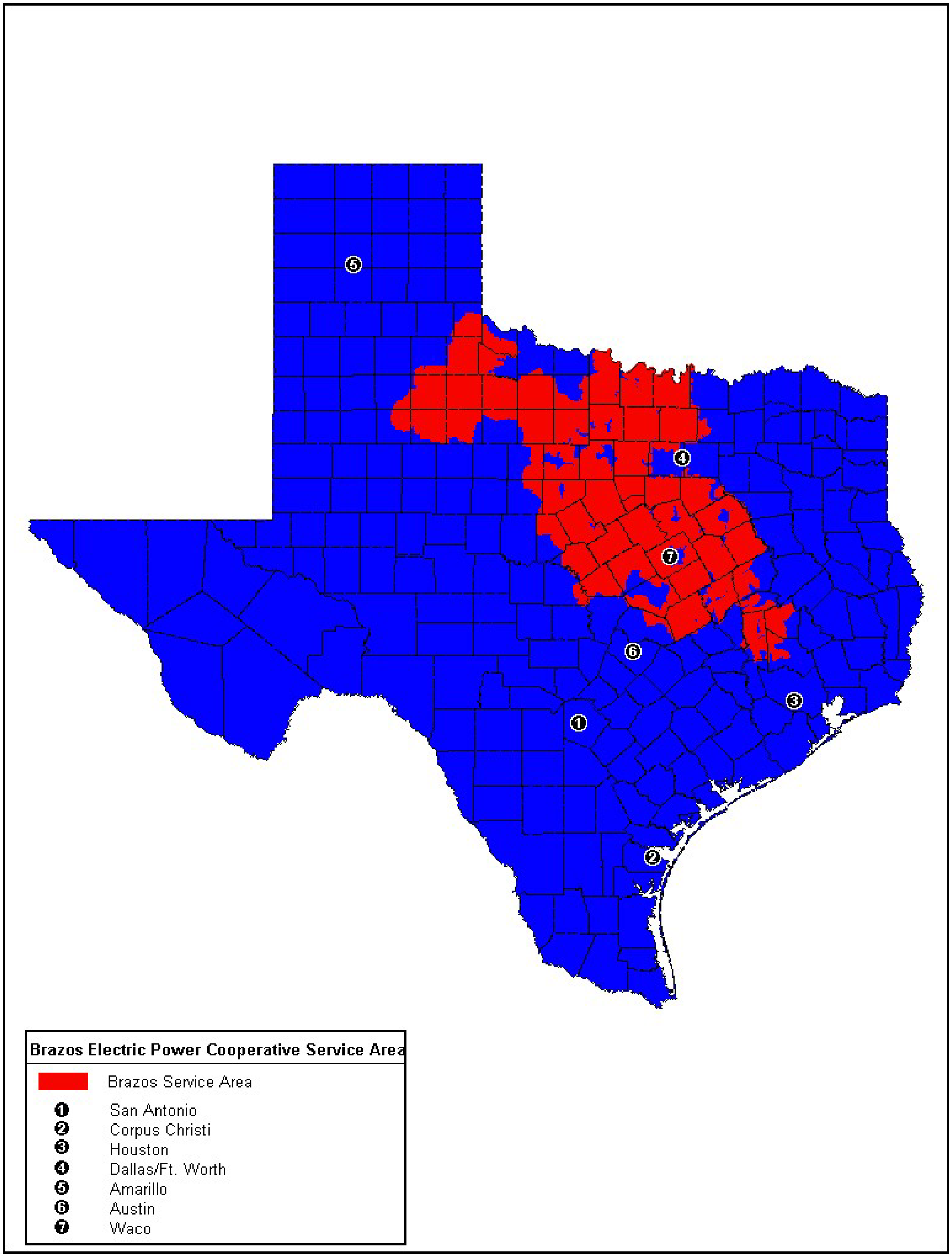
Brazos Electric Member-Owners

Bartlett EC	Belfalls EC	Comanche County EC	Cooke County EC
CoServ Electric	Fort Belknap EC	Hamilton County EC	HILCO EC
J-A-C EC	McLennan County EC	Mid-South EC	Navarro County EC
Navasota Valley EC	South Plains EC	Tri-County EC	Wise EC
United Cooperative Services			

Brazos Electric owns two conventional gas-fired generating plants (Miller and North Texas) with a total capacity of 686 MW. It has long-term contracts for the output of the Morris Sheppard hydroelectric plant (24 MW), the Whitney hydroelectric plant (30 MW), and the San Miguel Electric Cooperative lignite plant (195.5 MW). Another contract with Ponderosa Pine Energy Partners (formerly referred to as Tenaska) provides 240 MW from a natural gas-fired combined-cycle cogeneration plant. At the present time, construction is underway at the new Jack County Power Plant site, which will consist of a new gas-fired combined-cycle 600 MW unit to be completed in early 2006.

Brazos Electric has an extensive transmission development program, with more than 2,500 miles of transmission lines and 300 substations in existence. Brazos Electric is the sixth largest

Figure 3-2 Brazos Electric Service Area



transmission provider in the state of Texas, and is the largest generation and transmission cooperative in the state.

The majority of the member cooperative load is residential, at approximately 57 percent in 2000. The commercial classes comprise approximately 36 percent, while losses and own use account for approximately 6 percent. The remainder is comprised of miscellaneous categories such as sales to public authorities and public street lighting, which generally account for less than one percent of the cooperative's load.

It is expected that residential usage will continue to comprise a majority of the member cooperative load. However, it is anticipated that the commercial class will grow somewhat as a percent of total sales, from 34 percent of cooperative load in 1998 to 43 percent by 2010. One aspect to note is that the large commercial category has been a driving force behind the commercial load growth for most of the 1990s. This is mainly due to oil extraction activity, petroleum and water pumping loads, lignite mining loads, large business complexes, and large manufacturing facilities.

From a customer perspective, it is interesting to note that 86 percent of the average number of customers for all member cooperatives is residential, while just fewer than 12 percent are small commercial customers. Less than 0.1 percent of the average number of end-use customers is in the large commercial classification. However, the large commercial customers contribute significantly to the overall energy load.

4.0 PURPOSE AND NEED FOR THE PROJECT

4.1 WESTERN FARMERS

WFEC's last Power Requirements Study (which is required by RUS every three years with annual updates) was completed and submitted to RUS in March 10, 2003. WFEC received approval of the study from RUS on July 22, 2003. A new study is currently underway and will be completed in the near future.

4.1.1 Demand Forecast

The projected average yearly increase of WFEC's summer peak demand is between 11 and 23 MW with an annual compound growth between 0.80 and 1.57 percent for the period 2001-2031. Each of WFEC's members has developed separate summer and winter peak projects. A summary of WFEC's projected system peak demand for the period 2001-2023 is shown in Figure 4-1. Figure 4-2 shows WFEC's annual historical and projected energy consumption for the period from 1982 to 2031.

Figure 4-1 WFEC System Peak Demand (2001-2031)

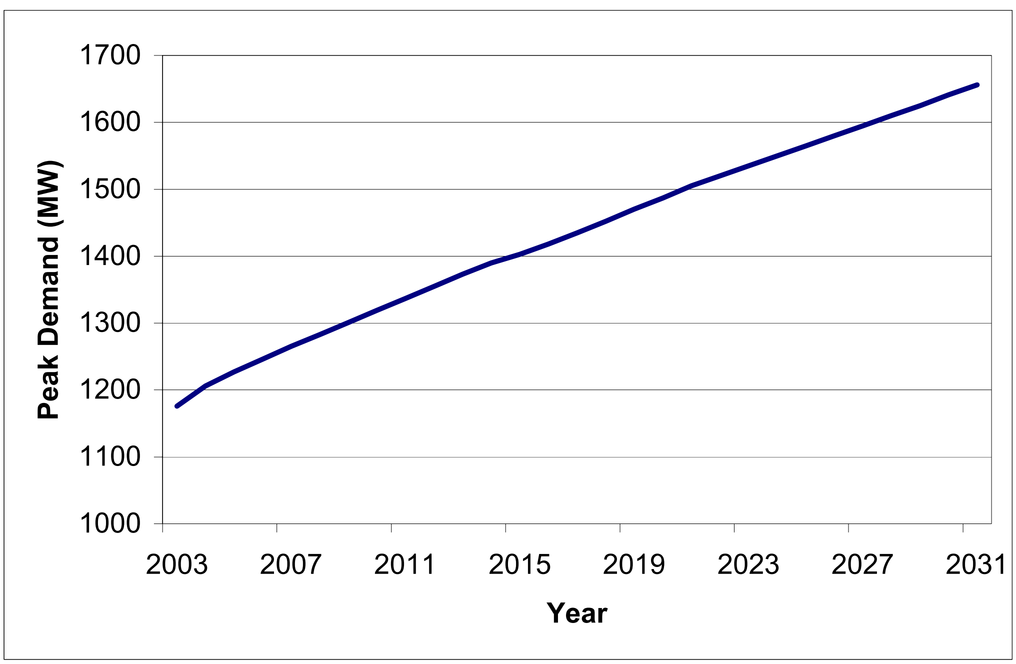
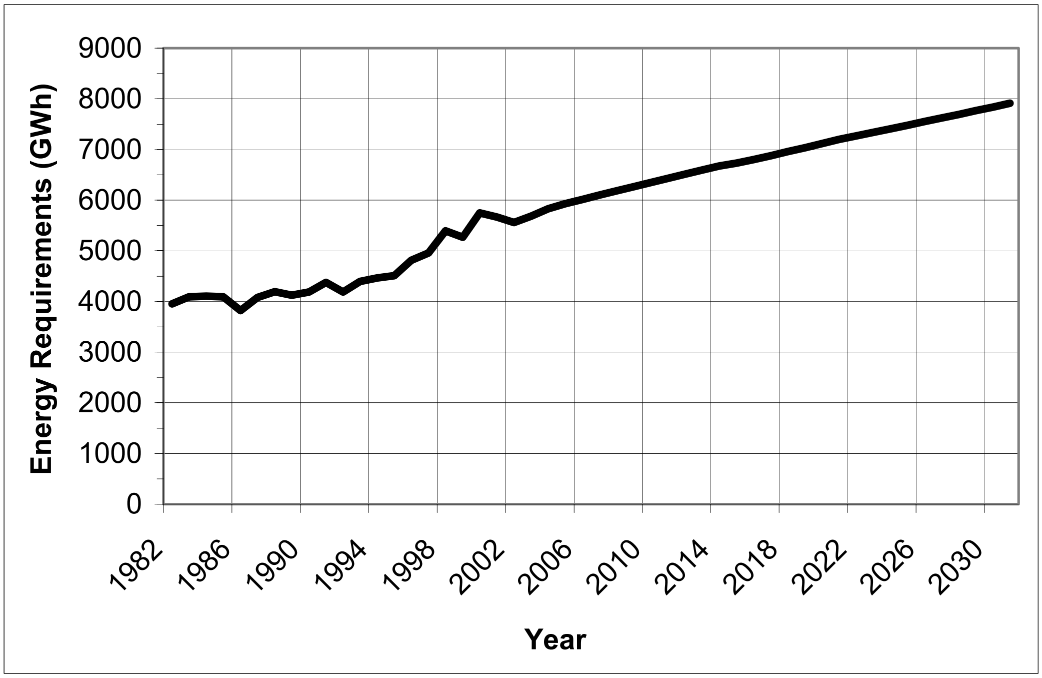


Figure 4-2 WFEC Annual Energy Requirements



WFEC has developed forecasts for the number of consumers, the energy use per consumer and total energy requirements for the following classes of consumers: residential, small commercial, irrigation, large commercial, and resales and cities. Each class's projected energy sales are summarized in Table 4-1 for the period 2001-2031.

Table 4-2 summarizes WFEC's net generating capacity, purchases, sales reserves and percent reserve margin for the period from 2001-2023. The table indicates that WFEC will have a net deficit in 2011, rising to 230 MW in 2023.

4.1.2 Planning History

WFEC is required to submit regular Power Requirements Studies and Construction Work Plans to RUS for approval in order to justify improvements to its system. In addition WFEC, as a member of the Southwest Power Pool (SPP), establishes appropriate reserve margins as required by the pool.

In 2001, WFEC's consultant prepared the Phase 2 WFEC Planning Study (Black & Veatch 2001), to determine the best incremental capacity additions to the WFEC system. The 2001

Table 4-1 WFEC Projected Percent Distribution of Sales by Customer Class (2001-2031)

Year	Residential	Irrigation	S. Commercial	L. Commercial	Others	Resales	Total
2001	58.1	1.0	23.8	16.5	0.1	0.5	100.0
2002	58.5	0.8	23.9	16.1	0.1	0.5	100.0
2003	58.0	0.8	23.6	17.0	0.1	0.5	100.0
2004	57.9	0.8	23.3	17.4	0.1	0.5	100.0
2005	58.0	0.7	23.3	17.4	0.1	0.5	100.0
2006	58.2	0.7	23.4	17.2	0.1	0.5	100.0
2007	58.3	0.7	23.4	16.9	0.1	0.5	100.0
2008	58.5	0.7	23.4	16.7	0.1	0.5	100.0
2009	58.7	0.7	23.5	16.5	0.1	0.5	100.0
2010	58.9	0.7	23.5	16.3	0.1	0.5	100.0
2011	59.1	0.7	23.6	16.1	0.1	0.5	100.0
2012	59.3	0.7	23.7	15.9	0.1	0.5	100.0
2013	59.4	0.7	23.7	15.7	0.1	0.5	100.0
2014	59.6	0.7	23.7	15.5	0.1	0.4	100.0
2015	59.9	0.7	23.5	15.3	0.1	0.4	100.0
2016	60.1	0.6	23.6	15.2	0.1	0.4	100.0
2021	60.6	0.6	23.9	14.3	0.1	0.4	100.0
2026	61.3	0.6	24.0	13.7	0.1	0.4	100.0
2031	61.7	0.5	24.2	13.1	0.1	0.4	100.0

study indicated that additional capacity would be required beginning in 2004 and would reach 710 MW by the end of the study period in 2023. The results of the base case expansion plan study indicated at that time that the addition of a 600 MW coal unit at the existing Hugo site was part of the least cost plan for WFEC. Since this option was not assumed to be available until 2008, additional capacity would be required beginning in 2004 to maintain the WFEC reserve margin. The repowering of Mooreland Unit 3 was an option, as was power purchases. The Phase 2 Study results allowed the elimination of several generating alternatives that were clearly not cost-effective, and showed a substantial advantage to installing a second coal-fired unit at the Hugo site.

In May 2002, WFEC issued an open-ended RFP to approximately 100 developers and utilities. In addition, the RFP was posted on the WFEC website and advertised in the Wall Street Journal, USA Today, and the Dallas Morning News. It allowed for power sales to WFEC to replace the

Table 4-2 WFEC Capacity Balance and Projected Reserve Margin (2001-2023)

Year	Net Generating Capacity (MW)	Net System Purchases With Reserves (MW)	Net System Sales (MW)	Net System Capacity (MW)	System Peak Demand (MW)	Required Reserves (MW)	Reserve Margin (%)	Excess (Deficit) to Maintain 12.5% Reserve Margin (MW)
2001	1103	279	45	1337	1287	126	8	(76)
2002	1163	279	0	1442	1256	122	19	64
2003	1183	279	0	1462	1176	112	32	174
2004	1183	279	0	1462	1206	116	28	140
2005	1183	279	0	1462	1227	119	25	117
2006	1183	279	0	1462	1246	121	22	95
2007	1183	279	0	1462	1265	123	20	74
2008	1183	279	0	1462	1283	126	18	54
2009	1183	279	0	1462	1301	128	16	33
2010	1183	279	0	1462	1319	130	14	13
2011	1183	279	0	1462	1337	132	12	(7)
2012	1183	279	0	1462	1355	135	10	(28)
2013	1183	279	0	1462	1373	137	8	(48)
2014	1183	279	0	1462	1390	139	6	(67)
2015	1183	279	0	1462	1403	141	5	(82)
2016	1183	279	0	1462	1418	142	4	(98)
2017	1183	279	0	1462	1435	144	2	(117)
2018	1183	279	0	1462	1452	147	1	(137)
2019	1183	279	0	1462	1470	149	(1)	(156)
2020	1183	279	0	1462	1487	151	(2)	(176)
2021	1183	279	0	1462	1505	153	(4)	(196)
2022	1183	279	0	1462	1520	155	(5)	(213)
2023	1183	279	0	1462	1535	157	(6)	(230)

short-term and long-term self-build options and also allowed expressions of interest in partial ownership of Hugo 2 or in WFEC ownership in another party's unit.

A total of 29 proposals and four expressions of interest were received. Of the proposals received, 12 were renewable energy proposals and 17 were conventional technology proposals. Many contained numerous alternatives. The results of the analysis indicated that the lowest cost plan appeared to involve a share of a proposer's combined-cycle unit in either 2004 (250 MW) or 2006 (275 MW), followed by Hugo 2 in 2009 or 2011, respectively.

In mid-January 2003, WFEC issued letters to the short-listed bidders explaining that due to lower than expected load growth it was in WFEC's best interest to withdraw from the RFP process.

In February 2003, WFEC's consultant conducted a Planning Study Update incorporating a number of significant changes compared to the Phase 2 Study. In addition to the updated load growth projections, the analysis utilized a revised fuel forecast. Other changes included new study period dates of 2003 through 2040, and the restriction of the analysis to only include options appearing to have a realistic chance of being cost-effective. The Planning Study Update followed the same methodology as the Phase 2 Study. A base case was developed and then several sensitivities were performed to determine whether the least-cost plan in the base case was also the least-cost plan or a low-cost plan under alternative but realistic future conditions. The fuel sensitivities analyzed in the study included a high coal price (escalation of 2.00 percent versus 0.95 percent in the base case), and a low natural gas price (escalation of 2.00 percent versus 3.31 percent in the base case).

The results of the updated base case analysis indicated the need for additional capacity in 2008 in the high-load case and 2011 in the low-load case, which eliminated the need for short-term capacity since Hugo 2 could be brought on-line in that timeframe. Should the high-load forecast scenario occur, WFEC has the option to recall additional capacity out of the existing GenCo facility prior to bringing Hugo 2 on-line (see discussion of GenCo in 4.1.3.2 below)

4.1.3 Existing Resources

4.1.3.1 Existing Generation Resources

WFEC generation facilities consist of 320 MW at the Mooreland Plant and 331 MW at the Anadarko Plant, both powered by natural gas delivered through WFEC's pipeline system. The Hugo facility currently provides 450 MW of coal-fired power. The Anadarko Plant currently consists of three gas-fired steam units and three gas-fired combined-cycle units. The Mooreland plant consists of three gas-fired steam units. The Hugo plant is a pulverized coal steam-electric generating unit. WFEC also has a firm power contract with SPA for delivery of 260 MW of power. Table 4-3 lists the capacity for each generating unit, type of fuel used, unit type, and ownership.

With the exception of a few MW of load at Clayton and Crowell in southeastern and western, Oklahoma, WFEC supplies all system requirements. Part of the power is delivered to members via transmission lines owned by other utilities. These deliveries are completed through wheeling agreements. The majority of wheeling is done through Oklahoma Gas and Electric (OG&E), lesser amounts are wheeled through lines owned by Public Service Company of Oklahoma (PSO), KAMO Electric Cooperative (KAMO), and SPA.

Table 4-3 WFEC Existing Generation Resources

Unit	Capacity	% Share	Fuel	Unit Type
Owner				
Mooreland				
1	53 MW	100	Gas	Steam
2	135 MW	100	Gas	Steam
3	135 MW	100	Gas	Steam
Anadarko				
1	15.5 MW	100	Gas	Steam
2	15.5 MW	100	Gas	Steam
3	46 MW	100	Gas	Steam
4	105 MW	100	Gas	Combined-cycle
5	105 MW	100	Gas	Combined-cycle
6	105 MW	100	Gas	Combined-cycle
Hugo	450 MW	100	Coal	Steam
Contract				
Blue Canyon	74.25		Wind	
Southwest Power Administration	260 MW		Hydro	Peaking

4.1.3.2 Existing Purchase Contracts

Part of the member power requirements are provided by a purchase power agreement with the SPA. The WFEC purchase power agreement with SPA allows for 260 MW of firm hydro capacity for peaking, but is limited to 312 gigawatt-hour (GWh) energy-per-year and 52 GWh energy in any one month. This contract's original term expired in 1997, but has been extended with the same capacity and energy restriction for an additional 15 years. In addition, SPA also provides supplemental power to WFEC beyond the agreement whenever this is available. Historically, this energy has been of the order of 300 GWh.

WFEC has entered into a purchase power agreement with Blue Canyon Windpower LLC (a company formed for this venture), for all of the energy produced from a 74.25 MW wind energy project. Blue Canyon is co-owned by Zilkha Renewable Energy of Houston, Texas and Kirmart Corporation of Wichita Falls, Texas. The project has the capability of producing 282,000 megawatt-hours (MWh) of energy per year. This will be taken as generated and blended into the WFEC generation mix.

WFEC is also meeting some of its needs through a power purchase agreement with GenCo, LLC, a wholly-owned subsidiary of WFEC, which includes two LM6000 gas turbines (91MW total) at WFEC's Anadarko plant. WFEC currently has 30 MW of capacity from the GenCo units. Coral Energy has the remaining 61 MW. Prior to the installation of a new unit at Hugo, WFEC will recall an additional 20 MW of peaking capacity from the GenCo facility. As noted earlier WFEC has the option of recalling additional capacity from GenCo if needed prior to Hugo 2 coming on-line.

4.1.3.3 Existing Demand Side Management Resources

Demand Side Management (DSM) refers to utility activities undertaken to modify the pattern of consumers' electricity usage. DSM programs can include tariff pricing mechanisms, load management techniques, and increased end-use efficiency. Nationally, energy savings attributed to DSM activities have declined over the period 1995-1999. The downward trend in DSM activity during that period is attributable to a number of factors including the higher efficiency of new generation, relatively low interest rates, the general increase in the efficiency of appliances and dwellings, and the passage of the 1992 Energy Policy Act, which reduced the willingness of utilities to implement programs not clearly cost-effective (Black & Veatch 2001). In 1999, approximately 86 percent of the energy savings achieved through DSM programs were attributable to investor-owned utilities while just over one percent was attributable to electric cooperatives.

No strict load management programs are currently being implemented by WFEC. However, some of the member coops are working toward the implementation of load management programs. This will reduce peak demand and will eventually reduce WFEC's peak demand which at this time cannot be clearly quantified. Two programs that are in place at WFEC are:

1. Curtailable Load through Rate Design – Through this program 90.9 MW of coincidence load can be controlled at WFEC's peak.

2. Efficiency Improvement through Rebate Program – This program is designed to improve the appliance efficiency of the existing customer by offering cash incentive to replace old, less efficient appliances with the new higher efficiency ones. Currently this program is available for water heaters and heat pumps whether they are replacements or new.

3. Peak Alert Program – As a power supplier, WFEC issues peak alerts on a possible peak day by noon to members, and in turn members call up their customers to "shave" (reduce) their loads. WFEC estimates this sheddable load to be 30-40 MW on peak.

A good way to control energy use is for consumers to be aware of how much energy they use each month and how it is being consumed in their home and on the farm. This involves learning how to read their meter, keeping track of their energy use, and using their meter as a tool to locate problems. In this way, consumers can budget their energy use just like they budget for groceries and other household items. WFEC and its member cooperatives have partnered with Oklahoma State University to develop a comprehensive online energy audit for the home.

4.1.3.4 Incremental Upgrades

The only incremental capacity addition initially considered (but later ruled out) by WFEC was the re-powering of the gas-fired steam generator at Mooreland Unit 3. WFEC forecasts assume that Anadarko Units 1, 2 and 3 (77 MW combined) and Mooreland Unit 1 (53 MW) would be retired in 2009.

4.1.3.5 Power Pool Member Resources

The SPP is a North American Electric Reliability Council - recognized reliability coordinator (a regional transmission organization) providing regional reliability coordination services to its members. As a reliability coordinator, SPP is responsible for reliability of the electric transmission system of its members and has the authority to direct actions required to maintain adequate regional generation capacity, adequate system voltage levels, and transmission system loading within specified limits. SPP currently consists of 48 members, serves more than four million customers, and covers a geographic area of 400,000 square miles containing a population of over 18 million people. SPP's current membership consists of 14 investor-owned utilities, 6 municipal systems, 8 generation and transmission cooperatives, 3 state agencies and 1 federal agency, 3 independent power producers, and 13 power marketers (SPP, Nov 2003). SPP's current operable capacity (including net power purchases of 2,974 MW) is 47,190 MW, with a mix of 41 percent coal, 41 percent gas, 3 percent oil, and 15 percent other.

SPP anticipates consistent growth in demand and energy consumption over the next 10 years. Adequate generation capacity will be available over the short term to meet native network load needs with committed generation resources meeting minimum capacity margins. Capacity margins are used to measure the amount of "extra" generating capacity that electric companies maintain to meet emergency demand situations. Beyond the short term, adequate capacity margins will be highly dependant on the capability of the market to provide the necessary generation resources. SPP is a summer-peaking region with projected annual peak demand and energy growth rates of 2.4 and 2.2 percent respectively, over the next 10 years. These demand growth rates are consistent with the 10-year historical growth rates of SPP.

The 2003 peak demand for the SPP region was 40,126 MW. Based on a growth rate of 2.4 percent the estimated summer peak demand for 2011 is 48,509 MW. The net internal demand, peak demand less interruptible demand and DSM, for the region was 38,706 MW for 2003. The net internal demand is compared to existing resources in Figure 4-3. This figure indicates the existing resources are not projected to meet capacity requirements of the region beyond 2011. In addition, by the 2006 timeframe, reserve margins for the region will no longer be met by existing resources.

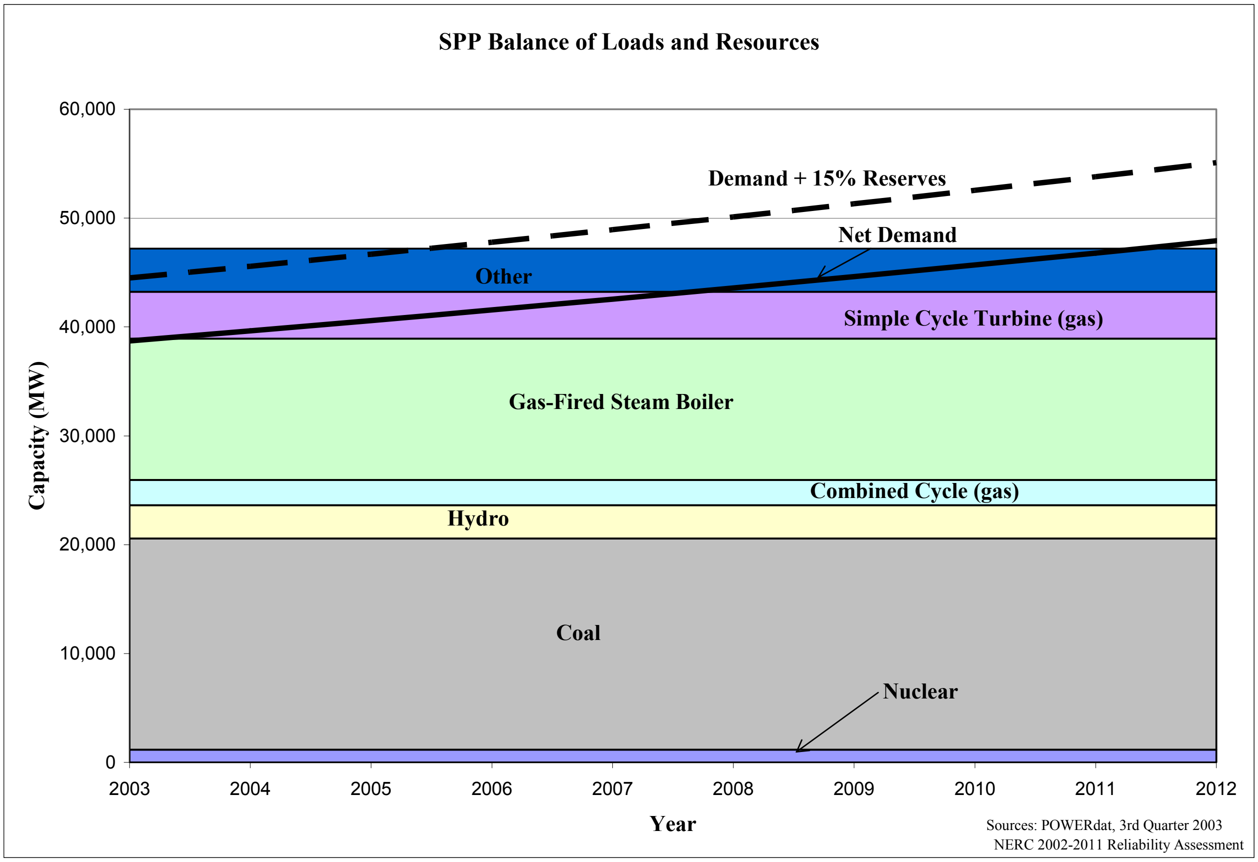
Energy requirements for the region are not yet available for 2002 or 2003. However, the energy used in 2001 was 193,590 GWh and was projected to increase at 2.2 percent annually through 2011. Based on this growth rate, the expected energy requirement for 2011 will be 240,653 GWh.

4.1.3.6 Transmission System Constraints

WFEC has a transmission system that covers approximately 75 percent of the state of Oklahoma and small areas in Texas and Kansas. The system is made up of 3,341 miles of transmission lines in Oklahoma, 98 miles in Texas, and 10 miles in Kansas. The system has 1,613 miles of 69-kV, 1,829 miles of 138-kV (of which 231 miles are operated at 69-kV), and 7 miles of 161-kV (but currently operated at 69-kV). The transmission network makes up a fairly well-looped 69-

kV system over most of the region, with 138-kV bulk transmission supporting the 69-kV at strategic points through 18 (138/69-kV) auto transformers.

Figure 4-3 SPP Balance of Loads and Resources



Interconnection with five neighboring utilities helps support the system during contingencies. The contracts for these interconnections have original terms of 10 to 20 years with a provision of a 2-year termination notice of the agreement or any individual interconnection after the original term. All existing interconnections are expected to continue during the study period.

WFEC has 240 substations and 15 low-voltage metering points serving members. High side voltage is 69-kV on 138 substations and 138-kV on 87 substations. The average load per station is approximately 4.35 MW and the average transformer capacity is 8.75 MVA. Total transformer capacity on substations is 2.2 GWA. Oklahoma Gas and Electric and Public Service of Oklahoma serve 27 of WFEC's total substations.

4.1.3.7 Characteristics of Energy Needs

WFEC's needs are for firm, base-load generation to meet their demand and energy requirements.

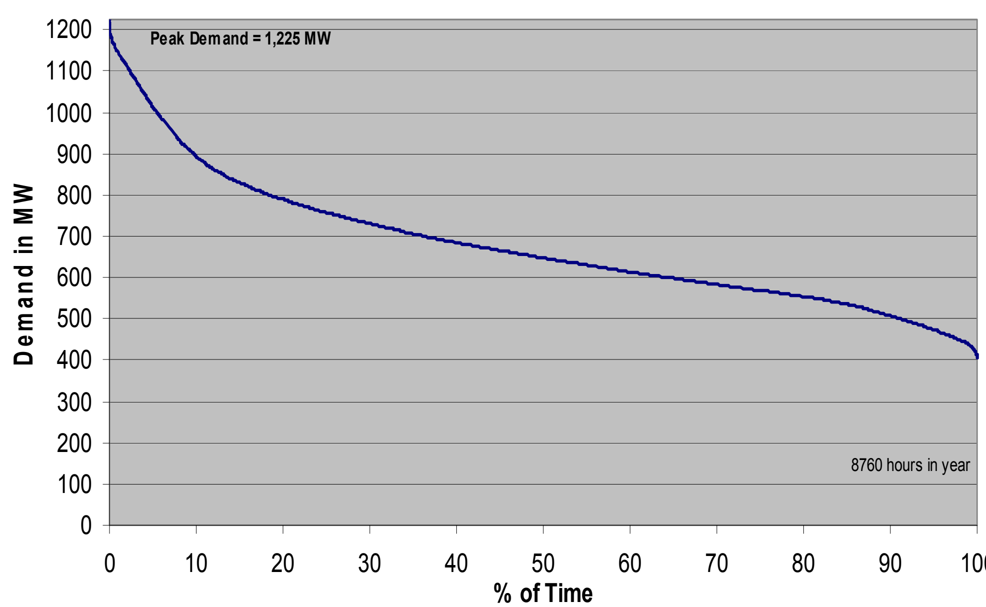
As discussed earlier, WFEC issued a Capacity Solicitation in 2002 to determine whether a cost-effective alternative to WFEC's self-build option exists. Four short-term capacity offers (2004-2009) were received. Two of the four offers were in-state units and were both recommended for the short-list.

Three long-term offers were also received. All would involve equity participation by WFEC. Detailed modeling indicated that none of these options are competitive as a true replacement for Hugo 2. In fact, the analysis indicated that all are more than $150,000,000 higher than the Hugo 2 option (Black & Veatch 2001).

The capacity solicitation also produced offers for wind energy. These proposals could not be relied on for firm capacity. However, because the offers appeared to lower WFEC's overall system energy costs, WFEC proceeded with negotiations with the short-listed wind developers.

Thus, the load shape for 2001 is currently being utilized for various studies. This 2001 load duration curve is shown in Figure 4-4.

Figure 4-4 WFEC Load Shape (Based on 2003)



4.2 BRAZOS ELECTRIC

The 2001-2020 Load Forecast was submitted to RUS for approval on January 10, 2003, following approval by the Brazos Electric Board of Directors on December 18, 2002. The study was approved by RUS via a letter dated June 2, 2003. A new study is currently underway and will be completed in the near future.

4.2.1 Demand Forecast

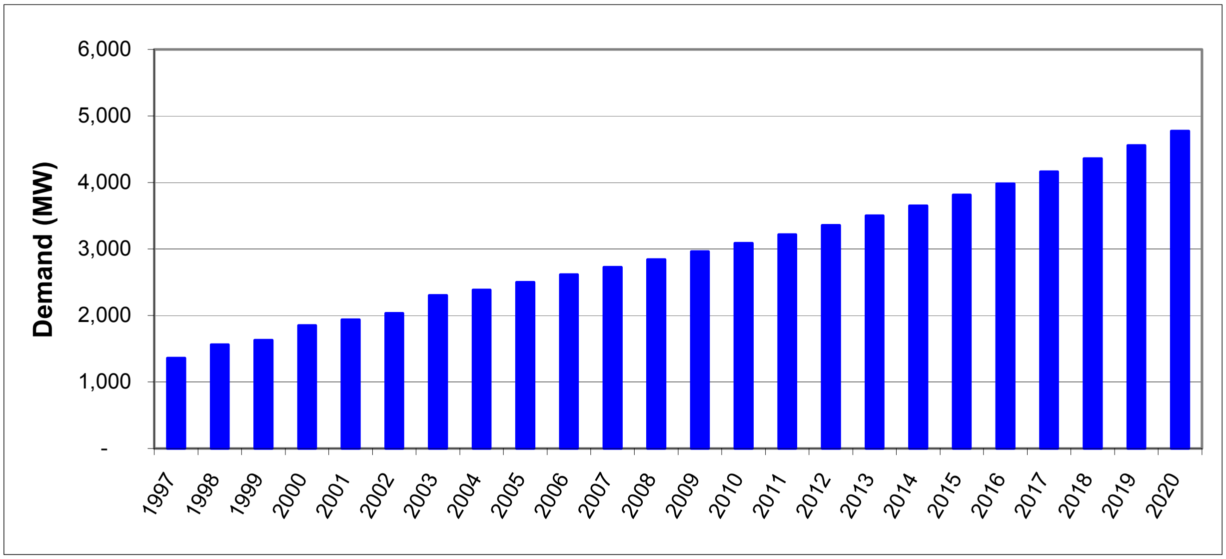
Econometric modeling is utilized for forecasting the residential and small commercial sectors of the member cooperatives. The member cooperatives independently forecast power requirements for the other classes including irrigation, large commercial, security lights, own use, public street and highway, etc. The summation of these energy requirements comprises the individual cooperative's total energy forecast. The summation of the individual wholesale customer system requirements comprises the Brazos Electric system forecast.

For the latter half of the ‘90s, customer growth and energy usage accelerated for most of the member cooperatives, rural and suburban, at a faster rate than indicated by previous load forecast’s, indicative of the strong growth of the Texas economy. A significant portion of Brazos Electric load continues to occur in the region surrounding the Dallas/Fort Worth (D/FW) Metroplex. Economic growth in the communities north of the D/FW Metroplex has continued to be stronger than expected.

Service certification was defined by the Public Utility Commission in the 1970s. As the D/FW Metroplex growth continues to expand outward, much of this growth is occurring in areas which are predominantly single-certified to be served by Brazos Electric member cooperatives. Thus, development of these areas has caused high growth rates for the cooperatives surrounding the Metroplex. Figure 4-5 depicts the historical and projected load growth including beneficiary and non-members.

The system peak can occur in either summer or winter depending upon the severity of the weather. In recent years, the system peaks have consistently occurred in the summer due to mild winter conditions. Generally speaking, if Brazos Electric does happen to set a peak during

Figure 4-5 Brazos Electric Historical & Forecasted Demand Requirements (Includes Beneficiary & Non-Member)



winter conditions, it has usually been surpassed during the following summer. Thus, for planning purposes, the annual peak is assumed to occur during summer conditions. Figure 4-6 illustrates the recent summer/winter peaks and Figure 4-7 illustrates the historical and forecasted energy usage including beneficiary and non-members.

Figure 4-6 Brazos Electric System Demand - Historical Values

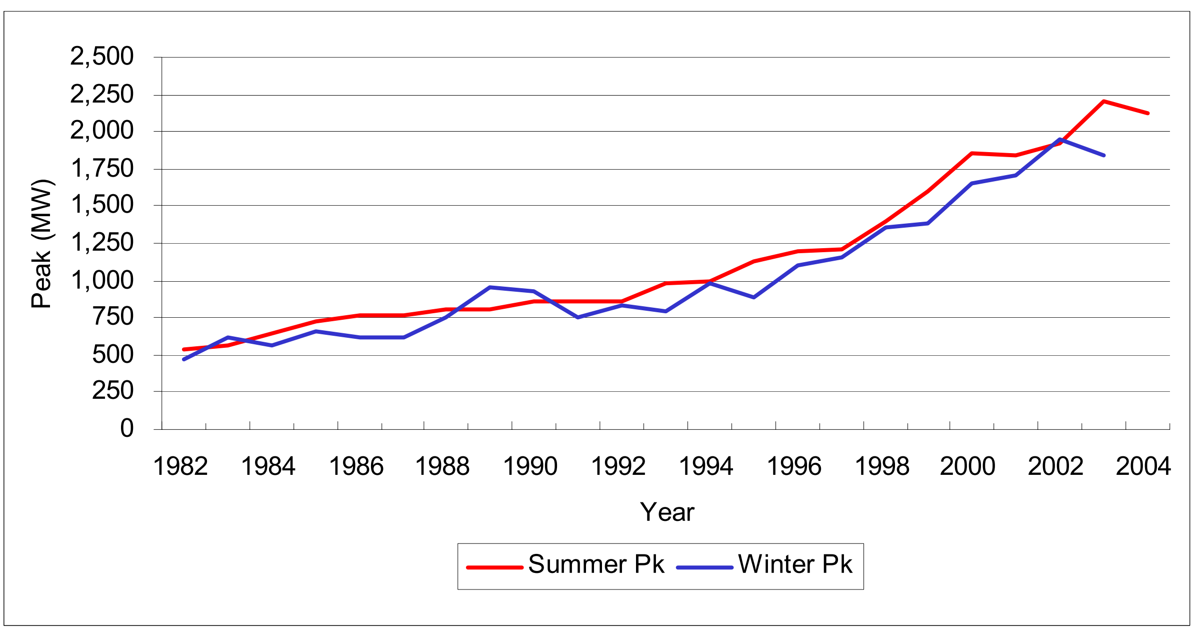


Figure 4-7 Brazos Electric Historical and Forecasted Energy Usage (Includes Beneficiary & Non-Member)

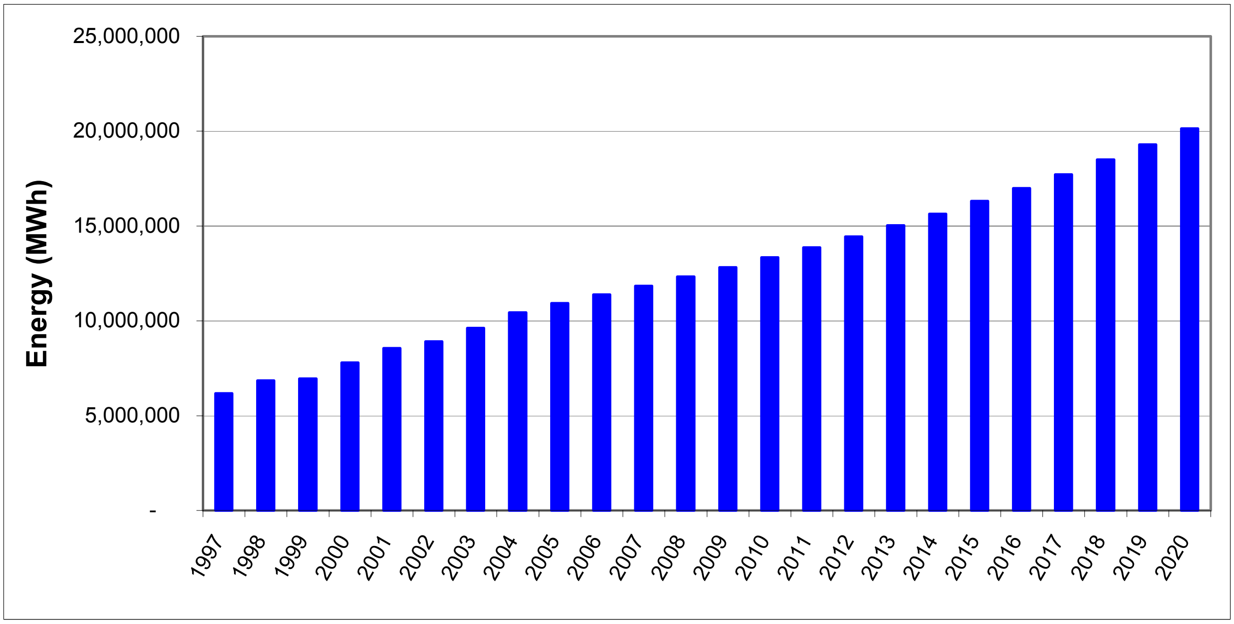


Table 4-4 shows the historic and forecast peak demand and energy growth rates for 1997-2020. Table 4-5 depicts the projected loads, projected capacity requirements, existing capacity and projected capacity deficits for 2001 – 2020.

4.2.2 Planning History

Brazos Electric has financed generation resources with RUS loan funds for over 50 years. RUS approved a loan guarantee for the Jack County Power Plant in 2004 based on Brazos Electric's needs for additional resources and those needs meet the financing requirement of RUS. [The Study is only part of the supporting document and not the only basis for making the loan recommendation].

ERCOT collects data from market participants and prepares an Annual Capability, Demand, and Reserves (ERCOT CDR) Report. The ERCOT CDR projects adequate reserves for the next 5 years.

The PUCT has indicated that a resource adequacy mechanism will be implemented when future ERCOT reserves are anticipated to fall below 12.5 percent.

Table 4-4 Brazos Electric Forecast of Demand and Energy

Year	Net Coincident Demand (MW)	Losses @ 2.0 %	Non-Member Diversified Load (incl. Losses)	Total Demand	Annual Energy (MWh)	Non-Member Energy (MWh)	Total Energy (MWh)	Growth Rate %
1997	1296[1]	25[1]	38[1]	1359[1]	5,969,691[2]	197,957[2]	6,167,648[2]	
1998	1492[1]	29[1]	42[1]	1563[1]	6,619,385[2]	232,460[2]	6,851,845[2]	11.1%[2]
1999	1546[1]	30[1]	52[1]	1628[1]	6,714,010[2]	236,559[2]	6,950,569[2]	1.4%[2]
2000	1772[1]	34[1]	46[1]	1852[1]	7,558,268[2]	241,481[2]	7,799,749[2]	12.2%[2]
2001	1845[1]	36[1]	56[1]	1937[1]	8,234,943[2]	319,835[2]	8,554,778[2]	9.7%[2]
2002	1938[1]	38[1]	58[1]	2033[1]	8,639,611[2]	270,214[2]	8,909,825[2]	4.2%[2]
2003	2200[1]	43[1]	60[1]	2303[1]	9,338,069[2]	279,467[2]	9,617,536[2]	7.9%[2]
2004	2307	44	34	2385	10,316,366	124,203	10,440,569	8.6%
2005	2420	47	35	2502	10,795,081	127,858	10,922,939	4.6%
2006	2531	49	36	2615	11,260,044	131,418	11,391,462	4.3%
2007	2638	51	37	2726	11,714,930	135,027	11,849,957	4.0%
2008	2750	53	38	2841	12,192,497	138,690	12,331,187	4.1%
2009	2868	55	39	2962	12,686,218	142,401	12,828,619	4.0%
2010	2989	58	40	3086	13,195,001	146,162	13,341,163	4.0%
2011	3114	60	41	3215	13,722,736	149,970	13,872,706	4.0%
2012	3251	63	42	3355	14,292,638	153,818	14,446,456	4.1%
2013	3390	65	43	3499	14,874,768	157,706	15,032,474	4.1%
2014	3536	68	44	3648	15,480,694	161,634	15,642,328	4.1%
2015	3698	71	45	3814	16,147,605	165,599	16,313,204	4.3%
2016	3860	75	46	3981	16,816,456	169,573	16,986,029	4.1%
2017	4035	78	48	4161	17,534,783	173,629	17,708,412	4.3%
2018	4230	82	49	4361	18,324,668	177,684	18,502,352	4.5%
2019	4424	86	50	4560	19,112,386	181,759	19,294,145	4.3%
2020	4635	90	51	4776	19,963,945	185,860	20,149,805	4.4%

Notes:

[1] Historical Actuals (note: 2.0% peak demand losses used for 1997-2001 (system only) to be consistent with current methodology)
Historical information includes Texas A&M University (service ended 6/30/04)
Member Beneficiary includes both integrated system & isolated load (served by Entergy and Lower Colorado River Authority (LCRA))

[2] Historical Actuals (note: 1.7% average losses used for 1997-2001 to be consistent with current methodology)
Forecasted load based on 2001-2020 load forecast, approved by RUS in a letter dated 6/03/03
Historical information includes Texas A&M University (service ended 6/30/04)
Member Beneficiary includes both integrated system & isolated load (served by Entergy and LCRA)

Table 4-5 Brazos Electric Load / Capacity Comparison
Member Beneficiary Load and Non-Member Load Requirements

	2001 [1]	2002 [1]	2003 [1]	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
System Load (MW)																				
Members Coincident Peak [2]	1,845	1,938	2,200	2,307	2,420	2,531	2,638	2,750	2,868	2,989	3,114	3,251	3,390	3,536	3,698	3,860	4,035	4,230	4,424	4,635
Losses @ 2.0%	36	38	43	44	47	49	51	53	55	58	60	63	65	68	71	75	78	82	86	90
Sub-Total	1,881	1,975	2,243	2,351	2,467	2,579	2,689	2,803	2,923	3,046	3,174	3,313	3,456	3,604	3,769	3,935	4,113	4,312	4,510	4,725
Non-Member Diversified Load (incl Losses)	56	58	60	63	65	67	69	71	73	75	77	79	81	83	85	87	88	89	90	91
Total	1,937	2,033	2,303	2,414	2,532	2,646	2,758	2,874	2,996	3,121	3,251	3,392	3,537	3,687	3,854	4,022	4,201	4,401	4,600	4,816
Reserve Requirements	231	243	275	286	300	314	327	341	355	370	385	402	419	437	457	477	499	523	546	572
System Peak w/ Reserve Req.	2,169	2,276	2,578	2,700	2,831	2,960	3,084	3,215	3,351	3,491	3,636	3,795	3,956	4,124	4,312	4,499	4,700	4,924	5,146	5,388
Resource Capacity without Proposed Capacity Addition (MW)																				
Miller Plant (Units 1,2,3) [3]	403	403	403	403	403	403	403	403	403	403	403	403	403	403	403	403	403	403	403	403
Miller Plant (Units 4,5)	208	208	208	208	208	208	208	208	208	208	208	208	208	208	208	208	208	208	208	208
N. Texas Plant	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75
San Miguel PPA	196	196	196	196	196	196	196	196	196	196	196	196	196	196	196	196	196	196	196	196
Tenaska PPA	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240
Hydro PPA	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54
(F) Full Requirements Contract - LCRA (ERCOT)	23	27	29	34	35	37	38	40	42	43	45	47	49	51	53	55	58	60	62	65
(G) Full Requirements Contract - Entergy (Non-ERCOT)	63	64	73	93	97	101	105	109	114	118	123	128	133	138	144	149	155	161	168	174
Purchase Contract - Mirant	716	884	956																	
Other Purchase Contracts	131	75	200	1450	800															
Available Capacity	2,109	2,226	2,433	2,752	2,108	1,313	1,319	1,325	1,331	1,337	1,344	1,350	1,357	1,365	1,372	1,380	1,388	1,397	1,406	1,415
Surplus (Deficit)	(60)	(50)	(145)	52	(724)	(1,647)	(1,765)	(1,890)	(2,021)	(2,154)	(2,293)	(2,444)	(2,599)	(2,760)	(2,940)	(3,119)	(3,312)	(3,527)	(3,741)	(3,973)

Notes
[1] Historical Actuals
[2] Members REACT Load
[3] Forecasted load Based on 2001-2020 Load Forecast, approved by RUS in a letter dated 6/03/03
[4] Reserve requirements computed at 12.5% (recommended by ERCOT Board)

4.2.3 Existing Resources

4.2.3.1 Existing Generation Resources

Brazos Electric owns and operates the Miller and North Texas generating stations. The Miller station consists of three conventional gas-fired steam generating units, with a combined capacity of 403 MW, and two simple cycle combustion turbine generating units with a combined capacity of 208 MW. The North Texas station consists of three conventional gas-fired steam generating units, with a combined capacity of 75.5 MW. Table 4-6 presents the available resources Brazos Electric has to meet requirements; the total capacity owned or under long-term contract is 1,176 MW.

Table 4-6 Brazos Electric Generation Resources

Existing Generation Resources				
Owner				
Unit	**Capacity**	**% Share**	**Fuel**	**Capabilities**
North Texas				
1	18 MW	100	Gas	Peaking
2	18 MW	100	Gas	Peaking
3	39.5 MW	100	Gas	Peaking
Miller				
1	75 MW	100	Gas	Peaking
2	120 MW	100	Gas	Peaking
3	208 MW	100	Gas	Peaking
4	104 MW	100	Gas	Peaking
5	104 MW	100	Gas	Peaking
Co-Owner				
San Miguel	195.5 MW	50	Lignite	Base-load
Contract				
Tenaska Ponderosa Pine Energy Partners, LP	240 MW		Gas	Intermediate-load
Whitney Dam (SPA)	30 MW		Water	Base-load / Peaking
Morris Sheppard (BRA)	24 MW		Water	Base-load / Peaking
Subtotal	1176 MW			
Generating Resources Under Construction				
Jack County	600 MW	100%	Gas	Intermediate
Total	1776 MW			

4.2.3.2 Existing Purchase Contracts

Brazos Electric purchases power from the following sources under long-term purchase agreements.

Table 4-7 Brazos Electric Long-Term Purchase Contracts

Contract	Capacity	Term through:
Integrated System		
San Miguel	195.5	June 30, 2020 (anticipate renewal)
Ponderosa Pine Energy Partners, LP	240.0	January 2, 2020 (Initial Term; may be extended for an additional 17-year Renewal Term)
Whitney Dam (SPA)	30.0	June 30, 2018 (anticipate renewal)
Morris Sheppard (BRA)	24.0	March 26, 2019 (anticipate renewal)
Isolated System		
LCRA (Full Requirements)	Varies	June 25, 2016 (anticipate extension)
Entergy (Full Requirements)	Varies	March 31, 2005 (anticipate renewal)

Brazos Electric has agreements to purchase capacity and energy at defined heat rates (heat rate call options) from Calpine Energy Services (300 MW) through December 31, 2005; BP Energy (250 MW) through December 31, 2005, with an option for continuation through March 31, 2006; and Constellation (250 MW) through December 31, 2005. The Calpine agreement requires that Brazos Electric schedule a minimum of 100 MW during the period from Hour Ending ("HE") 7:00 a.m. through HE 10:00 p.m. each day. The agreements permit Brazos Electric to schedule the remaining amounts of energy on a day-ahead basis. The Calpine and Constellation agreements also allow intra-day changes to the hourly schedules.

In addition, for 2004 Brazos Electric has agreements to purchase 50 MW of base-load capacity from TXU Generation (PUCT mandated Capacity Auction Entitlements), 50 MW of peaking capacity from Bryan Texas Utilities, and 100 MW of peaking capacity from Coral Power.

For the peak period of July - August, 2005, Brazos Electric plans to purchase 650 MW of capacity under annual and monthly forward contracts. Varying amounts of capacity will be purchased for other periods during 2005.

Brazos Electric purchases additional energy on a monthly or daily basis in the bi-lateral market in ERCOT.

For the isolated system load, Brazos Electric purchases full-requirements service from Entergy Gulf States and LCRA.

Table 4-8 Brazos Electric Short-Term Purchase Contracts

Contract	Capacity	Term Through:
Calpine Energy Services	300 MW	December 31, 2005
BP Energy	250 MW	December 31, 2005
Constellation	250 MW	December 31, 2005
Bryan Texas Utilities	50 MW	December 31, 2004
Coral Power	100 MW	December 31, 2004

4.2.3.3 Existing Demand Side Management Resources

Brazos Electric conducted a direct load control pilot project from June 1993 through June 1994, and found that the expenditures required were not justified. With the introduction of retail customer choice in the ERCOT region of Texas, utility-sponsored load management programs have been terminated. Brazos Electric Board Policy No. 316 provides that member cooperatives may utilize targeted demand-side resources under their control to supply up to 5 percent of their peak demand. A number of member cooperatives utilize voltage reduction schemes that may be implemented through their distribution supervisory control and data acquisition systems. The anticipated effect of load management on forecast loads and Brazos Electric's power supply requirements is minimal. Use of load management as a power supply alternative was not considered in the study.

With the introduction of retail customer choice in the ERCOT region, most utility-sponsored energy conservation programs have been terminated. Brazos Electric committed to providing funding for low-income conservation programs in 1999, but available funds have typically not been spent. The anticipated effect of such conservation programs on forecast loads and Brazos Electric's power supply requirements is minimal. Use of energy conservation as a power supply alternative was not considered in the study.

Brazos Electric Board Policy No. 316, Customer Controlled Distributed Resources, provides that member cooperatives may utilize distributed generation, energy storage, or targeted demand-side resources under their control to supply up to 5 percent of their peak demand. The capacity of distributed generation resources used by members in not expected to be significant. The anticipated effect of such resources on forecast loads and Brazos Electric's power supply requirements is minimal. Use of distributed generation as a power supply alternative was not considered in the study.

The anticipated effect of load control and conservation programs, and distributed generation resources used by members on Brazos Electric's power supply requirements is minimal.

4.2.3.4 Incremental Upgrades

No upgrades or deratings to generation resources are planned or projected.

4.2.3.5 Power Pool Member Resources

ERCOT is the corporation that administers the state's power grid. ERCOT is one of 10 regional reliability councils in North America. As one of the largest control areas in the United States, the organization serves seven million customers and oversees the operation of over 78,000 MW of generation and 37,500 miles of transmission lines in the State of Texas. ERCOT serves approximately 85 percent of the state's electric load and 75 percent of the geographic land area in Texas.

ERCOT's members include retail consumers, investor and municipally owned electric utilities, rural electric co-ops, river authorities, independent generators, power marketers, retail electric providers and independent members. ERCOT's current membership presently consists of 158 members including 38 cooperatives, 20 municipals, 9 investor-owned utilities, 18 independent generators, 18 independent power marketers, 25 independent retail electric providers, 28 consumers, and 2 adjunct.

ERCOT is divided into three planning regions, North South, and West. Total load coincident with ERCOT peak in 2002 for the North Region was 27,028 MW. Total generation in the North Region in 2003 was 39,676 MW. The North Region has a historical growth rate of 7 percent between 1997 and 2002 and has a projected load growth of 2.8 percent between 2004 and 2008.

The annual growth rates for peak demand range from 2.2 percent (actual annual growth rate between 1998 and 2003) to 2.8 percent (ALDR data). The capacity includes known planned generation with signed interconnection agreements and considers potential retirements based on the in-service dates for the units.

The largest load centers do not have corresponding capacity in the immediate area. Both the Dallas/Fort Worth and the Houston areas are highly dependent on the transmission system to provide power from surrounding areas in order to serve their loads. As load continues to grow, transmission additions and upgrades will be necessary to continue reliable load service.

A detailed analysis of ERCOT constraints is included in the "Report on Existing and Potential Electric System Constraints and Needs Within the ERCOT Region", dated October 13, 2003.

4.2.3.6 Transmission System Constraints

Brazos Electric operates a transmission system located in the north central portion of Texas covering 66 counties. The transmission system consists of 1,405 miles of 69-kV lines, 1,046 miles of 138-kV lines, and 96 miles of 345-kV lines.

The transmission systems in ERCOT are regulated under the jurisdiction of the PUCT. Under Texas Senate Bill 7 (SB7) the PUCT designated ERCOT as the Independent System Operator for the interconnected transmission systems in Texas.

Brazos Electric, an electric cooperative and member of ERCOT, is governed primarily by the PUCT for the transmission facilities that operate at or above 60-kV. The PUCT has bylaws or rules that outline its authority and the responsibilities of utilities in Texas. Substantive Rule 25 applies to Electric Service Providers in ERCOT. Brazos Electric functions as a Transmission Service Provider (TSP) and Distribution Service Provider (DSP) as defined in this Rule. Brazos Electric is also a transmission customer of the ERCOT system as defined by this Rule and as such the rules and rights for use of the open access transmission system apply. The open access right is based on the principle that all transmission customers have equal access to the ERCOT transmission grid on a non-discriminatory basis.

The rule clearly states the terms and conditions that govern transmission access for Electric Service Providers operating within ERCOT. It defines transmission service providers (TSPs) to include river authorities and other electric utilities, municipally-owned utilities, and electric cooperatives.

Substantive Rule 25 provides language regarding service to transmission customers and the obligation to provide transmission service. It states that a TSP or a DSP that owns facilities for the delivery of electricity to a transmission service customer purchasing electricity using facilities rated at less than 60 kilovolts shall provide the customer access to its facilities on a non-discriminatory basis. A TSP or DSP shall provide access to its facilities at the distribution level to a transmission service customer, in order to transmit power to a retail customer in an area in which the transmission service customer has the right to provide retail electric service." Such service is to be provided on a non-discriminatory basis and in accordance with the Public Utilities Regulatory Act.

Section 25.191(d) covers transmission service to generating customers. It states that a TSP shall interconnect its facilities with new generating sources and construct facilities needed for such an interconnection. A TSP is to use all reasonable efforts to communicate promptly with a power generation company to resolve any questions regarding the requests for service in a non-discriminatory manner. If a TSP or a power generation company is required to complete activities or to negotiate agreements as a condition of service, each party shall use due diligence to complete these actions within a reasonable time.

Regarding the terms and conditions for transmission service, Section 25.195 states "As a condition to obtaining transmission service, a transmission service customer that owns electrical facilities in the ERCOT region shall execute interconnection agreements with the transmission service providers (TSPs) to which it is physically connected.

The responsibilities of the TSP may include construction of new facilities. Specifically the rule indicates that…"If additional transmission facilities or interconnections between TSPs are needed to provide transmission service pursuant to a request for such service, the TSPs, where the constraint exists, shall construct or acquire the facilities necessary to permit the transmission service to be provided in accordance with good utility practice unless ERCOT identifies an alternative means of providing the transmission service that is less costly, operationally sound, and relieves the transmission constraint at least as effectively as would additional transmission facilities". However, the generating customer is also obligated to provide a portion of the interconnection facilities. When an eligible transmission service customer requests transmission service for a new generating source that is planned to be interconnected with a TSPs transmission network, the transmission service customer is responsible for the cost of installing step-up transformers to transform the output of the generator to a transmission voltage level and protective devices at the point of interconnection capable of electrically isolating the generating source owned by the transmission service customer."

More TSPs responsibilities are included further in the section where it mentions other arrangements such as a Certificate of Convenience and Necessity (CCN). Specifically, the rule directs the TSP to plan, construct, operate and maintain its transmission system in accordance with good utility practice, which includes sufficient transmission capacity to ensure adequacy and reliability of the network to deliver power to transmission service customer loads. The TSP should plan, construct, operate and maintain facilities that are needed to relieve transmission constraints, as recommended by ERCOT and approved by the PUCT. If a TSP determines a need to construct new facilities necessary to provide transmission service, the certificate of convenience and necessity (CCN) is subject to PUCT approval. The TSP has the responsibility to obtain the CCN and approval from the PUCT for these new projects.

A transmission service customer, in this case Brazos Electric's new generation, will have some requirements when making a request for service. There are conditions for initiating transmission service. Section 25.198 covers these conditions in detail. Section (b) states "Subject to the terms and conditions of this section and in accordance with the ERCOT protocols and commission-approved tariffs, the TSP will provide transmission service to any transmission service customer provided that: (1) the transmission service customer has complied with the applicable provisions of the ERCOT protocols; (2) the transmission service customer and the TSP have completed the technical arrangements set forth in subsection (e) of this section; and (3) if the transmission service customer operates electrical facilities that are interconnected to the facilities of a TSP, it has executed an interconnection agreement for service under this section or requested in writing that the TSP file a proposed unexecuted agreement with the commission." Thus the transmission service customer is bound to comply with ERCOT protocols including the generation interconnect procedures and execute an interconnection agreement.

As stated above a transmission service customer requesting transmission service must comply with the ERCOT protocols. ERCOT may require a system security screening study to insure that the transmission system is adequate to accommodate the service. If ERCOT determines that additions or upgrades to the transmission system are needed to supply the transmission service customer's forecasted transmission requirements the TSP will initiate a facilities or full interconnect study. When completed, this study will include an estimate of the cost of any required facilities or upgrades needed and the time required to complete such construction and initiate the requested service.

Technical arrangements to be completed prior to commencement of service are detailed in the interconnection agreement between the transmission service customer and the TSP. The interconnection agreement also provides that transmission service shall be conditioned upon the transmission service customer's constructing, maintaining and operating the facilities on its side of the point of interconnection that is necessary to reliably interconnect to the transmission system.

The complete set of PUC Substantive Rules can be found at the PUC website at www.puc.state.tx.us/rules/subrules/electric/index.cfm. Additional information is also available in the *Report on Existing and Potential Electric System Constraints and Needs Within the ERCOT Region* (October 1, 2003).

4.2.3.7 Characteristics of Energy Needs

Based on the 2002 Power Supply Study, Brazos Electric concludes that the combination of (1) installing 500 MW of combined-cycle generation in the ERCOT North commercially significant constraint (CSC) Zone, and (2) contracting with power generation companies and/or power marketers for the remainder of its capacity and energy requirements, and (3) developing appropriate hedging strategies for managing risks provide the most reliable, least cost, and least risk alternative for meeting the power supply requirements of member cooperatives and wholesale customers. Current conditions in the economy and the electricity market provide an excellent opportunity for building low cost generation. Interest rates and equipment prices are at or near historic lows. Architect/Engineering firms and contractors are hungry for new business as their role in completed and cancelled generation projects winds down.

According to the 1999 Load Forecast, demand in the Brazos Electric Integrated System will increase from 1,918 MW in 2001 to almost 4,000 MW in 2018. Brazos Electric's need for additional capacity is forecast to increase from approximately 1,600 MW in 2006 to over 3,500 MW in 2018.

In Phase I of the 2002 Power Supply Study, Brazos Electric's consultant assessed the ERCOT market for capacity and energy prices, and evaluated the impact of market prices on Brazos Electric's cost under various scenarios. In addition to the base case, the study included scenarios for high-, low-, and mid-range fuel prices; low and boom/bust cycle cases for merchant plant development; low cost and high cost cases for emissions; weak and strong economy, and mild and severe weather cases for load growth; and south-north transmission limitations. The study concluded that owning combined-cycle generation was beneficial, and recommended that Brazos Electric evaluate building new generation capacity.

In Phase II, Brazos Electric and its consultant evaluated the cost of various self-build generation alternatives; issued a RFP for (1) a full-requirements contract, (2) ownership of new or existing generation, and (3) purchases of capacity and energy; and analyzed the proposals submitted. This phase of the study concluded that a combination of building 500 MW of combined-cycle generation, and purchasing capacity and energy provides the lowest total revenue requirements.

In Phase III, Brazos Electric continued analysis of the costs for various power supply alternatives. Annual revenue requirements and the net present value (NPV) of revenue requirements for combinations of building 500 MW of generation and 5-year capacity purchases were compared. Cases with combinations of the following alternatives consistently rank among the lowest NPV:

- Building 500 MW of combined-cycle generation in 2005 or 2006
- Purchasing 500 MW of capacity and energy from C&E Bidder A
- Purchasing 250 MW of capacity and energy from C&E Bidder F.

The NPV for from five to seven of the cases varied by less than one percent, indicating the combinations produced almost identical results.

Congestion costs have differing impacts on the capacity purchase alternatives. Cases with combinations of the same power supply alternatives continued to rank among the lowest NPVs, but combinations that included the C&E Bidder F alternative had slightly higher NPVs. The NPV for from six to seven of the cases varied by less than one percent, indicating the combinations produced almost identical results.

Based on these analyses, the Brazos Electric Board of Directors approved negotiations with C&E Bidder A and Bidder F, and further study of building 500 MW of combined-cycle generation.

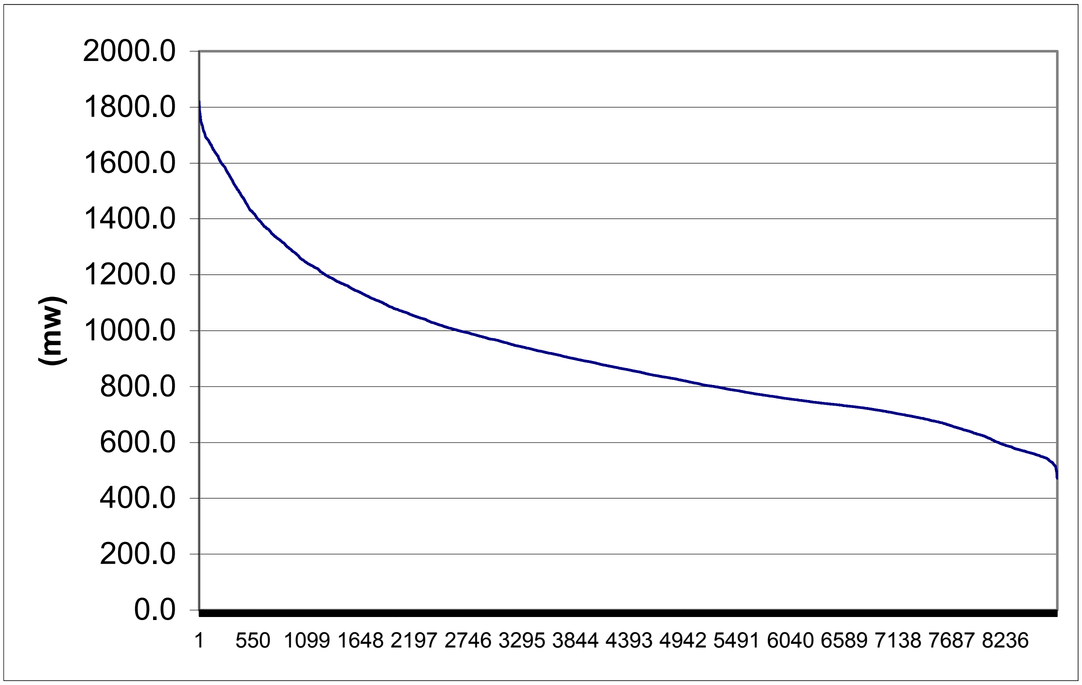
Phase II of the 2002 Power Supply Study also evaluated scenarios that included coal-fired generation additions. Total revenue requirements for self-build additions of (i) 1000 MW of coal-fired capacity, (ii) 1000 MW of combined cycle gas-fired capacity, and (iii) a combination of 500 MW of coal-fired capacity and 500 MW of combined cycle gas-fired capacity compared favorably. For later years of the study, including the period from 2008 through 2016, total revenue requirements for the 1000 MW additions were lower than those for 500 MW additions based on the price assumptions for market capacity and energy. The study also indicates that Brazos Electric's increasing energy needs require that low cost, base-load energy sources be available. Brazos Electric is conducting additional studies with updated market capacity and energy pricing forecasts and Hugo 2 site-specific cost estimates.

Analysis has shown that the calendar year 2001 was fairly "typical" or normal in terms of weather impact (heating degree days and cooling degree days). Thus, the load shape for 2001 is currently being utilized for various studies. This 2001 load duration curve is shown in Figure 4-8.

4.2.4 Need Summary Conclusion

As is described in detail in the preceding sections, both Brazos Electric and WFEC have need for additional base-load capacity in the 2009-2010 time period. Studies indicate that Hugo 1 and 2 would operate at a high capacity factor based on economic dispatch. That is, the two coal units would be run at a higher priority relative to other more costly units within Brazos and WFEC's systems, respectively. [The preceding section showed that additional capacity is needed but it is not clear to me how it was determined that base-load capacity is needed.] B&V report shows that the two units would be at a high capacity factor based on economic dispatch.

Figure 4-8 Brazos Electric Load Shape (Based on 2001)



5.0 CAPACITY ALTERNATIVES

5.1 WESTERN FARMERS

5.1.1 Load Management

As noted earlier, few load management options are available to greatly affect WFEC expected load growth. Such programs have been tried in the past and found not to be cost-effective. Therefore no additional programs are currently planned.

5.1.2 Renewable Energy Sources

Based on the expected future base-load energy needs of WFEC, the solar and wind energy technologies, while innovative and environmentally preferable, do not provide a reliable generation source for meeting base-load requirements. This is due in large part to their dependence on uncontrollable factors (i.e. the wind and sun) and the relatively large land requirement per MW of capacity of these technologies. Nonetheless they can be considered as a potential source of energy during ideal conditions.

Oklahoma's newest renewable energy venture, Blue Canyon Wind Farm, began commercial operation on December 23, 2003. In an agreement with Blue Canyon Windpower LLC, WFEC is purchasing all of the electricity produced from this 74.25 MW wind energy project.

Solar energy (photovoltaic) was evaluated as a non-combustible renewable technology. However, no solar sites have been identified in Oklahoma that may be suitable for the type of commercial applications WFEC requires for development of this resource. Nonetheless WFEC continues to follow commercial advances in solar photovoltaic technology.

In general, renewable technologies hold promise for certain applications and in certain locations. Their use is on the rise as the technologies mature and the costs come down. At this time, however, these technologies are still expensive and most are not feasible in WFEC's service territory. In addition, as would relate to providing for the needs of WFEC's customers, these alternative technologies also exhibit various operational and reliability issues.

There are several hydroelectric generating sources in Oklahoma operated by the Grand River Dam Authority, the US Army Corps of Engineers, and the Oklahoma Municipal Power Authority. These entities have taken advantage of the limited sites for hydro in the state. No areas that would offer a suitable location (i.e. economical based on hydraulic head and/or environmental permittability) for new hydroelectric facilities remain.

5.1.3 Distributed Generation

Fuel cells, micro-turbines, internal combustion engines and battery energy storage systems were briefly considered to meet WFEC's needs and rejected. Fuel cells are not currently economical on a commercial electric generation basis. Microturbines, while increasingly becoming an element of an overall resource planning strategy, are not cost effective as a primary source of meeting overall customer requirements. Microturbines will continue to provide an option for niche power requirements where lack of transmission access, footprint limitations, and low load factor situations exist. Internal combustion engines (i.e. diesels) are used throughout the country for smaller generation needs. A large engine could produce approximately 15 MW of power, which means that about 50 such engines would be needed to be distributed throughout the project service territory to replace the centralized generation of Hugo 2.

5.1.4 Fossil Fuel Generation

The following sections apply to central station projects as opposed to distributed generation.

5.1.4.1 Natural Gas

Natural gas-fired generation was evaluated and determined to not be a preferred option for base-load energy generation due to the higher fuel costs and volatility of natural gas prices. Natural gas-fired generation can be developed using either simple-cycle or combined-cycle combustion turbine technology, or used as boiler fuel. Simple-cycle combustion turbine technology is a relatively lower capital cost but also lower efficiency alternative that is primarily used to meet peak electrical demands. Combined-cycle plants provide a higher level of efficiency with a capability to cycle daily (but with an associated higher capital cost) and therefore are better suited to intermediate electrical demands.

The basic principle of the combined-cycle plant is to utilize the natural gas to produce power in a gas turbine - which can be converted to electric power by a coupled generator - but also use the hot exhaust gases from the gas turbine to produce steam in a Heat Recovery Steam Generator (HRSG). This steam is then used to create electric power with a coupled steam turbine and generator.

The use of both gas and steam turbine cycles in a single plant to produce electricity results in high conversion efficiencies and low emissions. The gas turbine (Brayton) cycle is one of the most efficient cycles for the conversion of gas fuels to mechanical power or electricity. Adding a steam turbine to the cycle to utilize the steam produced by the HRSG increases the efficiencies to the range of 52 to 58 percent. Gas turbine manufacturers are continuing to develop high temperature materials to raise the firing temperature of the turbines and increase the efficiency. They are also developing cooling techniques to allow higher firing temperatures.

Both simple-cycle and combined-cycle options were studied in detail during WFEC's 2001 Planning Study (Black & Veatch 2001). Cost estimates were developed for the following options: simple-cycle 501D (101 MW), 501F (134 MW), 7EA (106 MW), LM6000 (41.7 MW) and a 2-on-1 501F combined-cycle facility (550 MW). Due to the relatively high cost of fuel, none compared favorably with the solid fuel options. Since that study, natural gas prices have risen to $4.31 per million Btu (as of September 9. 2004).

5.1.4.2 Oil

Similarly, the high cost of oil (in the range of $8.35 per million BTU on September 9, 2004), which could theoretically be used in the simple-cycle and combined-cycle facilities described above under natural gas, and as boiler fuel, would not be competitive with other solid fuel options. In addition, the significantly greater emissions of pollutants from oil-fired facilities suggest that such a facility would have a much greater impact on regional air quality. Therefore, oil-fired generation was ruled out as a viable option.

5.1.4.3 Coal

WFEC's evaluated several coal technologies to meet their needs, including circulating fluidized bed (CFB), integrated gasification combined-cycle (IGCC) and pulverized coal (PC).

Fluidized Bed

The combustion process within a fluidized bed boiler occurs in a suspended bed of solid particles in the lower section of the boiler. Combustion within the bed occurs at a slower rate and lower temperature than a conventional pulverized coal boiler. Deviations in fuel type, size or British Thermal Unit (BTU) content have minimal effect on the furnace performance characteristics. The bed also allows for re-injection of a sorbent, such as fly ash or limestone, to reduce emission levels.

This technology is well suited to burn fuels with large variability in constituents. Plant sites with access to an abundant source of fuel that presents combustion challenges in a pulverized coal boiler (such as waste coal or tires) are typically good prospects for application of fluidized bed technology. Currently, fluidized bed units are limited to approximately 250 MW

Integrated Gasification Combined-cycle (IGCC)

IGCC produces a low calorific value syngas from coal or solid waste to be fired in a combined-cycle or utility boiler. Gasification is a proven technology utilized extensively for chemical production of products such as ammonia for fertilizer. Utilizing coal as a solid feedstock to a gasifier is currently under development for projects jointly funded by the Department of Energy (DOE) at several power plant facilities throughout the US. The gasification process represents a link between solid fossil fuels such as coal and existing gas turbine technologies.

Much of future technology development will be supported through government support of clean coal technology within the power industry. Operational flexibility for rapid start-up and load following remains to be demonstrated and may be required for an IGCC plant to compete effectively within the current US power market.

Significant design issues have limited coal gasification units from achieving acceptable availability levels. Some of the design issues include fouling within the syngas cooler, design of the pressurized coal feeding system, molten slag removal from the pressurized gasifier, durability of gas clean-up equipment and solid particulate carryover resulting in erosion within the combustion turbine. The complexity of the combined-cycle unit in conjunction with the reliability of numerous systems including the gasifier, O_2 generator, air separation unit and multiple scrubbers tends towards reduced plant availability. The current generation of IGCC plants should be capable of operation at availability of around 75 percent compared to around 90 percent for conventional plants.

IGCC projects in the US have been plagued with technical difficulties and an additional generation of units incorporating cost reduction strategies will be required prior to US commercial implementation. The DOE has not yet defined additional projects that will complete development of technology required to support their current goal of $1,000/kW capital cost for IGCC plants utilizing a coal feedstock by 2008. Based on challenges encountered in the coal gasifier units, additional development may refocus on utilization of waste liquids, pet coke and other solid fuels that have demonstrated superior performance compared to coal. The current DOE Vision 21 Program provides joint project funding for integrating fuel cells into the IGCC cycle to achieve in excess of 50 percent overall plant efficiency.

Acceptance of coal within the power industry and the relative price of natural gas will also influence the future development and commercialization of IGCC in the US. The technical barriers to commercialization still remain to be addressed through future generations of government jointly-funded coal IGCC facilities. Once the development effort has been successfully completed, coal-fueled IGCC technology appears to have the potential to be the long-term future for clean-coal generation within the United States.

Pulverized Coal (PC)

Conventional PC technology is a reliable energy producer around the world and can be characterized by the maximum operating pressure of the cycle. Coal is supplied to the unit through coal bunkers, then to the feeders and into the pulverizers where the coal is crushed into fine particles. The primary air system transfers the coal from the pulverizers to the steam generator burners for combustion. Flue gas is transferred from the steam generator, through a selective catalytic reducer (SCR) for NOx reduction and into an air heater. From the air heater it flows to an SO2 scrubber system and a particulate removal system.

The operating pressure of conventional coal-fired power plants can be classified as subcritical and supercritical. Subcritical and supercritical technology refers to the state of the water that is used in the steam generation process. The critical point of water is 3208.2 psi (pounds per square inch) and 705.47 °F. At this critical point, there is no difference in the density of water and steam. At pressures above 3208.2 psi, heat addition no longer results in the typical boiling process in which there is an exact division between steam and water. The fluid becomes a composite mixture throughout the heating process. Supercritical units, which are slightly more expensive, are somewhat more efficient than subcritical units.

Subcritical power plants utilize pressures below the critical point of water in which there is a distinct difference in the state of the liquid. The majority of the steam generators built in the United States utilize subcritical technology. These units utilize a steam drum and internal separators to separate the steam from the water.

In general, the steam cycle consists of one steam generator and one steam turbine generator. The balance of plant equipment consists of a condenser, condensate pumps, low-pressure feedwater heaters, deaerating feedwater heater, boiler feedwater pumps and high-pressure feedwater heaters.

In the steam generator, high-pressure steam is generated for throttle steam to the steam turbine. The steam conditions are typically 2,400 psig and 1,000 °F at the steam turbine inlet. The steam expansion provides the energy required by the steam turbine generator to produce electricity. A portion of the steam is also extracted to the feedwater heaters and is supplied to the boiler feedwater pump turbines.

The steam turbine exhausts to a condenser where the steam is condensed. The heat load of the condenser is typically transferred to a wet cooling tower system. The condensed steam is then returned to the steam generator through the condensate pumps, low-pressure feedwater heaters, deaerating heater, boiler feed pumps and high-pressure feedwater heaters.

Most subcritical units utilize a deaerating feedwater heater as the last low-pressure feedwater heater before the boiler feedwater pumps. This helps remove oxygen from the feedwater before entering the steam generator. Some operating units utilize a closed feedwater system in lieu of a deaerating feedwater heater with a deaerating condenser included in the system.

As part of WFEC's Capacity Planning Study all three technologies (Fluidized bed, IGCC, and PC) were evaluated. A pulverized coal unit was found to have the lowest installed cost and the lowest fixed operations and maintenance costs of the three options and was selected as the preferred coal technology.

5.1.5 Repowering/Uprating of Existing Generating Units

WFEC considered the repowering of Mooreland 3 in the 2001 Capacity Planning Study. This could be accomplished by the addition of a simple-cycle combustion turbine, or a 1-on-1 combined-cycle unit. The advantage was that such a unit could be brought on line during the period when the Hugo 2 was being built. A re-evaluation in 2003 indicated that repowering of Mooreland 3 would be less viable than Hugo 2 and that the market would dictate whether it compared favorably with power purchases.

5.1.6 Participation in Another Company's Generation Project

The study also evaluated the economics of combined operation with the Kansas Electric Power Cooperative (KEPCo). KEPCo has partial ownership of Wolf Creek nuclear plant and access to other cost-effective generation. Results of the analysis indicated that although there is the potential for cost-effective joint dispatch on the combined systems, the benefits have not been found to be substantial enough to generate an agreement between WFEC and KEPCo.

5.1.7 Purchased Power

As discussed earlier, WFEC conducted an RFP process to identify all means to cost-effectively meet its capacity and energy requirements in the planning horizon. Purchased power was one of the options evaluated. None resulted in an advantage over the addition of a second unit at the Hugo Plant.

5.1.8 New Transmission Capacity

WFEC is currently conducting studies of their transmission system (in coordination with the SPP) to determine the system constraints within the region that would preclude the transfer of capacity over the existing grid adequate to serve their forecasted resident load and that will determine any transmission system upgrades needed to interconnect and deliver the power and energy from the proposed project.

5.2 BRAZOS ELECTRIC

5.2.1 Load Management

No load management or energy conservation programs are pending implementation or being considered by members. Therefore, no impact on forecast loads and Brazos Electric's power supply requirements is expected.

5.2.2 Renewable Energy Sources

Brazos Electric's contracted resources include 54 MW of hydroelectric generation. Brazos Electric Board Policy No. 316, Customer Controlled Distributed Resources, excludes facilities with a demand of less than 5 kW. As a result, member cooperatives may purchase excess energy from retail customers that install small renewable energy resources. While Brazos Electric is aware of one proposed renewable energy source being considered by a member (about 2.5 MW), the anticipated effect of renewable resources on forecast loads and Brazos Electric's power supply requirements is considered to be minimal. Use of new renewable energy resources as a power supply alternative was not considered in the study.

5.2.3 Distributed Generation

One member has contracted for 2.25 MW of distributed generation. Brazos Electric is unaware of any other proposed distributed generation capacity being considered by a member.

As was noted under the WFEC discussion, none of the distributed generation sources are suitable to meet Brazos Electric's need for a large quantity of base-load generation

5.2.4 Fossil Fuel Generation

The following section applies to central station projects versus distributed generation.

5.2.4.1 Natural Gas

Repowering and conversions of gas-fired steam electric generating units at Brazos Electric's Miller and North Texas plants with simple-cycle combustion turbines have been studied in the past. Such additions or conversions were not found to be economically feasible.

Capacity additions at Brazos Electric's existing gas-fueled generation facilities or the Jack County site that is under construction are not considered feasible because of (1) the quantity of base-load capacity required, (2) current portfolio primarily includes substantial gas-fueled capacity, (3) the current, and forecasted future, high cost of natural gas encourages fuel diversity, and (4) the cost of re-powering existing generating units is not economically feasible.

5.2.4.2 Oil

The same reasons explained above for natural gas apply to oil as well.

5.2.4.3 Coal

As was described earlier in the WFEC section, alternative coal technologies were evaluated by Brazos Electric to meet their capacity and energy requirements, including CFB, IGCC and PC units. The results of their studies indicated that based on reliability and limitations on current technologies, PC technology would have been the choice had Brazos decided to build its own facility.

5.2.5 Repowering/Uprating of Existing Generating Units

As was described above in section 5.2.4.1, Brazos Electric studied repowering and conversions of existing gas-fired units and found they were not economically feasible.

5.2.6 Participation in Another Company's Generation Project

Brazos Electric will consider participation in other company's projects once responses are received during the RFP process. The current plan is to participate in the Hugo Plant addition at 500 MW.

5.2.7 Purchased Power

As noted earlier, RUS requires that Brazos Electric issue an RFP. The RFP is complete and was reviewed by RUS prior to being issued on September 27, 2004. Notices were published on September 27, 28, and 29 in MW Daily, Wall Street Journal, and USA Today. Once proposals are received, Brazos Electric will evaluate the options that are presented.

ERCOT operates a wholesale energy market in the region. Ancillary Services can be self-provided or purchased through ERCOT. ERCOT acquires ancillary services and sets market clearing prices based on bids provided by market participants. Ancillary Services include (1) Balancing Energy Service, for which a market clearing price for energy is established for every 15-minute interval, and (2) Up and Down Regulation Services, Responsive Reserve Service, and Non-Spinning Reserve Services, for which individual market clearing prices for capacity are established for each hour.

The ERCOT region also has an active bi-lateral market. Gas-fueled units almost always determine the cost of energy. Information on the resources in the ERCOT market is contained in the *Report on Existing and Potential Electric System Constraints and Needs Within the ERCOT Region*, dated October 1, 2003.

A substantial quantity of combined-cycle gas-fueled capacity has been constructed in ERCOT during the past 5 years. The ERCOT CDR anticipates adequate reserves for the near-term future. Although reserves are considered adequate, a significant quantity of older, conventional steam capacity has been mothballed or retired.

ERCOT's current market design uses a zonal model for direct assignment of zonal congestion management costs on CSCs. CSCs and CSC Zones are determined annually. In 2004, ERCOT has five CSC zones (West, North, Northeast, South and Houston Zones). Congestion management costs for local congestion (non-CSC congestion) are charged to all load-serving entities based on their load ratio share. The congestion cost for resolving local congestion has been high in areas such as the Dallas/Ft. Worth Metroplex. The counties surrounding the Dallas/Ft. Worth area are non-attainment areas for ozone, which limits generation-siting alternatives for resolving transmission congestion. Pursuant to a PUCT order, ERCOT is designing a nodal market under which generators would be settled at locational marginal prices (LMPs) and loads would be settled at zonal weighted averages of LMPs. If approved by the PUCT, the nodal market design could be implemented in late 2006.

Potential risks include (1) high market dependence on natural gas-fueled generation, (2) anticipated continuation of high-cost, volatile natural gas prices, (3) uncertainty of future reserves because of mothballed and retired generation, and (4) impact of market design changes.

5.2.8 New Transmission Capacity

Building additional transmission is considered feasible. Brazos Electric or other ERCOT TSP's could construct transmission additions. See ERCOT region transmission discussion above. Brazos Electric is currently conducting studies of its transmission system (in coordination with ERCOT) to determine the system constraints within the region that would preclude the transfer of capacity over the existing grid adequate to serve their forecasted resident load and that will determine any transmission system upgrades needed to interconnect and deliver the power and energy from the proposed project.

5.3 CAPACITY ALTERNATIVES SUMMARY

As described in the preceding sections, both WFEC and Brazos Electric have investigated a variety of options to meet their respective forecasted loads and the most cost-effective appears to be the joint participation in the construction and operation of a new 750 MW supercritical pulverized-coal unit.

6.0 SITING ALTERNATIVES

6.1 OVERVIEW OF THE SITING STUDY

The siting process for this project was different from a normal process due to the fact that the Hugo Plant was originally sited and planned for additional units as far back as the late 1970s. In fact, the Environmental Impact Statement completed by the Rural Electrification Administration (now RUS) addressed the full site-development scenario. Hugo 2 was originally expected to be needed within a couple of years of Unit 1. However, that need did not materialize, primarily due to the slow-down in the U.S. economy during that period and changes in the electric utility industry (i.e. deregulation).

The factors that led to the selection of the Hugo site in the 1970s are re-examined in this current study and the sites that were close to Hugo in the original comparison are re-evaluated to determine whether they currently have any advantages over the option of adding a second unit at the existing plant. In reality, the fact that the Hugo Plant and all of its associated infrastructure is in place (including raw water intake, on-site reservoir, outfall pipeline, etc.) will greatly limit the environmental impact of any additional units, particularly when compared to a greenfield site.

Because Brazos Electric is a partner in the project, it was important to also consider suitable sites in Texas that might reduce or eliminate the need for new transmission lines to transmit power from the Hugo Plant to the ERCOT system. In 2002, prior to considering the partnership with WFEC on this project, Brazos Electric conducted a siting study of both gas-turbine and coal-fired generation options within their service territory. The best sites for coal-fired generation from that study can be compared to the Hugo Plant to determine whether they would have any advantages over a new unit at Hugo. Of course, a new plant in Texas would still require a transmission connection back to the Southwest Power Pool to allow WFEC to meet its members' needs.

Another option would be for the two cooperatives to build units independent of each other, thus avoiding some of the transmission needs of the current proposal. For example, if Brazos were to construct their own unit close to a 345-kV termination point in Texas, the line back into Oklahoma would not be needed. WFEC would still likely need to construct 345-kV lines to the

SPP termination points at the Pittsburg and Lydia or Valliant Substations. However, such an option would miss out on the very significant benefits of joint ownership of a larger unit (less cost per kW generated, more effective staff utilization, etc.). It would also not allow the significant benefit of the inter-pool transfer capability that the current proposal of a jointly owned unit offers.

This current siting study, therefore, identifies and evaluates sites for up to 750 MW in both Oklahoma and Texas, including the existing Hugo Plant. The transmission needs of each are addressed in a general way since detailed interconnection studies would be required for each scenario. Only if a site would have significant advantages over the Hugo Plant would such studies be warranted.

The primary purpose of this study is to identify the best site for locating the new unit. The preferred site will be one that can accommodate a new 750 MW coal-fired unit and also best meets the following general criteria:

- Satisfies the requirements and guidelines of RUS.
- Allows for economical construction and operation of the proposed generating station or stations.
- Minimizes adverse environmental and social impacts.
- Possesses the necessary physical attributes such as size, and topography; and has access to adequate fuel and water supplies, and transmission facilities.

The study area for this current study includes the areas previously examined in the earlier siting studies. These include the southeast counties of Oklahoma and several north central counties of Texas as listed in Table 6-1.

Table 6-1 Counties in Study Area

Brazos Electric – Texas Counties		WFEC – Oklahoma Counties	
Collin	Jack	Atoka	Marshall
Cooke	Montague	Bryan	McCurtain
Denton	Wise	Choctaw	Pushmataha
Grayson		Johnston	

6.2 STUDY APPROACH

The identification and assessment of potential generation site areas for the project was based on the following four steps.

- Step 1 – Review previous siting studies completed for both WFEC and Brazos Electric to determine if the preferred sites identified in each study meet the criteria stated in Section 6.1.
- Step 2 – Conduct field reconnaissance to obtain current information about each site and surrounding areas.
- Step 3 – Evaluate the sites to assess the relative advantages and disadvantages of each.
- Step 4 – Select the best location for the new unit.

The following sections describe the previously completed siting studies, field reconnaissance, and evaluation of the alternative sites.

6.2.1 Previous Western Farmers Siting Study

A siting study for Hugo Plant was completed by Burns & McDonnell, Inc. for WFEC in 1977 (B&McD 1977). The primary purpose of that study was to identify the best greenfield site or sites within the WFEC service area for a new of coal-fired generating station, with a total site capacity of 1,600 MW. The study concluded that the Hugo site in Choctaw County was the best overall location for such a facility. Of course, since that study was completed, Hugo 1 and all of its associated infrastructure was built, which now makes the site even more suitable for the addition of new capacity. In fact, most plant facilities were sized for the ultimate site capacity of 1,600 MW.

The EIS prepared by the Rural Electrification Adminstration (now the Rural Utilities Service or RUS) addressed the construction of <u>three</u> units at the Hugo site. An extensive amount of field studies were conducted to assess the environmental impacts of developing the site as planned. These included terrestrial biological studies, aquatic biological studies of the Kiamichi and Red Rivers, archeological studies, and air monitoring studies.

Although more than 27 years have past since the initial study, only a relatively small number of changes have occurred in the study area to raise any question as to the viability of additional capacity at the Hugo Plant. These relate to potential impacts on the Class I Caney Creek Wilderness Area in Arkansas from plant emissions, and impacts that may result from the construction of several new transmission lines to transmit power from Hugo 2 into the regional transmission grids.

The following is a summary of the results of the 1977 siting study.

6.2.1.1 Study Approach

The initial phase defined the regional area followed by an extensive program of map studies and literature review to determine areas unsuitable for site location. Typical constraints included national parks, forests and monuments; state parks and forests; officially recognized historic and archaeological sites; wildlife refuges, preserves, breeding areas and habitat for rare and endangered plant and animal species; areas within controlled air space for airports; and incorporated cities and towns.

After the map and literature review was completed and the exclusion areas defined, field reconnaissance trips were made to inspect those areas considered suitable for site locations. These trips confirmed the information collected during the map and literature review. As a result, nine alterative sites were identified. Evaluation and comparison of the alternative sites with regard to factors of environmental effect, fuel and water supplies and rail access led to the identification of three preferred sites.

The three preferred sites were studied in a systematic manner to develop a basis for environmental and economic comparison of the sites. Preliminary site layouts for all on-site and off-site facilities including water supply, wastewater discharge system, fuel delivery system and plant were prepared for each site. Cost estimates were developed and analyzed to determine the most economically feasible site. Concurrent with the economic analysis, preliminary assessments of the environmental acceptability of each of the preferred sites was determined.

The siting study was then reviewed with consideration given to both tangible and intangible factors which influence site location. Items considered included: project schedule; absence of commitment for an Oklahoma coal supply suitable for mine-mouth operation or short haul delivery; the economic effect of competition for western fuels on site location; fuel transportation; potential water supplies; public acceptability and environmental factors. The review of these tangible and intangible factors led to the selection of a recommended site (Hugo).

6.2.1.2 Evaluation Criteria

Upon completion of the field reconnaissance phase of the 1977 study, all relevant data collected was assembled and compared. The major factors in the comparison were as follows:

- Compatibility with existing environment
- Water source and water supply development cost– 32,000 acre-feet per year
- Suitability of the site from engineering aspects, including anticipated site development
- Rail accessibility – near at least two major railroad lines to insure competition in negotiation for freight rates
- All-weather highway accessibility – within 3 miles of adequate highways to facilitate access by construction and operation personnel and allow delivery of equipment and materials.
- Waste disposal
- Land requirements – approximately 2,300 acres total; 300 for the plant site; 250 acres for rail access, rail loop, and coal storage; 1,100 acres for waste disposal and 400 to 600 acres for buffer zones.

6.2.1.3 Site Evaluations

Nine alternative sites were subjected to a preliminary environmental analysis using available literature and additional information obtained by field reconnaissance. Items listed for comparison included proximity to national parks, forests and monuments; state parks and forests; officially recognized historical sites; wildlife refuges, preserves, breeding areas and habitat for rare and endangered plant and animal species, and population centers. The alternative sites were ranked in the order of least expected environmental impact.

Water sources and methods and anticipated costs required to develop a suitable water supply were compiled for each alternative site. It was determined that the water supply would provide the required quantities of water at the lowest treatment cost. According to data available at the time of this 1977 study, water quality parameters of the Kiamichi River were such that full water treatment appeared unlikely. Therefore, any site using this source as a water supply would have definite advantages over those sites relying on other sources.

The evaluation procedures used for engineering aspects included expected ease of construction, length and grade of rail spur, accessibility, expected geologic conditions, and existing land use.

Methods of fuel delivery were also considered. Those sites that allowed for rail delivery and /or barge delivery of remote fuel supplies were given priority. The condition of the existing railroad was also investigated in addition to the haul distance from a number of proposed fuel sources.

Of the nine alternative sites, three appeared to have advantages over the other six. These sites were identified as: LeFlore, Atoka, and Hugo.

The LeFlore site is located in LeFlore County approximately 15 miles west of Ft. Smith, Arkansas. Water for this site would have come from the Eufala Reservoir by way of the Arkansas River. Water quality of the Arkansas River was a significant concern requiring high treatment costs. In addition the 1977 study indicated that approximately 71 percent of the site would be considered to be prime farmland. The site was bounded on the west by the Kansas City Southern rail line.

The Atoka site is located in southern Atoka County, two miles north of Oklahoma Highway 22 approximately 12 miles north of Durant, Oklahoma. The water supply for this site would have been the Blue River which is located 4 miles to the southwest of the site. Flow records and existing water rights below the anticipated diversion point on the Blue River indicated that continuous pumping from the river would not have been possible and that a storage reservoir would be required. As with the LeFlore site, significant water treatment costs would have been required. Approximately 62 percent of the site would be considered prime farmland. Rail for this site would have been the Texas and Pacific railroad which bordered the site on the west.

The Hugo site is in Choctaw County, approximately three miles west of Ft. Towson, and 12 miles east of Hugo, Oklahoma. The real advantage of the site was access to very high quality water from the Kiamichi River and availability of storage rights in the Hugo Reservoir.

6.2.2 Previous Brazos Electric Study

A previous Brazos Electric Siting Study was completed by Burns & McDonnell, Inc. in 2002 for both a natural gas-fired and coal-fired generating stations. The primary purpose of coal portion of the study was to identify the best greenfield site or sites for location with a capacity of up to 1,000 MW that would be owned by Brazos Electric. Although Brazos Electric did not move forward on any of the coal-fired options, the results of the study remain valid as a comparison to the Hugo 2 option. The following sections provide a summary of that study.

6.2.2.1 Study Approach

The study used a three-phased approach: Phase 1 – Identification of Candidate Site Areas; Phase 2 – Identification of Potential Site Areas; and Phase 3 – Site Evaluation.

The study area included the region served by Brazos Electric's existing transmission system. This included the north central Texas counties of Cooke, Collin, Denton, Ellis, Erath, Grayson, Hood, Jack, Johnson, Montague, Palo Pinto, Parker, and Wise.

The first task in the siting process was to identify candidate site areas. These areas were located by giving consideration to regional environmental constraints and proximity to the necessary infrastructure for power transmission and fuel delivery. The principal environmental constraint that was considered in this phase was the Dallas/Fort Worth air quality non-attainment area. For access to the transmission grid, the search for candidate site areas was limited to areas within 10 miles of an existing transmission line with a voltage of 138 kV or higher. Areas within 5 miles of an active rail line were included for coal delivery.

This process yielded 41 preliminary site areas for a coal-fired plant. The preliminary site areas were then subjected to a "desktop" screening process using topographic maps and aerial photographs. Through this process, some of the preliminary site areas were eliminated due to potential air permitting concerns or proximity to urban areas. After the desktop screening, 21 candidate site areas remained.

A field reconnaissance of the candidate site areas, consisting of an automobile survey along public roads in the vicinity of each site area, was made by Burns & McDonnell staff. The information collected during the field reconnaissance was used to identify potential problems with the respective sites. It consisted of the identification of adverse topography, unattractive rail or road access, significant competition for available water supplies, urbanization in the vicinity of the sites, and adverse aesthetic impacts.

Through the major flaw analysis, 11 site areas were eliminated. The remaining site areas were grouped by county and compared to the other site areas in the same county. The better site areas in each county were retained and designated "potential" sites areas. This process left nine potential site areas for a new coal-fired plant.

All of the potential site areas are considered to be generally acceptable sites but differed in several evaluation factors. A numerical decision analysis process was used to rank the potential site areas to identify Brazos Electric's best development options. The first step in this process was to identify the criteria used to evaluate the potential site areas. These criteria are not all equivalent in their importance so each criterion was also assigned a relative weight. The evaluation criteria and their weights are listed below:

- Air quality impacts (4);
- Electrical transmission (10);
- Fuel supply (10);
- Heavy equipment delivery (2);
- Public impacts (5); and
- Water supply (10).

A numeric score between zero and ten was assigned to each potential site area for each criterion. These individual criterion scores were multiplied by their respective weights and summed to yield a weighted composite score for each site area. These composite scores were then used to rank the site areas. The top-ranked, or preferred, site areas were the Tom Bean, Tolar and Auburn site areas.

6.2.2.2 Evaluation Criteria

Upon completion of the field reconnaissance phase of the study, all relevant data collected was assembled and compared. The criteria for comparison were as follows:

- Current land use and social conditions
- Air quality considerations

- Electrical transmission access
- Environmental conditions
- Fuel delivery
- Heavy equipment delivery
- Highway access
- Water supply

6.2.2.3 Site Evaluations

The nine alternative sites were subjected to a numerical analysis to rank the potential site areas for a coal plant. Based on their respective weighted composite scores, the potential site areas were ranked in order of decreasing attractiveness.

Ideally, the proposed generating facilities should be located on a site where regional air quality conditions are favorable (i.e. will not result in difficulties in obtaining an air permit or imposition of unfavorable permit conditions. The relative attractiveness of the potential site areas with regard to air quality were generally based on the assessment of air quality attainment status and potential impacts the proposed facility may have on distant Class I areas.

All of the potential coal plant site areas were located in “attainment” areas for all air criteria pollutants and no Class I areas would be affected by the proposed facility. Therefore, there should be no significant obstacles to obtaining an air permit at any of the potential site areas. The only concerns were at the Auburn and Rio Vista site areas where prevailing winds may transport emissions from these site areas into the Dallas/Fort Worth non-attainment area.

Each candidate site must have a feasible means to connect the proposed generating units into the regional transmission network to deliver this power to Brazos Electric's customers. The transmission construction necessary to accomplish this was estimated by the Brazos Electric staff from preliminary transmission analyses for each potential site area. If a decision had been made to move forward on the preferred site, a formal generation interconnection request would have been submitted to ERCOT. This generation interconnection request initiates more detailed transmission analyses that verifies or revises the preliminary transmission construction estimates.

Providing transmission connections to the existing grid is the responsibility of ERCOT and not Brazos Electric. Brazos Electric might choose to finance and construct the needed transmission facilities, but would be reimbursed for its costs pursuant to the Transmission Cost of Service mechanism. Therefore, the costs associated with any required transmission improvements for this project would not be born directly by Brazos Electric but by all of the electric customers in Texas. Even so, the amount of transmission construction required at each potential site area is a significant evaluation factor as it will impact the permitting and approval process for this project. The scores for this criterion were assigned based on the weighted length of required transmission construction.

Modern construction techniques and economics favor delivery of power plant components in large prefabricated modules. Transport of these large and/or heavy components to a site is practical over long distances only by rail or barge. Since there are no navigable rivers in the study area that can accommodate barge traffic, the ideal site would be one that is located adjacent to an existing rail spur.

Each suitable site must have access to a reliable supply of coal. This requires that the site be located where it can be served by a railroad line with capacity to delivery the required coal. The ratings for this criterion were assigned based on the distance from the site to an existing rail line based on a set of criteria.

The potential site areas were evaluated to assess the relative impacts to the public that could result from construction and operation of the proposed generating facilities at each site area. The primary sources of public impacts are dislocation of residents, and potential noise and visual impacts to nearby residents and passing motorists. Minimizing dislocations was one of the criteria used to select the potential site areas so few dislocations should be required at each site area and the number of dislocations comparable between site areas. Therefore, the ratings for this criterion were assigned based on the distance from the site area to the nearest town or city.

The availability of water resources varies across the study area and is a very important evaluation factor. Electric generating units must have a very high availability of water. Therefore, when these generating units depend on a supply of water to operate, this water supply must also have a high availability. Research into potential water supplies indicated that the study area is underlain by productive groundwater aquifers, but these aquifers are stressed in many areas by existing withdrawals. Therefore, the potential for developing a surface water source is considered higher because of reduced competition. Both the Brazos River Authority and Red River Authority indicated they have water available for sale so the initial ratings for this criterion were assigned based on the distance to one of these two surface water sources. For site areas with a reasonable prospect of developing a groundwater source, one point was added to this initial score, limited to a maximum total score of ten.

Of the nine alternative sites, three appeared to have advantages over the other six. These sites were identified as the Tom Bean, Tolar, and Auburn sites.

6.2.3 Original "Preferred" Sites

The top rated sites carried forward from the 1977 WFEC and 2002 Brazos Electric siting studies included the Atoka, Hugo, and LeFlore sites in Oklahoma and the Tom Bean, Tolar, and Auburn sites in Texas. Although detailed transmission interconnection studies were not performed for these sites, it was felt that the location of the LeFlore, Tolar, and Auburn sites would be less desirable in meeting the needs of the two utilities due to their distances from the other utility's system. Therefore they were eliminated from further study. The following section discusses the evaluation of the Atoka, Hugo, and Tom Bean sites. The location of each is depicted in Figure 6-1.

6.3 RE-EVALUATION OF PREVIOUS STUDIES' PREFERRED SITE(S)

The three preferred sites were re-evaluated against a list of criteria designed to evaluate their environmental impacts, their relative suitability, and cost. The criteria included in this evaluation include:

- Water supply and discharge
- Fuel delivery
- Transmission interconnection capability
- Air quality
- Site accessibility
- Land use and availability

Legend

- Preferred Sites
- Potential Substation Interconnections

Approximate Scale (Miles)

0 5.0 10.0

BRAZOS ELECTRIC COOPERATIVE

wfec western farmers electric cooperative

A Touchstone Energy® Cooperative

Figure 6-1
Alternative Site Locations

- Constructability
- Site permitting constraints (wetlands and floodplains, threatened and endangered species, cultural resources)
- Proximity to existing development, visual and noise receptors

6.3.1 Site Reconnaissance

A site reconnaissance of the two alternative sites and the Hugo Plant was conducted in July 2004. The purpose of this field reconnaissance trip was to obtain first-hand information about each site and surrounding areas. To the extent possible, each site area was assessed to determine if there were any changes in conditions since the original site selection studies conducted at these sites. The following is a description of the changes at each site.

Atoka Site

The only change identified at the Atoka site since 1977 was that the railroad adjacent to the west boundary of the site is now abandoned.

Hugo Site

Of course the Hugo site now supports the existing 450-MW Hugo 1 power plant and all of its associated infrastructure, including coal handling facilities, waste ponds, intake structure on the Kiamichi River, a raw water pipeline from the intake to the on-site raw water storage reservoir, a discharge pipeline to the Red River, a switchyard, and 138-kV transmission lines. Construction at the site resulted in the conversion of pasture and hay-fields to an industrial facility.

Tom Bean Site

No noticeable changes were identified at the Tom Bean site since Brazos Electric's 2002 site selection study.

6.3.2 Water Supply Availability

The proposed facility will require a significant quantity of water (9.9 million gallons per day (mgd)); therefore, the sites must have access to a dependable and substantial water supply. To reduce economical and environmental impacts from pipeline construction, sites must be located within 10 miles of a surface water supply. Following is a description of the water supply availability at each site. Figure 6-2 depicts the location of surface water near each preferred site.

Atoka Site

The nearest water supply source is the Blue River, which is approximately 4 miles west of the site. Flow records and existing water rights below the anticipated diversion point on the Blue River indicate that continuous pumping from the river is not possible and that a storage reservoir would be required. Water diverted from the Blue River would require treatment for conservation purposes. Therefore, the Atoka site would not only require the construction of water pipelines and associated facilities to obtain water, but a separate storage reservoir. Land requirements for a new reservoir would be approximately 1,800 acres.

Hugo Plant

Water for the Hugo Plant comes from the Hugo Reservoir via the Kiamichi River and is withdrawn at an intake approximately five miles downstream from the dam. Adequate water rights are owned by WFEC to supply Hugo 2. The only requirement would be for additional pumps at the intake point.

Tom Bean Site

The nearest viable water source to the Tom Bean site is the Red River, which is located approximately 12.5 miles north of the site. The Red River Authority has indicated that only 25 percent of the Red River is allotted to Texas and that the Texas Commission on Environmental Quality (TCEQ) allocates Texas's allotment. The TCEQ stated that they believe that the required quantity of water is available.

The Greater Texoma Utility Authority has a permit from the state to use 10,000 acre-feet for industrial purposes from Lake Texoma, which is located approximately 20 miles from the site. They have another 50,000 acre-feet in reserve that they have already permitted for usage.

The Texas Water Development Board indicated that some groundwater may be available within Grayson County. They have also indicated that it is already a strained aquifer and may not be

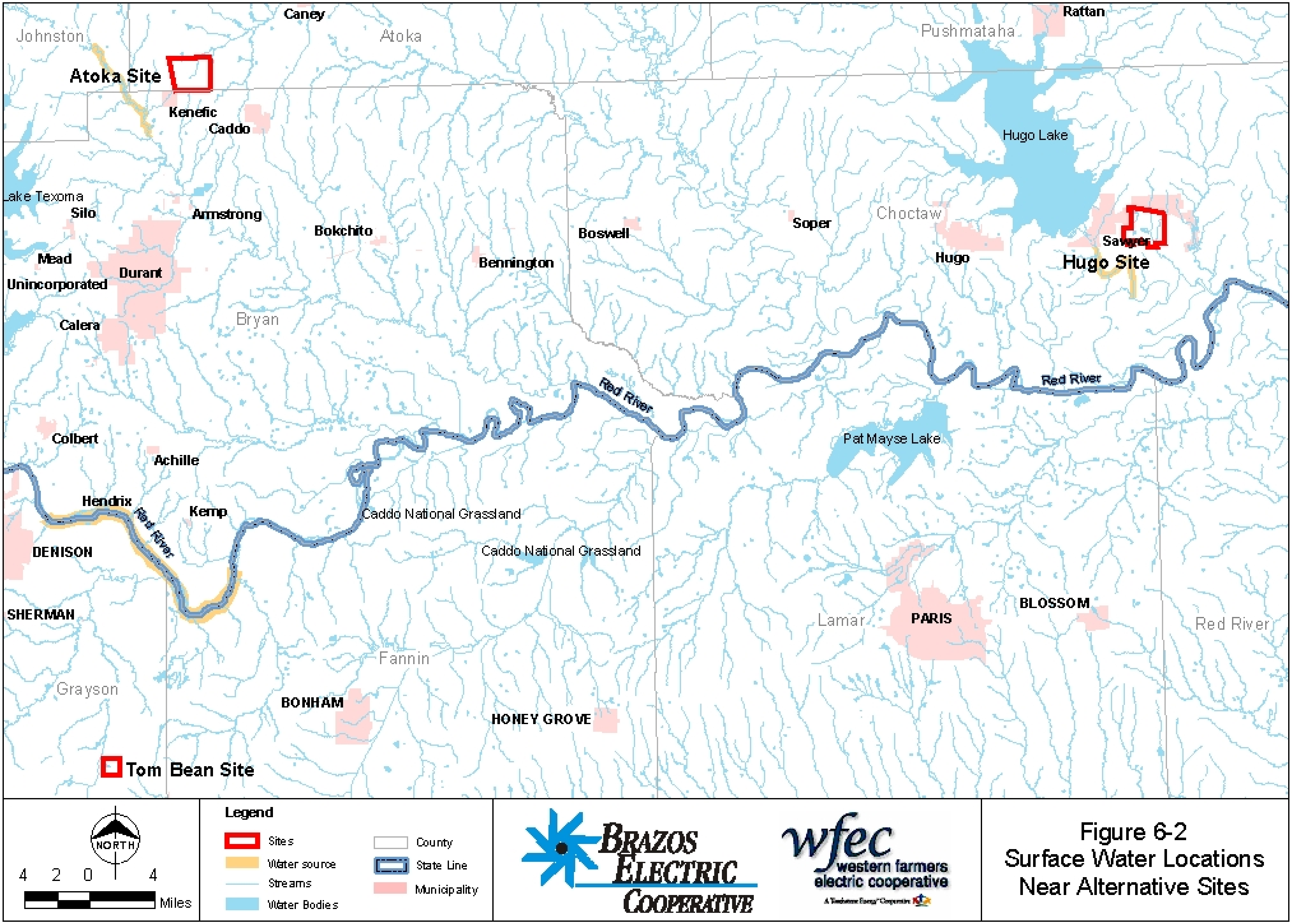


Figure 6-2
Surface Water Locations
Near Alternative Sites

dependable. There are no water districts currently serving the Tom Bean site area. Existing residences in the area have individual water supply wells.

6.3.3 Fuel and Heavy Equipment Delivery and Transmission Availability

Rail delivery of coal is the only practicable option for this project. In addition, construction techniques and economics favor delivery of power plant components in large prefabricated modules. Transport of these large and/or heavy components to a site is practical over long distances only by rail or barge.

The transmission system required to deliver capacity and energy from a proposed power generating facility to the loads can be a substantial part of the total wholesale power cost and therefore must be considered in a siting study. The generating units at the proposed power plant must connect into the regional transmission network in order to deliver electrical power from these facilities to Brazos Electric and/or WFEC member cooperatives.

6.3.3.1 Rail Access

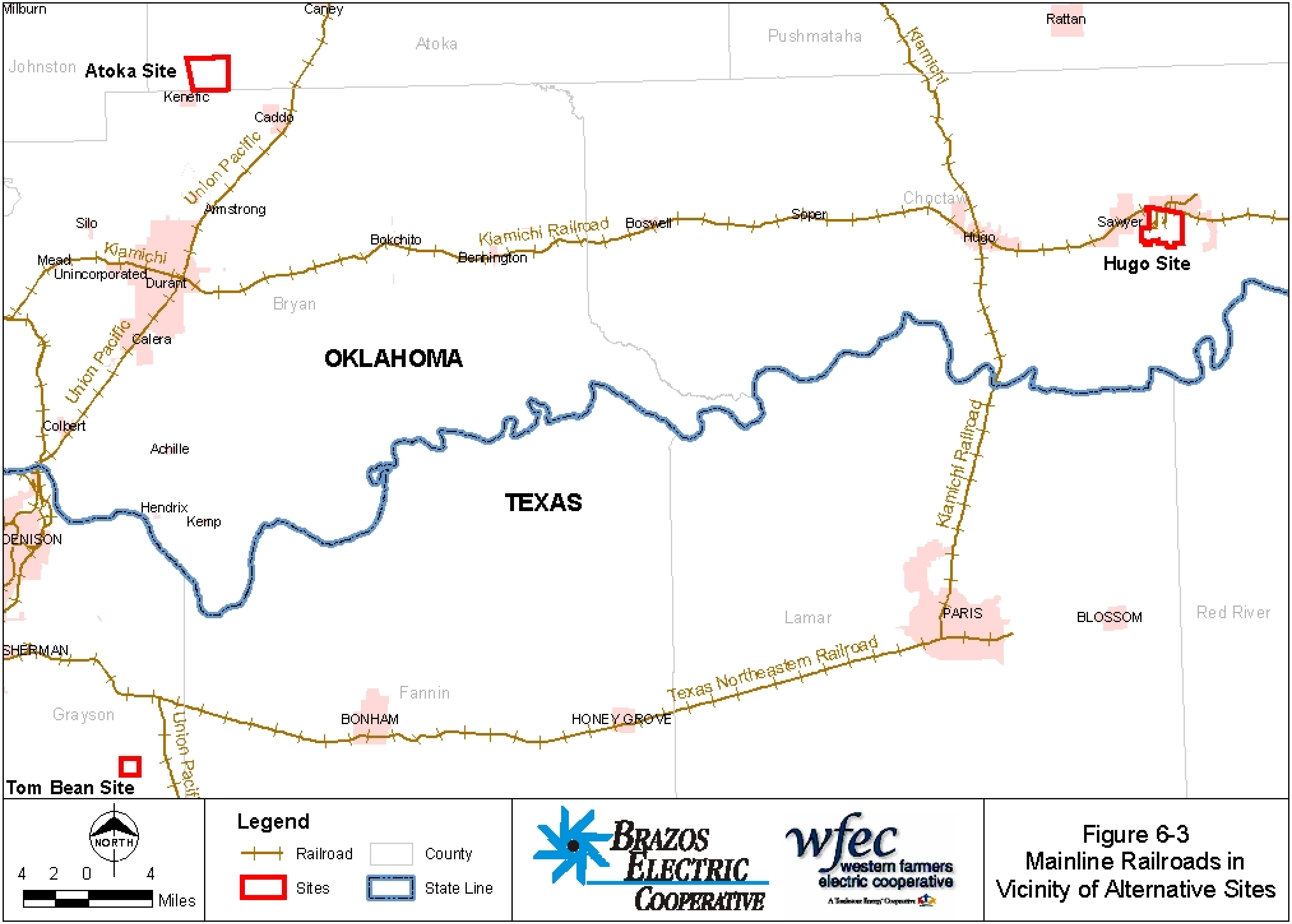
The ideal site for this criterion in this siting study would be one that is located adjacent to an existing rail line since barge delivery is not feasible. To reduce economical and environmental impacts from rail line construction, sites must be located within 5 miles of an active railroad. Following is a description of each preferred site's rail availability. Figure 6-3 illustrates the location of rail lines relative to the alternative sites.

Atoka Site

The nearest rail access for the Atoka site is from an existing Union Pacific Railroad line located approximately 4 miles east of the site and paralleling US Highway 69. This site would require the construction of approximately 4 miles of rail spur to connect the proposed coal plant to the existing Union Pacific Railroad line, in addition to the crossing of US Highway 69.

Hugo Site

Rail access for the Hugo site is from the existing Kiamichi Railroad line located at the northern border of the site. This railroad currently serves the Hugo Generating Station, and no upgrades to the existing rail system at this site are anticipated with the expansion of this plant.



Brazos Electric Cooperative

wfec western farmers electric cooperative

Figure 6-3
Mainline Railroads in Vicinity of Alternative Sites

Tom Bean Site

Rail access for the Tom Bean site area would be from the Union Pacific Railroad located approximately 2 miles east of the site area and paralleling US Highway 69. This site would require the construction of approximately 2 miles of rail line to connect the proposed plant to the Union Pacific Railroad line, in addition to the crossing of US Highway 69.

6.3.3.2 Electric Transmission Availability

The generating units at the proposed power plant must be connected into a regional transmission network. Therefore, a component of the search for prospective power plant sites is the location of existing transmission facilities and efforts to identify sites that can utilize these existing facilities while minimizing the need for new transmission line construction. However, in the case of this project where power would be available to electrical systems in both Oklahoma and Texas, it would not be possible to find a site with access to both systems. Construction and operation of some new lines would be required to connect to one or both electrical grids. Additionally, it has been determined that connections at 345-kV would be required for the proposed project. A review of the existing transmission systems in Oklahoma and Texas was conducted to identify the location of 345-kV facilities, both transmission lines and substations. The following is a description of the transmission availability at each site. Figure 6-4 presents a map of the exiting transmission lines.

Atoka Site

No transmission lines are present in the vicinity of the Atoka site. Construction of the new unit at this location would require construction of new transmission lines to connect with ERCOT and SPP systems. It was assumed that these interconnections would be the Pittsburg Substation (45 miles to the northeast) and Lydia Substations (100 miles to the southeast) for SPP, and the Valley Substation (40 miles to the south) for ERCOT.

While these may not be the appropriate locations to ensure system reliability and efficiency, they provide the closest connection points and therefore the most optimistic transmission scenario. Should the connections be needed at other locations or additional, lower voltage lines or upgrades be needed, they would only increase the already extensive transmission needs associated with this site.

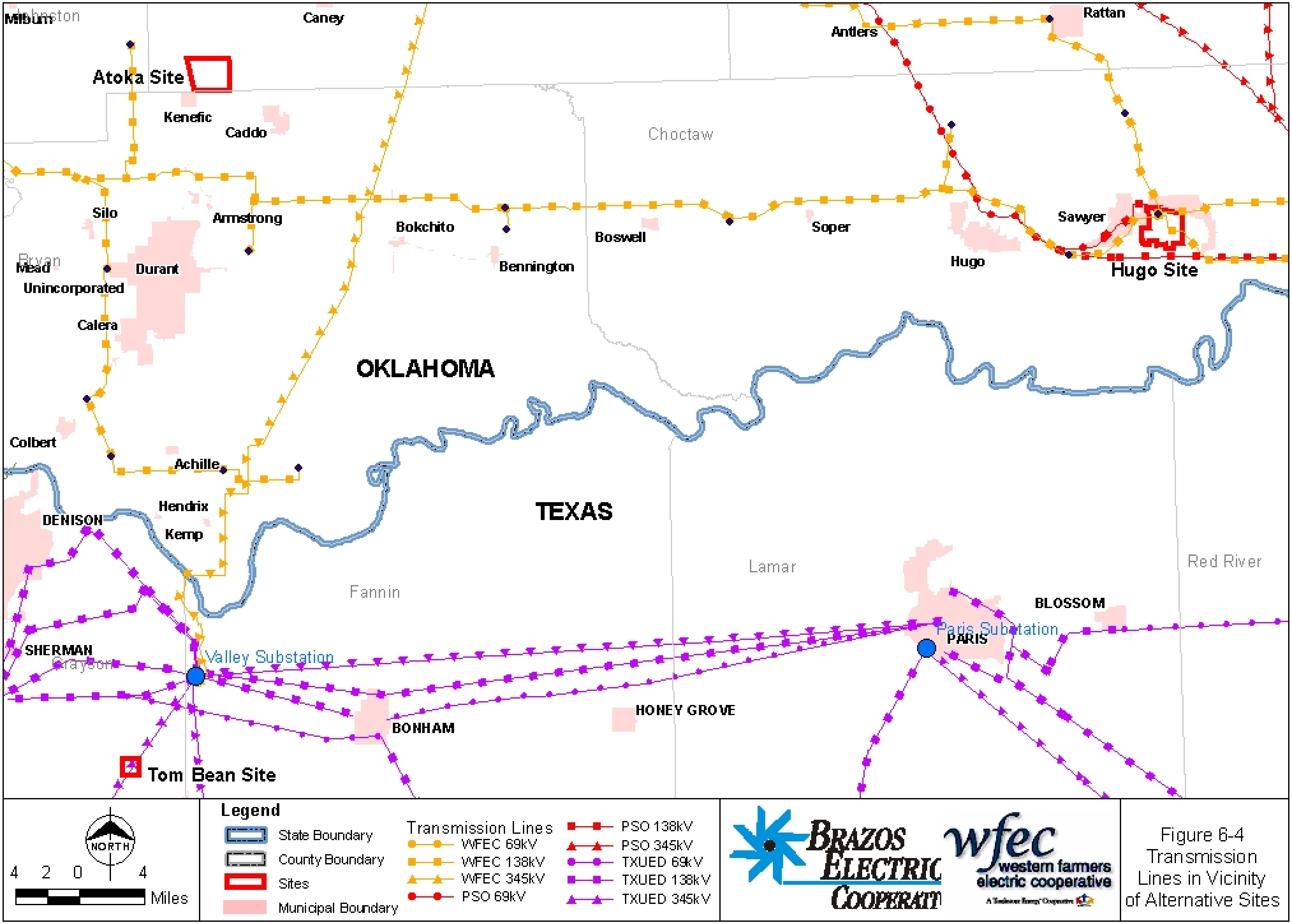


Figure 6-4
Transmission
Lines in Vicinity
of Alternative Sites

Hugo Site

The Hugo site area currently has electrical transmission lines and a substation on site serving the current needs of the plant for connection to the electrical system in Oklahoma. Construction and operation of the proposed project would require additional line connections between the plant and the system to accommodate the additional power generated. These connections would be at 345-kV and include new lines between Hugo Station and Lydia Substation (60 miles to the southeast) and between Hugo Station and the Pittsburg Substation (60 miles to the northwest). An additional connection between Hugo Station and the electrical system in Texas would also be required. This connection would also be at 345-kV and include new line construction between Hugo Station and the Valley Substation (60 miles to the southwest).

Tom Bean Site

The Tom Bean site area is located near TXU Electric's 345-kV lines that extend between the Valley Substation to the Anna and Farmersville switching stations. The new coal plant would be interconnected to the Texas system at 345-kV by looping both the Valley-Anna and Valley-Farmersville lines through the new plant switchyard. Both of these lines would have to be reconductored to prevent overloads. Portions of the 345-kV Anna-Collin and 138-kV Valley-Cherry lines would also have to be reconductored.

In order to connect to SPP, new 345-kV lines would need to be constructed to the Pittsburg Substation (85 miles to the northeast) and the Lydia Substation (100 miles to the east).

Although locating a power plant near existing transmission facilities is advantageous, this does not guarantee that these facilities will have adequate capacity to support the new unit. Additional transmission analyses will be required to determine if these facilities will require upgrades or construction of additional transmission circuits.

6.3.4 Current Conditions

Current conditions at each alternative site were reviewed for various evaluation criteria. These criteria included air quality attainment areas, site accessibility, land use and availability, constructability, site permitting constraints, and proximity to existing development and visual and noise receptors. These criteria are described in more detail in the following subsections.

6.3.4.1 Air Quality Attainment Areas

Ideally, the proposed generating facilities should be located on a site where air quality conditions are favorable. Favorable air quality conditions at a given potential site area are those where a construction permit and operation permit for air emissions from the proposed generating units can be obtained in a timely manner without significant permit conditions or other restrictions. The relative attractiveness of the potential site areas with regard to air quality are generally based on the assessment of air quality attainment status and potential impacts the proposed facility may have on nearby Class 1 areas.

Atoka Site

The Atoka site area is located in Atoka County, Oklahoma, which is in attainment for all criteria air pollutants. The closest non-attainment area is located in the Dallas/Fort Worth metropolitan area. Since prevailing winds are from the south or southwest, it is unlikely air emissions from generating units within this site area would exacerbate to air quality problems in the Dallas/Fort Worth non-attainment area. Since the Atoka site is more than 200 kilometers (km) from the nearest Class 1 area, it is not expected to have a significant impact on Class 1 air quality or visibility. Therefore, there should be no significant obstacles to obtaining an air emissions permit at this site.

Hugo Site

The Hugo site area is located in Choctaw County, Oklahoma, which is in attainment for all criteria air pollutants. The nearest Class 1 area to the Hugo site is Caney Creek Wilderness Area in southwestern Arkansas. Because Caney Creek is approximately 113 km from the Hugo site, it will be a factor in determining potential air quality and visibility impacts from the plant.

Tom Bean Site

The Tom Bean site area is located in Grayson County, Texas, which is in attainment for all criteria air pollutants. The closest non-attainment area is located in the Dallas/Fort Worth metropolitan area. Since prevailing winds are from the south or southwest, it is unlikely air emissions from generating units within this site area would contribute to air quality and visibility problems in the Dallas/Fort Worth non-attainment area. Since the Tom Bean site is more than 200 km from the nearest Class 1 area, it is not expected to have a significant impact on Class 1 air quality or visibility. Therefore, there should be no significant obstacles to obtaining an air emissions permit at this site.

6.3.4.2 Site Accessibility

The proposed power plant site must be accessible from an all-weather road for construction and operating personnel and for delivery of materials and equipment. These roads must also be capable of supporting heavy truck traffic for delivery of equipment during construction.

The distance of the site from a major highway is an important evaluation factor. The condition of local roads which connect the site to a major highway is another transportation-related evaluation factor.

Atoka Site

The Atoka site is located 2 miles north of Oklahoma Highway 22 and approximately 12 miles north of Durant, Oklahoma.

Hugo Site

The Hugo site is located immediately south of US Highway 70 and the St. Louis-San Francisco Railroad, approximately 3 miles west of Ft. Towson and 12 miles east of Hugo, Oklahoma.

Tom Bean Site

Access to the Tom Bean site area is provided by Farm to Market (FM) 697. This primary paved road should be adequate for delivery of equipment and access by construction and operating personnel. General maintenance may be required to preserve the integrity of the road. This road connects with US Highway 69, approximately 2 miles east of the site.

6.3.4.3 Land Use and Availability

Coal-fired power plants require large, contiguous parcels of land for both the main power island and ancillary facilities such as fuel handling/storage and ash disposal. Coal-fired power plants create combustion waste product that must be disposed of either off-site, or in a landfill located onsite, to the extent beneficial reuse of the combustion waste product is not possible. Off-site disposal results in additional truck or rail traffic to haul the combustion waste product from the site to an approved landfill, as well as additional environmental impacts outside of the proposed facility's physical boundaries.

Atoka Site

The southern portion of the site area is relatively flat (slopes 1-3 percent) and is used mainly for pastureland, although some areas are cultivated. Vegetation consists of native grass and a few scattered trees. The northern portion of the site consists of many well-defined intermittent streams with relatively steep banks that drain to small reservoirs. It appears that much of the area is a mixture of woody vegetation and rangeland. The woody vegetated areas are predominantly along the stream corridors. The USGS 7.5 minute topographic map also indicates that the northern portion of the site includes at least three gravel pits. The status of the gravel pits is unknown at this time.

Hugo Site

The Hugo site is slightly rolling with well-defined drainage courses. There is approximately 100 feet of relief with some gentle sloping areas which are more than sufficient to accommodate the required plant structures. The current land use at this site is industrial, since the site contains the existing Hugo Station power plant and associated facilities.

The Hugo site has adequate space to accommodate an additional 600-750 MW coal unit. In addition, the property needed to expand the facility is currently owned by WFEC, so no property acquisition will be necessary at this site.

Tom Bean Site

Land uses within the Tom Bean site area include rural residences and agriculture. The predominant crops grown in Grayson County are wheat, sorghum, corn, and soybeans. Livestock present in the area include cattle, horses, hogs, sheep, and goats. The Tom Bean site area is located in gently rolling to slightly sloped terrain with ground elevations of approximately 750 feet. On the site there are two intermittent streams that drain to the existing reservoir. These two streams join together prior to emptying into the reservoir and divide the site on the diagonal southeast to northwest. The outfall of the reservoir drains to nearby Mill Creek.

6.3.4.4 Constructability

Constructability can be assessed by evaluating various criteria such as topography and drainage that determine the amount of site preparation and grading necessary at the site. Site areas with significant variations in ground surface elevations would require more grading and other site preparation effort to level an area for plant development. Greenfield sites would require much more grading and site preparation than developed sites. Following is a description of each preferred site in terms of constructability.

Atoka Site

The topography at the Atoka site area is generally gently rolling hills of low relief (30 feet maximum). The south half of the site is gently rolling topography. The northern half is rougher with steep slopes and well defined drainage courses. Approximately 50 percent of the site is presently under dry cultivation, the remaining 50 percent is native grass presently used for pasture land. It is anticipated that the amount of grading and other site preparation at this site would be low.

Hugo Site

The Hugo site area is an existing, developed coal-fired power plant. This site would be the most favorable of the preferred sites in terms of constructability since the site pad has already been prepared and developed. Therefore, very minimal grading and site preparation is anticipated with the addition of another coal unit at this site.

The Hugo site is slightly rolling with well-defined drainage courses. There is approximately 100 feet of relief with some gentle sloping areas which are more than sufficient to accommodate the required plant structures.

Tom Bean Site

The Tom Bean site area is located in gently rolling to slightly sloped terrain with ground elevations of approximately 750 feet. The site area is drained by Mill Creek.

6.3.4.5 Site Permitting Constraints

Due to the large quantity of land and a significant source of water required for the proposed facility, there is a high potential for impacts to each site area's existing ecosystem. The environmental review of the potential site areas included desktop evaluations for the following resources:

- Wetlands
- Protected species

- Floodplain
- Cultural resources

The information reviewed included electronic National Wetland Inventory (NWI) maps, aerial photography, USGS topographic maps, federal and state threatened and endangered species listings, and Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). Wetlands have been determined to be a valuable natural resource which should be protected. Section 404 of the Clean Water Act stated that there should be no net loss in wetlands caused by development. Therefore, any impact to wetlands will likely have to be mitigated. The NWI maps were consulted to estimate the amount of wetlands on each site.

Atoka Site

Most of the Atoka site is fair to good pastureland. The northern portion of the site contains many intermittent streams and associated riparian areas. Wetlands appear to be more dominant in the northern portion of the site and are mostly associated with Caney Creek and other intermittent streams. This portion of the site also contains 100-yr floodplains that are closely associated with Caney Creek, one of its tributaries, and a small reservoir located in the northeastern part of the site.

The federal threatened and endangered species list from the USFWS for Atoka County identifies three species, which include one insect, the American burying beetle (*Nicrophorus americanus*) and two bird species, the bald eagle (*Haliaeetus leucocephalus*) and piping plover (*Charadrius melodus*). Since the southern portion of the site borders Bryan County, the threatened and endangered species list for Bryan County was also reviewed. There are five federally listed species, which include four birds, the American peregrine falcon (*Falco peregrinus anatum*), bald eagle, piping plover, and least tern (*Sterna antillarum*), and one insect, the American burying beetle.

The American burying beetle is a potential concern as much of the site contains grasslands. It is unlikely that the other species would inhabit the site as their preferred habitats do not exist at the site and the site is not in close proximity to a major river or large body of water.

Since the Red River was a major corridor for human migration during Historic and Prehistoric times, the portion of Oklahoma where the site is located is typically a rich area for archaeological sites. Since the southern portion of the site appears to have been used for agricultural purposes and not heavily disturbed, the probability of finding archaeological sites is relatively high.

Hugo Site

The Hugo site is the most uniform (least diversity) with respect to terrain and flora. The site is the least productive of the three preferred sites because of soil limitations and current land use. The site does contain numerous intermittent streams that drain into Bird Creek, which is the dominant drainage on site. Wetlands are predominately associated with Bird Creek and it's tributaries. Bird Creek and the dominant intermittent stream on the eastern portion of the site have a 100-year flood plain associated with them. The flood plain is narrow and appears to be constrained to the stream corridors.

Choctaw County contains six federally listed species. These species include four birds, the bald eagle, piping plover, least tern, American peregrine falcon; one insect, the American burying beetle; and one mussel, the scaleshell mussel (*Leptodea leptodon*).

Since this is an existing site that already contains a coal power plant and associated facilities, the probability of impacting federally listed species or their respective habitat is low. With the exception of the American burying beetle, the listed species are more associated with the Red River and it's corridor that is located 5 to 10 miles to the south of the site. Since the site has been partially disturbed by the existing power facility and does not contain upland grasslands it is unlikely that this insect would be impacted by the project.

Preliminary environmental investigations based on information contained in the Hugo Reservoir survey indicated a possibility of finding several archaeological sites along Bird Creek. However, subsequent investigations by local expert consultants indicated no prehistoric or historic resources of potential significance were found on the site. Since surveys on other portions of the site have not revealed significant sites, the probability of discovering additional sites is medium to low.

Tom Bean Site

The Tom Bean site area is located in gently rolling to slightly sloped terrain with ground elevations of approximately 750 feet. On the site there are two intermittent streams that drain to the existing reservoir. These two streams join together prior to emptying into the reservoir and divide the site on the diagonal southeast to northwest. The outfall of the reservoir drains to nearby Mill Creek. There also appears to be isolated wetland scattered throughout the site. Wetlands on the site are mostly associated with the streams that feed into the reservoir. A 100 year floodplain is associated with the larger of the two streams and the reservoir. The floodplains appear to be constrained to the stream corridor and banks of the reservoir.

Grayson County contains three federally listed species, which are all bird species and include the bald eagle, least tern, and piping plover.

Similar to the Atoka site, the Tom Bean site is a greenfield site that appears to have only been disturbed by agricultural practices, some residences, and a few roadways. The site area is bordered to the east by US Highway 69, partially bordered by Route 697 to the south, and contains a couple of secondary roads. The site that has not been previously disturbed, except by agriculture, and contains a lake, streams, riparian areas, and cropland. However, it is unlikely that any of the listed species would be impacted as their preferred habitats do not appear to exist at the site. These species are more associated with larger rivers and bodies of water.

Since the much of the site appears to have been used for agricultural purposes and not heavily disturbed, the probability of finding archaeological sites is relatively high.

6.3.4.6 Proximity to Existing Development, Visual and Noise Receptors

Impacts to a site area's existing development and ambient noise environment can be reduced by locating a site away from existing and planned residential and commercial development to the extent practical. Aerial maps identifying potential noise receptors in and around each site area are included as Figures 6-5 through 6-7.

Atoka Site

The Atoka site is located 2 miles north of Oklahoma Highway 22 and approximately ½ mile north of the Town of Kenefic, 4 miles northwest of the Town of Caddo, and 12 miles north of

Legend

- Site Area
- Noise Receptor
- Residential Area

Approximate Scale (miles)

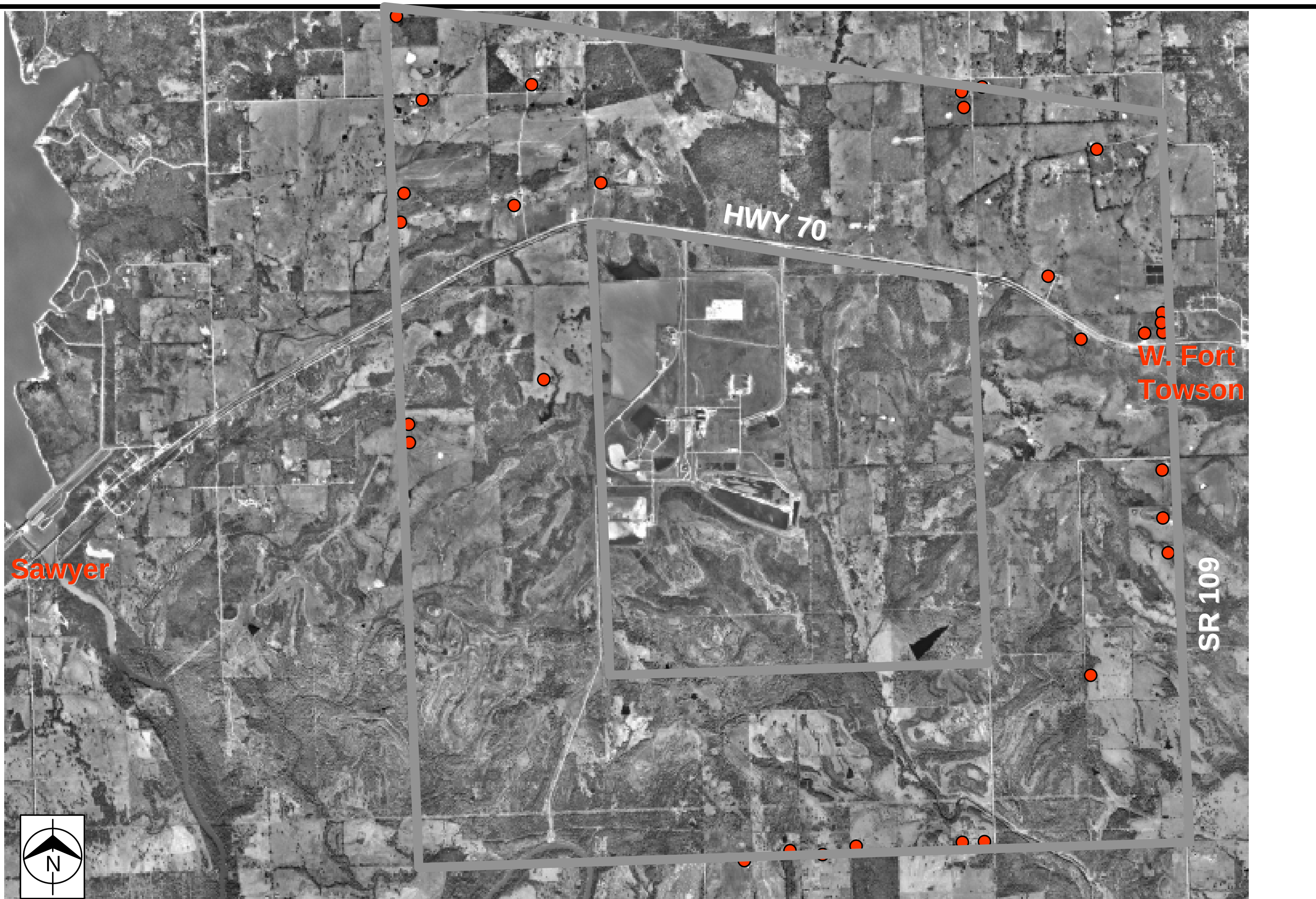
0 0.5 1.0

Source: www.microsoft.terraserver.com, Aerial 1995

Brazos Electric Cooperative

wfec western farmers electric cooperative

Figure 6-5
Noise Receptor Locations
Atoka Site



Legend

Site Area

Noise Receptor

Residential Area

Approximate Scale (miles)

0 0.5 1.0

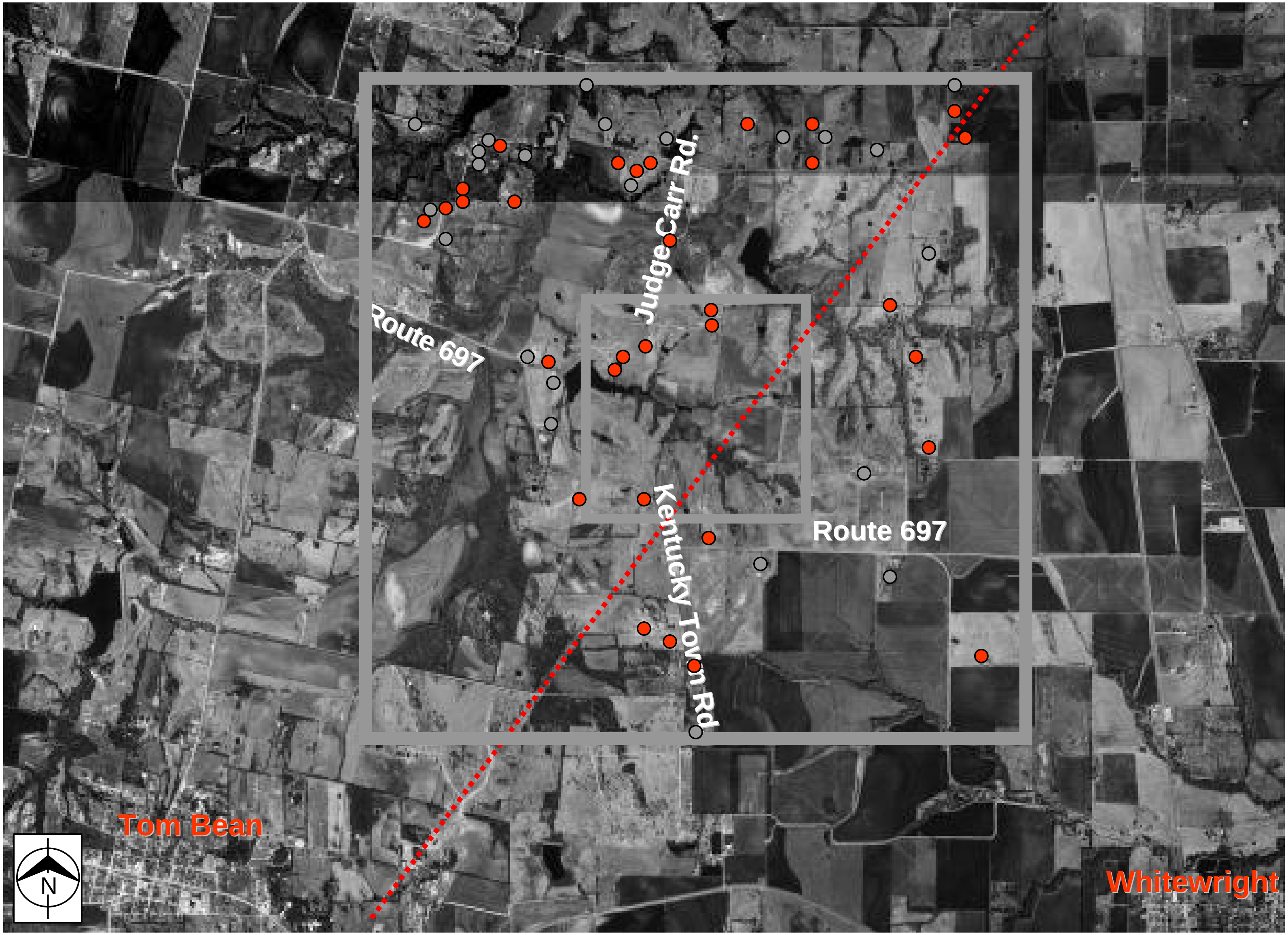
Source: USDA-FSA-APFO, Aerial 2002

BRAZOS ELECTRIC COOPERATIVE

wfec western farmers electric cooperative

A Touchstone Energy® Cooperative

Figure 6-6
Noise Receptor Locations
Hugo Site



Legend

- Site Area
- Noise Receptor
- Residential Area

Approximate Scale (miles)

0 0.5 1.0

Source: www.microsoft.terraserver.com, Aerial 1995

Brazos Electric Cooperative

wfec western farmers electric cooperative

A Touchstone Energy® Cooperative

Figure 6-7
Noise Receptor Locations
Tom Bean Site

Durant, Oklahoma. The towns of Kenefic and Caddo are small, rural communities with populations of 192 and 944 persons, respectively; the City of Durant has a population of 13,549 persons (Census 2000). The nearest major highway is Oklahoma Highway 22 located 2 miles north of the site. Noise receptors at or adjacent to the site include most of the town of Kenefic, homes just north of Kenefic along E. 1970 Road, and homes along S. Cheyenne Road. and N. 3738 Road.

Hugo Site

The Hugo site is located immediately south of U.S. Highway 70 and the St. Louis-San Francisco Railroad, approximately 1.5 miles west of Ft. Towson, three miles east of Sawyer, and 12 miles east of Hugo, Oklahoma. The towns of Ft. Towson and Sawyer are small, rural communities with populations of 611 and 274 persons, respectively. The City of Hugo has a population of 5,536 persons (Census 2000). Noise receptors at or adjacent to the site include homes to the east near Ft. Towson and to the northwest along US Highway 70 and along State Route 109.

Tom Bean Site

The Tom Bean site area is located approximately two miles northeast of the Town of Tom Bean, 3 miles northwest of the Town of Whitewright, and eight miles southeast of the City of Sherman. The towns of Tom Bean and Whitewright are small, rural communities with populations of 941 and 1,740 persons, respectively. The City of Sherman has a population of 35,082 persons (Census 2000). The nearest major highway is US 69, located approximately two miles to the east of the site. Noise receptors at or adjacent to the site include homes scattered around the site area; however, the highest density of homes are located north of the site between Judge Carr Road and FM 697.

6.3.5 Differential Site Development Costs

The current estimate to construct Hugo Unit 2 is $1,164,000,000, with an additional cost of approximately $150,000,000 for the new transmission lines needed to inject the power into the SPP and ERCOT systems. A new unit at either of the alternative sites would be approximately 15 percent more for the plant alone or approximately $174,000,000. The transmission costs for the two alternative sites would be similar to that required for Hugo (assuming the same interconnection points would be identified by SPP and ERCOT).

6.3.6 Selection of Preferred and Alternative Sites

The siting review indicated that construction of a second unit at the Hugo site was the most cost-effective and least environmentally impacting of the three final options. This is based on the fact that the site was initially developed for a total site capacity of 1,600 MW. It has sufficient land to accomodate all of the Unit 2 components on site, adequate water storage rights in Hugo Lake, an in-place intake structure and pipeline from the Kiamichi River, an on-site raw water storage reservoir, existing ash ponds, a discharge pipeline and outfall on the Red River, and two rail lines to provide competitive access for coal delivery.

The alternative sites would require new infrastracture including rail, water pipeline, discharge pipeline, etc., resulting in significantly more capital costs and environmental impact. Table 6-3 presents the overall summary comparison of the alternative sites.

Hugo was selected over a number of other sites, including the Atoka site, in the WFEC siting study conducted in 1977. Since that time Hugo has improved its position relative to the other sites due to the installation of the infrastructure noted above. No new issues have developed since that original conclusion, with the exception of potential visibility impacts on the Caney Creek Wilderness area in Arkansas. Long-range air quality modeling studies are underway to address this issue. The results will be included in the EIS.

6.4 SITE DESCRIPTION

The Hugo Power Plant Site is located near Oklahoma's southeastern border with Texas. The site consists of approximately 3,000 acres located 12 miles East of Hugo, Oklahoma on the South side of U.S. Highway 70. Access to the plant is from US Highway 70. Hugo lies 126 miles northeast from Dallas, Texas, 154 miles south of Tulsa, Oklahoma, and 187 miles southeast of Oklahoma City, Oklahoma. Figure 6-8 shows the plant location.

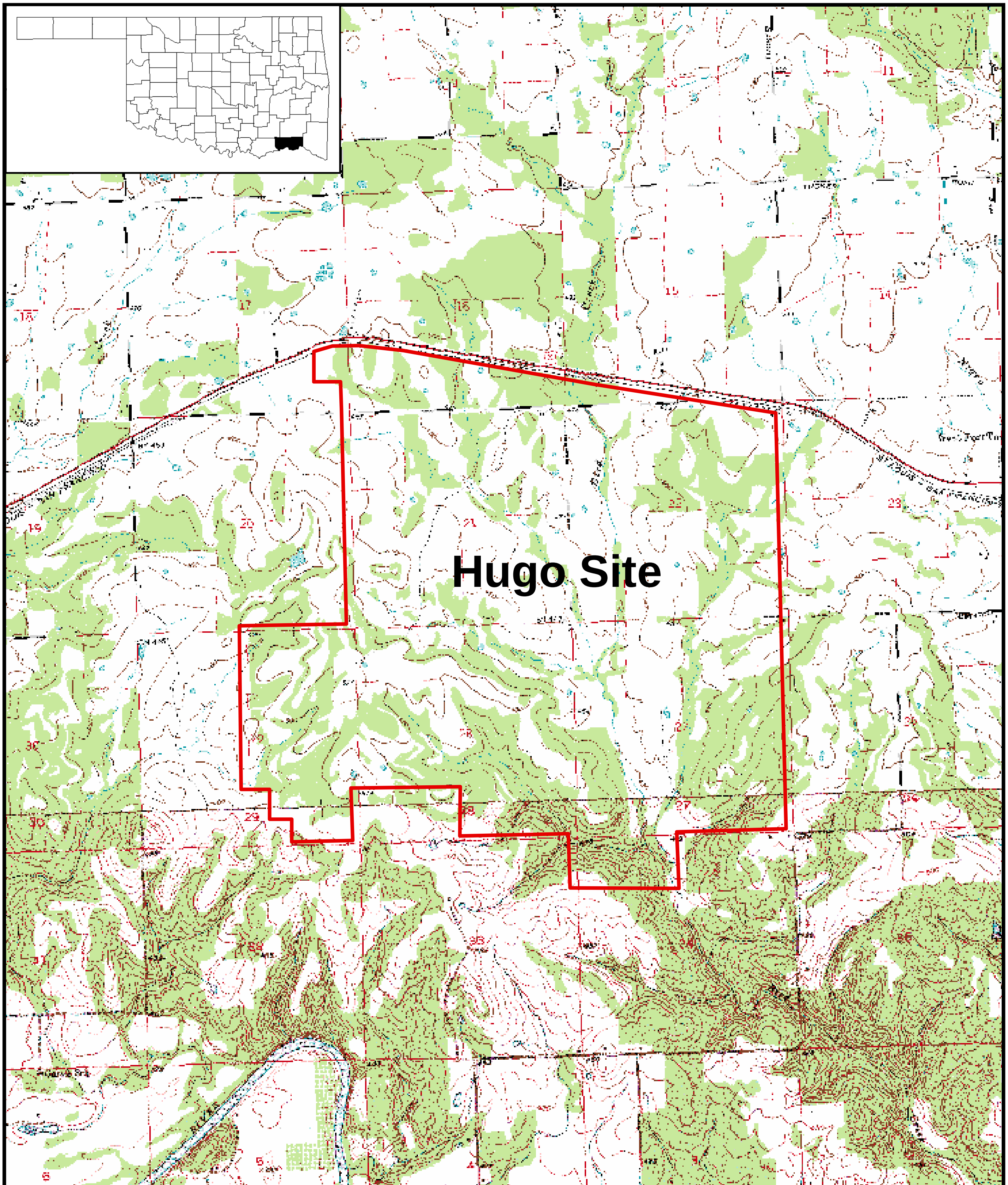
Table 6-2 Evaluation Results

	Constraints		
Criteria	**Atoka**	**Hugo**	**Tom Bean**
Water Supply	Requires water rights, construction of supply pipeline and storage reservoir	None	Requires water rights, construction of supply pipeline, and storage reservoir
Transmission Capability	TBD	TBD	TBD
Fuel Delivery	Construction of 4- mile rail spur to site and cross over of major highway	None	Construct 2-mile rail spur to site and cross over of major highway
Air Quality	None	Requires modeling for impacts to Class I area	None
Site Accessibility	Construction of access road	None	Construction of access road
Land Use and Availability	Requires property purchase and potential zoning changes	None	Requires property purchase and potential zoning changes
Constructability	Minimal grading	Minimal grading	Moderate to high grading
Site Permitting Constraints	High potential for archaeological sites Low potential for T&E species Low potential for wetlands	None	High potential for archaeological sites High potential for T&E species High potential for wetlands
Existing Development & Noise Receptors	High number of potential noise receptors	Low number of potential noise receptors	Moderate number of potential noise receptors

Rail connections for coal and equipment delivery are made with the Burlington Northern-Santa Fe and the Union Pacific railroads, providing competitive rail access. The area surrounding the plant is primarily agricultural with light residential use.

The area was originally developed in the 1970s for the nominal 400 MW Hugo Unit 1, which went into service in 1982. The site was designed for expansion to 1,600 MW.

WFEC originally secured a contract for water rights from the Hugo Reservoir allowing for up to 32,000 acre-feet of water annually for use at the plant. The water is pumped from the Kiamichi River below the Hugo Reservoir Dam to the Raw Water Holding Pond on the plant property.



Legend

Sites

NORTH

0 0.25 0.5 1 Miles

Brazos Electric Cooperative

wfec western farmers electric cooperative

A Touchstone Energy Cooperative

Figure 6-8
Hugo Site Location

From there the water is used in the cooling tower, for service water needs such as fire protection and equipment cooling, for drinking water and treated further to achieve ultra-pure water for the boiler.

Many existing facilities are available with the capacity to accommodate the new unit addition. Facilities that will be common for both units include:

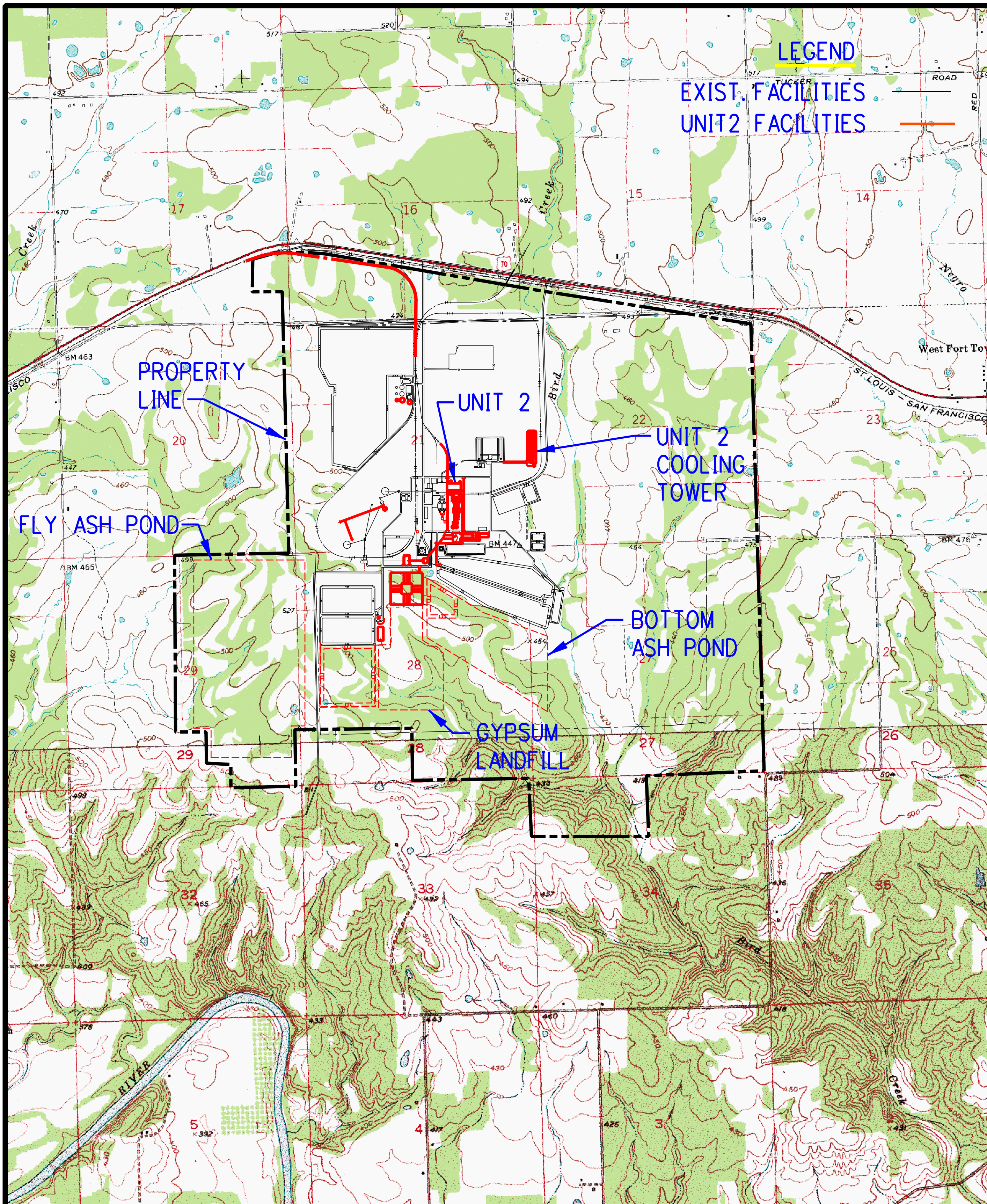
- coal unloading and handling
- raw water supply and water treatment
- fire protection
- administrative offices
- roads and parking
- warehousing and maintenance shops
- area for expansion of substation interconnects and additional transmission lines available land for an on-site landfill

6.5 PROJECT DESCRIPTION – HUGO SITE

6.5.1 Facility Equipment and Layout

The proposed electric generating facility will consist of a single new 600-750 MW base-load pulverized coal electric generating unit. The Project's major components will include a pulverized coal-fired boiler, steam turbine generator, cooling tower, emission control equipment, and stack. Figure 6-9 illustrates a generic site layout of the facility and Figure 6-10 is an artists rendering of the site showing a second unit adjacent to Unit 1. This is a modern coal plant design that uses the most recent commercially available boiler, turbine generator, air emission control, and cooling tower equipment.

Coal delivered to the plant by rail, will be unloaded via an existing rotary railcar dumper and transported by conveyor to either the coal yard for storage or to the power block area where it is placed in storage silos adjacent to the boiler. Combustion will take place in the boiler furnace where water is converted to steam. The forced draft fans provide combustion air. Steam is produced in the boiler area and heated in both the furnace and convection sections of the boiler.



0' 3000'
SCALE IN FEET

N

SourceL: 1:24,000 USGS Topographic
Quadrangles: Fort Towson (1971), Frogville (1951)

Brazos Electric Cooperative

wfec western farmers electric cooperative

A Touchstone Energy Cooperative

FIGURE 6-9
Preliminary Site Plan

COPYRIGHT © 2004 BY BURNS & McDONNELL ENGINEERING COMPANY, INC.

Figure 6-10 Artist's Rendering of Site Showing Unit 2

Steam at high pressure and temperature from the boiler enters the steam turbine. Steam from the high-pressure turbine section is reheated in the boiler for improved cycle efficiency. Steam continues to flow through the turbine converting steam pressure and temperature energy to mechanical energy turning the generator to produce electricity. When the steam reaches the lowest practical pressure (i.e., significantly below atmospheric pressure, which results in higher cycle efficiency), it leaves the turbine and enters the condenser. The condenser functions to remove heat from the low pressure steam and condense it for return to the condensate system.

Heat entering the condenser is transferred through the condenser tubes into the cooler circulating water system which is returned to the cooling towers where the heat is rejected to the atmosphere.

After the steam is condensed, condensate and boiler feed pumps return the water to the boiler through the feed water heaters. The feed water heaters improve the cycle efficiency by heating the water before it enters the boiler. This often-used regenerative design is called the advanced Rankine Cycle.

Makeup water (new water added to the boiler circuit) is needed because some water and steam is lost in the boiler, turbine, and other equipment and systems and because it is necessary to periodically drain (blow down) a portion of the boiler water to maintain the needed water chemistry. The makeup water is pumped from the service water storage and treated in a demineralizing system.

6.5.2 Emissions Controls

Activities are underway to ultimately secure an air (Prevention of Significant Deterioration (PSD)) permit for construction of Hugo 2. Burns & McDonnell and WFEC have discussed modeling protocol with the Oklahoma Department of Environmental Quality (ODEQ) to perform modeling for potential emission impacts on the Caney Creek Wilderness Area, which is a federal Class I area. EPA-approved CALPUFF long-range air dispersion modeling is underway. Model results will be presented to the Federal Land Manager at Caney Creek for review.

Hugo Unit 2 is planned to have state-of-the-art environmental controls that correspond to current Best Available Control Technology for criteria pollutants and Maximum Achievable Control Technology for hazardous air pollutants. Control technologies and predicted emissions rates will be such that Hugo 2 will be one of the cleanest coal-fired plants in the country. Predicted impacts on ground level concentrations and visibility will be modeled and submitted to the Oklahoma Department of Environmental Quality (ODEQ) and Caney Creek Wilderness Area Federal Land Manager for review and approval to obtain a PSD permit. Table 6-4 provides the estimated annual emissions of Hugo 2 based on the various criteria pollutant permit limits.

The boiler is expected to use low nitrogen oxide (NO_x) burners, which have staged fuel and air mixing and over-fire air. These burners reduce the flame temperature, which results in lower NO_x concentrations in the boiler exhaust flue gas. Equipment for control of boiler emissions is expected to include a selective catalytic reduction (SCR) system, to provide very efficient NO_x

Table 6-3 Potential Annual Emissions

Pollutant	Facility Total (tons per year (tpy))
CO*	5,321.70
NO_x†	2,838.24
PM_{10}‡	683.60
SO_2§	3,547.80
VOC¶	127.70
Pb**	0.59

*CO emissions are based on manufacturer's specifications at 0.15 lb/million British thermal units (MMBtu)
†NO_x emissions are based on a permit limit of 0.08 lb/MMBtu
‡PM_{10} emissions are based on a permit limit of 0.018 for the coal-fired unit. All particulate emissions are assumed to be PM_{10}, and represent both filterable and condensable particulates.
§SO_2 emissions are based on a permit limit of 0.10 lb/MMBtu
¶VOC emissions are based on a permit limit of 0.0036 lb/MMBtu for the coal-fired unit
**Lead emissions are based on a permit limit of 0.59 tpy.

emission control. The solids handling systems for coal, ash, and limestone are covered or include spray dust suppression and wind break fencing to reduce fugitive emissions.

The suggested operational constraints will specify an hourly limit for operation of emergency generators to maintain overall compliance with emissions.

Low-NO_x burner designs are currently available that generate less than 50 percent NO_x compared to burner designs available 10 to 15 years ago. This reduction is accomplished mainly with staged combustion and with over-fire air. Over-fire air provides the oxygen needed to complete the combustion mixture of air and fuel gradually so burner flame temperatures are lower, resulting in lower NO_x.

The boiler flue gas (i.e., combustion exhaust) enters the SCR unit for conversion of NO_x to water and nitrogen. SCR equipment in combination with low-NO_x burners treats the boiler exit gas to reduce NO_x by approximately 80 percent. NO_x is converted by injecting ammonia upstream of a catalyst. In the presence of the catalyst, NO_x reacts with ammonia and produces water and nitrogen. The catalyst is located downstream of the boiler economizer and before the air heater where boiler exit gas temperature is at an optimum. Installation of SCRs on coal plants is a relatively new development, but sufficient experience has been established to have a high confidence in proper operation of this equipment. This equipment is being employed to meet current air emission limits.

The delivered coal, which has a low-sulfur content, in combination with a flue gas desulfurization (FGD) wet limestone forced oxidation absorber (wet scrubber) is expected to provide the required sulfur dioxide (SO_2) control. Dry fly ash will be removed upstream of the FGD vessel by a fabric filter baghouse and either sold as an alternative for cement or transported to the landfill by either truck or overland conveyor. A limestone and water slurry is sprayed into the FGD vessel. This limestone slurry, consisting mainly of calcium oxide, is atomized in the wet scrubber chamber. Calcium oxide reacts with sulfur in the boiler exhaust gas to produce a calcium sulfur compound that is subsequently dewatered and removed from the absorber recycle slurry. Dewatered wet scrubber waste, gypsum, will discharge to a concrete bunker. Gypsum would be transferred by truck for off-site sales or disposal in the landfill.

The combination of low sulfur fuel and SO_2 removal equipment result in low SO_2 emissions. Water needed for this system is obtained mainly from Project wastewater flows. Existing commercial sources are available to supply the needed limestone, which are delivered to the Project by rail or truck.

The fly ash generated during the combustion process will be removed by a fabric filter (baghouse) system. The air permit that will be issued for this Project will set emission limits for particulate matter.

Ash from the bottom of the boiler and baghouse accumulates in separate hoppers and is carried by truck or conveyor to the disposal area. Induced draft fans aid in moving the combustion gases through the boiler and emission control equipment with subsequent exhaust to the stack.

The SCR system will use aqueous ammonia (19 percent ammonia and 81 percent distilled water) for NO_x control. In a SCR system, NO_x reacts with ammonia in the presence of a catalyst to form nitrogen gas and water. Ammonia is vaporized and introduced to the SCR upstream of the catalyst bed through a series of injection nozzles. A SCR system must be operated within a narrow temperature range (about 600-800 degrees Fahrenheit (^oF)) to achieve efficient NO_x

removal. The SCR system will be located between the economizer and air heaters where gas temperature will typically fall within this range.

The aqueous ammonia will be stored in a closed tank to minimize release of odors. The ammonia storage tank will be equipped with safety relief valves that may be a source of odors in the event of over-pressurization of the storage tank. During loading and unloading a vent back to the delivery truck is used; therefore, no odors are expected.

A Risk Management Plan is not required for the aqueous ammonia at the 19 percent concentration irrespective of the quantity stored on site.

Wet scrubber ash will be disposed of in an existing on-site ash landfill in similar manner as the existing system. The wet scrubber gypsum will be disposed of in a new dedicated landfill. It is also very likely that much of the gypsum may be sold for beneficial reuse due to proximity to Dallas and gypsum plants in Arkansas.

Low NOx burners and SCR produces the best cost NOx control per ton of ash removed. Because the plant is in an attainment area for all criteria, no further controls are necessary.

Wet scrubbers provide better SO_2 removal than dry scrubbers. A dry scrubber system will not provide the level of SO_2 removal likely required by the future air permit.

Fabric filters provide better PM_{10} removal than cyclones or electric static precipitators. The cost to remove PM_{10} with a fabric filter system would be considered cost effective per ton of PM_{10} removed.

6.5.3 Transmission Requirements

The requirements for transmission from the plant are still being refined. The Brazos Electric load is located in the ERCOT pool and WFEC load is located in SPP. Several alternatives are being reviewed to develop the best means of transmitting the energy to the respective member cooperatives of both utilities. The Brazos Electric power is expected to be injected into ERCOT at the Valley Substation in Fannin County, Texas. WFEC will connect to SPP at the Pittsburg Substation, in Pittsburg County, Oklahoma, and the Lydia Substation in Bowie County, Texas. Interconnect requests to both ERCOT and SPP will be filed to define these requirements.

6.5.4 Fuel Use and Waste Disposal

The fuel supply strategy for the new unit will be developed by a Fuels Committee consisting of representatives of the equity owners. This strategy will allow WFEC to integrate the coal and transportation requirements of a proposed Hugo 2 with the current needs of the Hugo 1 facility. With a projected coal burn of approximately 5 million tons per year, WFEC will use a "portfolio" approach to coal purchases whereas some coal will be purchased under long, intermediate, and short term (spot) contracts, with the goal of assuring for security of supply while staying at the "then current" market prices. Coal transportation will be achieved utilizing a competitive access strategy, whereas some or all of the rail deliveries will be contracted between one or two competing carriers. State of the art aluminum railcars will be purchased or leased to assure for maximum economies for the railroads and thus the lowest transportation cost to the Hugo facility. Modifications and upgrades to the existing coal handling/unloading facilities will be accomplished as part of the Hugo 2 construction to accommodate the increased coal deliveries and yard handling.

Sub-bituminous coal will be the primary fuel for the generating unit. For planning and air permitting purposes, Powder River Basin coal is the coal of choice, predominantly mined in Wyoming and Montana.

Coal will be delivered to the power plant site by rail in unit trains consisting of approximately 130 to 150 rail cars averaging 15,000 to 18,000 tons per train. Rail cars will be unloaded with the existing rotary car dumper. A unit train positioner may be provided to accommodate the 150-car unit trains.

Total on-site storage capacity is approximately 45-60 days of storage or about 1,100,000 tons of coal. Coal will be stored in uncovered outdoor piles in the existing coal storage system. Adequate storage space exists without the need for modification.

Distillate fuel oil will be delivered and stored on site in an existing storage tank with an approximate capacity of 400,000 gallons. Fuel oil would be pumped directly to the existing fuel oil storage tank. This system includes piping and equipment to provide for the safe transportation and distribution of distillate fuel oil to its point of utilization.

Solid waste will consist primarily of bottom ash and combustion waste material from the FGD system. Bottom ash would consist of noncombustible coal material that settles to the bottom of the boiler, where it is cooled and collected in a hopper. Combustion waste material consists of noncombustible coal material entrained in the flue gas exhaust (fly ash) and is collected in the fabric filter baghouse.

The bottom ash handling system will be a submerged scraper conveyor. The bottom ash hopper and economizer ash hoppers will have 3 days of storage capacity. Bottom ash will be transported to the landfill from the submerged chain conveyor using an overland conveyor system. A dedicated bottom ash concrete containment area will be provided for periods of downtime or for off-site sales via front end loaders into trucks. An ash sluicing system similar to the existing ash sluicing system is being investigated as an option.

The fabric filter (i.e., baghouse) will collect fly ash (i.e. combustion waste material) prior to the wet limestone forced oxidation FGD system. The combustion waste material collects on the outside of the bags and then drops into the baghouse hoppers. This dry material will be conveyed by a pneumatic conveyor system from the hoppers to a large storage silo. Fabric filters on the transport air venting from the storage silo will provide fugitive dust control. Combustion waste and dust from the silo flow through a mixer where water is added to condition the material prior to being loaded into trucks and to prepare the combustion waste material for compaction in the landfill disposal area.

6.5.5 Water Supply and Wastewater Disposal

Water for the Project systems will be supplied by the Kiamichi River using the existing intake system. One set of primary and secondary clarifiers will be furnished to operating in parallel to the existing parallel sets of clarifiers. The new clarifiers will be the same size as the existing clarifiers with a capacity to treat 6,000 gallons per minute (gpm). The effluent from the clarifiers will overflow into the existing clearwell. The additional clarifiers will provide redundancy and improve the reliability of the raw water treatment system. The clearwell will provide clarified water storage to level the flow rate through the clarifiers and facilitate maintenance.

The preliminary normal maximum Project operating water supply and usage rates are shown on the Project Water Balance Diagram, Figure 6-11. The information provided at this time is preliminary pending the completion of sufficient detailed design information and obtaining complete water analysis. The flows shown in the water balance diagram represent average daily conditions and are shown in gpm with the unit operating at 100 percent output. Water from the river will supply adequate capacity to the plant with treatment equipment, surge tanks and storage tanks as required to implement the water balance strategy.

Expected water usage for the unit operating at full load is approximately 6,900 gpm. The size of the surge and storage tanks will be determined during the detailed design phase of the Project; however, it is estimated that the condensate tank will be 250,000 gallons to 500,000 gallons and the demineralized water tank will be 500,000 to 1,000,000 gallons. Nearly all makeup water for the Project will be required in cooling towers, with the remaining water going to the wet limestone forced oxidation FGD system, service water supply, and the supply of existing demineralized water treatment system providing makeup to the boiler systems.

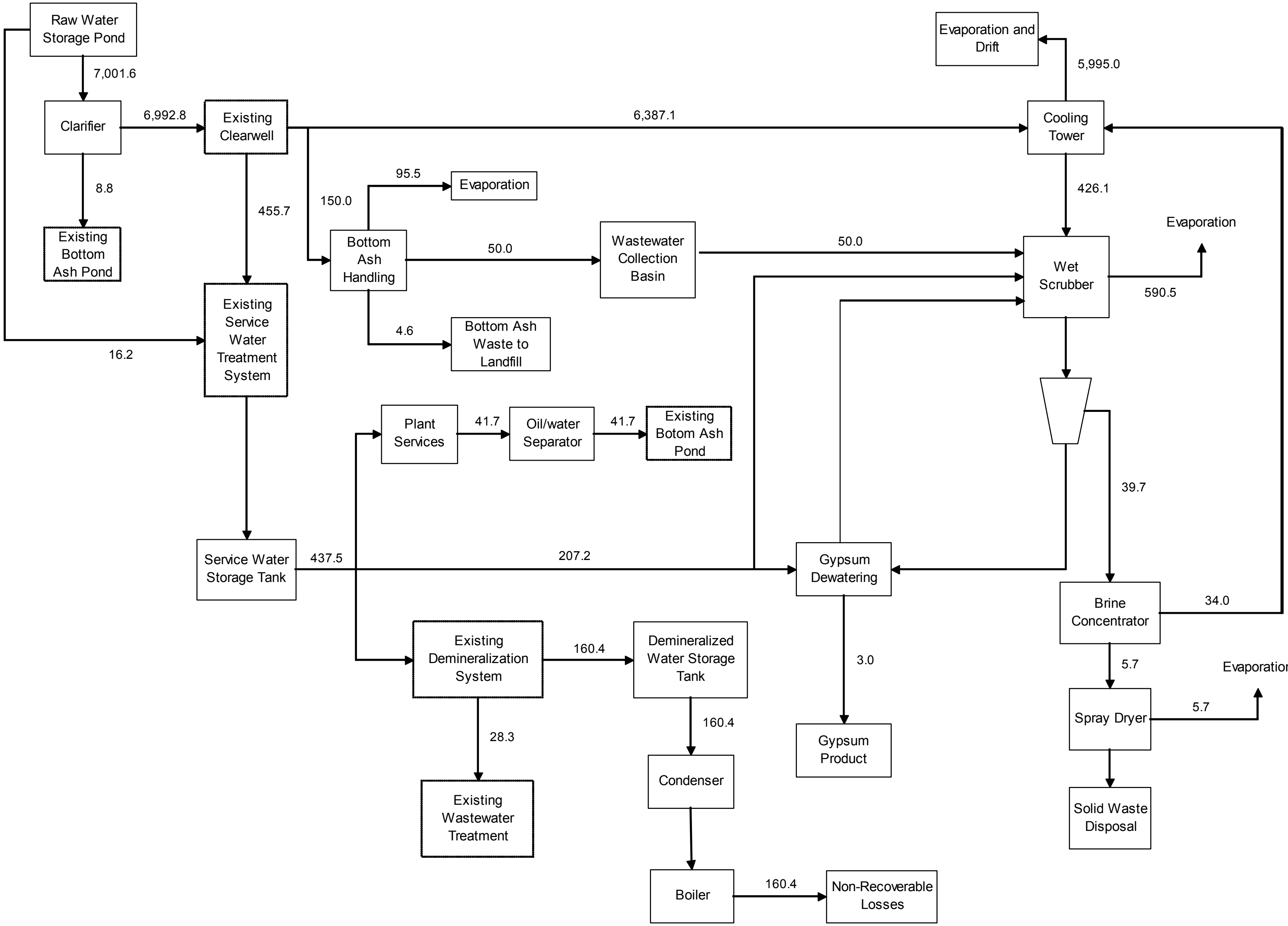
Water directly from the service water storage tank will supply the bottom ash system drag chain hopper. Most of this water will evaporate and be carried with the boiler flue gas and discharged from the stack. Overflow/blowdown from the drag chain hopper and other wastewater is recovered in the wastewater collection basin and reused as makeup to the wet limestone forced oxidation FGD system.

Fire protection supply would be tied into the existing fire protection loop. There would be a pressure booster pump to provide adequate water supply pressure in the boiler area. A large emergency diesel-driven pump would be provided for major fire water supply in the event of power failure.

Potable quality water for drinking fountains, washrooms, showers, and toilet facilities will be supplied from the existing potable water system. Sanitary waste from showers, wash basins, and toilet facilities will be directed to and treated in the existing sanitary treatment system.

The existing demineralized water treatment system will be used to furnish makeup to a new demineralized water storage tank. This tank provides adequate reserve margin for the boiler to

Figure 6-11 Preliminary Water Balance



remain in operation when the demineralized water treatment system is temporarily out of service, the unit is being started, and/or there are leaks in the boiler or other equipment.

Blowdown from the new clarifier will be combined with the blowdown from the existing clarifiers and returned to the Raw Water Storage Pond. Blowdown from the cooling tower is used as makeup water to the wet limestone forced oxidation FGD system. Purge water from the initial stage of the scrubber waste dewatering system is further processed through a zero liquid discharge system consisting of a brine concentrator/spray dryer system which treats and recovers a significant portion of the blowdown for cooling tower makeup.

Ultra-pure demineralized water is required for the main boiler. Normally, about one-third to one-half of the main boiler water makeup rate is used for sootblowing. The remaining boiler makeup is water converted to steam and vented as part of the required flows to the atmosphere from the feed water heaters for removal on non-condensable gases, or from the discharge of the condenser vacuum pumps. In addition, some demineralized water is lost as leakage in pump seals, valve packing, water sampling drains and other miscellaneous places in the large amount of piping and equipment making up the plant steam and water systems. Boiler water chemistry is maintained with the use of the condensate polisher system. Chemical feed to the condensate-feedwater system will be based on the Oxygenated Treatment (OT) method of water chemistry control.

Sanitary wastes will be directed to the existing sanitary treatment system. Plant equipment and floor drains that may be potentially contaminated with oil are routed through an oil/water separator prior to reuse. Effluent from the oil/water separator will be collected in the wastewater collection basin for reuse as makeup to the forced oxidation FGD system.

The proposed Project design includes a wet cooling system which condenses steam in a tube-and-shell heat exchanger (a condenser) with water. Cool water enters the condenser where it is warmed by the steam. The warm water is circulated from the condenser through a wet mechanical draft-cooling tower, cooled and returned to circulate again through the condenser.

The majority of the water entering the cooling tower will be consumed by evaporation and drift (5,993 gpm). The remaining cooling tower blowdown will be sent to the FGD system (426 gpm).

The wastewater collection basin will be designed to hold the plant wastewater discharges. The basin will hold discharges from the bottom ash hopper overflow and oil/water separator overflow. Discharge from the wastewater collection basin will be pumped to the forced oxidation FGD system for reuse.

Wastewater streams from the bottom ash hopper overflow, and oil/water separator will be essentially service water quality. The wastewater collection pond will allow these waste streams to commingle and any suspended solids to settle. The decanted water from the wastewater collection basin will be used to supply a small portion of the forced oxidation FGD system.

Cooling tower blowdown will be used to control the water chemistry of the circulating water. The existing cooling tower is operated at 15 cycles of concentration. The operation of the new unit cooling tower is assumed to operate at the same cycles of concentration as the existing cooling tower. All of the cooling tower blowdown will be recovered and reused as makeup to the FGD system.

The FGD system will evaporate more water than will be provided by the cooling tower blowdown and will require additional makeup. This makeup will be provided from the service water storage tank and will be first used to wash the gypsum product from the scrubber. In the FGD scrubber, the sulfur content of the flue gas will be reacted with limestone to form calcium sulfate (gypsum). This reaction produces a solid produce which is washed to a quality that will make it suitable for use in manufacturing of wall board. The wash water from the gypsum washing process will be recovered and used as the second makeup source for the FGD scrubber.

In order to maintain the desired chloride concentration in the FGD scrubber, a portion of the scrubber water will be purged from the system. The purge water will be taken from a point in the system that contains the highest dissolved solids content with as little suspended solids as possible. The FGD scrubber purge water is not suitable for direct reuse and will be directed to the zero discharge treatment system. The volume of the purge stream will be dependent on the chloride content of the coal. The purge flow shown on the water balance of nearly 40 gpm allows up to 0.03 percent chloride in the coal.

The FGD scrubber purge stream will contain about 30,000 part per million (ppm) dissolved solids of which about 15,000 ppm will be due chlorides. The zero discharge system will consist of a brine concentrator (BC) with the waste stream from the brine concentrator being evaporated in a spray dryer and produce a dry salt for landfill disposal. The BC will produce a clean water stream which will be suitable for reuse as makeup to the cooling tower. The concentrated brine from the BC will contain about 200,000 ppm dissolved solids and will be evaporated in the spray dryer. The evaporated liquid will not be recovered. The waste from the evaporator will be dry salt crystals which will be disposed in a landfill area. The salt will be predominantly calcium chloride, sodium chloride, and calcium sulfate.

6.5.6 Operating Characteristics

The plant will operate 24-hours-per-day to provide maximum electrical output throughout the year. Plant operations are monitored for staff safety, meeting environmental requirements, and providing reliable and efficient operations while striving to achieve power output objectives, limiting emissions and minimizing fuel and other consumables.

Planned maintenance will be coordinated to reduce the impact of having the unit shut down for maintenance and overhauls. Normally, this work is planned during spring when the need for electricity is reduced. Short maintenance periods of one to two weeks will likely occur once each year or two. Longer maintenance periods of 6 to 8 weeks for major steam turbine overhauls probably will occur once every 6 to 9 years.

6.5.7 Noise

During construction of the power plant and associated facilities, short-term noise sources would include heavy mobile equipment (e.g., bulldozers, backhoes, cranes, rock drills, heavy trucks, pumps, generators, compressors, loaders, and compactors). Construction equipment operation would vary considerably during the Project and during any given day. During the construction periods, the heavy mobile equipment is typically not run continuously and construction noise would generally occur only during the daytime hours.

Near the end of the Project construction, it would be necessary to generate steam in the boiler and release it to the atmosphere to clean the steam piping. This operation is usually a one-time event and would be done during the day, one operation per day generally over a two-week period. The steam blow silencer could be used to reduce the steam discharge noise which would result in moderate noise levels. Notices providing the schedule for these operations could be given to nearby residents and others in the community.

Although the construction noise levels could be audible at nearby receptors and may be considered an annoyance during the various construction phases, the construction noise impacts predicted to be low. Construction noise would normally only occur during the day and residents are typically less sensitive to noise during the day than they are at night.

The major noise producing equipment associated with power plant operations includes fans, cooling towers, pulverizers, pumps, air compressors, valves and turbine generators. Table 6-5 lists the potential project noise sources. Other periodic noises of short duration are produced by boiler blowdowns, pressure reliefs and other venting processes. Noise frequencies generated by these sources run the entire range of audible sound from a 20 hertz to 16,000 hertz.

Noise attenuating equipment and materials will be incorporated into the equipment design to reduce sound impacts of the facility on the surrounding area.

Table 6-4 Project Noise Sources

Exposed Plant Equipment	Associated Facility/Coal Handling Equipment
Air-cooled condensing units	Coal pile bulldozers
Main transformers	Enclosed Transfer Tower
Induced-draft (ID) fans	Crushers in crusher house-enclosed
	Forced-draft fans
	Primary-air fans

6.5.8 Transportation

The existing construction rail spur will be used for receipt of equipment. Rail will be upgraded as required and will be extended to the new unit. Existing roads will be used for construction access. No upgrades to roads are anticipated.

Construction traffic will include all craft labor, construction management staff, contractors, contractor equipment, vendors, and material and equipment deliveries. In addition to road vehicular traffic, the existing rail facilities will be utilized occasionally for delivery of large equipment. The frequency of the daily auto traffic will be proportionate to on-site labor projections.

In addition to the auto traffic, deliveries of construction materials, primarily by large truck, can average between 15 and 25 a day. Special deliveries, for such items as structural steel and concrete, may occasionally exceed 50 on a given day. However under normal conditions, truck deliveries during the day should not coincide with the early morning, late afternoon labor traffic.

Traffic impacts associated with the additional site construction traffic will most likely occur around the starting and quitting times of the construction craft labor when auto traffic will be at its peak. The amount of added traffic will also be dependent on the phase of construction. It will start moderately and continue to increase until the peak period of construction. Additional traffic caused by material deliveries will have a lesser impact as they are typically intermittently spread throughout the day. There will be exceptions when truck traffic will significantly increase for a given day due to a special construction process.

6.5.9 Project Schedule

The project is scheduled to begin engineering, procurement and construction shortly after the Project Definition Report is completed in November 2004. Award of a steam-generator, emissions control equipment and steam turbine-generator is planned by June 1, 2005, which would then lead to a start of construction a year later by June 1, 2006 pending environmental release to construct. Permitting began in July 2004 and is expected to conclude after 18 months by February 2006. Table 6-6 provides a list of the potential federal, state, and local permits and / or approvals this project may require. A 23-month time span is available from July 2004 until June 2006 to receive EIS and PSD permit approvals and to begin construction. RUS financing will also be contingent on environmental approvals. A 39-month construction is required to meet a commercial operation date of September 1, 2009. While this date is after the summer season, much of the summer timeframe could have the unit capable of full load operation while additional tuning and performance testing is performed.

The in-service schedule will be evaluated and confirmed based on continuing assessment of development progress. The in-service date is targeted for the time frame between 3rd quarter 2009 and 2nd quarter 2010. A schedule outline for permitting and construction activities is provided in Figure 6-12.

The following sequence provides the anticipated order of construction:

- site preparation
- underground utilities installation
- start foundation installation
- start building steel erection
- start boiler erection
- start air quality control equipment erection
- start turbine erection
- start balance of plant mechanical erection
- start electrical construction
- perform plant startup and initial operation activities
- commercial operation

The construction activities will be sequenced according to an overall project schedule using industry proven techniques augmented by current technology.

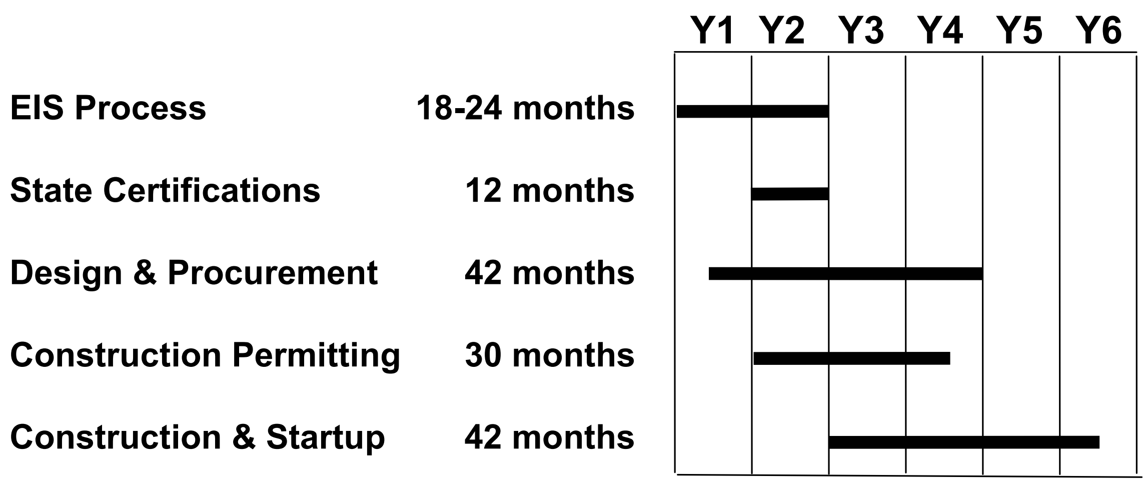
Table 6-5 Federal, State, Local Permits, Approvals, and Authorizing Actions

ISSUING AGENCY	PERMIT/APPROVAL NAME	NATURE OF PERMIT	AUTHORITY
Federal Government			
Federal Aviation Administration	Notice of Proposed Construction or Alteration	Structure location and height relative to air traffic corridors	49 USC 1501; 13 Code of Federal Regulations (CFR) 77, Objects affecting navigable air space
Environmental Protection Agency (EPA)/Oklahoma Department of Environmental Quality (DEQ)	Title IV Acid Rain Permit	This permit requires monitoring and reporting so as to comply with Sulfur Dioxide allowances	40 CFR 72
US Army Corps of Engineers (USCOE)	Section 404 Permit (Clean Water Act) Nationwide Permit/Individual Permit	Controls discharge of dredged or fill materials in wetlands and other waters of the US	Section 404 of the Clean Water Act (33 CFR 323.1)
	Section 10 Permit of the Rivers and Harbors Act	Included with Section 404 Permit submittal. Regulates the construction of all structures that could impact functioning of navigable waterways, such as an outfall or intake structure.	Section 10 of the rivers and Harbors Act (33 USC. 403)
US Fish and Wildlife Service (FWS)	Threatened and Endangered Species Clearance	Clearance to ensure that state listed protected species and/or their habitat will not be impacted	Endangered Species Act (16 USC 1531 et seq.)
State Government			
Oklahoma DEQ – Water Quality Division	Wetland or Dredge and Fill Approval (Section 401 Water Quality Certification)	Review of potential adverse water quality impacts potentially associated with discharges of dredged or fill materials in wetlands and other waters of the US	OAC 252:611-3-2
	OPDES General Permit & Storm Water Pollution Prevention Plan for Construction Activities - OKR10	Apply for coverage under General Permit in order to authorize stormwater discharges to surface waters of the state associated with the construction of the Project	OAC 252:606-1-3(L) and OAC 252:606-5-5(a)

ISSUING AGENCY	PERMIT/APPROVAL NAME	NATURE OF PERMIT	AUTHORITY
Oklahoma DEQ – Water Quality Division	OPDES Multi-Sector General Permit and SWPPP for Industrial Activities – GP-00-01	Apply for coverage under General Permit in order to authorize stormwater discharges to surface waters of the state associated with the operation of the Project	OAC 252:606-1-3(L) and OAC 252:606-5-5(a)
	OPDES Industrial Discharge Permit	Apply for coverage under Individual Permit in order to authorize industrial discharges associated with the operation of the Project	OAC 252:606-1-3(b)(3)(A)
	Hydrostatic Testing General Permit – OKG270000	Apply for coverage under General Permit in order to authorize hydrostatic testing discharges to surface waters of the state associated with the construction of the Project	OAC 252:606-1-3(b)(3)(N)
	Underground Storage Tank General Permit – OKG830000	Apply for coverage under General Permit in order to authorize storage tank discharges to surface waters of the state associated with the operation of the Project	OAC 252:606-1-3(b)(3)(N)
	Total Retention of Surface Impoundment Systems containing Class III industrial Wastewater – OKGC3T	Apply for coverage under General Permit in order to authorize impoundments of Class II wastewater associated with the operation of the Project	OAC 252:616-3-1
Oklahoma DEQ – Air Quality Division	Prevention of Significant Deterioration (PSD) Permit	Permit to construct, install and operate a major emission source in Kansas. Typically consist of BACT, MACT, Air Dispersion Analysis, and Air Quality Related Values Analysis.	40 CFR 52.21, OAC 252:100 "Air Pollution Control "
	Title V Operating Permit	Permit for operation of major equipment or major facilities that may directly or indirectly cause or contribute to air pollution	OAC 252:100 -"Air Pollution Control"

ISSUING AGENCY	PERMIT/APPROVAL NAME	NATURE OF PERMIT	AUTHORITY
Oklahoma DEQ – Land Protection Division	Solid Waste Landfill Permit	Permit to construct and operate a solid waste disposal facilities	OAC 252:515-1-1(a) and OAC 252:515-1-1(b)
Oklahoma Department of Wildlife Conservation	Threatened & Endangered Species Clearance	Clearance to ensure that state listed protected species and/or their habitat will not be impacted by the project	State Endangered Species Program
Oklahoma State Historic Preservation Office	Section 106 of the National Historic Preservation Act	Consult with project applicants and state agencies regarding impacts on cultural resources that are either listed or eligible for listing on the National Register of Historic Places	National Historic Preservation Act
Local Government			
Choctaw County Planning & Zoning Office	Special Use Permit Building Permit Floodplain Development Permit	Obtain county rezoning approval prior to construction Permit to construction buildings Permit to construct in a flood zone	To Be Determine (TBD) TBD TBD

Figure 6-12 Project Schedule



6.5.10 Project Cost

The current capital cost estimate (for the plant only) without transmission or interest during construction is $975,000,000. The engineering, procurement and construction would span from December 2004 to September 2009.

Black and Veatch did a bus-bar cost analysis of potentially feasible alternative technologies in the 2001 WFEC Planning Study. According to the analysis there is considerable advantage for the solid fuel options over the combined-cycle options; 1) the price of natural gas has greatly increased an many forecasts reflect the notion that gas prices have undergone a permanent step increase in price compared to the Mid-1990s price level, and 2) the capital cost of gas-fired technologies has increased significantly due to the increased demand for these units.

6.5.11 Employment

Based on similar type projects, the Project employment begins with approximately 50 construction workers in the first year and rise to a peak of approximately 1,200 in year three. All construction activity is completed by year five. The Project will share operational staff with the existing unit. The existing staff will be expanded by approximately 50 employees to accommodate the unit expansion. By sharing staff, both units will benefit from added flexibility and will be able to operate with fewer on-site staff per unit.

7.0 TRANSMISSION LINE MACRO-CORRIDOR ANALYSIS

7.1 INTRODUCTION

As discussed earlier, the existing Hugo Power Plant is the preferred site for construction and operation of the new unit. In order for power generated from the Hugo Plant to reach the wholesale customers of both WFEC and Brazos, new transmission facilities will be needed. An additional factor is the fact that there are two separate and asynchronous power grids involved: the Southwest Power Pool (SPP), and the Electric Reliability Council of Texas (ERCOT). For power to be transferred from the Hugo Plant into ERCOT it either needs to be generated and transferred synchronously with the ERCOT system, or first converted to direct current (DC) and back to alternating current (AC) at the correct frequency via a converter station. Another option is to transmit the power via a DC line to a converter station at the termination point. Studies are underway by both the SPP and ERCOT to determine the best solution for the transmission system to accommodate the addition of the new unit.

WFEC and Brazos Electric met with SPP staff on September 9, 2004 to discuss the process for Hugo Unit 2 interconnection studies. The studies are a three-step process starting with a Feasibility Study, followed by a System Impact Study, and finally a Facilities Study. Results from these studies will be incorporated into a FERC 2003A compliant Interconnection and Operating Agreement between WFEC and SPP.

WFEC discussed with the SPP the possible outcomes of these studies which included possible line additions for interconnection of the new 750 MW Unit 2. SPP indicated that the 345-kV system in the Hugo area is heavily congested with flowgates based on the outage of either the 345-kV Pittsburg to Valliant or Valliant to Lydia lines. (ie lines would be overloaded).They indicated that WFEC should expect the studies will recommend additions that address these flowgates. Therefore, WFEC expects the ultimate SPP solution to include the construction of new 345-kV lines from the Hugo Plant to the Pittsburg Substation (approximately 60 miles) and from Hugo to the Lydia Substation in Texas (approximately 50 miles). Until the studies are completed, WFEC is including the Hugo-Valliant option (approximately 16 miles) as a potential, but less-likely alternative to either the Hugo-Pittsburg option or the Hugo–Lydia option.

Several options exist for delivery of up to 500 MW of power to Brazos. These include a synchronous operation of Hugo Unit 1 (450) MW in the ERCOT grid, a DC tie or DC line that would require an AC-DC converter station at the Hugo Plant and a DC-AC converter at the termination point in Texas, and a combination synchronous and DC tie option which also would require an AC-DC-AC converter station at the plant to allow the transfer between the asynchronous SPP and ERCOT systems from either of the two units. Although the studies are currently underway, it was WFEC and Brazos' consensus to pursue synchronous operation with the possibility of a smaller DC transfer via a converter at a future date. That means that Hugo Unit 1 would be connected directly into the ERCOT system and Hugo Unit 2 (750 MW) would be connected directly into the SPP system.

ERCOT indicated that their studies would likely indicate that the best interconnection point into the Texas grid would be at the Valley Substation in western Fannin County, approximately 65 miles southwest of the plant. An alternative, but less likely, option would be at the Paris Substation, approximately 30 miles south of the plant. Another possibility is to construct a new DC line from the Hugo plant to another appropriate site in north Texas, with converter stations at either end.

WFEC submitted an Interconnection Application on September 14, 2004 to begin the Feasibility Study for a 750 MW addition into SPP. Similarly, Brazos Electric submitted a Generation Interconnection Request on September 3, 2004 to initiate the ERCOT study.

In order to identify the potential locations for these new transmission line facilities, Burns& McDonnell conducted an investigation of the existing human and environmental resources within the study area identified for these new facilities. This investigation centered on identifying those resources within the areas between the Hugo Plant and the five substations to which it would potentially connect that would present issues or concerns for the routing of new transmission facilities. Additionally, this study sought to identify any opportunities within the study area that would provide a potential corridor or alignment for a new transmission line. The goal of the investigation was to identify and define a macro-corridor, an area up to several miles in width extending between the desired end-points, within which the proposed connecting transmission lines could be constructed.

7.2 TRANSMISSION FACILITIES STUDY AREA

The study area developed for the proposed transmission facilities encompassed the Hugo Station, the Pittsburg and Valliant Substations in Oklahoma, and the Paris, Valley and Lydia Substations in Texas, and substantial lands between these points (Figure 7-1). An area of sufficient size to provide numerous potential corridors for location of a new transmission line, as well as incorporate the desired end-points, was established. This study area consists of portions of eight counties, five in Oklahoma and three in Texas and was divided into five study corridors, all originating from the Hugo Station. Each of these study corridors addressed one of the three required transmission line connections. The following sections include a description of these study corridors and identify the macro-corridors identified within each for further investigation.

7.3 HUGO TO VALLIANT CORRIDOR

The Hugo to Valliant study corridor extends eastward from the Hugo Station approximately 16 miles to the Valliant Substation (Figure 7-2). This corridor includes eastern Choctaw County and western McCurtain County. The Valliant Substation is located approximately 1.5 miles east of Valliant, just south of US Highway 70. The most dominant features in the area between Hugo Station and Valliant Substation include US Highway 70, which extends east-west through the area, the Kiamichi Railroad running along the south side of the highway, WFEC Railroad running along the north side of the highway, Lake Raymond Gary (located south of the highway, approximately 3.5 miles east of Hugo Station), the towns of Fort Towson, Swink, and Valliant, and the Weyerhaeuser paperboard facility immediately southwest of Valliant.

7.3.1 Human Resources

The Hugo to Valliant study corridor in Choctaw and McCurtain counties contains primarily undeveloped, rural lands. General population and employment data for these counties is included in Tables 7-1 and 7-2. Land use throughout the area consists of a mixture of woodlands (some of which are for production of pulp and other forest products), pasture land, and scattered rural residences and small farmsteads.

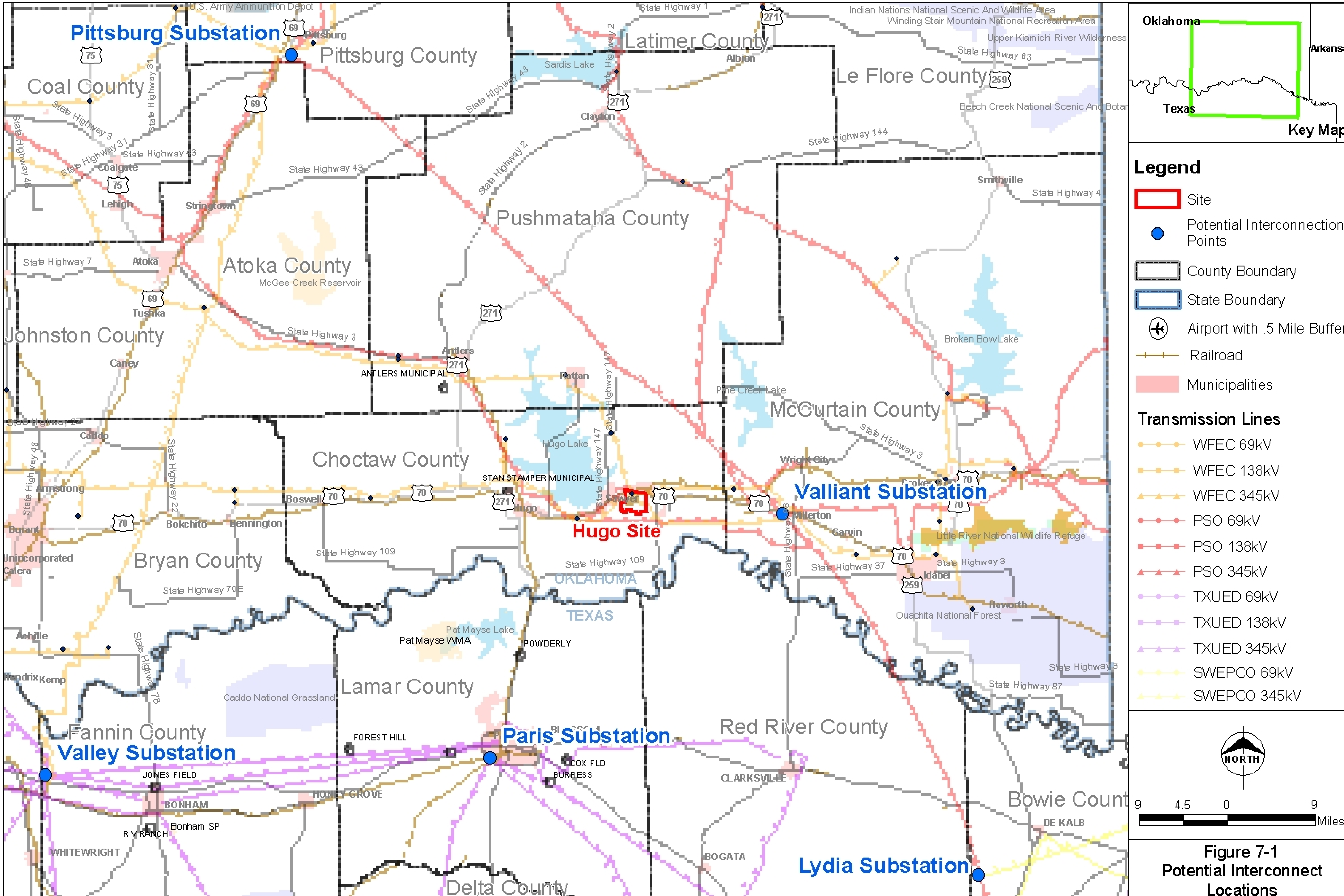


Figure 7-1
Potential Interconnect Locations

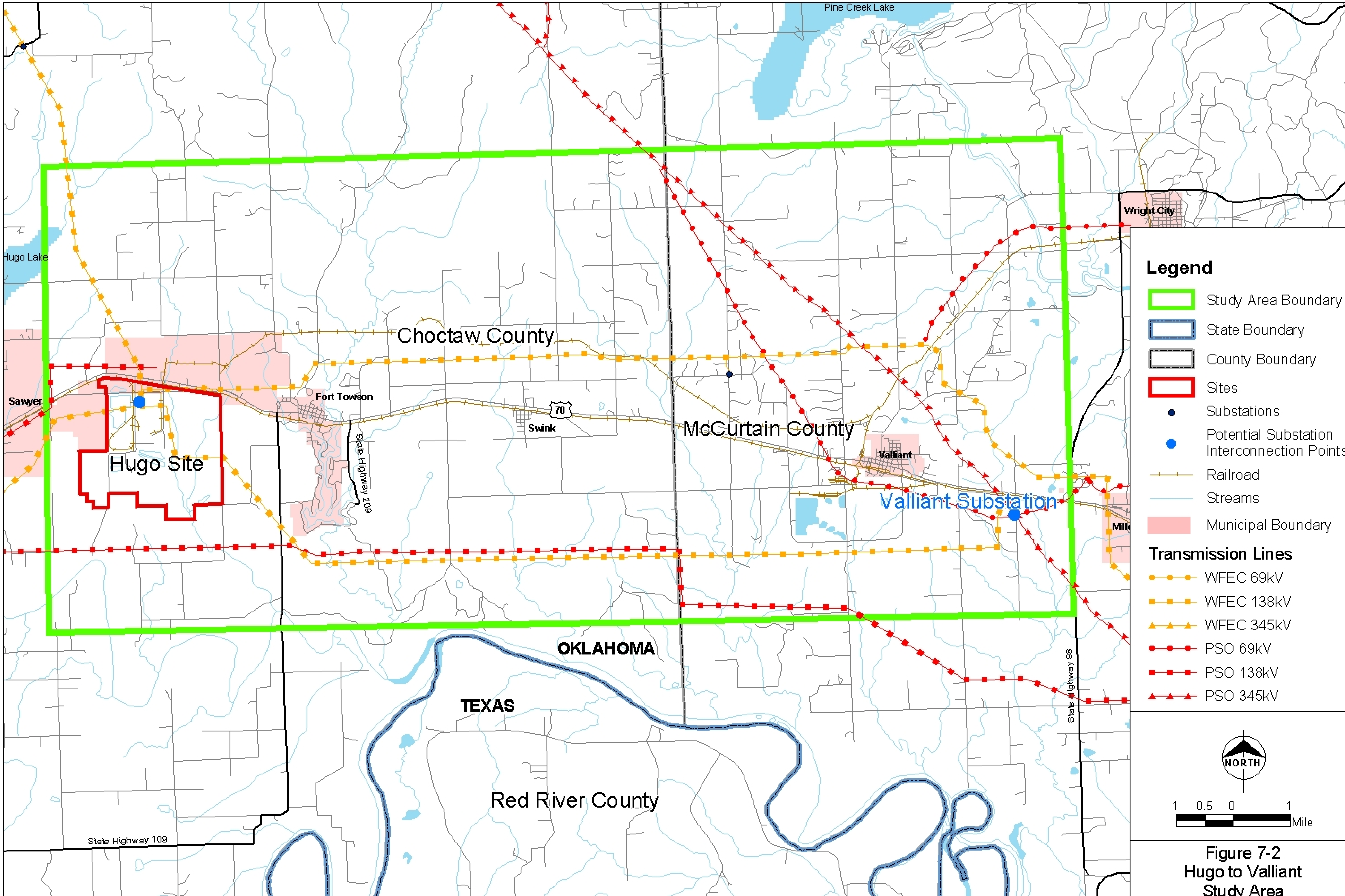


Figure 7-2
Hugo to Valliant
Study Area

Table 7-1 Population for Hugo to Valliant Study Corridor Counties, Oklahoma

	Choctaw	McCurtain
Population 2003	15,431	34,006
Population 2000	15,342	34,402
Population % Change	0.6	-1.2

Source: US Census Bureau, 2000

Table 7-2 Percent Employment for to Hugo to Valliant Study Corridor Counties, Oklahoma

Industry	Choctaw	McCurtain
Agriculture, forestry, fishing and hunting, and mining	6.5	9.3
Construction	8.8	8.0
Manufacturing	9.5	21.2
Wholesale trade	3.3	2.0
Retail trade	11.9	13.5
Transportation and warehousing, and utilities	8.8	4.4
Information	1.5	1.3
Finance, insurance, real estate, and rental and leasing	4.3	2.6
Professional, scientific, management, administrative, and waste management services	4.0	2.9
Educational, health and social services	23.9	19.5
Arts, entertainment, recreation, accommodation and food services	4.7	6.0
Other services (except public administration)	7.0	4.7
Public administration	5.9	4.6

Source: US Census Bureau, 2000

Minor amounts of cropland do occur. However, most agricultural lands are used for grazing or hay. Generally, only incorporated areas, such as the City of Hugo and town of Valliant, have land use zoning.

Several communities are located within the study area. These include Fort Towson and Swink in Choctaw County and Valliant in McCurtain County. All of these communities are located along US Highway 70. Fort Towson had a population of 611 in 2000. The village of Swink had a population of 83 people in 2000. Valliant had a 2000 population of 771 people. Other than these communities, little development besides small farms and rural residences is present in the area.

Three parks, all located in the Fort Towson area, were identified in the study corridor: the Fort Towson Military Park, the Raymond Gary State Park and the New Hopson Park. The Fort Towson Military Park is a historic site, an 1824 US Army base that presently hosts rendezvous and re-enactment activities. The purpose of the fort is to preserve historic structures of the frontier. The Raymond Gary Lake and State Park contains a 390-acre lake with 10 miles of shoreline and offers fishing, boating, swimming and camping.

The primary roadway in the study area is US Highway 70, as mentioned previously. It runs east-west through the study corridor. Hugo Station is accessed from this highway, which is just north of the station property. US Highway 70 extends east from Hugo Station through Ft. Towson, Swink, and Valliant, providing the main transportation route between the largest communities in the area, Hugo to the west and Idabel to the east. Both of these communities lie outside the study corridor for this portion of the project.

In addition to US Highway 70, an extensive network of county roads is present in the area. County Highway 109 runs south from US Highway 70, as does County Highway 209 (which provides access to Raymond Gary State Park) at Ft. Towson. County Highway 98 runs north-south from US Highway 70 slightly east of the Valliant Substation. Numerous other paved and unpaved roads provide access throughout the area.

Several rail lines provide service to customers in the local region. The Kiamichi Railroad line runs along the south side of US Highway 70, extending from Hugo to Idabel. It provides rail access for coal delivery to Hugo Station as well as serves customers in Idabel. The DeQueen and Eastern Railroad line extends from northeast of the study area to Valliant. It primarily provides rail service to the Weyerhauser paper facility just southwest of Valliant. The WFEC Railroad line extends from the DeQueen and Eastern rail line westward north but parallel to US Highway 70, providing a second access to Hugo Station for coal delivery.

Several transmission lines occur within the study corridor. A 138-kV transmission line, crossing to the north side of US Highway 70 after leaving Hugo Station, extends approximately 16.5 miles east. It passes north of Valliant, then turns southeast, crossing US Highway 70 again and passes within one mile of the Valliant Substation. A second transmission corridor containing two lines, both 138-kV, extends east-west across Choctaw and McCurtain Counties, approximately 1.5 miles south of Hugo Station. One of these lines, operated by PSO, turns north just southeast of Valliant and connects to the Valliant Substation. The second line is operated by WFEC and connects to the Hugo Station Switchyard. This line continues east out of the study area. Numerous distribution lines are located along area roadways providing electrical service to local residents and commercial and industrial customers.

7.3.2 Natural Resources

The Hugo to Valliant study area is located on the Southern Coastal Plains and in the Ouachita Mountains. Topography of the area ranges from relatively flat, rolling hills to moderately steep areas around drainage valleys. Drainage in the area is generally southward toward the Red River. Numerous creeks and rivers occur throughout the area. These drainage ways are predominantly contained within narrow, highly-incised stream channels. More significant drainage ways include the Kiamichi River, Bird Creek, Gates Creek (impounded to create Lake Raymond Gary), Doaksville Creek, Clear Creek, and Garland Creek, and the Red River.

Vegetation throughout the study area forms a mosaic of different community types. These types range from deciduous woodlands to pine plantations for pulp production, to mixed warm and cool season pastures to minor amounts of cultivated cropland. More level areas generally have been cleared for agricultural use, while areas along drainage ways and in more hilly areas are wooded. Wetland communities also occur within the study area but are primarily associated with drainage ways and small ponds providing water for livestock.

The abundance and variety of vegetative communities provides habitat for numerous species of wildlife. Wildlife include both game species such as white-tailed deer, turkey, rabbit, squirrel, quail, dove, and waterfowl, as well as numerous non-game species including rodents, bats, songbirds, shorebirds, amphibians, and reptiles.

Preliminary investigation identified several federally listed species as potentially occurring in Choctaw and McCurtain Counties. While several of these species, such as American burying beetle and red-cockaded woodpecker, may occur in the study corridor, others such as the American alligator, interior least tern, and piping plover are not expected due to the lack of suitable habitat in the area. Table 7-3 provides a complete list of the potential federally listed species.

Table 7-3 Threatened and Endangered Species – Hugo to Valliant Corridor

Common Name	Scientific Name	Federal Status	County	
			Choctaw	McCurtain
American Alligator	*Alligator mississippiensis*	DM, SAT	-	X
American Burying Beetle	*Nicrophorus americanus*	E	X	X
Peregrine Falcon	*Falco peregrinus anatum*	DM	X	X
Bald Eagle	*Haliaeetus leucocephalus*	AD, T	X	X
Interior least tern	*Sterna antillarum*	E	X	X
Ouachita rock pocketbook	*Arkansia wheeleri*	E	-	X
Piping Plover	*Charadrius melodus*	E, T	X	X
Red-cockaded woodpecker	*Picoides borealis*	E	X	X
Scaleshell mussel	*Leptodea leptodon*	E	X	X

E – endangered DM – Delisted, being monitored for 5 years SAT – similar in appearance to listed species
T – threatened AD – Proposed for delisting

The study corridor has a long history of habitation, both by prehistoric Native American groups and Euro-American settlers. Twelve sites in Choctaw County and 18 sites in McCurtain County listed on the National Register of Historic Places were identified. The majority of these sites are historic structures located in the communities throughout the region. However, it is likely that many additional prehistoric archaeological sites occur throughout the area.

7.4 HUGO TO PARIS CORRIDOR

The Hugo to Paris study corridor extends southwest from the Hugo Station in Choctaw County, Oklahoma approximately 30 miles to the Paris Substation in Lamar County, Texas (Figure 7-3). The Paris Substation is located on the southwest side of the City of Paris near the intersection of County Highway 137 and the US Highway 82 loop. The most dominant features in the study corridor include the Red River, which forms the boundary between Oklahoma and Texas; US

Highway 271 which extends between the towns of Hugo and Paris; Pat Mayse Lake, State Park and Wildlife Area; Camp Maxey Military Reservation, Lake Crook; and the City of Paris itself.

7.4.1 Human Resources

The Hugo to Paris study corridor includes southern Choctaw, northern Lamar, and extreme northwestern Red River Counties. General population information about Lamar and Red River Counties is presented in Table 7-4 (information on Choctaw County is presented in Tables 7-1

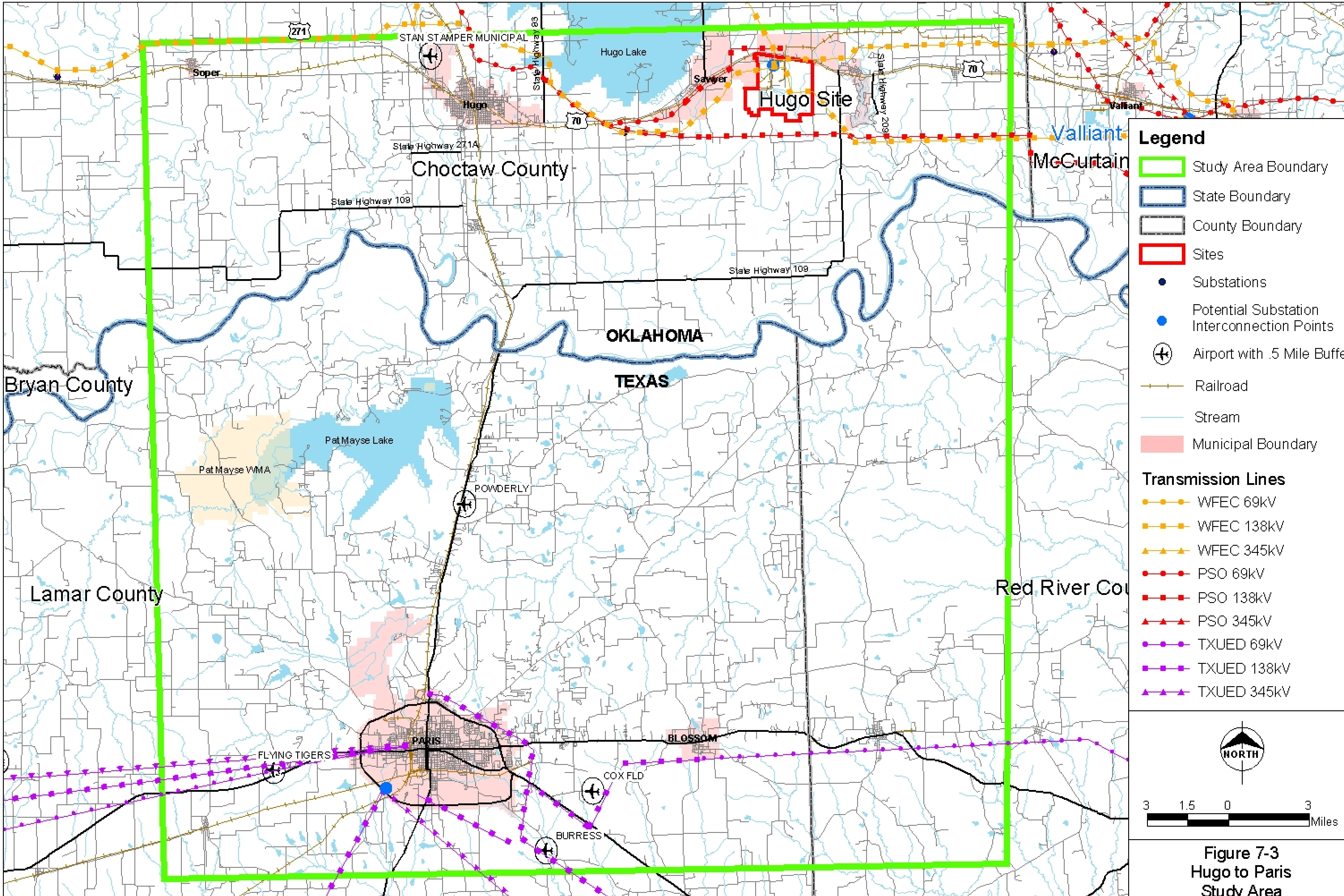


Figure 7-3
Hugo to Paris
Study Area

and 7-2). Land use in the Hugo to Paris study corridor is primarily open pasture or rangeland. The developed areas include the communities of Sawyer, Fallon, the City of Hugo, Grant, Ord, Arthur City, Midcity, Powderly, Frogville, Sun Valley, Reno, Blossom, and the City of Paris. Hugo, Oklahoma and Paris, Texas are by far the largest communities in the region. Generally, only the incorporated areas of these counties (Hugo and Paris) have land use zoning.

Table 7-4 Population for Hugo to Paris Study Corridor Counties, Texas

	Lamar	Red River
Population 2003	49,464	13,812
Population 2000	48,499	14,314
Population % change	2.0	-3.5

Source: US Census Bureau, 2000

The City of Hugo is the county seat of Choctaw County. In 2000, the city had a total population of 5,536. In the late 1960s Hugo was designated as the termination point of the Indian Nation Turnpike, which provides a major transportation artery to northern and central Oklahoma. Most recently, Hugo won distinction as one of only 30 rural Enterprise Communities in the United States designated by the USDA RUS Program. Designation is based on the community embodying the principles of economic opportunity, sustainable community development, community-based partnership, and strategic vision for change.

The town of Paris is located in northeast Texas, in Lamar County, approximately 105 miles northeast of Dallas. Paris is the county seat for Lamar County. The town is marketed as being located midway between the Atlantic and Pacific seaboards making it ideal for distribution of products to national markets. The town's extra-territorial jurisdiction (ETJ) extends 2 miles from the city limit boundary. In 2000, the population of the city was 25,898.

The town of Sawyer, Oklahoma is located along US Highway 70 in Choctaw County. The town had a population of 274 in 2000. Frogville is an unincorporated community in Choctaw, Oklahoma on North 4340 Road and State Highway 109.

In Texas, Sun Valley is a town on US Highway 82. In 2000, Sun Valley had a population of 51. Blossom is located on the US Highway 82 and Farm Road (FR) 196 intersection. The 2000 census indicates that Blossom had a total population of 1,439. Reno is located on US Highway 82 adjacent to Paris. The town had a total population of 2,767 in 2002.

The area offers numerous opportunities for outdoor activities because of the game and fishing resources. Many of these opportunities are provided by the Kiamichi Mountains and the Kiamichi River. The Kiamichi River flows into Hugo Lake, which is located in the lower Kiamichi River Basin approximately five miles east of Hugo and immediately north of US Highway 70 approximately 18 river miles upstream from its confluence with the Red River. Hugo Lake is operated by the US Army Corps of Engineers primarily for flood control. This multipurpose reservoir became operational in 1974. Hugo Lake Park offers paved roads for cycling, jogging, hiking or horseback riding. The Park contains a 3,000-acre deer management area. The lake area offers over 25,000 acres of land for hunting. Recreational facilities include boat launching ramps, group camping, picnic and camping areas, playgrounds, beaches, cycling, equestrian and hiking trails.

The Pat Mayse Lake, State Park, and Wildlife Area are in the Red River basin, in north central Lamar County, 10 miles north of Paris. The lake was created in 1967 by the US Army Corps of Engineers by impounding the waters of Sanders Creek. Primary uses for the lake include municipal and domestic water supply, flood control and recreation.

The Camp Maxey Military Reservation is a World War II infantry training camp 10 miles north of Paris, Texas. The facility was activated on July 15, 1942. Army ground forces were trained at Camp Maxey and Army service forces and Army air forces had a part in camp activities. The varied terrain provided unique opportunities for infantry training. An artillery range, obstacle course, infiltration course, and "German Village" were included in training maneuvers. Troop capacity was 44,931 and German prisoners of war were also held at the military reservation. On October 1, 1945, the camp was put on inactive status and served as a training center for the Texas National Guard. Most of the original buildings were demolished or sold and removed. In 1990 the camp sewage-treatment plant was used by the town of Paris. When Pat Mayse Lake was constructed in 1965-67, parts of the northern edge of the base were inundated.

The Hugo to Paris area contains an extensive network of roadways, both paved and unpaved. US Highway 271 runs north/south through the entire corridor and is the primary thoroughfare of the area. Portions of US Highway 82 Loop and Park Road 286 are in the southern most portions of the corridor. In Oklahoma, US Highway 271 and State Highway 109 merge together while heading north before connecting to US Highway 70, which runs south of the City of Hugo. State Highway 109 heads west out of the corridor and US Highway 71 continues north before heading west at the US Highway 271 intersection. The Kiamichi Railroad runs north/south from Hugo to Paris generally parallel to US Highway 271. The Texas Northeastern Railroad line extends from Paris to the southwest.

A number of small airports and airfields were identified within the study corridor. The Flying Tigers Airport (FAA designation 39TA) is west of the City of Paris. The Powderly Airport (48TE) is located off of US Highway 271. The Stan Stamper Muni Airport (HHW) is located northwest of the City of Hugo. None of these airports are instrument certified and all have utility runways with visual approaches. Cox Field (PRX) airport is located south of US Highway 82. Cox Field has limited instrumentation but receives scheduled air carrier service. Runway 17/35 has non-precision instrument markings while the others have none. In addition to these registered airfields, it is likely that a number of small, private landing strips occur scattered throughout the area.

While a number of electrical transmission lines occur throughout the study area, none of them currently provide a connection or corridor between Hugo Station and Paris Substation. Transmission lines located in the area include the two transmission lines running east-west south of Hugo Station and a number of lines extending southeast and southwest from the Paris Substation. Several additional lines extend westward from other substations in the Paris area.

7.4.2 Natural Resources

The Hugo to Paris corridor generally lies within the Southern Coastal Plain region and the Red River Valley. Paris is located on a ridge south of the Red River, with drainage north of the city flowing north to the Red River and drainage south of the city flowing south to the Sulphur River. Topography of the area is similar to that described for the Hugo to Valliant area, ranging from rolling hills to more hilly areas with moderately steep slopes. Drainages generally narrow and highly incised, although areas adjacent to the Red River may have wider, more developed flood plains. More substantial drainage ways in the area include the Red and Kiamichi Rivers and Pine, Sanders, and Nolan Creeks.

Vegetation throughout the study area forms a mosaic of different communities. These communities range from deciduous woodlands to mixed warm and cool season pastures to minor amounts of cultivated cropland. More level areas generally have been cleared for agricultural use, while areas along drainage ways and in more hilly areas remain wooded. Wetland communities also occur within the study area but are primarily narrow bands associated with drainage ways, borders of local lakes, or are small ponds providing water for livestock.

The abundance and variety of vegetative communities provides habitat for numerous species of wildlife. Wildlife include both game species such as white-tailed deer, turkey, rabbit, squirrel, quail, dove, and waterfowl, as well as numerous non-game species including rodents, bats, songbirds, shorebirds, amphibians, and reptiles.

Several wildlife areas have been established in the study corridor. Lake Crook is owned by the City of Paris but managed by Texas Parks and Wildlife. The Lake is on Pine Creek, a tributary of the Red River, five miles north of Paris. The Lake was impounded in 1923 and has a capacity of 9,960 acre-feet and a surface area of 1,226 acres at the spillway crest elevation of 476 feet above mean sea level. The drainage area above the dam is 52 square miles. Lake Crook offers fishing, boating, camping and picnicking.

Lake Gibbons is a 158-acre lake, located 4.2 miles northwest of Paris, developed by the Texas Parks and Wildlife Department as a Goose Refuge. The Lake is closed from November to April each year for incoming geese. Boats are not allowed during that time except for boats under 10 horsepower. Lake Gibbons offers swimming, boating and fishing.

Hugo Lake and Pat Mayse Lake, previously discussed, also have adjacent wildlife management areas. These areas provide a variety of hunting and other recreational opportunities.

Preliminary investigation identified several federally listed species as potentially occurring in Choctaw, Lamar, and Red River Counties. A number of these species, including the interior least tern, piping plover, and scaleshell mussel, are associated with the Red River. Table 7-5 provides a complete list of the potential federally listed species.

Table 7-5 Threatened and Endangered Species – Hugo to Paris Corridor

Common Name	Scientific Name	Federal Status	County		
			Lamar	Red River	Choctaw
American Burying Beetle	*Nicrophorus americanus*	E	X	-	X
Peregrine falcon	*Falco peregrinus anatum*	DM	-	-	X
Bald Eagle	*Haliaeetus leucocephalus*	AD, T	X	X	X
Interior least tern	*Sterna antillarum*	E	X	X	X
Louisiana black bear	*Ursus americanus luteolus*	T	X	-	-
Piping plover	*Charadrius melodus*	E, T	-	-	X
Scaleshell mussel	*Leptodea leptodon*	E	-	-	X
Whooping Crane	*Grus americana*	E, EXPN	X	-	-

E – endangered DM – Delisted, being monitored for 5 years EXPN – experimental population
T – threatened AD – Proposed for delisting

The study corridor has a long history of habitation, both by prehistoric Native American groups and Euro-American settlers. Investigation of cultural, both historic and archaeological, sites listed on the National Register of Historic Places, identified 12 sites in Choctaw County, 41 sites in Lamar County, and 6 sites in Red River County. Of the Lamar County sites, 34 are historic structures located within the town of Paris. None of the sites in Red River County occur in the study corridor. However, it is anticipated that many additional prehistoric archaeological sites occur throughout the area. Prehistoric archaeological sites, potentially of National Register significance and of importance to Native American Tribes historically inhabiting the area, are likely to occur along the Red River. These sites, although currently unidentified, would be of particular concern for any transmission line crossing of the Red River.

7.5 HUGO TO PITTSBURG CORRIDOR

The Hugo to Pittsburg study corridor extends northwest from the Hugo Station in Choctaw County, Oklahoma approximately 60 miles to the Pittsburg Substation in Pittsburg County, Oklahoma (Figure 7-4). The study corridor includes southwest Pittsburg, northeast Atoka, central and west Pushmataha, and north Choctaw Counties. The Pittsburg Substation is located east of US Highway 69, approximately 3 miles south of Kiowa, Oklahoma. Dominant features

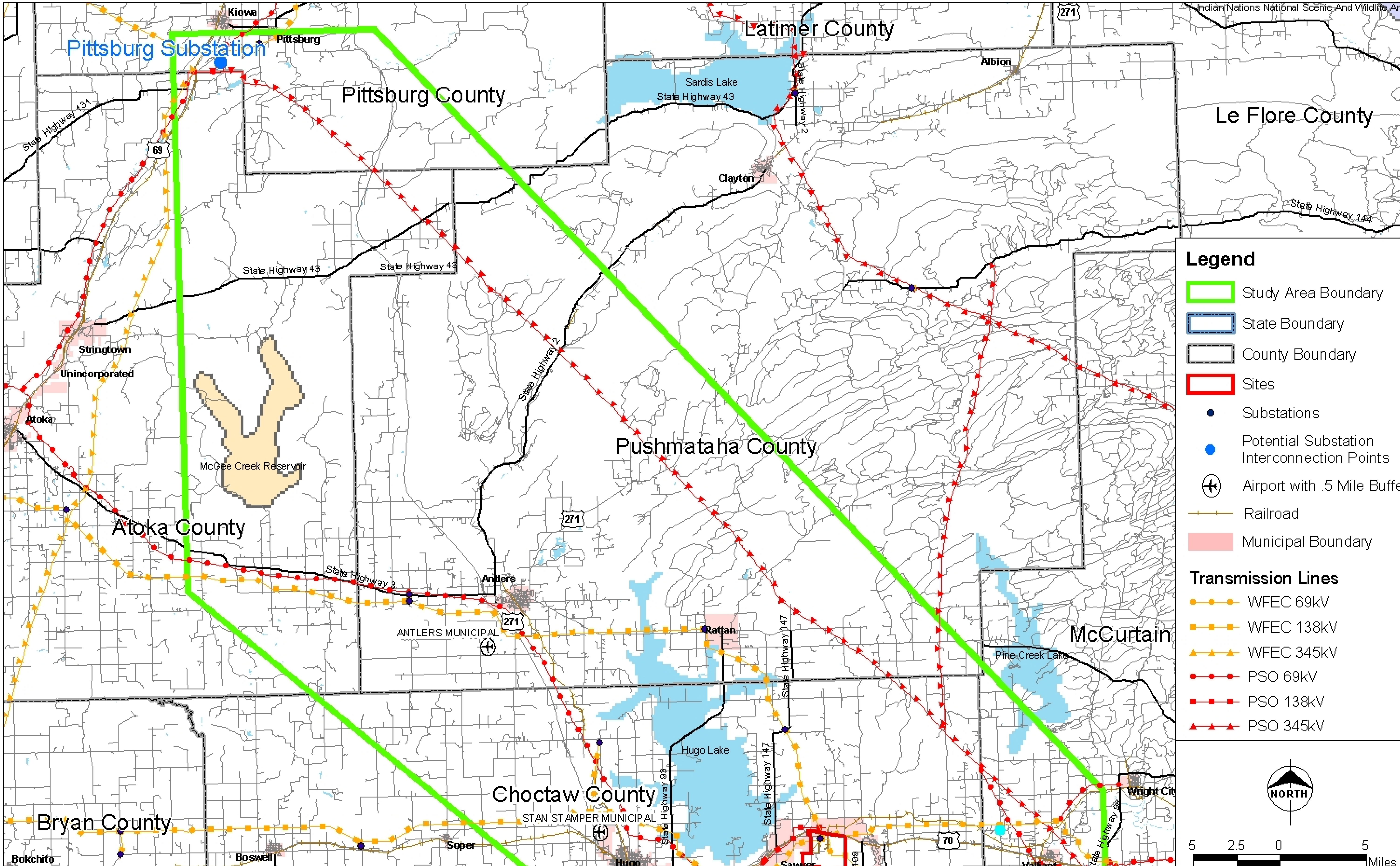


Figure 7-4
Hugo to Pittsburgh
Study Area

in this study corridor include Indian Nation Turnpike, Hugo Lake, a number of wildlife management areas, and several mountain ridges.

7.5.1 Human Resources

The Hugo to Pittsburg study corridor is primarily rural and undeveloped. Except for small, scattered towns and communities, small farms and rural residences, the lands are relatively remote and accessible primarily only by local roads, many of which are unpaved. The remoteness and undeveloped nature of these counties is a reflection of the often rugged, mountainous terrain they contain. Large areas of lands within the counties have been acquired and managed as wildlife management areas, further restricting development or agricultural activities. Tables 7-6 and 7-7 provide general population and employment information concerning the counties in this study corridor. No zoning or land use restriction occur in areas outside incorporated communities in this study corridor.

Table 7-6 Population for Hugo to Pittsburg Study Corridor Counties, Oklahoma

	Choctaw	Pushmataha	Atoka	Pittsburg	McCurtain
Population 2003	15,431	11,750	14,142	44,168	34,006
Population 2000	15,342	11,667	13,879	43,953	34,402
Population % change	0.6	0.7	1.9	0.5	-1.2

Source: US Census Bureau, 2000

Land use in this corridor is primarily open pasture/grassland except for the small villages, towns or cities. The flat terrain becomes mountainous as the corridor heads northwest to the Pittsburg Substation. The communities of Fort Towson (included in the Hugo to Valliant study corridor) and Hugo (included in the Hugo to Paris study corridor) are also included in the Hugo to Pittsburg study corridor. The cities of Kiowa and Pittsburg are just northwest and north of the study corridor. In 2000, Kiowa had a population of 693. Pittsburg had a 2000 population of 280. Other small communities within the study area include High Hill, High Bridge, Sobol, North Sobol, Corrine, Cloudy, Snow, Dunbar, Daisy and Goss.

Major roads in the corridor include the east-west US Highway 70; State Highway 3 extending east-west, US Highway 271, State Highways 2 and 43, and the Indian Nation Turnpike which is the primary north-south thoroughfare for the region. Numerous other county highways and roads traverse the area providing connections between the aforementioned arterials as well as access to

Table 7-7 Percent Employment for Hugo to Pittsburg Study Corridor Counties, Oklahoma

Industry	Choctaw	Pushmataha	Atoka	Pittsburg	McCurtain
Agriculture, forestry, fishing and hunting, and mining	6.5	8.9	7.0	4.3	9.3
Construction	8.8	8.4	8.6	6.9	8.0
Manufacturing	9.5	9.2	16.2	11.4	21.2
Wholesale trade	3.3	2.6	2.0	2.3	2.0
Retail trade	11.9	11.0	10.5	12.7	13.5
Transportation and warehousing, and utilities	8.8	6.0	6.7	5.0	4.4
Information	1.5	1.7	0.9	1.8	1.3
Finance, insurance, real estate, and rental and leasing	4.3	4.5	2.6	3.8	2.6
Professional, scientific, management, administrative, and waste management services	4.0	3.7	3.3	4.4	2.9
Educational, health and social services	23.9	25.8	19.0	23.9	19.5
Arts, entertainment, recreation, accommodation and food services	4.7	5.4	5.6	6.9	6.0
Other services (except public administration)	7.0	6.3	5.7	5.9	4.7
Public administration	5.9	6.5	12.0	10.7	4.6

Source: US Census Bureau, 2000

the small towns and communities throughout the area. A private landing strip is located southwest of the corridor in the extreme southwest corner of Pittsburg County. The McAlester Regional Airport is located south of McAlester in northern Pittsburg County, well outside the study corridor. It is likely that other unregistered, private landing strips occur within the study corridor.

Few electrical transmission lines occur within this study area. An existing PSO 345-kV line extends from the Valliant Substation to the Pittsburg Substation and eventually northward to Oklahoma City. A WFEC 138-kV transmission line leaves the Hugo Station Substation to the west, turning northwest and passing between Hugo Lake and the City of Hugo. This line extends northwest to Atoka, Oklahoma and beyond. It is generally located 10 or more miles southwest of the Valliant-Pittsburg line but the two lines are roughly parallel to each other. A PSO transmission line follows a similar route. The 138-kV line extends west along the south side of Hugo Station property, meeting the WFEC line along US Highway 70 south of Hugo Lake. This line also turns north between the lake and City of Hugo, connecting to a substation serving the city. A 69-kV line extends north from this substation, roughly along Indian Nation Turnpike, to Antlers. At Antlers, it turns west along the same corridor as the WFEC 138-kV line previously discussed.

7.5.2 Natural Resources

The Hugo to Pittsburg study corridor is primarily located in the Ouachita Mountains physiographic region. Although the portion of the study corridor near the Hugo Station in Choctaw County is within the Southern Coastal Plain, most of the corridor includes the more rugged and mountainous terrain characteristic of the Ouachita Mountains. Drainage is ultimately to the south toward the Red River. However, because of the numerous mountain ridges and peaks, drainage flow at any particular location could be in any direction. The primary drainages in the study corridor include the Kiamichi River and McGee Creek.

Vegetation throughout the study area forms a mosaic of different communities. These communities range from deciduous woodlands to mixed deciduous-evergreen to evergreen forests to mixed warm and cool season pastures to minor amounts of cultivated cropland. More level areas generally have been cleared for agricultural use, while areas along drainage ways and in mountainous areas remain wooded. Wetland communities also occur within the study area but are primarily narrow bands associated with drainage ways and small ponds providing water for livestock.

The abundance and variety of vegetative communities provides habitat for numerous species of wildlife. Wildlife include both game species such as white-tailed deer, turkey, rabbit, squirrel, quail, dove, and waterfowl, as well as numerous non-game species including rodents, bats, songbirds, shorebirds, amphibians, and reptiles.

The Oklahoma Department of Wildlife Conservation (ODWC) manages and maintains 64 areas throughout the state with direct ownership by the ODWC and through license agreements with other agencies or entities. Named Wildlife Management Areas or WMAs, provide public access for hunting and various other uses. These areas are located throughout the state and span a variety of habitat types and species. Several such areas occur within the Hugo to Pittsburg study corridor, as discussed below.

The Hugo to Pittsburg study corridor runs north-south between the Pine Creek Wildlife Management Area (WMA) and the Hugo WMA. Further north, is the Honobia Creek WMA. The majority of the Honobia Creek WMA is located across Blackjack Mountain. The Pushmataha and Gary Sherrer WMAs are located northeast and outside of the corridor, while the Atoka WMA is located outside the corridor to the southwest.

The Hugo WMA is located along the Kiamichi River with the majority in Choctaw County. The northern portion is in southern Pushmataha County. The Hugo WMA covers 18,196 acres with two additional areas (Sawyer Unit and Hamden Unit) of 720 and 650 acres respectively. The total WMA is 19,566 acres. The Lyndol Fry Waterfowl Refuge, part of the overall area, is located adjacent to the Kiamichi River and includes 3,500 acres. Habitat within the refuge includes mature stands of hardwoods in the bottom land areas to hardwood/pine tree mixes in some areas. Much of the area is old farm field habitat that is maintained through intensive management practices such as prescribed burning, discing, and cattle grazing operations. The variety of trees includes six species of oak as well as ash, hickory, pine, river birch, willow. Sand plum, holly, sumac, and a great variety of grasses and legumes are also present. Game species of interest include quail, white-tailed deer, turkey, rabbit, coyote, bobcat, beaver, mink, raccoon, dove, geese and ducks. Non-game species of interest include black bear, river otters and bald eagles that winter at Hugo Lake and travel the Kiamichi River Basin.

Pine Creek WMA covers 10,280 acres and is located in McCurtain and Pushmataha Counties approximately seven miles north of Valliant, Oklahoma. The WMA is adjacent to Little River and Pine Creek Lake. Habitat ranges from mature stands of hardwoods in the bottom land areas to hardwood/pine tree mixes, to large stands of mostly pine. Some of the area is old farm field habitat that is maintained through intensive management practices. Game species of interest include quail, deer, turkey, rabbit, coyote, bobcat, beaver, mink, raccoon, dove, geese and ducks. Non-game species of interest include black bear, river otters and bald eagles that winter at Pine Creek Lake and travel the Little River Basin.

Honobia Creek WMA covers 175,000 acres in Pushmataha, LeFlore, and McCurtain Counties in southeast Oklahoma. Located north of State Highway 3 and west of US Highway 271 (northeast of Antlers), Honobia Creek WMA is a mixture of pine and hardwood forests. Loblolly pine plantations of various age classes predominate within the WMA. Interspersed within the pine plantations are hardwood benches and streamside management zones dominated by oaks and hickories. The Little River Black Fork Creek and Honobia Creek run through the WMA. Game species of interest include quail, deer, turkey, rabbit, squirrel, coyote, bobcat, opossum, gray fox, beaver, raccoon, dove, wood ducks and mallards. Non-game species of interest include black bear.

Stringtown WMA covers 2,260 acres of south central Atoka County and is located 7 miles east of Stringtown on Greasy Bend road. Terrain within the WMA ranges from steep to moderately steep. Vegetation consists of oak-pine association. Game species of interest include quail, deer, turkey, rabbit, coyote, bobcat, raccoon, dove, wood ducks can be found on Potapo Creek, and squirrel. Non-game species of interest include bald eagle that winter on nearby McGee Creek Lake, owls and numerous bird species.

McGee WMA includes 10,000 acres within the McGee Creek State Park. It is located in southeastern Oklahoma in Atoka County. The state park includes approximately 2,600 acres in conjunction with the 3,880-acre McGee Creek Lake and an 8,900-acre scenic area. The lake provides fishing for bass, channel catfish, crappie, flathead catfish, and sunfish in an unspoiled forested area. The state park offers lake huts, over 50 campsites, hiking, biking, equestrian trails, boating, water-skiing, and fishing.

Several federally-listed species potentially occur in the counties included in the Hugo to Pittsburg study corridor. Table 7-8 provides a complete list of the potential federally listed species.

The study corridor has a long history of habitation, both by prehistoric Native American groups and Euro-American settlers. Investigation of cultural, both historic and archaeological, sites listed on the National Register of Historic Places, identified 12 sites in Choctaw County, 18 in McCurtain County, 18 in Atoka County, 25 in Pittsburg County, and 7 in Pushmataha County. The majority of these sites are historic structures and are located in the communities throughout

Table 7-8 Threatened and Endangered Species – Hugo to Pittsburg Corridor

Common Name	Scientific Name	Federal Status	County				
			Choctaw	McCurtain	Pushmata	Atoka	Pittsburg
American Alligator	*Alligator mississippiensis*	DM, SAT	-	X	-	-	-
American Burying Beetle	*Nicrophorus americanus*	E	X	X	X	X	X
Peregrine Falcon	*Falco peregrinus anatum*	DM	X	X	X	-	-
Arkansas River Shiner	*Notropis girardi*	T	-	-	-	-	X
Bald Eagle	*Haliaeetus leucocephalus*	AD, T	X	X	X	X	X
Indiana bat	*Myotis sodalis*	E	-	-	X	-	-
Leopard darter	*Percina pantherina*	T	-	-	X	-	-
Interior least tern	*Sterna antillarum*	E	X				
Ouachita rock pocketbook	*Arkansia wheeleri*	E	-	X	X	-	-
Piping Plover	*Charadrius melodus*	E, T	X	X	X	X	X
Red-cockaded woodpecker	*Picoides borealis*	E	-	X	X	-	-
Scaleshell mussel	*Leptodea leptodon*	E	X	X	X	-	-

E – endangered DM – Delisted, being monitored for 5 years SAT – similar in appearance to listed species
T – threatened AD – Proposed for delisting

the region. However, it is likely that many additional prehistoric archaeological sites exist throughout the area.

7.6 HUGO TO VALLEY CORRIDOR

The Hugo to Valley study corridor extends southwest from the Hugo Station in Choctaw County, Oklahoma approximately 65 miles to the Valley Substation in Fannin County, Texas (Figure 7-5). The corridor includes Choctaw County and the northern portions of Lamar and Fannin Counties. The Valley Substation is located at the Valley Lake Power plant, north of US Highway 82, approximately 2.5 miles north of Savoy, Texas. Dominant features in this study corridor include the Red River; Pat Mayse Lake, State Park and Wildlife Area; Caddo National Grasslands; Lake Coffee Mill; Lake Davy Crockett; and Bonham Lake State Park.

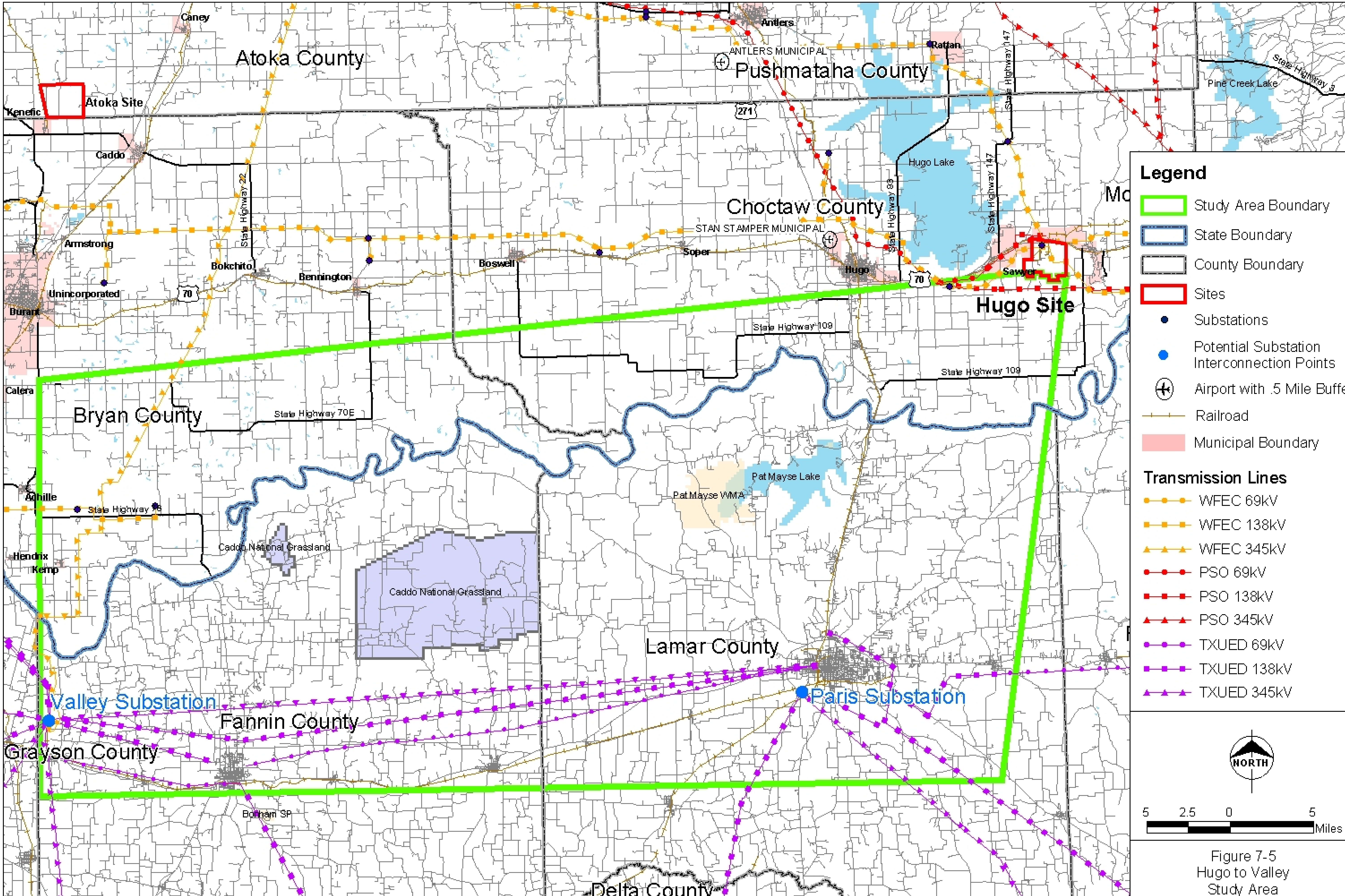


Figure 7-5
Hugo to Valley
Study Area

7.6.1 Human Resources

The study corridor in Choctaw, Lamar and Fannin counties contains primarily undeveloped and rural lands. General population and employment data for these counties is included in Tables 7-9 and 7-10. Land use in the corridor is primarily open pasture or rangeland. Communities within in Choctaw and Lamar counties include Sawyer, Fallon, Grant, Ord, Arthur City, Chicota, Forest Chapel, Razor, Garretts Bluff, Belk, Ragtown, Bunker Hill, and Direct. Several of these communities are included in the Hugo to Paris Corridor and were discussed previously in Section 7.4 of this report. Chicota, Forest Chapel, Razor, Garretts Bluff, Belk, Ragtown, Bunker Hill and Direct are all small communities in Lamar County.

Table 7-9 Population for Hugo to Valley Study Corridor Counties, Oklahoma and Texas

	Choctaw	Lamar	Fannin	Bryan
Population 2003	15,431	49,464	32,276	37,306
Population 2000	15,342	48,499	31,242	36,534
Population % change	0.6	2.0	3.3	2.1

Source: US Census Bureau, 2000

Bonham is the county seat and commercial center of Fannin County. Bonham is located on US Highway 82 and State Highways 78 and 121 on the northern edge of the Blackland Prairie, 12 miles south of the Red River. In 2000, Bonham's population was 9,990.

The communities of Monkstown and Telephone are located in Fannin County, north of the Caddo National Grassland area. In the 1970s, most of the land surrounding Monkstown reverted to pastureland, though some peanuts, soybeans, and grain were still produced. In 1990, the community population was 35. Telephone is located 12 miles northeast of Bonham in northeastern Fannin County. In 1990, Telephone reported a population of 210 residents. Lamasco, Bettis, Ivanhoe, Ridings, and Boyd are all small communities within close vicinity to the City of Bonham.

Honey Grove, Windom and Dodd cities are located between the City of Paris and Bonham. The City of Honey Grove is on US Highway 82, 15 miles east of Bonham. The railroad established Honey Grove as a retail center and shipping point for area farmers. In 2000, the population was

Table 7-10 Percent Employment for Hugo to Valley Study Corridor Counties, Texas and Oklahoma

Industry	Choctaw	Lamar	Fannin	Bryan
Agriculture, forestry, fishing and hunting, and mining	6.5	2.4	4.4	3.8
Construction	8.8	8.1	9.0	6.2
Manufacturing	9.5	17.2	18.5	5.5
Wholesale trade	3.3	2.6	2.9	3.7
Retail trade	11.9	12.9	10.6	12.9
Transportation and warehousing, and utilities	8.8	5.9	5.4	4.3
Information	1.5	2.3	1.9	2.2
Finance, insurance, real estate, and rental and leasing	4.3	4.7	6.4	4.9
Professional, scientific, management, administrative, and waste management services	4.0	4.0	4.5	4.2
Educational, health and social services	23.9	23.5	21.3	24.2
Arts, entertainment, recreation, accommodation and food services	4.7	6.5	4.9	7.3
Other services (except public administration)	7.0	5.7	4.7	5.8
Public administration	5.9	4.2	5.4	4.9

Source: US Census Bureau, 2000

1,746. Windom is located on US Highway 82, 10 miles east of Bonham. Dodd City is located 5 miles east of Bonham. In 2000, Windom's population was 245. Dodd City had a 2000 population of 419.

The cities of Ravenna, Ector and Savoy are northwest and west of Bonham within the study corridor. The city of Ravenna is located 5 miles northwest of Bonham and 6 miles south of the Red River. In 2000, the population of Ravenna was 215. Ector City is located 6 miles west of Bonham. The City of Savoy is located 10 miles west of Bonham. In 2000, Ector had a population of 600. Savoy had a 2000 population of 850.

The area within the study corridor offers several options for outdoor activities. The Pat Mayse Lake, State Park, and Wildlife Area and the Camp Maxey Military Reservation in Lamar County were presented in Section 7.4.1 of the Hugo to Paris Corridor.

The Caddo National Grassland is located 11 miles north of Honey Grove in Fannin County. The 17,785-acre preserve was purchased by the US Department of the Interior during the 1930s. The preserve, which borders on both Lake Coffee Mill and Lake Davy Crockett, is administered by the US Department of Agriculture, Forest Service regional office in Lufkin for multiple use including range, watershed, recreation, and wildlife. Open grasslands and post oak and blackjack oak savannas provide habitats for a variety of animal life, ranging from deer and opossums to bobwhite quail and mourning doves. Facilities include camping and picnicking areas and boat ramps.

The East Lake Crockett Recreation Area is located on the northeast shore of the 450-acre Lake Crockett. The East Lake Crockett Recreation Area was completed in 1968. Lake Crockett was built in the 1930's and has provided recreational opportunities to its visitors for many years. Recreational opportunities available at the East Lake Recreation Area include fishing, boating, picnicking and camping.

Bonham State Park is a 261-acre park located in Fannin County that includes the 65-acre Lake Bonham on Timber Creek, rolling prairies, and woodlands. The Lake supplies water to the City of Bonham. The Civilian Conservation Corps (CCC) constructed the Park in early 1930s. The land was acquired in 1933 by the City of Bonham and was opened in 1936. The park is situated in the Blackland Prairie Region of Texas. The terrain is dominated by grassland interspersed by woodlands. The Park's grasslands are no longer pristine; however, they are recovering and have small areas dominated by little bluestem and bushy bluestem. The woodlands are composed of Texas oak, eastern red cedar, Bois D'Arc, and Eve's necklace, with sugarberry, cottonwood, black willow, and green ash becoming more common along the creeks. Activities available include swimming and fishing in the lake, as well as camping, picnicking, mountain biking, boating.

Valley Lake, near the Valley Substation, is also known as Brushy Creek Reservoir. The reservoir is located on Brushy Creek, a tributary to the Red River, three miles north of Savoy in Fannin County and Grayson counties. The lake is owned and operated by the Texas Power and Light Company for the purpose of condenser cooling and other power plant uses for its Valley Creek steam-electric generating station. Construction of Valley Dam was started on April 18, 1960, and completed on September 5, 1961. The lake has a capacity of 16,800 acre-feet and a surface area of 1,180 acres at the service spillway crest elevation of 610 feet above mean sea level. The drainage area is eight square miles, but the water level is maintained by the diversion of water from the Red River by two pumps at the mouth of Sand Creek.

Major roads in the eastern portion of the corridor include the east-west US Highway 70 and US Highway 271. US Highway 82 (State Highway 56) is in the southwest portion of the corridor and is the primary east-west thoroughfare for the region. State Highway 109 is located in Choctaw County. North-south State Highways 78 and 121 are located in Bonham in Fannin County. Numerous other Farm to Market Roads traverse the study corridor connecting the major highways and communities.

Jones Field, a public use airport is located north of the City of Bonham. Two private landing strips, RV Ranch and Reward Ranch, are located south of Bonham City. RV Ranch airport is located two miles south of Bonham and Reward Ranch is located five miles south of Bonham.

Several electrical transmission lines occur within the corridor. Two major transmission lines (345-kV and 138-kV) owned and operated by Texas Utilities (TXU) extend east-west in the southern portion of the corridor between the Cities of Paris and Bonham. These lines continue west and connect with the Valley Power plant in Fannin. The Union Pacific/Missouri Pacific Railroad extends east-west through the communities of Paris, Honey Grove, Windom, Dodd City, Bonham, Ector and Savoy.

7.6.2 Natural Resources

The Hugo to Valley study corridor is located within the Southern Coastal Plain. Topography varies from nearly level to moderately steep. Drainage in Choctaw and Bryan counties in Oklahoma is south to the Red River, whereas drainage in Lamar and Fannin counties in Texas is north to the Red River.

Fannin County is divided into three land resource areas, two occur in the study corridor, with distinct difference in relief, drainage, soils, and vegetation. The study corridor within Fannin County lies in the East Cross Timbers Area, where soils formed under savannah vegetation and the East Texas Timber Land Resource Area where the soils formed under trees. The natural flora consists of oak, hickory, ash, walnut, pecan, cottonwood, elm, cedar, and Bois D'Arc trees, as well as redbud, spicewood, dogwood, pawpaw, and dwarf buckeye. The main natural resource is timber, with wood-product manufacturing an important component of the local economy.

Vegetation and wildlife in the remainder of the Hugo to Valley study corridor are similar to that described previously for Choctaw and Lamar counties.

The Hugo to Valley study corridor runs northeast-southwest along the Red River Basin. It includes Pat Mayse Lake and Wildlife Management Area, Lake Creek, Caddo National Grassland and Caddo National Wildlife Management Area, and Bonham Lake State Park.

The Caddo National Grasslands WMA is administered by the US Forest Service and is managed under a cooperative agreement with Texas Parks and Wildlife. The WMA is located in Fannin County and is divided into two units, the 13,360 acre Bois D'Arc Creek Unit and the 2,780 acre Ladonia Unit. Parks and Wildlife manages the wildlife hunting opportunities with permitted hunts. The Ladonia Unit attracts mostly doves and quail. The Bois D'Arc Creek Unit has a more diversified habitat with two lakes and four streams. This Unit is used mainly to hunt white-tailed deer, squirrels and waterfowl. Feral hogs, dove, other migratory game birds, quail, rabbit, hare, predators, furbearers, and frogs are also present. Most hunting is by Annual Public Hunting Permit (APH). Spring turkey hunting is by Special Permit only. Coffee Mill Lake and Lake Davy Crockett, located with the grassland, offer fishing for sunfish, crappie, catfish and largemouth bass.

Several federally-listed species potentially occur in the counties included in the Hugo to Valley study corridor. Table 7-11 provides a complete list of the potential federally listed species.

The Texas Lakes Trail runs through the northern portion of the study corridor. The Texas Lakes Trail Region is a regional heritage tourism initiative funded in part by a grant from the Texas Historical Commission. The Texas Lakes Trail Region is comprised of 31 counties in North Central Texas that work together to promote historical attractions and cultural events in the region. The Texas Lakes Trail parallels FM 197 out of Arthur City heading west through Lamar County into Fannin County. In Fannin County, the Texas Lakes Trail continues along FM 79, 100 and then continues west along FM 273 into the City of Bonham. If the Texas Lakes Trail is

Table 7-11 Threatened and Endangered Species – Hugo to Valley Corridor

		Federal	County			
Common Name	**Scientific Name**	**Status**	**Choctaw**	**Bryan**	**Lamar**	**Fannin**
American Burying Beetle	*Nicrophorus americanus*	E	X		X	-
Peregrine Falcon	*Falco peregrinus anatum*	DM	X		-	-
Bald Eagle	*Haliaeetus leucocephalus*	AD, T	X		X	X
Interior least tern	*Sterna antillarum*	E	X		X	X
Louisiana black bear	*Ursus americanus luteolus*	T	-		X	X
Piping Plover	*Charadrius melodus*	E, T	X		-	-
Scaleshell mussel	*Leptodea leptodon*	E	X		-	-
Whooping Crane	*Grus americana*	E, EXPN	-		X	-

E – endangered DM – Delisted, being monitored for 5 years SAT – similar in appearance to listed species
T – threatened AD – Proposed for delisting

determined to be a constraint, there is potential for the study corridor to bend to the south after bypassing the Pat Mayse Park and Wildlife Management Area. Heading south and then west beneath the Caddo National Grassland and Caddo National Wildlife Management Area provides opportunities to utilize the existing 345-kV and 138-kV transmission line corridors.

The study corridor has a long history of habitation, both by prehistoric Native American groups and Euro-American settlers. Investigation of cultural, both historic and archaeological, sites listed on the National Register of Historic Places, identified 12 sites in Choctaw County, 15 in Bryan County, 41 in Lamar County, and 8 in Fannin County. The majority of these sites are historic structures and are located in the communities throughout the region. However, it is likely that many additional prehistoric archaeological sites exist throughout the area.

7.7 HUGO TO LYDIA CORRIDOR

The Hugo to Lydia transmission line would extend southeast from the Hugo Station in Choctaw County, Oklahoma approximately 50 miles to the Lydia Substation in Bowie County, Texas (Figure 7-6). The study area for this project also includes portions of McCurtain County, Oklahoma and Red River County, Texas. The Lydia Substation is located approximately 2 miles to the southeast of the City of Lydia and south of F-M 44. The most dominant features in the study corridor include the Red River (which forms the boundary between Oklahoma and Texas); the Kiamichi River; US Highway 70 (which extends east-west in the Oklahoma portion of the study area from Hugo to Idabel); US Highway 82 (which extends east-west in the Texas portion of the study area from Clarksville to De Kalb); the Kiamichi Railroad running along the south

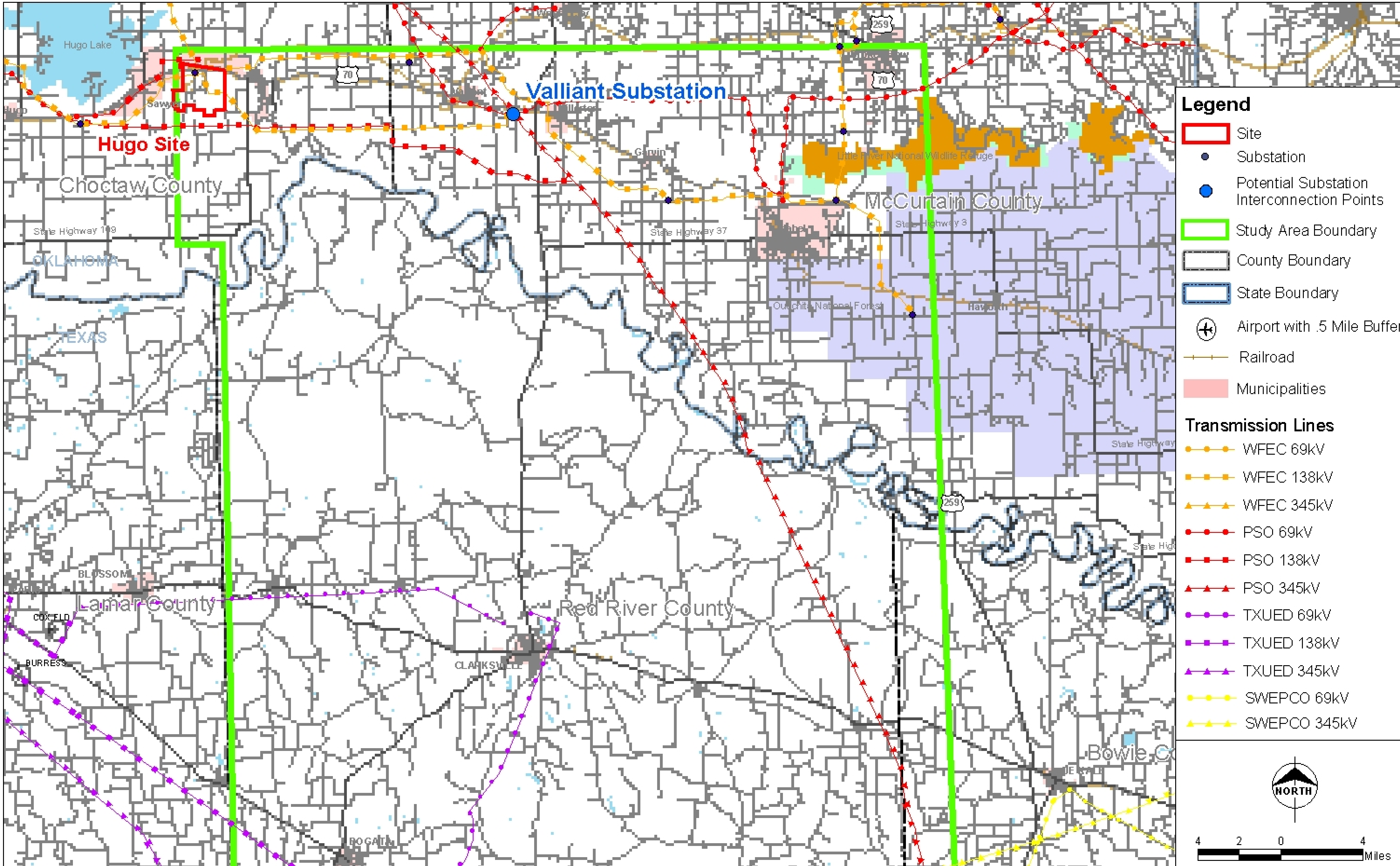


Figure 7-6
Hugo to Lydia
Study Area

side of US Highway 70; the Texas Northeastern Railroad running along the south side of US Highway 82; SR 37 running north-south in Texas and primarily east-west in Oklahoma; SR 109 running north-south just east of Hugo Station; Lake Raymond Gary (located south of Fort Towson, approximately 3.5 miles east of Hugo Station); and the towns of Fort Towson, Swink, Valliant, Millerton, Garvin, Idabel, Clarksville, Annona, Avery, and Lydia.

7.7.1 Human Resources

The Hugo to Lydia study corridor includes southeastern Choctaw, southwestern McCurtain, northern Red River, and extreme western Bowie Counties. Land use in the Hugo to Lydia study corridor is primarily undeveloped, open pasture or rangeland. The developed areas include the communities of Fort Towson, Swink, Valliant, Millerton, Garvin, and Idabel in Oklahoma and Clarksville, Avery, Annona, and Lydia in Texas. Idabel, Oklahoma and Clarksville, Texas are the largest communities in the region. Other than these communities, little development besides small farms and rural residences is present in the area. General population and employment data for Choctaw, McCurtain, Red River, and Bowie Counties is presented in Tables 7-12 and 7-13.

Table 7-12 Population for Hugo to Lydia Study Corridor Counties, Texas and Oklahoma

	Oklahoma		Texas	
Population	**Choctaw County**	**McCurtain County**	**Red River County**	**Bowie County**
Population 2003	15,431	34,006	13,812	89,699
Population 2000	15,342	34,402	14,314	89,306
Population % change	0.6%	-1.2%	-3.5%	0.4%

The city of Idabel is the county seat of McCurtain County, Oklahoma. In 2000, the city had a total population of 6,952 persons. Idabel is in the rugged foothills of the Ouachita Mountains. The area's heritage centers from the Choctaw Indian Nation. When the Choctaw Indians completed their "Trail of Tears" journey, they settled in Indian Territory, in what is now known as Idabel. Idabel is an active Main Street community selected by the Oklahoma Department of Commerce (ODC). The Oklahoma Main Street Program is maintained by the ODC to help Oklahoma cities revitalize their central business districts and neighborhood commercial districts by utilizing preservation and economic development strategies.

Table 7-13 Percent Employment for Hugo to Lydia Study Corridor Counties, Texas and Oklahoma

	Oklahoma		Texas	
Industry	**Choctaw County**	**McCurtain County**	**Red River County**	**Bowie County**
Agriculture, forestry, fishing and hunting, and mining	6.5%	9.3%	8.7%	1.7%
Construction	8.8%	8.0%	8.6%	6.6%
Manufacturing	9.5%	21.2%	24.0%	11.6%
Wholesale trade	3.3%	2.0%	1.1%	4.2%
Retail trade	11.9%	13.5%	11.9%	14.8%
Transportation and warehousing, and utilities	8.8%	4.4%	4.3%	4.9%
Information	1.5%	1.3%	1.1%	1.6%
Finance, insurance, real estate, and rental and leasing	4.3%	2.6%	3.6%	4.4%
Professional, scientific, management, administrative, and waste management services	4.0%	2.9%	2.9%	4.9%
Educational, health and social services	23.9%	19.5%	20.7%	22.8%
Arts, entertainment, recreation, accommodation and food services	4.7%	6.0%	2.8%	6.1%
Other services (except public administration)	7.0%	4.7%	4.1%	6.0%
Public administration	5.9%	4.6%	6.2%	10.5%

The City of Clarksville is located in northeast Texas in Red River County. The Red River County Seat, Clarksville, is one of the oldest permanent settlements in the county. Clarksville was selected as a Main Street community in 2003. The Texas Historical Commission's (THC) Community Heritage Development Division maintains the Texas program, similar to the Oklahoma Main Street Program. In 2000, the population of the city was 3,883 persons.

The town of Fort Towson, Oklahoma is located along US Highway 70 in Choctaw County. The town had a population of 611 persons in 2000. In addition, the Oklahoma towns of Valliant, Millerton, and Garvin are also located along US Highway 70 in Choctaw County. The populations in 2000 were, respectively, 711, 359, and 143 persons. The small town of Swink is included in the total surrounding population, reported as 2,289 persons in 2000.

In Texas, Avery and Annona are towns located along US Highway 82. In 2000, Avery had a population of 462 persons and Annona had a population of 282 persons. The small town of Lydia is located at the intersection of F-M 911 and F-M 44. The 2000 census indicates that the population of Lydia and the surrounding area was 1,305 persons. All three of these towns are located in Red River County.

The area offers numerous opportunities for outdoor activities centering on the abundant game and fishing resources. Many of these opportunities are provided by the Ouachita Mountains and the numerous rivers and streams in the area. The Ouachita National Forest is located directly southeast of Idabel and offers more than 352,000 acres of scenic vistas, hiking and mountain biking trails, hang gliding opportunities, an equestrian camp and trails, hunting and fishing opportunities. The forest provides public campgrounds and several miles of unpaved forest roads for off-road vehicles. There are historic sites found along the Talimena Scenic Drive, including the Horsethief Springs and the Old Military Road.

Two parks are located in the Fort Towson area, the Fort Towson Military Park and the Raymond Gary State Park. The Fort Towson Military Park is a historic site, an 1824 US Army base that presently hosts rendezvous and re-enactment activities. The purpose of the fort is to preserve historic structures of the frontier. The Raymond Gary Lake and State Park contains a 390-acre lake with 10 miles of shoreline and offers fishing, boating, swimming and camping.

The Hugo to Lydia area contains an extensive network of roadways, both paved and unpaved. US Highway 70 runs east-west through the northern Oklahoma portion of the corridor and is one of the primary thoroughfares of the area. In addition, US Highway 82 is a primary thoroughfare in the southern portion of the corridor. US Highway 82 runs east-west in Texas. In Oklahoma, State Highway 109 merges with US Highway 70 just east of Hugo. State Road 37 runs north-south in Texas and east-west in Oklahoma, where it turns to travel toward Idabel. State Road 98 joins US Highway 70 with State Road 37. The Kiamichi Railroad runs east-west from Hugo to Idabel and parallel to US Highway 70. The railroad provides rail access for coal delivery to Hugo Station as well as serves customers in Idabel. The Texas Northeastern Railroad runs east-west from Clarksville to De Kalb and generally parallel to US Highway 82.

A number of small airports and airfields were identified within the study corridor. The Idabel Airport (FAA designation CBR) is located on the western edge of the City of Idabel. The Clarksville-Red River County Airport, JD Trissell Field (LBR) is located southwest of the City of Clarksville. Two private airfields were also identified in the study area. The Russells Ranch Airfield is located approximately 3 miles south of the town of Annona and the Key's Ranch Airfield is located approximately 6 miles west of the Lydia Substation.

Several transmission lines occur within the study corridor. A WFEC 138-kV transmission line, crossing to the north side of US Highway 70 after leaving Hugo Station, extends approximately 16.5 miles east. It passes north of Valliant, then turns southeast, crossing US Highway 70 again and passes within one mile of the Valliant Substation. A second transmission corridor containing two lines, both 138-kVs (WFEC and PSO), extends east-west across Choctaw and McCurtain Counties, approximately 1.5 miles south of Hugo Station. The PSO line turns north just southeast of Valliant and connects to the Valliant Substation. The second line is operated by WFEC and connects to the Hugo Station Switchyard. This line continues east out of the study area. A PSO 345-kV line runs southeast from the Valliant Substation to the Lydia Substation. A 345-kV line operated by SWEPCO extends east from the Lydia Substation. Numerous distribution lines are located along area roadways providing electrical service to local residents and commercial and industrial customers.

7.7.2 Natural Resources

The Hugo to Lydia study area lies within the Southern Coastal Plain, Ouachita Mountains, and the Red River Valley regions. Land use throughout the area consists of a mixture of woodlands (some of which are for production of pulp and other forest products), pasture land, and scattered rural residences and small farmsteads. Most agricultural lands are used for grazing or hay.

Topography of the area ranges from relatively flat, rolling hills to moderately steep areas around drainage valleys. Drainage in the Oklahoma portion of the study area is generally southward toward the Red River. In Texas, the northern area of the study area drains northward to the Red River, while areas south of Clarksville and around Lydia drain south to the Sulphur River outside the study area. Drainages are generally narrow and highly incised, although areas adjacent to the Red River may have wider, more developed floodplains. More substantial drainage ways in the area include the Red and Kiamichi Rivers. Numerous other creeks and rivers occur throughout the area. These include Gates Creek (impounded to create Lake Raymond Gary), Pecan Bayou, Big Pine Creek, Clear Creek, Waterhole Creek, Mill Creek, Kickapoo Creek, Anderson Creek, Dillard Creek, and Blythe Creek.

Vegetation patterns in the Hugo to Lydia Study area are similar to those discussed in Section 7-X for the Hugo to Paris corridor. The abundance and variety of vegetative communities provides habitat for numerous species of wildlife. Wildlife include both game species such as white-tailed deer, turkey, rabbit, squirrel, quail, dove, and waterfowl, as well as numerous non-game species including rodents, bats, songbirds, shorebirds, amphibians, and reptiles.

There are no wildlife management areas established in the study corridor. However, there are wildlife management areas associated with the Ouachita National Forest, but these areas all would be located outside of the study area. The Raymond Gary Lake and State Park does offer wildlife viewing and fishing, as well as other recreational opportunities.

Preliminary investigation identified several federally listed species as potentially occurring in Choctaw, McCurtain, Red River, and Bowie Counties. Several of these species, such as American burying beetle and red-cockaded woodpecker, may occur in the study corridor, others such as the American alligator, are not expected due to the lack of suitable habitat in the study area. The interior least tern, piping plover, and scaleshell mussel, are all associated with the Red River. The Ouachita rock pocketbook mussel is associated with the Kiamichi River and was recently found within an 88-mile section of the river upstream from the Hugo Reservoir. Table 14 provides a complete list of the potential federally listed species.

The study corridor has a long history of habitation, both by prehistoric Native American groups and Euro-American settlers. Investigation of cultural, both historic and archaeological, sites listed on the National Register of Historic Places, identified 12 sites in Choctaw County, 18 sites in McCurtain County, 6 sites in Red River County, and 13 in Bowie County. The majority of these sites are historic structures located in the communities throughout the region. However, it is likely that many additional prehistoric archaeological sites occur throughout the area. Prehistoric archaeological sites, potentially of National Register significance and of importance to Native American Tribes historically inhabiting the area, are likely to occur along the Red

Table 7-14 Threatened and Endangered Species – Hugo to Lydia Corridor

Common Name	Scientific Name	Federal Status	Oklahoma		Texas	
			Choctaw County	McCurtain County	Red River County	Bowie County
American Alligator	*Alligator mississippiensis*	DM, SAT	-	X	-	-
American Burying Beetle	*Nicrophorus americanus*	E	X	X	-	-
Peregrine falcon	*Falco peregrinus anatum*	DM	X	X	-	-
Bald Eagle	*Haliaeetus leucocephalus*	AD, T	X	X	X	AD, T
Interior least tern	*Sterna antillarum*	E	X	X	X	E
Louisiana black bear	*Ursus americanus luteolus*	T	-	-	-	T
Ouachita rock pocketbook	*Arkansia wheeleri*	E	-	X	-	-
Piping plover	*Charadrius melodus*	E, T	X	X	-	-
Red-cockaded woodpecker	*Picoides borealis*	E	X	X	-	-
Scaleshell mussel	*Leptodea leptodon*	E	X	X	-	-
Whooping Crane	*Grus americana*	E, EXPN	-	-	-	-

E – endangered DM – Delisted, being monitored for 5 years EXPN – experimental population
T – threatened AD – Proposed for delisting SAT – similar in appearance to listed species

River. These sites, although currently unidentified, would be of particular concern for any transmission line crossing of the Red River.

7.8 MACRO-CORRIDORS

Following establishment and investigation of the study areas for the three required transmission lines, more defined areas, macro-corridors, within which specific route alignment alternatives could be developed were identified. These macro-corridors considered the locations of natural and human resources within the study areas and the potential opportunities available for the compatible location of a new transmission line. Macro-corridors were established so as to minimize potential environmental impacts to existing natural and human resources and make use of any potential opportunity areas. The macro-corridors identified for further evaluation of alternative routes for each connection are discussed below.

7.8.1 Hugo Station to Valliant Substation

In developing the macro-corridors for alternative routes to connect Hugo Station and Valliant Substation, the primary considerations are:

- Communities of Ft. Towson, Swink, and Valliant located along US Highway 70,
- Lake Raymond Gary and Raymond Gary State Park, extending south from US Highway 70,
- The large Weyerhaeuser industrial facility located southwest of Valliant,
- Existing transmission line south of Hugo Station extending eastward to Valliant Substation, and
- Existing transmission line between Hugo Station and Valliant Substation, generally located north of US Highway 70.

The most direct route between Hugo Station and Valliant Substation would essentially be the US Highway 70 corridor. However, the communities of Ft. Towson (located primarily north of the highway), Swink (located south of the highway), and Valliant (north of highway) preclude location of a new transmission line in close proximity to the highway. Additionally, Lake Raymond Gary and Raymond Gary State Park extend over a mile south of US Highway 70. Locating a line in this area would require a significant lake crossing, probably require acquisition of state lands, and raise permitting concerns with the US Army Corps of Engineers. Therefore, the US Highway 70 corridor is itself not suitable for a macro-corridor.

The existing WFEC 138-kV transmission line south of Hugo Station, extending east to the Valliant Substation passes south of Lake Raymond Gary and the state park. It also passes south of the Weyerhaeuser facility and the developed communities along the highway, particularly Valliant and Swink. This transmission line provides an existing linear facility for a new line to parallel and thus an opportunity for location of a new line.

An additional existing WFEC 138-kV transmission line between Hugo Station and Valliant is primarily located north of US Highway 70 as previously noted. It crosses the highway shortly after leaving Hugo property and extends eastward north of Ft. Towson, Swink, and Valliant. It turns south across the highway after extending to the east of Valliant to pass within one miles of the Valliant substation. This existing line also provides a potential linear facility for the new line to parallel while generally avoiding potential constraint areas in the study area.

Two macro-corridors were established for the Hugo to Valliant transmission line connection (Figure 7-7). One of these corridors would extend south from Hugo, following the existing 138-kV line, turning west following the corridor containing the WFEC and PSO 138-kV lines east to the Valliant Substation. While it would generally be undesirable to cross the existing lines and then cross back to connect to the substation, the macro-corridor was established on both sides of the existing lines to allow flexibility to avoid specific constraints that may be encountered during the routing process.

The second macro-corridor would also generally follow the existing WFEC 138-kV line located north of US Highway 70. This corridor would extend east from Hugo to Valliant Substation generally following the existing line.

7.8.2 Hugo Station to Paris Substation

A number of areas occur within the Hugo to Paris study area that require consideration in defining macro-corridors. These considerations include:

- Relatively undeveloped area south of Hugo Station,
- City of Hugo and associated development, Red River,
- Pat Mayse Lake and associated Wildlife Management Area,
- Camp Maxey Military Reservation,
- Lake Crook,
- US Highway 271 corridor,
- City of Paris and associated development,
- City of Blossom and associated development, and
- Identified airstrips, particularly those around the City of Paris.

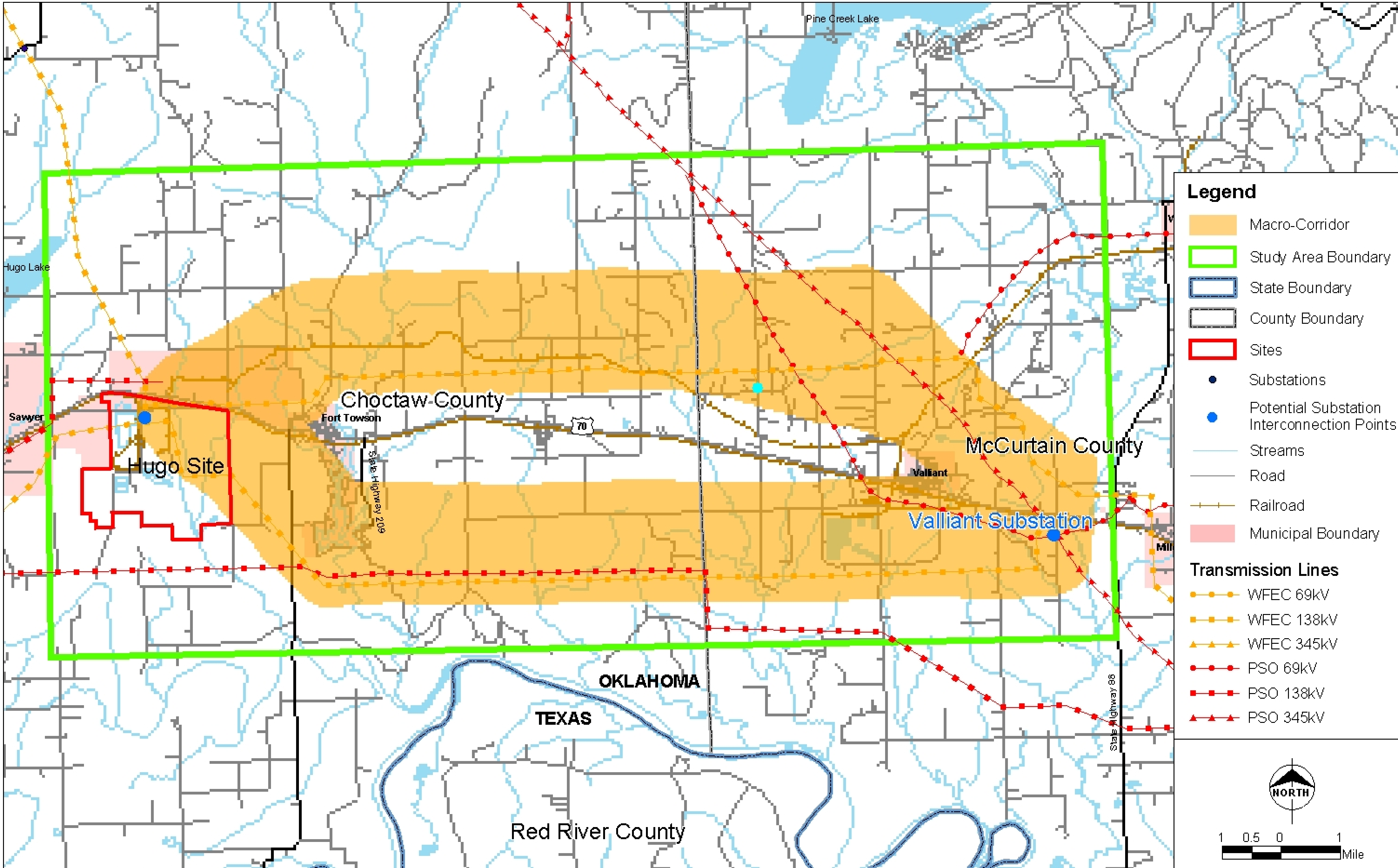


Figure 7-7
Hugo to Valliant
Macro-Corridors

In developing macro-corridors, it is necessary to examine the location of these various considerations and identify avoidance areas for a new transmission line. Once these areas have been identified, corridors between the desired endpoints (Hugo and Paris Substation) avoiding these areas can be identified.

The City of Hugo lies due west of the Hugo Generating Station, while the Paris Substation lies south and slightly to the west. While it would be possible to establish a macro-corridor extending west and then south, such a corridor would likely increase the overall miles of the transmission line. Increasing the miles would be expected to increase the potential environmental impacts (stream crossings, land required for right-of-way, wetlands crossed, homes in proximity to the new line) and cost of the project. Additionally, routing to the west would bring the project in closer proximity to the city, likely resulting in substantial conflicts with residential areas and other city-related developments. Therefore, the option of extending west from Hugo Station was eliminated as a potential macro-corridor.

The Red River is the most substantial topographic feature of the study area. A crossing of the river would be required to connect Hugo Station with the Paris Substation. Crossing the river presents several issues. It is anticipated that crossing the river may result in concerns for endangered species (least tern, piping plover, scaleshell mussel), wetlands, floodplain, and cultural resources (particularly Native American archaeological sites). Establishment of at least one macro-corridor that is located near an existing crossing should be considered. Only one existing crossing of the Red River was identified in the study area – the US Highway 271 bridge.

The Pat Mayse Lake and Wildlife Area are contiguous with the Camp Maxey Military Reservation, located south of the lake and west of US Highway 271. The lake and wildlife area extend approximately 10 miles west of US Highway 271. If a macro-corridor was to avoid these areas to the west, it would almost double the total project length (from approximately 30 miles to 50 miles or more). This would be unreasonable as other potential areas are available, as will be discussed. However, the location of the lake, wildlife area, and military reservation require macro-corridor development to the east and south of these areas.

The towns of Paris and Blossom, Texas, are approximately six miles apart with Blossom located to the west of Paris along US Highway 82. Substantial residential and other development has occurred around the Paris area, becoming less dense to the west, concentrating in the Blossom area. Between the towns is an area, approximately three to four miles wide that, while containing substantial development, contains open, undeveloped lands that would be suitable for a transmission line.

The location of the Paris Substation, on the southwest side of town, places it opposite the Hugo Station, located northeast of Paris. Options to access the substation include extending from Hugo around the east side of Paris to access the substation from the east or extending around the north and west side of Paris to access the substation from the west.

Finally, Lake Crook presents a substantial obstruction north west of Paris. A narrow corridor between the lake and city is present but would not likely provide more than one or two reasonable alignments for a new transmission line. Additionally, environmental issues identified during the routing and environmental review process (such as planned future development or an archaeological site) could render all alignments in this corridor un-usable. Development of a corridor around the lake as well as between the lake and city seems prudent.

The greater distance between Hugo Station and Paris Substation requires development of macro-corridors that include a larger geographic area to provide sufficient flexibility in the establishment of specific route alignments to avoid environmental and human resources and take of available opportunities. Macro-corridors developed for this portion of the project are therefore wider than those for the Hugo to Valliant section. While the Hugo to Paris macro-corridors are wider and include greater geographic area, by avoiding previously identified areas of concern, substantial geographic areas are eliminated from further evaluation and investigation.

Essentially one macro-corridor, with some slight variations, was defined for the Hugo Station to Paris Substation (Figure 7-8). The macro-corridor would extend southwest from Hugo Station, across the Red River, to the area north of Paris. North of Paris it would split into east and west macro-corridors. The east portion would pass between Paris and Blossom, circling around the southeast side of Paris to access the substation from the east. The west macro-corridor would circle around the west side of Paris to access the substation from the west.

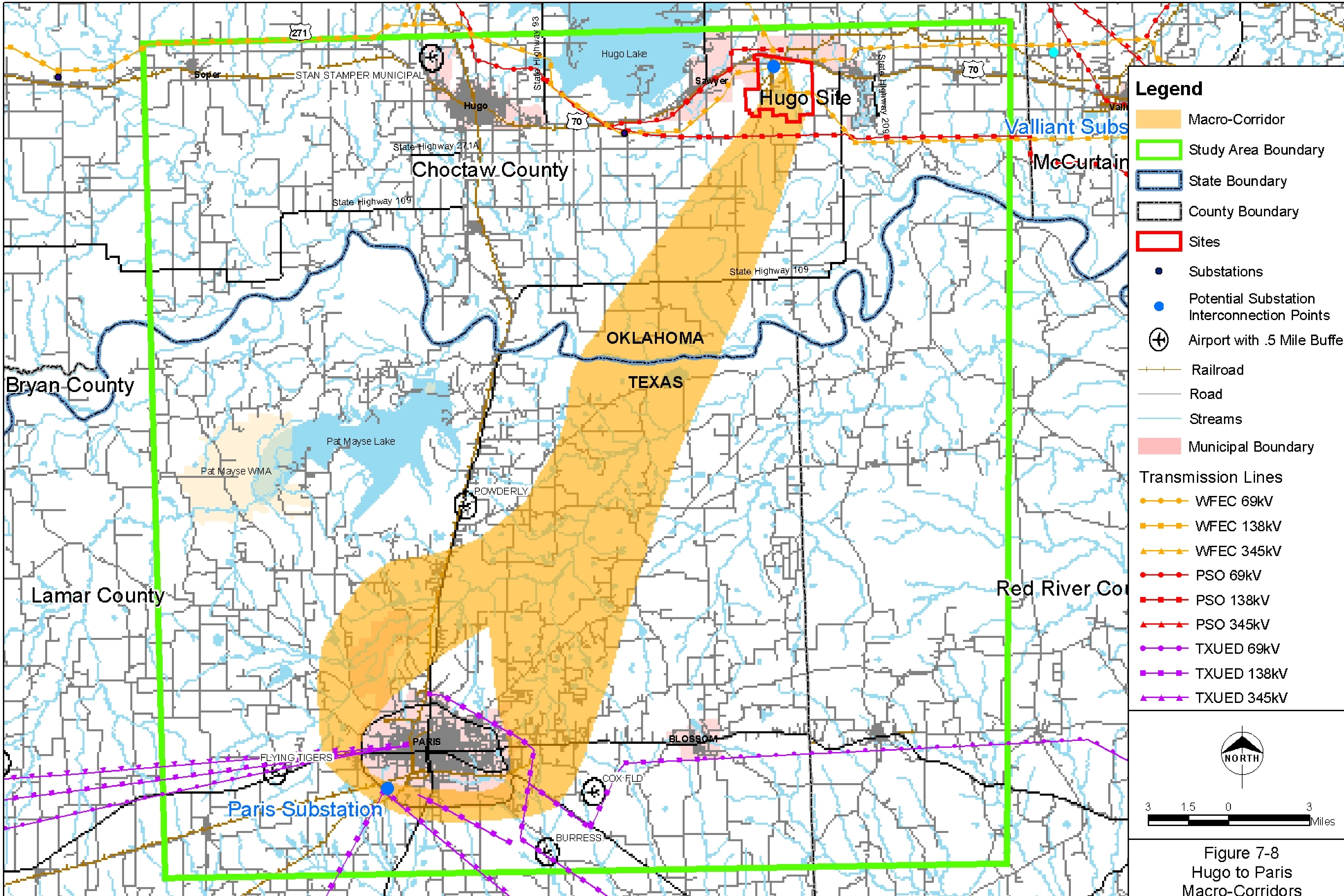


Figure 7-8
Hugo to Paris
Macro-Corridors

7.8.3 Hugo Station to Pittsburg Substation

The corridor from Hugo to Pittsburg would be approximately 60 miles. A number of significant features, discussed in detail previously, occur within the study area for development of these macro-corridors. These features include:

- Hugo Lake and Wildlife Management Area,
- Cities of Hugo, Antlers, and Rattan,
- Honobia Creek, Pine Creek, McGee Creek, and Stringtown Wildlife Management Areas,
- Indian Nation Turnpike, and
- Blackjack Mountain.

These resources would not usually be compatible with a new transmission line and would generally be avoided. Several transmission lines extend from the Hugo Station in a generally north direction that could be paralleled or double-circuited as part of the proposed project.

Additionally, an existing 345-kV line extends through the study area, connecting to the Pittsburg Substation. This line passes through the Honobia Creek Wildlife Area. While the wildlife area would not generally be considered compatible with a transmission line, the existing line provides an opportunity to use an existing linear corridor for the proposed project.

Hugo Lake and Wildlife Area lie directly between Hugo Station and the Pittsburg Substation. Any transmission line between these end-points would be required to circumvent the lake and surrounding lands. In so doing, existing transmission lines are found currently located within these corridor areas. These existing linear facilities formed the basis of the macro-corridors developed for this section.

Two primary macro-corridors were defined for the Hugo to Pittsburg section, an east and a west macro-corridor (Figure 7-9). The east corridor extends north from the Hugo Station around the east side of Hugo Lake. It continues north to the Rattan area where it turns northwest, following an existing PSO 345-kV line to the Pittsburg Substation. A variation of this macro-corridor would extend west from the existing 345-kV line north of Rattan, providing a connection

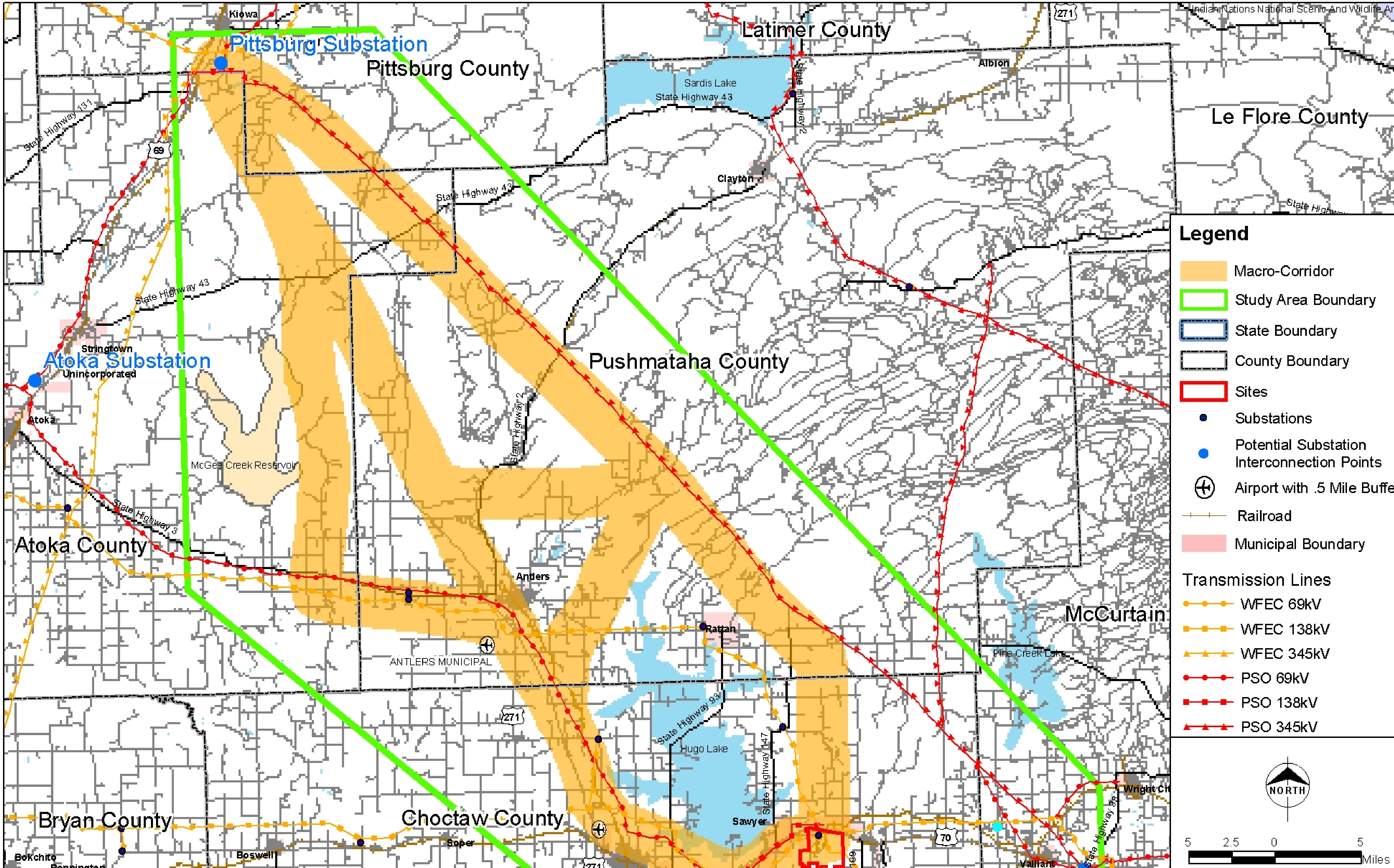


Figure 7-9
Hugo to Pittsburgh
Macro-Corridors

between the east and west macro-corridors. This variation would avoid passing in proximity to the City of Hugo but allow a connection between the two other corridors.

The west macro-corridor would leave Hugo Station to the east, generally following US Highway 70 and the existing WFEC 138-kV line from Hugo Station to the City of Hugo. It would turn north and pass between Hugo Lake and the city, continuing north generally following the existing line to Antlers. At Antlers, the west macro-corridor would continue northwest to the Pittsburg Substation. A variation of the west macro-corridor would diverge from the west corridor, passing between Antlers and Hugo Lake, joining the east macro-corridor north of the lake. This variation would allow cross-over from the west macro-corridor to the east macro-corridor. A second variation would extend west from the Antlers area, along the existing WFEC 138-kV transmission line for several miles. It would turn north along the east side of McGee Creek Reservoir and Wildlife Area to re-join the west corridor a few miles southeast of the Pittsburg Substation.

7.8.4 Hugo Station to Valley Substation

The Hugo Station and Valley Substation are approximately 65 miles apart. However, a number of features occur along the direct line between these two points. These features were discussed in detail in Section 7.6. They include:

- Pat Mayse Lake and Wildlife Management Area,
- Camp Maxey, and
- Caddo National Grassland.

Other significant features in the study corridor between Hugo and Valley include:

- Cities of Paris and Bonham,
- Crook Lake,
- Red River,
- US Highway 271 and associated adjacent development, and
- Existing transmission lines between Paris and Valley.

With the exception of the existing transmission lines, these resources would not usually be considered compatible with a new transmission line. They would generally be avoided during the routing process. However, while some of these features can be avoided by macro-corridors, others cannot. The Caddo National Grassland, Pat Mayse Lake and WMA, and Camp Maxey lie almost directly between Hugo and Valley. They occupy large areas within the project area. However, lands to the north and south of these areas provide potential corridors to avoid them. The same is true for the cities of Paris and Bonham. Although occupying much less area than the National Grassland, Pat Mayse facilities, and Camp Maxey, the cities contain dense residential and commercial development. Both, while located within the study corridor, are located along the southern edge, providing abundant area to the north within which to locate a new transmission line and avoid these communities.

In contrast, the Red River and US Highway 271 would have to be crossed for construction of the proposed project. The Red River extends east to west across the entire study corridor, forming the border between Oklahoma and Texas. Any project between Hugo Station and a location in Texas, including Valley Substation, would have to cross the river. Additionally, US Highway 271 extends north to south across the study corridor. Its location west of Hugo Station requires that it be crossed if the proposed project is to connect with the Valley Substation. Scattered, undeveloped areas along the highway provide potential crossing locations. Macro-corridors for the Hugo to Valley project were established based on these features and considerations.

The location of Pat Mayse facilities, Camp Maxey, and Caddo National Grassland directly between Hugo and Valley prevent the development of a straight-line macro-corridor between the two endpoints. Macro-corridors north or south of these areas would not differ significantly in overall distance nor encounter features or resources that would preclude location of a new transmission line. Therefore, two macro-corridors were identified for this project.

A south macro-corridor (Figure 7-10) would extend south from Hugo, cross the Red River and turn west. It would cross US Highway 271 between Paris and Camp Maxey, continuing west, generally following the existing transmission lines between Paris and Valley. It would pass between the Pat Mayse/Camp Maxey area and Caddo National Grassland to the north and Paris and Bonham to the south. This south macro-corridor would provide the potential opportunity to follow the existing transmission lines between Valley and the Paris area. Less than 10 miles of this corridor would be in Oklahoma, with approximately 55 miles in Texas.

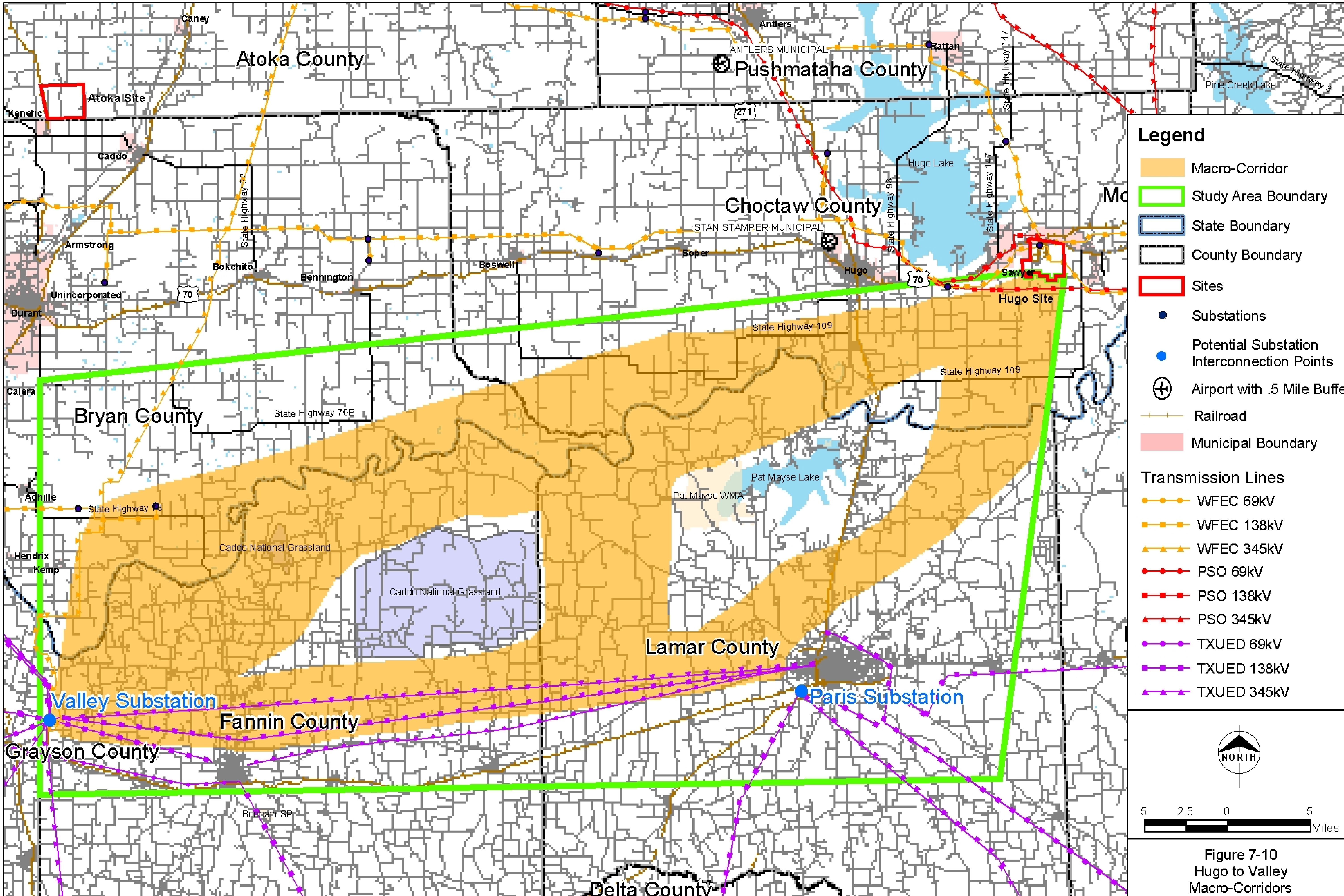


Figure 7-10
Hugo to Valley
Macro-Corridors

A north macro-corridor (Figure 7-9) was also identified for this project. The north macro-corridor would extend west from Hugo Station, crossing US Highway 271 between the City of Hugo and the Red River. After crossing the highway, the north macro-corridor would generally follow the Red River westward. It would provide routing opportunities north of Pat Mayse facilities and Caddo National Grassland. The corridor would include area both north and south of the Red River. The river would likely be crossed only once due to the potential environmental issues, design considerations, and costs associated with a crossing. Once in Texas, any route alignment would stay in Texas. The north macro-corridor would provide a large stretch of the river to identify potential crossing locations, as well as allow the flexibility to locate potential route alignments in Oklahoma or Texas as it extends west.

A final component of the Hugo to Valley macro-corridors includes a connection between the north and south macro-corridors (Figure 7-9). This connecting corridor would be located between Pat Mayse WMA and Caddo National Grassland. It would allow use of the north corridor west from Hugo and across US Highway 271. Once west of Pat Mayse WMA, the corridor would provide the opportunity to turn south and utilize the south macro-corridor, including the potential to follow the existing transmission lines located in the south corridor. It is not expected that the connecting corridor would provide for connection from the south macro-corridor to the north macro-corridor as this would resulting a substantial increase in overall project length and likely greater concern for environmental issues and resources.

7.8.5 Hugo Station to Lydia Substation

A number of resources for consideration during the routing of a transmission line occur within the Hugo to Lydia study area. However, most of these resources would not pose substantial constraints on the location of a new transmission line. As noted previously, numerous towns occur within the study area. With the exception of Clarksville and Valliant, these towns are small and widely scattered with abundant area between them within which to locate a new transmission line. Clarksville is located slightly south of the direct line between Hugo and Lydia. It could easily be avoided by either a corridor to the north or south of the town. Valliant is located on the northeast edge of the study area and could easily be avoided to the south. No federal or state parks, forests, or wildlife areas occur between Hugo and Lydia. Additionally, no large water bodies are present that would need to be avoided. The Red River, which would have to be crossed to connect these two points, while a consideration during project design and for potential environmental concerns, would not pose a significant obstacle for a new transmission line.

No constraints to a new transmission line route were identified between Hugo Station and Lydia Substation. Therefore, a single macro-corridor was identified between these two endpoints (Figure 7-11). This macro-corridor is essentially a direct route between the two endpoints, extending north from Clarksville, Texas for several miles. The macro-corridor is several miles wide, allowing abundant open area within which to identify potential routes. It also incorporates the existing 138-kV line corridor between Hugo and Valliant and the 345-kV line corridor between Valliant and Lydia as these corridors provide an opportunity for the proposed project to follow existing linear facilities the entire distance.

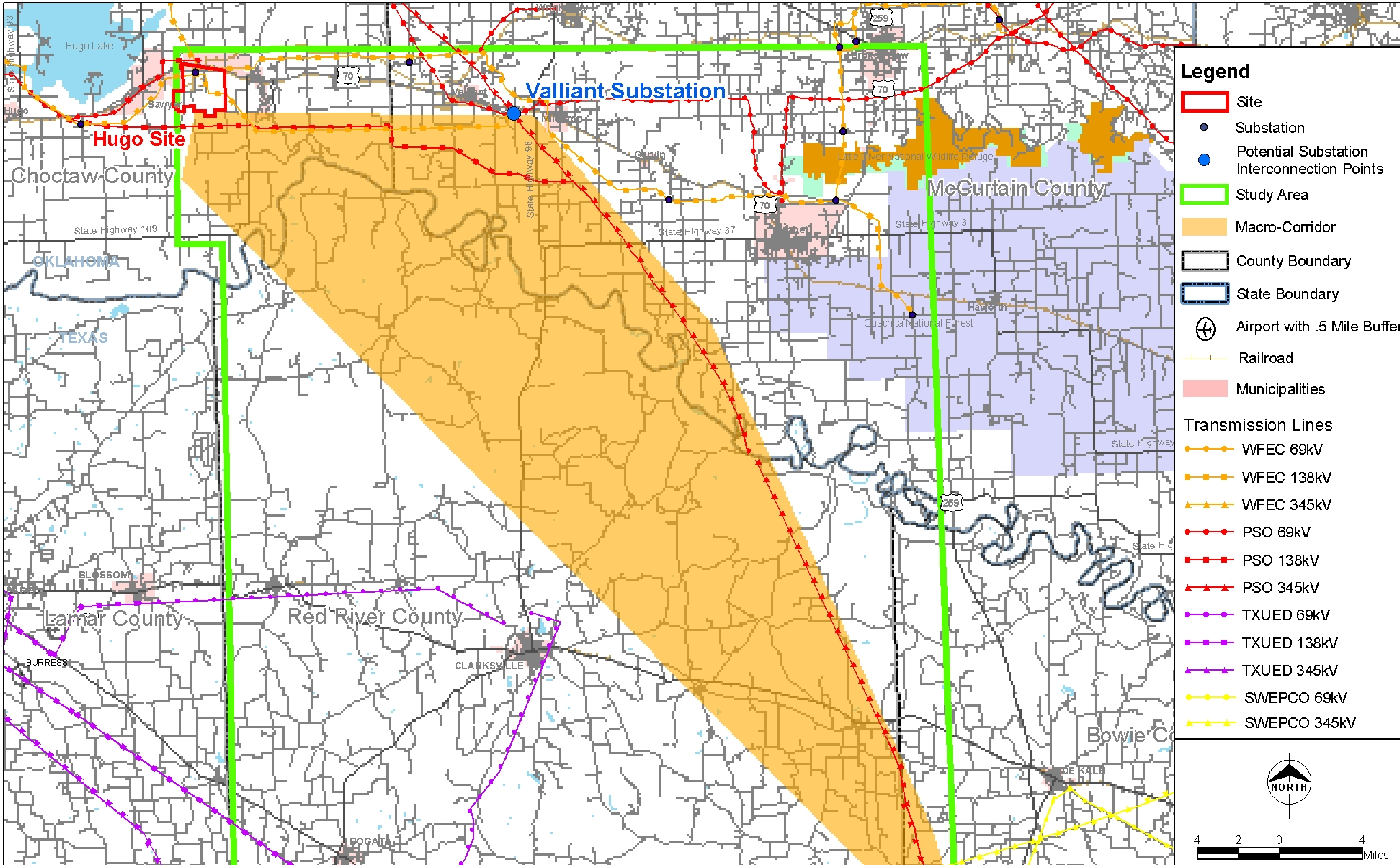


Figure 7-11
Hugo to Lydia
Macro-Corridors

8.0 CONCLUSIONS

The selection of the preferred transmission solution to economically transmit the power generated at Hugo 2 into the existing electrical grid will depend on the results of on-going studies being conducted by the SPP and ERCOT. Their studies will also indicate what additional improvements will be needed elsewhere in the two systems to accommodate the new unit.

9.0 REFERENCES

Arthur City, Texas. The Handbook of Texas Online. http://www.tsha.utexas.edu/handbook/online/articles/view/AA/hla26.html. [Accessed August 2004].

Atoka Wildlife Management Area. http://www.wildlifedepartment.com/atoka.htm [Accessed August 2004].

Bain, W.R. and A. Watterson. 1979. Soil Survey of Pushmataha County, Oklahoma. United States Department of Agriculture Soil Conservation Service in Cooperation with Oklahoma Agricultural Experiment Station. 99 pp.

Burns & McDonnell, 2002. Power Plant Site Selection Study. Brazos Electric Cooperative, Waco, TX. August 2002.

Burns & McDonnell, 1977. Site Selection Study for the Proposed Coal-Fired Generating Plant. Western Farmers Electric Cooperative, Anadarko, OK

Burns & McDonnell, 1978. Report of the Environmental Analysis for the Coal-Fired Generating Facility. Western Farmers Electric Cooperative, Anadarko, OK

Burns & McDonnell, 2002. Phase II Power Supply Study. Brazos Electric Power Cooperative, Waco, TX. June 2002.

Black & Veatch, 2001. 2001 WFEC Planning Study, Phase II. Western Farmers Electric Cooperative, Anadarko, OK. October 17, 2001

Brazos Electric Cooperative, 2002. http://www.brazoselectric.com/brazos.htm [Accessed August 2004].

Cemeteries of Oklahoma. http://www.rootsweb.com/~okgenweb/cemetery/cem-counties.htm. [Accessed August 2004.]

Choctaw Nation of Oklahoma. http://www.choctawnation.com/. [Accessed August 2004].

Clayton Oklahoma. http://www.lasr.net/pages/city.php?City_ID=OK0107003. [Accessed August 2004].

Endangered Species of Lamar County, Texas. http://www.rra.dst.tx.us/endangered/lamar.cfm. [Accessed August 2004].

ERCOT, 2003. Report on Existing and Potential Electric System constraints and Needs Within the ERCOT Region. ERCOT, Austin, Texas. October 1, 2003

ERCOT, 2003. Report on the Capacity, Demand, and Reserves in the ERCOT Region. ERCOT System Planning, Transmission Services, Taylor, Texas May 2003.

Gary Sherrer Wildlife Management Area. http://www.wildlifedepartment.com/sherrer.htm [Accessed August 2004].

Global Air.Com Aviation Exchange. Antlers Municipal Airport. http://www.globalair.com/airport/ airportinfo ~/AptCode=80F. [Accessed August 2004.]

_________2. Burress Airport. http://www.globalair.com/airport/airportinfo ~/AptCode=XS30. [Accessed August 2004.]

_________3. Cox Field Airport. http://www.globalair.com/airport/airportinfo ~/AptCode=PRX. [Accessed August 2004.]

_________4. Jones Field Airport. http://www.globalair.com/airport/ airportinfo ~/AptCode=F00. [Accessed August 2004.]

_________5. Flying Tigers Airport. http://www.globalair.com/airport/ airportinfo~/AptCode=39TA. [Accessed August 2004.]

_________6. Forest Hill Airport. http://www.globalair.com/airport/ airportinfo ~/AptCode=4TX3. [Accessed August 2004.]

__________7. Powderly Airport. http://www.globalair.com/airport/ airportinfo ~/AptCode=48TE. [Accessed August 2004.]

__________8. Stan Stamper Municipal Airport. http://www.globalair.com/ airport/ airportinfo~/AptCode=HHW. [Accessed August 2004.]

__________9. Rewards Ranch Airport. http://www.globalair.com/airport/ airportinfo /AptCode=TA22. [Accessed August 2004.]

_________10. RV Ranch Airport. http://www.globalair.com/airport/ airportinfo ~/AptCode=TX34. [Accessed August 2004.]

Global Security.Org Cam Maxey. http://www.globalsecurity.org/military/facility/camp-maxey.htm [Accessed August 2004.]

Handbook of Texas Online: Arthur City, Texas. http://www.tsha.utexas.edu/handbook/online/articles/view/AA/hla26.html. [Accessed August 2004].

__________2: Powderly, Texas. http://www.tsha.utexas.edu/handbook/online/articles/view/PP/hlp46.html. [Accessed August 2004].

Honobia Creek Wildlife Management Area. http://www.lasr.net/leisure/oklahoma/pushmataha/ff4.html. [Accessed August 2004].

Hugo Chamber of Commerce. http://www.hugochamber.com/index.htm. [Accessed August 2004].

Hugo Daily News: Community Profile. http://www.hugonews.com/profile.html. [Accessed August 2004.]

__________2: Community Profile-Fort Towson. http://www.hugonews.com/fttowson.html. [Accessed August 2004].

__________3: Community Profile-Hugo heritage Railroad. http://www.hugonews.com/hugoheri.html. [Accessed August 2004].

Hugo Oklahoma, The Natural Choice. http://www.neto.com/hugook/top.htm. [Accessed August 2004].

Hugo Wildlife Management Area. http://www.wildlifedepartment.com/hugo2.htm. [Accessed August 2004].

Indian Territory Interactive Map: Tribes and Nations of Oklahoma Indian Territories. http://www.rootsweb.com/~okgenweb/maps/itmap.htm. [Accessed August 2004].

Lamar County, Texas Links Page. http://www.rra.dst.tx.us/c_t/history/lamar/linkpage.cfm?County=Lamar. [Accessed August 2004].

Lake Raymond Gary. http://www.wildlifedepartment.com/raymond.htm. [Accessed August 2004].

McCurtain County Wildlife Management Area. http://www.wildlifedepartment.com/mccurtain.htm [Accessed August 2004].

McGee Creek Wildlife Management Area. http://www.wildlifedepartment.com/mcgee.htm [Accessed August 2004].

OA Online Oil & Gas: Paris Plant Offers Preview (1999) http://www.oaoa.com/oil/oil110299a.htm [Accessed August 2004].

Oklahoma Almanac: Almanac Features Online Oklahoma County Pages. Atoka County. http://www.odl.state.ok.us/almanac/counties/atoka.pdf. [Accessed August 2004].

__________2. Choctaw County. http://www.odl.state.ok.us/almanac/counties/choctaw.pdf. [Accessed August 2004].

__________3. McCurtain County. http://www.odl.state.ok.us/almanac/counties/mccurtn.pdf. [Accessed August 2004].

__________4. Pittsburg County. http://www.odl.state.ok.us/almanac/counties/pittsbrg.pdf [Accessed August 2004].

__________5. Pushmata County. http://www.odl.state.ok.us/almanac/counties/pushmtha.pdf. [Accessed August 2004].

Oklahoma Community Pages. http://www.50states.com/city/okla.htm. [Accessed August 2004].

Oklahoma RUS Atlas. http://arapaho.nsuok.edu/%7Eocrd/ordatlas/. [Accessed August 2004].

Paris, Texas Online: Paris, Texas Area Attractions. http://www.paristexasonline.com/Paris/attractions.htm. [Accessed August 2004].

Paris, Texas: Sports and Recreation. http://www.paristexas.com/vcc_content.asp?page=vcc_recreation.asp. [Accessed August 2004].

Pine Creek Wildlife Management Area. http://www.wildlifedepartment.com/pinecreek.htm [Accessed August 2004].

Pushmataha Wildlife Management Area. http://www.wildlifedepartment.com/pushmataha.htm [Accessed August 2004].

Reasoner, R.C. 1974. Soil Survey of McCurtain County, Oklahoma. United States Department of Agriculture Soil Conservation Service in Cooperation with Oklahoma Agricultural Experiment Station. 99 pp.

Red River Authority of Texas: About the Red River Authority. http://www.rra.dst.tx.us/aboutrra.cfm. [Accessed August 2004].

Ressel, Dennis. 1979. Soil Survey of Lamar and Delta Counties, Texas. United States Department of Agriculture Soil Conservation Service in Cooperation with Texas Agricultural Experiment Station. 148 pp.

River Valley Properties: Agricultural Information for Lamar County. http://www.paristechworks.com/rvalley/aginfo.cfm. [Accessed August 2004].

Shingleton, Lyle, C. 1971. Soil Survey of Pittsburg County, Oklahoma. United States Department of Agriculture Soil Conservation Service in Cooperation with Oklahoma Agricultural Experiment Station. 60 pp.

Shingleton, L.C. and Anderson Watterson. 1979. Soil Survey of Atoka County, Oklahoma. United States Department of Agriculture Soil Conservation Service in Cooperation with Oklahoma Agricultural Experiment Station. 153 pp.

Stringtown Wildlife Management Area. http://www.wildlifedepartment.com/stringtown.htm [Accessed August 2004].

Swafford, B.G. and Robert C. Reasoner. 1979. Soil Survey of Choctaw County, Oklahoma. United States Department of Agriculture Soil Conservation Service in Cooperation with Oklahoma Agricultural Experiment Station. 145 pp. [Accessed August 2004].

Texas Electric Cooperatives, Inc. 2004. Lamar County Electric Cooperative Association http://www.texas-ec.org/coop/lamar.html. [Accessed August 2004].

Texas Municipal Power Agency: Gibbons Creek Reservoir. http://www.gibbonscreek.com/ [Accessed August 2004].

Texas Online: Bonham, Texas. http://texas-on-line.com/graphic/bonham.htm. [Accessed August 2004].

Texas Online: Texas Trails of Lakes. http://texas-on-line.com/graphic/lake.htm. [Accessed August 2004].

Texas Parks and Wildlife Department: Lake Crook. http://www.tpwd.state.tx.us/fish/infish/lakes/crook/lake_id.htm. [Accessed August 2004].

Thomas, J.R. 1977. Soil Survey of Red River County, Texas. United States Department of Agriculture Soil Conservation Service in Cooperation with Texas Agricultural Experiment Station. 94 pp.

Three Rivers Wildlife Management Area. http://www.wildlifedepartment.com/threerivers.htm. [Accessed August 2004].

United Country Real Estate. Paris, Texas. http://www.rivervalleyproperties.com/area_information.htm. [Accessed August 2004].

U.S. Army Corps of Engineers: Pat Mayse Lake. http://www.swt.usace.army.mil/PROJECTS/civil/civil_projects.cfm?number=26. [Accessed August 2004].

U.S. Department of Agriculture RUS: EZ/EC. http://www.ezec.gov/Communit/index.html. [Accessed August 2004].

U.S. Census Bureau: State and County QuickFacts for Atoka County, Oklahoma. http://quickfacts.census.gov/qfd/states/40/40023.html. [Accessed August 2004].

U.S. Census Bureau: State and County QuickFacts for Choctaw County, Oklahoma. http://quickfacts.census.gov/qfd/states/40/40023.html. [Accessed August 2004].

U.S. Census Bureau: State and County QuickFacts for Fannin County, Texas. http://quickfacts.census.gov/qfd/states/48/48147.html. [Accessed August 2004].

U.S. Census Bureau: State and County QuickFacts for Lamar County, Texas. http://quickfacts.census.gov/qfd/states/48/48277.html. [Accessed August 2004].

U.S. Census Bureau: State and County QuickFacts for Pittsburg County, Oklahoma. http://quickfacts.census.gov/qfd/states/40/40121.html. [Accessed August 2004].

U.S. Census Bureau: State and County QuickFacts for Pushmatah County, Oklahoma. http://quickfacts.census.gov/qfd/states/40/40127.html. [Accessed August 2004].

U.S. Census Bureau: Profile of General Demographic Characteristics: 2000 Atoka County, Oklahoma. http://factfinder.census.gov/servlet/QTTable?_bm=n&_lang=en&qr_name=DEC_2000_S

F1_U_DP1&ds_name=DEC_2000_SF1_U&geo_id=05000US40005. [Accessed August 2004].

U.S. Census Bureau: Profile of General Demographic Characteristics: 2000 Choctaw County, Oklahoma. http://factfinder.census.gov/servlet/QTTable?_bm=n&_lang=en&qr_name=DEC_2000_SF1_U_DP1&ds_name=DEC_2000_SF1_U&geo_id=05000US40023 [Accessed August 2004].

U.S. Census Bureau: Profile of General Demographic Characteristics: 2000 Fannin County, Texas. http://factfinder.census.gov/servlet/QTTable?_bm=n&_lang=en&qr_name=DEC_2000_SF1_U_DP1&ds_name=DEC_2000_SF1_U&geo_id=05000US48147. [Accessed August 2004].

U.S. Census Bureau: Profile of General Demographic Characteristics: 2000 Lamar County, Texas. http://factfinder.census.gov/servlet/QTTable?_bm=n&_lang=en&qr_name=DEC_2000_SF1_U_DP1&ds_name=DEC_2000_SF1_U&geo_id=05000US48277. [Accessed August 2004].

U.S. Census Bureau: Profile of General Demographic Characteristics: 2000 Pittsburg County, Oklahoma. http://factfinder.census.gov/servlet/QTTable?_bm=n&_lang=en&qr_name=DEC_2000_SF1_U_DP1&ds_name=DEC_2000_SF1_U&geo_id=05000US40121 [Accessed August 2004].

U.S. Census Bureau: Profile of General Demographic Characteristics: 2000 Pushmatah County, Oklahoma. http://factfinder.census.gov/servlet/QTTable?_bm=n&_lang=en&qr_name=DEC_2000_SF1_U_DP1&ds_name=DEC_2000_SF1_U&geo_id=05000US40127 [Accessed August 2004].

U.S. Fish and Wildlife Service: Southwest Ecological Region Endangered Species List. http://ifw2es.fws.gov/endangeredspecies/lists/ListSpecies.cfm. [Accessed August 2004].

U.S. Gen Web Project: Choctaw County, Oklahoma. 2004. http://www.rootsweb.com/~okchocta/county/county.htm [Accessed August 2004].

U.S. Gen Web Project: Welcome to Fannin County, Texas. http://www.rootsweb.com/~txfannin/ [Accessed August 2004].

Western Farmers Electric Cooperative, 2003. Company Information. http://www.wfec.com/index.asp [Accessed August 2004].

Wikipedia–The Free Encyclopedia: Atoka County, Oklahoma. http://en.wikipedia.org/wiki/Atoka_County,_Oklahoma. [Accessed August 2004].

Wikipedia–The Free Encyclopedia: Choctaw County, Oklahoma. http://en.wikipedia.org/wiki/Choctaw_County%2C_Oklahoma. [Accessed August 2004].

Wikipedia–The Free Encyclopedia: Fannin County, Texas. http://en.wikipedia.org/wiki/Fannin_County,_Texas. [Accessed August 2004].

Wikipedia–The Free Encyclopedia: McCurtain County, Oklahoma. http://en.wikipedia.org/wiki/McCurtain_County,_Oklahoma. [Accessed August 2004].

Wikipedia–The Free Encyclopedia: Pittsburg County, Oklahoma. http://en.wikipedia.org/wiki/Pittsburg_County,_Oklahoma. [Accessed August 2004].

Wikipedia–The Free Encyclopedia: Pushmatah County, Oklahoma. http://en.wikipedia.org/wiki/Pushmataha_County,_Oklahoma. [Accessed August 2004].