CHAPTER 2

ENVIRONMENTAL DESCRIPTION

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CHAPTER 2

ENVIRONMENTAL DESCRIPTION

2.0 ENVIRONMENTAL DESCRIPTION

Chapter 2 describes the existing environmental conditions at the Lee Nuclear Site, in the site vicinity, and in the region. The level of detail provided in the environmental descriptions is sufficient to adequately describe the potential environmental effects of construction (Chapter 4) and operation (Chapter 5) of two AP1000 reactors at the site. This chapter consists of eight sections:

- Section 2.1 – Station Location.
- Section 2.2 – Land.
- Section 2.3 – Water.
- Section 2.4 – Ecology.
- Section 2.5 – Socioeconomics.
- Section 2.6 – Geology.
- Section 2.7 – Meteorology and Air Quality.
- Section 2.8 – Related Federal Project Activities.

The following definitions and figures are provided as additional information related to the content of the Chapter 2 sections:

- Lee Nuclear Site region - The area within approximately the 50-mile (mi.) radius around the site (Figures 1.1-1 and 2.0-1).
- Lee Nuclear Site vicinity - The area within approximately the 6-mi. band around the site boundary (Figures 1.1-2 and 2.0-1).
- Lee Nuclear Site - The 1900-acre (ac.) area identified by the site boundary (Figures 1.1-3 and 2.0-1).

2.1 STATION LOCATION

The Lee Nuclear Site is located in the eastern portion of Cherokee County in north-central South Carolina (Figures 1.1-1 and 1.1-2). It is on the west side of the Broad River at a point about 1.1 miles (mi.) upstream from the Ninety-Nine Islands Hydroelectric Plant. Within Cherokee County, the site is 8.2 mi. southeast of Gaffney, 7.5 mi. southeast of East Gaffney, 5.8 mi. south of Blacksburg, and 2.6 mi. southeast of the unincorporated village of Cherokee Falls (Reference 3). The three largest population centers (defined as having more than 25,000 residents) in the region are Charlotte, North Carolina; Spartanburg, South Carolina; and Greenville, South Carolina (Reference 2). The site is 40.1 mi. southwest of Charlotte, 24.6 mi. northeast of Spartanburg, and 51.6 mi. northeast of Greenville. The nearest population center is Gastonia, North Carolina, located 24.0 mi. northeast of the site (Reference 1). The 2005 estimated population of Gastonia is 68,964 (Reference 5). Gaffney is the largest city within a 10-mi. radius of the site (Reference 2). The site is in the Piedmont physiographic province of South Carolina (Reference 4).

As shown in Figure 1.1-3, the site boundary of the Lee Nuclear Site encompasses approximately 1900 acres of property. Figure 2.1-1 shows the site plot plan with major structures identified. Universal Transverse Mercator grid coordinates (NAD 83) for the proposed reactor location at Unit 1 of the new nuclear power plant are 453194 meters (m) east and 3877231 m north. The reactor coordinates at Unit 2 are 453447 m east and 3877285 m north. At the center of the Lee Nuclear Site (the midline between the two proposed reactors), the coordinates are 453321 m east and 3877258 m north.

The primary access to the site is from McKowns Mountain Road via South Carolina State Highway 329 and Interstate 85 (see Figure 1.1-2). An abandoned railroad spur runs from East Gaffney, entering the site at its northern boundary. Duke Power Company conducted partial construction of the proposed Cherokee Nuclear Station on this site from 1977 to 1982 as seen in Figure 1.1-3. As a result, the site consists of graded, open, partially developed land with low groundcover vegetation and scattered areas of sparse tree growth. The terrestrial surroundings near the site consist primarily of hardwood forest and farms, including fallow land, grazing, and crops (Reference 6). The Broad River, and more specifically Ninety-Nine Islands Reservoir with a pool elevation of 511 feet (ft.) above mean sea level (msl), closely bounds the Lee Nuclear Site to the north and east (Reference 3).

Topography on the Lee Nuclear Site ranges from a low elevation of approximately 512 ft. above msl along the river bank to a high elevation of 659 ft. above msl northwest of the existing excavation. The highest natural feature on the site is McKowns Mountain, which is located southwest of the previous excavation area. The elevation at the top of McKowns Mountain is 816 ft. above msl (Reference 3).

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2.2 LAND

The Lee Nuclear Site is located near the Broad River in rural Cherokee County, South Carolina (Reference 19). Situated near the town of Gaffney, South Carolina, the site is accessible only by road (Reference 19). An abandoned railroad spur connects the site to the main line running through Gaffney. Interstate 85 is the main transportation route and provides a connection between Spartanburg, South Carolina, and Gastonia, North Carolina (Reference 1). U.S. Highway 72 and South Carolina State Highways 329 and 105 also service this area (Reference 1).

This section describes, in general terms, the Lee Nuclear Site, land in the vicinity of the site, land in the region of the site, and transmission corridors.

2.2.1 THE SITE AND VICINITY

2.2.1.1 The Site

Duke Energy wholly owns the property on which the Lee Nuclear Site is located and directs land management activities at the site. Duke Energy is the named applicant and operator for the proposed Lee Nuclear Station. The 1900-acre (ac.) site is bounded by the Broad River to the north and east, McKowns Mountain Road to the south, and private properties to the south and west (Figure 2.1-1) (References 1 and 7). No transportation routes cross the Lee Nuclear Site (Reference 1). Duke Energy owns the mineral rights on the Lee Nuclear Site. No mineral resources, including oil and natural gas, within or adjacent to the site are being exploited or are of any known value (Reference 3).

The proposed location for the Lee Nuclear Station is an industrial site that was evaluated and licensed for the construction of three nuclear units in the 1970s. Approximately 750 ac. of ground on the site were disturbed by this early construction, which began in 1977 and was halted in 1982. These construction activities resulted in extensive alteration of the site. The site was purchased by Earl Owensby Studios, in 1986, and used for the production of a movie. The site sat idle for a number of years and was acquired in 2005 by Cherokee Falls Development Company LLC. Subsequently, Duke Energy and Cherokee Falls Development Company entered into an agreement to develop the site for the Lee Nuclear Station. Duke Energy purchased all outstanding ownership shares from Cherokee Falls Development Company in early 2007.

Previous construction activities on the site left in place a large excavated area, partially constructed power unit buildings (one partially completed power block and containment/shield building), and numerous other large and small on-site buildings that were used as warehouses, shops, construction support facilities, and a guard house. Concrete pads and remnant vehicle parking areas are present at various locations on the site. A large, active meteorological station is located immediately southeast of the remaining power unit buildings. These constructed surface features are linked by a system of paved roads and a related system of unpaved roads that serve peripheral areas of the site. Buried utility pipelines, overhead electric power lines, and communications lines that once served the buildings and construction areas are still present on the site. The electrical lines are suspended by wooden poles and metal towers. An abandoned railroad spur enters the site at a point on its northern boundary, extends across the northern half of the site, and ends in a former construction area. The site contains three major surface water impoundments established by previous construction activities on the site. These are the large

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Make-Up Pond B on the west side of the site, the Make-Up Pond A on the east side of the site, and the Hold-Up Pond A on the north end of the site.

The majority of the site is surrounded by chain link fencing and access to the site is restricted to authorized persons only. There are no recreational opportunities on the Lee Nuclear Site.

In 1991, South Carolina designated a 15.3-mile (mi.) section of the Broad River, from the Ninety-Nine Islands Hydroelectric Dam south to the confluence of the Broad River with the Pacolet River, as a State Scenic River (See Figure 2.3-19). With this designation, the Broad River became part of a program established by the South Carolina Scenic Rivers Act of 1989 (Scenic Rivers Act), the purpose of which is to protect unique and outstanding river resources throughout South Carolina. To accomplish this purpose, the Scenic Rivers Act provides for a voluntary, cooperative river management program to be administered by the South Carolina Department of Natural Resources (SCDNR), which enables landowners, community interests, and the SCDNR to work together toward common river conservation goals (Reference 11). The Broad River is not classified as a National Wild and Scenic River by the federal government (Reference 20).

No zoning laws are in place at either the state or county levels in unincorporated portions of Cherokee County. Because the site is located in an unincorporated portion of Cherokee County, it is not subject to any state, county, or city land management plans. Duke Energy intends to develop the site as indicated in Figure 2.1-1.

The land use is industrial, based on most recent use. The land cover within the site boundary, as described by the U.S. Geological Survey (USGS) 2001 National Land Cover Dataset, is primarily forest and is shown in Table 2.2-1 and Figure 2.2-1 (Reference 4). The excavated area (from previous construction) has been classified as water. Duke Energy removed the water from the excavation in 2005, and maintains pumps to remove seepage water from the excavation. Other site features are classified as grassland, pasture, and developed land (Reference 4).

According to U.S. Department of Agriculture (USDA) soil survey data, there are 2 ac. in the southeast corner of the site that are considered prime farmland. Although the USDA has identified areas of farmland that are of statewide importance in the area of proposed construction, many of these have already been excavated or have been previously disturbed (Reference 5). Sanitary wastewater treatment is provided by the city of Gaffney, South Carolina, and potable water is supplied to the site by the Draytonville Water System.

2.2.1.2 The Vicinity

The vicinity is a 6-mi. band from the site boundary and is located in both Cherokee and York counties, South Carolina (Reference 1). Several transportation routes, including roads and rails, are located within the site vicinity. One major interstate, I-85, is located 6.6 mi. northwest of the center point between the two reactors and connects the Greenville-Spartanburg area to Gastonia, North Carolina (see Figure 1.1-1). The abandoned Lee Nuclear Station railroad spur connects to the Norfolk Southern rail system in East Gaffney (see Figure 1.1-2) (Reference 1).

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No airports and only one heliport are located within 10 mi. of the Lee Nuclear Site (Reference 26). The Milliken & Company heliport is located approximately 6 mi. to the north of the Lee Nuclear Site. The facility has a 25-foot-square concrete helipad, and no aircraft are based at this heliport (Reference 26).

Two major industrial facilities are located within the vicinity of the Lee Nuclear Site. The Broad River Energy Center is a natural gas-fired peaking electric generation plant located approximately 4.7 mi. northwest of the site. The facility consists of five combustion-turbines with a base load capacity with peaking of 847 megawatts (Reference 27). Herbie Famous Fireworks (South Carolina Distributors) is a 1.4G Class C consumer fireworks wholesale distribution company. Herbie Famous Fireworks operates a warehouse facility located approximately 2.7 mi. north of the Lee Nuclear Site.

The nearest hospital is the Upstate Carolina Medical Center located in Gaffney, South Carolina approximately 7.9 mi. northwest of the center point of the Lee Nuclear Site (Reference 16).

Within the vicinity of the Lee Nuclear Site, there are no federal lands (Reference 6).

The nearest state park is Kings Mountain State Park, located approximately 7.8 mi. northeast of the site center point. Kings Mountain National Military Park adjoins the state park along its northwest border (Reference 8). Other nearby tourist attractions are Cowpens National Battlefield in Chesney, South Carolina; Prime Outlets in Gaffney, South Carolina; and Sumter National Forest, located south of the Lee Nuclear Site (References 9, 10, and 17).

Gaffney, South Carolina, has seven local parks: Gaffney Commercial Historic District, Limestone Springs Historic District, McCluney Park, Gaffney Residential Historic District, Irene Ball Park, Milliken Park, and Thompson Park (Reference 28). The nearest golf course to Gaffney is the Gaffney Country Club, located to the south of the city (Reference 22).

There are two campgrounds near the Lee Nuclear Site vicinity. They are Kings Mountain State Park and Pinecone Campground, approximately 5 mi. west of Gaffney, South Carolina (References 21 and 23).

Cherokee County contains 14 reservoirs and one lake, all with the potential to be used for various recreational activities, including hiking, fishing, and occasionally swimming. The nearest to the Lee Nuclear Site is the Ninety-Nine Islands Reservoir, directly adjacent to the eastern site boundary. Three recreational areas are identified on the Ninety-Nine Islands Reservoir: Cherokee Ford Recreation Area (near Goat Island); Pick Hill boat access (north of the dam on the east bank, accessible from South Carolina State Highway 43); and an area on the east bank just south of the dam that has a canoe portage, tailrace fishing area, and boat ramp. Another public body of water near the Lee Nuclear Site is Lake Cherokee, approximately 2 mi. from the western site boundary (References 24 and 25).

Duke Energy plans to use short and compact mechanical-draft cooling towers at the Lee Nuclear Station. The tallest structures planned for the station are the reactor domes. These structures would be 180.5 ft. above ground level. The reactor domes would be most visible from local parks in Gaffney, South Carolina, Kings Mountain State Park, Croft State Park, and Crowders Mountain State Park.

Land use within the site vicinity, as described by the 2001 USGS National Land Cover Dataset, is primarily forest and pastureland as shown in Table 2.2-1 and Figure 2.2-2 (Reference 4). In 2002, approximately 25 percent (64,020 ac.) of Cherokee County and 27 percent (118,997 ac.) of York County were farms (Reference 12). Of the lands considered by USDA as farmland, 39 percent (25,281 ac.) was cropland in Cherokee County, while 45 percent (54,013 ac.) was considered cropland in York County. The remaining areas were woodland, pasture, and other uses. The two counties contained 118,161 ac. of prime farmland, and if drained, they would contain an additional 7192 ac. (Reference 5).

As shown in Figure 2.2-5, the Lee Nuclear Site is bounded by the Broad River to the north and east with adjacent lands consisting of woodlands and Duke Energy-owned properties. To the south, there is a mixture of woodlands and residential or future residential lands immediately along McKowns Mountain Road, with field or farmland set further off the road to the south. The west and northwest land is primarily woodlands. Also shown in Figure 2.2-5 is the Exclusion Area Boundary (EAB), as discussed in Subsection 2.7.3.1.

Gaffney is the largest city within the vicinity of the Lee Nuclear Site and is the county seat of Cherokee County (References 13 and 28). The city of Gaffney has a detailed zoning ordinance and zoning map, which was last amended August 31, 2005. Approximately half of the total city area is zoned single-family residential, with those areas concentrated in the northwest and south-southeast portions of the city. General commercial and neighborhood commercial zones occupy corridors that run from the northwest to the south-southeast and from the central southwest to the central northeast. Medium-density and high-density residential zones bound these corridors. Industrial zoning is located primarily along the central southwest to central northeast commercial corridor, with outliers to the west and northwest. The southern city limits of East Gaffney and the unincorporated community of Cherokee Falls also fall within the vicinity of the plant (Reference 28).

The city of Blacksburg (5.8 mi. to the north) is zoned commercial on both sides of Cherokee Road between the eastern and western city limits. The portion of Mountain Road north of Cherokee Road is also zoned commercial on both sides until it reaches the northern city limit. The largest industrial area is located to the south of Osee Street and east of Wilbur Street, extending to the city limits on the south and west. Two other industrial areas are located in downtown Blacksburg. One is located on both sides of Carolina Street between Shelby Street on the west and Academy Street on the east. The other is located on both sides of North Charleston Street, bounded by Carolina Street to the north and the railroad tracks to the south. The remainder of property within the Blacksburg city limits is zoned residential (Reference 28).

Also within the vicinity of the Lee Nuclear Site are the towns of Smyrna and Hickory Grove, both located in York County. Neither of these areas has its own zoning information; however, countywide data are available from York County on acreages for all zoning types, as shown in Table 2.2-2 (References 15 and 28).

2.2.2 TRANSMISSION CORRIDORS AND OFF-SITE AREAS

Two transmission line rights-of-way are proposed for the plant. A 230 kilovolt (kV) and a 525 kV line would be constructed in each right-of-way. The plant would be connected to the transmission system through two switchyards on the Lee Nuclear Site. Corridors for the new transmission lines would radiate from the switchyard and extend for approximately 8 mi. south of the site where the 230 kV lines would fold into the existing Roddey (Catawba-Pacolet) 230 kV transmission line. The corridors then extend another 8 mi. south where 525 kV lines fold into the existing Asbury (Oconee-Newport) 525 kV transmission line. Current plans designate these lines as the Lee Nuclear 230 kV transmission line and the Lee Nuclear 525 kV transmission line. Modification of the existing transmission lines to carry the additional power load from the plant would be required. Additional information, such as proposed routes for corridors, corridor lengths, corridor widths, and easement information, can be found in Subsection 9.4.3.

As part of the Cherokee Nuclear Station, Duke Power Company constructed a 6.8 mi. rail line from the Norfolk Southern line near Gaffney, South Carolina, to the Cherokee site. This line is illustrated in Figure 4.1.1-4 of Reference 29. The rail line is built along a 100-ft. right-of-way covering a total of 83 ac. All clearing, grading, and construction was performed as part of the Cherokee Nuclear Station construction. When the Cherokee Nuclear Station was cancelled, the track and ballast were removed from the right-of-way, but the right-of-way remained intact. The right-of-way has since reverted to private ownership.

Duke Energy is reacquiring the right-of-way from current owners and plans to place new ballast and track to reactivate the rail line for construction of the Lee Nuclear Station. The original right-of-way remains intact. However, Duke Energy plans a short detour from this original route at the location of Reddy Ice Plant, which occupies part of the original rail bed. This detour involves approximately 1300 ft. of track.

2.2.3 THE REGION

The region is considered to be an area defined by a 50-mi. radius from the site center point and is located in both North Carolina and South Carolina (Reference 1). There are 23 counties (10 in South Carolina and 13 in North Carolina) completely or partially within the region (Reference 1). These counties are listed in Table 2.2-3.

The largest cities in the region are Charlotte, North Carolina (population estimate of 610,949 in 2005); Gastonia, North Carolina (population estimate of 68,964 in 2005); Greenville, South Carolina (population estimate of 56,676 in 2005); and Spartanburg, South Carolina (population estimate of 38,379 in 2005) (References 2 and 13). Major transportation networks within the region are shown in Figure 1.1-1. Because of security concerns, a major utility map is not available. There are three commercial passenger airports within the Lee Nuclear Station region:

Charlotte-Douglas International Airport (34 mi.) to the northeast, Hickory Regional Airport (49 mi.) to the northeast, and Greenville-Spartanburg International Airport (41 mi.) to the southwest.

Land use within the site region, as described by the 2001 USGS National Land Cover Dataset (Table 2.2-1), much like the vicinity and site, is primarily forest with some pasture, as shown in Figure 2.2-3 (Reference 4). The total value of agricultural production for York and Cherokee counties is approximately $106.9 million. Both counties show an increase in the market value of production when the 1992 agricultural census is compared to the 2002 agricultural census. The top livestock inventory item in York and Cherokee counties is turkeys, followed by cattle and calves. The value of livestock, poultry, and their products accounts for over 92 percent of the market in Cherokee County. The top crops by acre in both counties are forage for hay and haylage, grass silage, and greenchop. The annual yield of crops for Cherokee County, according to the 2002 agricultural census, was 830 bushels (bu.) of corn, 7246 bu. of wheat, 2960 bu. of oats, 761 bu. of soybean, and 13,486 tons (T.) of forage. The annual yield of crops for York County, according to the 2002 agricultural census, was 9078 bu. of corn; 23,965 bu. of wheat; 22,540 bu. of oats; 2250 bu. of barley, 7752 bu. of sorghum, 636 bales of cotton; and 29,990 T. of forage (References 12, 14, and 18).

Federal lands in the region include Cowpens National Battlefield, Sumter National Forest, and Kings Mountain National Military Park, as shown in Figure 2.2-4 (Reference 6). Cowpens National Battlefield commemorates a decisive battle in the Southern Campaign of the Revolutionary War (Reference 10). Sumter National Forest hosts activities ranging from hiking, hunting, and camping to horseback riding (Reference 9). Kings Mountain National Military Park commemorates a pivotal and significant victory by American patriots over American loyalists during the Southern Campaign of the Revolutionary War (Reference 8). There are no Native American lands and no ports within 50 mi. of the site (References 6 and 1).

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TABLE 2.2-1
LAND USE

USGS Description	Percentage of Site	Area in Hectares	Percentage of Vicinity	Area in Hectares	Percentage of Region	Area in Hectares
Water	14.5	111.2	1.4	585.2	1.5	29,595.7
Open Developed	2.6	19.7	5.6	2383.9	9.3	186,930.0
Low-Intensity Developed	0.4	3.2	2.2	920.7	4.5	89,723.6
Medium-Intensity Developed	0.0	0.0	0.3	139.7	1.2	25,117.7
High-Intensity Developed	0.0	0.0	0.2	64.5	0.6	12,642.4
Barren Land	0.1	1.1	0.04	15.8	0.6	12,980.4
Deciduous Forest	50.8	390.5	45.1	19,056.3	34.7	698,091.0
Evergreen Forest	7.0	54.0	15.9	6730.3	17.8	359,001.0
Mixed Forest	2.9	22.2	2.5	1052.7	1.5	30,194.5
Shrub/Scrub	2.6	20.1	2.8	1181.0	1.2	23,569.2
Grassland	15.5	119.4	7.8	3302.0	5.9	117,818.0
Pasture	3.1	23.6	15.3	6479.2	19.3	389,105.0
Cropland	0.3	2.2	0.3	113.3	0.3	5506.7
Woody Wetlands	0.2	1.7	0.5	203.3	1.6	31,643.0
Emergent Herbaceous Wetlands	0.0	0.2	0.01	4.5	0.0	122.0
Total	100.0	769.1	100.0	42,232.4	100.0	2,012,040.2

Sums may not match because of rounding effects.

(Reference 4)

TABLE 2.2-2
YORK COUNTY EXISTING LAND USE, 2005

Land Use Category	Ac.	Percent
Single-Family Residential	11,270	17.2
Multi-Family Residential	730	1.1
Residential Total	**12,000**	**18.3**
Commercial	900	1.4
Tourist Commercial	590	0.9
Commercial Total	**1490**	**2.3**
Limited Industrial	410	0.6
General Industrial	1250	1.9
Industrial Total	**1660**	**2.5**
Conservation/Recreation	16,410	25.1
Agricultural	680	1.0
Vacant	11,150	17.0
Open Space Total	**28,240**	**43.2**
Military	20,910	32.0
Public/Institutional	1130	1.7
Total	**65,430**	**100.0**

(Reference 15)

TABLE 2.2-3
COUNTIES WITHIN THE LEE NUCLEAR SITE REGION

North Carolina Counties		South Carolina Counties	
Burke	Lincoln	Cherokee	Laurens
Cabarrus	McDowell	Chester	Newberry
Catawba	Mecklenburg	Fairfield	Spartanburg
Cleveland	Polk	Greenville	Union
Gaston	Rutherford	Lancaster	York
Henderson	Union		
Iredell			

(Reference 1)

2.3 WATER

This section includes information that describes the physical, chemical, biological, and hydrological characteristics of the waters that may affect the Lee Nuclear Station effluents and water supply, or waters that may be assumed to be affected by the construction or operation of two new AP1000 units at the facility.

The 1900-acre (ac.) Lee Nuclear Site is located south and west of the Broad River in eastern Cherokee County, South Carolina. The nuclear units for Lee Nuclear Station are located south and west of the Ninety-Nine Islands Reservoir portion of the Broad River, approximately 1 linear mi. west of the Ninety-Nine Islands Dam. Approximately 750 ac. of ground were disturbed during the 1977–1982 construction on the Duke Power Company's Cherokee Nuclear Station under a U.S. Nuclear Regulatory Commission (NRC) construction permit. Approximately 25 ac. were excavated into underlying bedrock for construction of the formerly proposed Cherokee Nuclear Station reactor units. The excavation filled with precipitation and groundwater in the years following the cancellation of construction activities. The removal of this water is discussed in Chapter 4. The planned footprint of the two AP1000 reactor units is within the excavated portion of the site, with an elevation of 590 feet (ft.) above mean sea level (msl) for each unit.

2.3.1 HYDROLOGY

A detailed and thorough description of the hydrologic environment, considering both present and known future water use conditions, is essential for the evaluation of potential effects of plant construction and operation on the environment. In general, the information in the following subsections provides detailed descriptions of the surface water bodies and groundwater aquifers that could affect the Lee Nuclear Station's water supply and effluent disposal, or that could be affected by station construction or operation, including transmission corridors and off-site facilities.

The information presented in this subsection is supported by inclusion of site and regional maps (including digital databases such as a Geographic Information System [GIS]) that show the relationship of the site to major hydrological systems that could affect or be affected by plant construction or operation. The site-specific hydrology data assembled, analyzed, and presented in the following subsections is based initially on information developed for the former Cherokee Nuclear Station construction permit environmental report (ER), data from recent site-specific investigations, and information from citable sources listed in the references.

2.3.1.1 Surface Water

The Broad River basin region, the Broad River, and the majority of its tributaries, originate in the Blue Ridge Mountains of North Carolina and extend toward the foothills before entering the Piedmont ecoregion southeast and east of Lake Lure in North Carolina, all within the larger Santee River basin (six-digit Hydrological Unit Code [HUC] 030501) (Figure 2.3-1).

2.3.1.1.1 Streams

2.3.1.1.1.1 Upper Broad River Basin Watershed

The Broad River drainage basin above Ninety-Nine Islands Dam is located within the Upper Broad River basin watershed (U.S. Geological Survey [USGS] Hydrological Unit 03050105) and includes the Green River, First Broad River, Second Broad River, and Buffalo Creek as major tributaries (Reference 2). The Upper Broad River basin has an area of approximately 2500 sq. mi. (Table 2.3-1) and is situated over the North Carolina/South Carolina state border (Figure 2.3-2). The drainage area of the Upper Broad River basin above the Lee Nuclear Site is approximately 1550 sq. mi.

Broad River elevations range from about 1200 ft. above msl at the headwaters of the First Broad River in North Carolina, to 620 ft. above msl at the North Carolina/South Carolina border. Watershed elevations along the Broad River continue to decrease southward to 511 ft. above msl upstream of Ninety-Nine Islands Dam, 440 ft. above msl below Ninety-Nine Islands Dam, and 140 ft. above msl at the confluence of the Broad River with the Saluda River in Columbia, South Carolina (Reference 4).

The Broad River flows through Rutherford and Cleveland counties in North Carolina, then into Cherokee County, South Carolina. In North Carolina, the basin encompasses most of Cleveland, Polk, and Rutherford counties and small portions of Buncombe, Henderson, Lincoln, Gaston, Burke, and McDowell counties. Larger municipalities include the towns of Forest City, Kings Mountain, Lake Lure, Rutherfordton, Shelby, and Spindale. Approximately one-half of the basin is covered in forest; however, agriculture is still widespread (Reference 2).

The Lee Nuclear Site is located in the USGS Subbasin Hydrological Unit 03050105-090 of Cherokee and York counties, South Carolina (Figure 2.3-2). The predominant soil types consist of an association of the Cecil-Wilkes-Goldston-Badin series. The erodibility of the soil (K) averages 0.28, and the slope of the terrain averages 12 percent, with a range of 2–45 percent. Land use/land cover in the watershed includes 67.8 percent forested land, 18 percent agriculture land, 5 percent scrub/shrub land, 4.5 percent urban land, 2.8 percent water, and 1.1 percent barren (Reference 1).

The Broad River accepts drainage from Ross Creek (Sarratt Creek), Mikes Creek, the Bowens River (Wylies Creek), the Buffalo Creek Watershed, and the Cherokee Watershed. Further downstream, Peoples Creek (Furnace Creek, Toms Branch) drains into the river near the city of Gaffney. Doolittle Creek enters the river next, near the town of Blacksburg, followed by London Creek (Lake Cherokee, Little London Creek), Bear Creek, McKowns Creek (which feeds the Make-Up Pond B at the site), Dry Branch, the Kings Watershed, and Quinton Branch. Mud Creek enters the river next, downstream from Mud Islands, followed by Guyonmbore Creek, Mountain Branch, Abington Creek (Wolf Branch, Service Branch, and Jenkins Branch), the Thicketty Creek Watershed, Beaverdam Creek (McDaniel Branch), the Bullock Watershed, and Dry Creek (Nelson Creek). There are numerous impoundments and lakes (totaling 246 ac.) in this watershed (03050105-090) and all 133 stream mi. are classified as fresh water (Reference 1).

2.3.1.2 Freshwater Streams

The major streams in the Upper Broad River basin watershed (USGS Hydrological Unit 03050105) that create the head waters of the Broad River above Ninety-Nine Islands Reservoir include:

- First Broad River
- Second Broad River

- Green River
- Buffalo Creek

The headwaters of each of these streams originate in North Carolina (Figure 2.3-3) and the water quality is generally good (Reference 2).

2.3.1.2.1 Broad River Description

The drainage area of the Upper Broad River basin is approximately 2500 sq. mi. (North Carolina and South Carolina). The drainage area of the Upper Broad River basin to Ninety-Nine Islands Dam, located one-half river mile downstream from the site, is approximately 1550 sq. mi. The slope percentage of the Broad River is 0.55 and it has a gradient of 28.9 ft. per mile (Reference 3). In North Carolina, three major tributaries to the Broad River are the Green, the First Broad, and the Second Broad rivers (Reference 1). In South Carolina, a major tributary of the Broad River above Ninety-Nine Islands Dam is Buffalo Creek.

The Broad River originates upstream of Lake Lure and is formed by the Flat, Hickory, and Reedypatch creeks. The Lake Lure Dam is located on the east side of Lake Lure and the majority of the lake water is provided by the Broad River (also known as the Rocky Broad River).

2.3.1.2.1.1 Bedforms

The bottom of the Broad River is influenced by the formation of bedforms. Bedforms are likely to be (1) scoured in bedrock, (2) formed from sand resulting in migrating dunes, (3) created from alluvial bed material of mixed sizes forming pools and riffles, or (4) produced by a combination of the above. Pools and riffles are the most common bedforms. At low flow, riffles are essentially flow-resistant dams forming each upstream pool. Water velocity over the riffles at low flow is considerably greater than that in adjacent pools. Therefore, fine sediment such as sand or silt is found on riffles. At high flow, the stepped water surface characteristic of pools and riffles at low flow tends to disappear, and bedform conditions may be greatly altered from that found at low flow. At high flow, pools become areas of greater scour and thus may have similar water velocity as that found in the adjacent riffle areas. Although pools are quiet environments similar to impoundments during low flow, they generally have a high water velocity at the center of the river and the outside bends of the river. During high river flows, the riparian vegetation and inside bends of the river provide the low velocity regions typically provided by the pools at low flow. The boundary between a pool and the adjacent riffles is primarily a function of discharge. The basic morphology of these forms does not change through exposure to a variety of flow levels. The most distinct break is between a riffle and an upstream pool; the deepest part of the pool is likely to be fairly close to the adjacent downstream riffle (Reference 5).

Bedform surveys for areas on the Broad River upstream and downstream of the Lee Nuclear Station were conducted in the 1970s. Between the Gaston Shoals impoundment and USGS Gauging Station 02153500 at U.S. Highway 29 (U.S. 29) (Figure 2.3-2), the Broad River channel is characterized by pools and riffles. The riffles are bedrock ridges cut into felsic schist. The bed material in pools and moving through riffles is entirely composed of uniform sand. Between U.S. 29 and Cherokee Falls Dam at Cherokee Falls, a resistant outcrop of felsic gneiss forms a long, continuous area of shallow riffles in which no pools have developed. From Cherokee Falls to Ninety-Nine Islands Reservoir, the stream is again characterized by bedrock highs (riffles) formed from schist, alternating with deeper pools in which the substrate material is nearly all sand. Below the reservoir another resistant gneiss bedrock outcrop creates a long, continuous shallow riffle area that gives way downstream to more pools and riffles. Below the Irene Bridge, the pools become larger and much longer while the riffles become smaller and less conspicuous. This dominance of pools is accompanied by steeper river banks, a diminution of sand beds, and the introduction of silt and mud substrates in the pools (Reference 5).

In summary, alternating pools and riffles cut in bedrock are the dominant bedforms of the Broad River above and below the Lee Nuclear Station. Where bands of resistant gneiss cross the course of the river, they create anomalous shallow riffles. The bedload is mostly coarse sand, making scoured rock outcrops and sand beds the two common substrate types (Reference 5).

2.3.1.2.1.2 Sediment Transport

The Broad River is generally wide and fairly shallow (Figure 2.3-4), and it normally carries high bedloads composed mainly of sand with some coarse gravel and cobbles. Water samples were collected in the early 1970s to estimate the suspended sediment load in the river for the Cherokee Nuclear Station construction permit ER. Samples were collected during sampling events from October 1973 through September 1974. The average total suspended solids (TSS) concentration was 89 milligrams per liter (mg/L) with a range of 2 – 1284 mg/L.

Sample results from Station 8 (Figures 2.3-3 and 2.3-21), located just above the proposed site, were less variable with a range from 20 to 282 mg/L and a mean TSS concentration of 73.9 mg/L with a standard deviation of 63.3 mg/L (Reference 5). In a study conducted in 1989 – 1990 for the Ninety-Nine Islands Dam license renewal, the Broad River exhibited a mean TSS of 41 mg/L, ranging from 6 to 243 mg/L (Reference 3). Suspended solids concentrations can vary widely as a function of stream flow.

Analytical results from samples collected quarterly in 2006 (see Subsection 2.3.3.1) exhibited lower TSS than exhibited during the previous investigations. The 2006 results show a mean TSS concentration of 11.5 mg/L. TSS concentrations ranged from 1 to 62 mg/L with a standard deviation of 12.4 mg/L. The waters within the main channel of the Broad River near the intake structure exhibited a mean TSS concentration of 10.2 mg/L. The difference in TSS concentrations between data collected in 1973 –1974 and that collected in 2006 is predominantly attributable to the lower flow conditions during the more recent study.

Modeling studies conducted for the water intake structure of the former Cherokee Nuclear Station (Reference 17) demonstrated that local flows near the intake are expected to deter significant sediment accumulation in the local scour hole near the intake structure.

2.3.1.2.1.3 Discharge Characteristics

Broad River discharge recorded at the USGS Station No. 02153551 located just below Ninety-Nine Islands Dam ranged from 138 cfs on September 14, 2002, to over 60,000 cfs in September 2004. The highest recorded flow at USGS Station No. 02153500 at Gaffney, South Carolina, was 119,100 cfs. USGS gauging stations are shown on Figure 2.3-2 and the 2005 annual mean flows are provided on Table 2.3-2 to illustrate the Broad River’s gaining stream characteristics.

Low-flow conditions on the Broad River are a function of natural flow in the rivers and streams, available storage capacity of upstream reservoirs, and regulated discharge flow from upstream dams. Low-flow conditions are generally defined as the lowest consecutive 7-day stream flow that is likely to occur every 10 years (7Q10). Estimated long-term flows for the Broad River are based primarily on extrapolated USGS streamflow gauge data from the Gaffney Station (No. 02153500) due to its proximity to the Lee Nuclear Site and long record of data collection. Daily average flows were compiled for periods 1938 – 1971 and 1986 – 1990. Data from two upstream gauges (Station No. 02153200 near Blacksburg and Station No. 02151500 near Boiling Springs) were used to fill the data gaps, calculating pro-rated flows based on their drainage areas relative to the Gaffney gauge. The resulting 81-year period of record (1926 – 2006) for the Broad River at the Gaffney Station was used to determine an average annual flow of the Broad River of 2538 cfs. The 7Q10 was calculated with this same database to be 479 cfs using Log-Pearson Type III distribution.

The South Carolina Water Use Report 2005 Summary (Reference 21) reported that the South Carolina climate is subject to periodic droughts. Since 1900, severe droughts have occurred statewide in 1925, 1933, 1954, 1977, 1983, 1986, 1990, 1993, and 1998. The latest multiyear drought was one of the most severe in South Carolina's history, with average precipitation, groundwater levels, and stream flows at or near record lows. The drought that officially began in June 1998 abated in the late summer of 2002 with the onset of the hurricane season. The effects of these droughts are reflected in the Broad River discharge characteristics.

In September 2006, water velocities were characterized in the vicinity of the intake structures. Station No. 02153551 (located below the Ninety-Nine Islands Dam) measured Broad River discharge ranging from 1500 to 1800 cfs at the time of this assessment. Bathymetry at the intake structure shows a narrow linear feature (i.e., scour hole) aligned along the direction of flow and appears to be approximately 30-ft. deep (elevation 480 ft. msl). This linear feature is located in a section of the Broad River channel that is approximately 240 ft. across. Water velocities were measured at seven stations along a transect crossing the Broad River perpendicular to the intake at channel depths of 1, 5, 10, and 15 ft. Water velocity around the intake structure had an average flow rate of 0.32 feet per second (fps) with a standard deviation of 0.04 fps. No water velocity measurements were obtained near the proposed discharge location due to access restrictions and safety considerations related to hydroelectric operations.

To supplement characterization of the Broad River as a heat sink for the discharge of cooling water blowdown, temperature data from USGS Station No. 02156500 (located near Carlisle, South Carolina, in Union County) were compiled and are presented in Table 2.3-3. For the period 1996 to 2006, the monthly water temperatures ranged from 40.8°F to 85.3°F (4.9°C to 29.6°C).

2.3.1.2.2 Description of Major Tributaries

The four major tributaries of the Broad River above the Lee Nuclear Site include the First Broad River, Second Broad River, Green River, and Buffalo Creek (Figure 2.3-3, Reference 2). Each is discussed below.

2.3.1.2.2.1 First Broad River

The First Broad River originates in Rutherford County and flows into the Broad River in Cleveland County, North Carolina, just above the South Carolina border (Figure 2.3-3). The entire First Broad River and its tributaries are located in USGS HUC 030804 (Table 2.3-1). Major tributaries include Brier Creek and North Fork First Broad Creek (Rutherford County), Brushy, Hinton, Knob, and Wards creeks (Reference 2).

Approximately two-thirds of the 426 sq. mi. of the First Broad River subbasin is forested and one-third is in pasture. The largest urbanized areas are the towns of Shelby and Boiling Springs. These municipalities are restricted to the southern third of the subbasin and are concentrated along the U.S. Highway 74 corridor. The First Broad River has a slope of 0.33 percent and a gradient of 17.4 feet per mile (ft/mi) based on analysis of the USGS Topographic Map (Reference 4).

2.3.1.2.2.2 Second Broad River

The Second Broad River originates in McDowell County and flows into the Broad River near the Rutherford and Cleveland counties border (Figure 2.3-3). The Second Broad River and its tributaries lie within USGS HUC 030802; it has a drainage area of approximately 513 sq. mi. (Table 2.3-1). Major tributaries include Catheys, Hollands, and Roberson creeks. The largest urbanized areas are the towns of Spindle and Forest City. The Second Broad River has a slope of 0.37 percent, and a gradient of 19.7 ft/mi.

2.3.1.2.2.3 Green River

The Green River has been impounded at two locations to form Lake Summit and Lake Adger. Both reservoirs are used to produce hydroelectric power (Subsection 2.3.1.3.3). The Green River and its tributaries lie within USGS HUC 030802 and 030803 (Figure 2.3-2) and comprise a drainage area of approximately 137 sq. mi. (Table 2.3-1). This drainage area is mostly undeveloped with more than 90 percent of the surface area forested. Major tributaries include the Hungry River and Brights Creek. The Green River has a slope of 0.69 percent and a gradient of 36.5 ft/mi.

2.3.1.2.2.4 Buffalo Creek

Buffalo Creek drains eastern Cleveland, southwestern Lincoln, and northwestern Gaston counties of North Carolina (Figure 2.3-3), and this creek and its tributaries flow in a southern direction through USGS HUC 030805 (North Carolina) and 100 (South Carolina) (Figure 2.3-2). The Buffalo Creek drainage area is approximately 181 sq. mi. in North Carolina and 16 sq. mi. in South Carolina (Table 2.3-1). Approximately 40 percent of the surface area is pasture land and almost 50 percent continues to be forested (Reference 2). The major tributaries of Buffalo Creek include Muddy Fork and Beason Creek. Buffalo Creek is impounded approximately 16 river mi. northeast of the Lee Nuclear Site and forms Kings Mountain Reservoir in North Carolina. The creek discharges into the Broad River approximately 7 river mi. north of Ninety-Nine Islands Dam. Buffalo Creek has a slope percentage of 0.29 and a gradient of 15.1 ft/mi.

2.3.1.2.3 Local Tributaries

In addition to the Broad River and its major tributaries, there are several smaller streams in the vicinity of the Lee Nuclear Site (above Ninety-Nine Islands Dam), including Cherokee Creek, Doolittle Creek, London Creek, and McKowns Creek (Figure 2.3-3). In addition, an unnamed intermittent creek drains into the Make-Up Pond A.

The most significant of these features is McKowns Creek, which is dammed at the Lee Nuclear Site to form the Make-Up Pond B (see Subsection 2.3.1.3). McKowns Creek's drainage area is estimated to be 1633 ac., including a small impoundment feeding the creek. This small impoundment has a drainage area of approximately 181 ac. (Reference 8). The intermittent stream mentioned in the previous paragraph features a drainage area of approximately 385 ac.

There are a number of other creeks and impoundments within a 6-mi. radius of the Lee Nuclear Site; however, these features are hydraulically insignificant (i.e., small storage, low hazard structures, or outside drainage). The largest of these features within this radius is the Wildlife Dam and reservoir located on London Creek. The reservoir has a maximum storage of 720 ac.-ft., is hydraulically insignificant.

2.3.1.2.4 Wetlands

Wetlands are areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. At the Lee Nuclear Site, wetlands occupy a total of 42.8 ac. or 2.3 percent of the site. They are currently represented by Alluvial Wetland, Non-alluvial Wetland, and Non-jurisdictional Wetland that total 2.3 ac. (0.12 percent), 8.1 ac. (0.43 percent), and 32.4 ac. (1.7 percent) of the total site area, respectively. No appreciable seasonal variations of wetland settings were documented during the year of assessment. Further discussion of wetlands is provided in Subsection 2.4.1.

2.3.1.3 Lakes and Impoundments

The following four man-made impoundments are located in the vicinity of the Lee Nuclear Station:

- Ninety-Nine Islands Reservoir.
- Make-Up Pond B (formerly known as the nuclear service water reservoir).
- Make-Up Pond A.
- Hold-Up Pond A.

The Ninety-Nine Islands Reservoir is discussed in Subsection 2.3.1.3.1. The other listed impoundments are discussed in Subsection 2.3.1.3.2.

2.3.1.3.1 Ninety-Nine Islands Reservoir

Ninety-Nine Islands Dam is located on the Broad River approximately 4.5 river mi. downstream from the Cherokee Falls Dam. The Ninety-Nine Islands Dam and associated hydroelectric plant were constructed in 1910 (Reference 11), and the dam structure is a concrete gravity dam.

The Federal Energy Regulatory Commission (FERC) operating license for Ninety-Nine Islands Hydroelectric Station limits reservoir drawdown to 1 ft. below full impoundment (511 ft. above msl) from March through May and 2 ft. below full impoundment from June through February. In addition, the minimum flows to be maintained below the dam are: 966 cfs January through April; 725 cfs May, June, and December; and 483 cfs July through November (Reference 3). When river flow drops below these minimum flows, the Ninety-Nine Islands Hydroelectric Station must discharge the inflow to the reservoir. The FERC license requires that the elevation of the reservoir not fall more than 2 ft. below full impoundment (511 ft. above msl). This allows for a short-term potential of zero flow to occur at the site, immediately followed by the required minimum flow. Because Duke Energy operates the hydroelectric station, Duke Energy has the ability to regulate flow and to mitigate low-flow concerns, within the confines of the FERC license.

2.3.1.3.1.1 Reservoir Characteristics

Ninety-Nine Islands Dam impounds a 433-ac. mainstem "run-of-the-river" reservoir[1] with a normal water level at 511 ft. above msl and a shoreline of approximately 14 mi. (Reference 3). Flow through Ninety-Nine Islands Reservoir is dominated by the flow of the river channel, which divides the reservoir into two backwater regions. The two backwater regions exhibit very little circulation during nonflood periods. Therefore, the average transit time through the reservoir is conservatively estimated from the volume of the reservoir along the main channel excluding the backwater areas. Based on a storage volume of 570 ac-ft along the main channel to a point about 0.7 river mi. upstream from the dam and an average annual flow of the Broad River of 2538 cfs, the average transit time for water flow through the reservoir is approximately 3 hours. During low flow conditions (i.e., 479 cfs) the transit time slows to around 14 hours.

From October 1998 to 2006, the USGS recorded a minimum pool elevation in the Ninety-Nine Islands Reservoir of 508.20 ft. on February 14, 2005 (Reference 6). Duke Power data from 1964 to 1973 indicate that the minimum pool elevation was 505.6 ft. during May 1965 (Reference 5). Based on hydrologic analyses discussed in final safety analysis report (FSAR) Section 2.4 (particularly Subsections 2.4.2 and 2.4.3), the Broad River design basis flood elevation is 549.77 ft above msl.

Based on the flood frequency curve generated from analysis of the USGS Gaffney gauge, the projected 100-yr. flow is 97,900 cfs and the projected 500-yr. flow is 127,000 cfs. The corresponding elevations based on interpolation of the rating curve for Ninety-Nine Islands Dam and assuming flashboard failure are 520.95 ft. and 522.63 ft. for the 100-yr. and 500-yr. events, respectively.

Because the Ninety-Nine Islands Reservoir is a "run-of-the-river" reservoir, evaporation and seepage have little effect on the water budget of the reservoir. The aspects of annual yield and dependability as they relate to the construction or operation of Lee Nuclear Station are discussed above in terms of discharge and low-flow characteristics of the Broad River.

2.3.1.3.1.2 Morphology

Ninety-Nine Islands Reservoir is characterized by three hydrographic areas, the main river channel and two backwater areas, that have developed because of sedimentation patterns since impoundment of the reservoir. The reservoir is a dynamic system that is constantly changing, due to the effects of floods, low flow, sedimentation, and scouring. In its present state the

1. The mainstem refers to the main channel of the river in a river basin, as opposed to the streams and smaller rivers that feed into it. A "run-of-the-river" dam is a dam without a large reservoir and, therefore, with only a limited capacity for water storage.

reservoir is a combination of two large backwater areas separated by the river channel and its associated sediment bars, spits, banks, and coves. A bathymetry study of the reservoir was conducted in the fall of 1973 by Duke Power Company (Reference 5). In the fall of 2006, additional bathymetry of the reservoir and the Broad River was conducted (Figure 2.3-6, Sheet 1). This impoundment exhibited a maximum depth of 35.2 ft. and a mean depth of 9.2 ft. The impoundment is relatively shallow and relatively minor fluctuations in reservoir levels can result in significant changes in surface area. The estimated volume of storage is 1691 ac-ft based on the limited 233-ac. survey area. The U.S. Army Corps of Engineers (USACE) National Inventory of Dams (NID) reports the storage volume as 2300 ac-ft. Deltaic sedimentation associated with creeks was evident in the backwater areas and limited the aerial extent of the survey.

The backwater areas can be divided into two hydrographic sections: one paralleling the river-influenced channel areas (being separated from them by an area of sediment deposition) and the other located at the lower end of each backwater area perpendicular to the main stream flow. Shallow backwater sections parallel to the main channel areas contain large deposits of river-borne sediments deposited during flooding conditions. The areas of backwater perpendicular to the river flow are less influenced by the main channel sediment transport. These sections exhibit relatively deeper waters with shoreline and bathymetric profiles more reflective of local topography and original reservoir characteristics (Reference 5).

The main channel area is characterized by a shallow sand and gravel bed extending through the center of the reservoir area and between the two major backwater areas. Unlike the previously described backwater areas, the main channel portion of the reservoir has a strong current, when the hydroelectric station is operating, and relatively homogeneous physiochemical characteristics.

River-borne sedimentation has greatly altered the reservoir from its original condition. Dredging in the dam area has been performed periodically to ensure efficient hydroelectric generating operations. Dredging activities include keeping the hydroelectric intakes clear of sediment, which is a routine maintenance issue for most hydroelectric projects in this area. Large areas of the stream bed in the original reservoir have been filled completely and stabilized by heavy vegetation growth. During the 1973 study, backwater areas that were not already completely filled exhibited changes in some water depths in the first 6-month sampling period, thus illustrating the influence of heavy sedimentation (Reference 5).

2.3.1.3.1.3 Circulation and Mixing

Ninety-Nine Islands Reservoir circulation and mixing characteristics are influenced primarily by discharge. The central channel is almost completely dominated by river discharge and accounts for the primary circulation pattern of the reservoir during nonflood periods. Currents through the Ninety-Nine Islands Reservoir, while less than those in the upstream and downstream river, are much stronger than expected for an impoundment. Based on data from the 1975 Cherokee Nuclear Station Construction Permit ER, temperature and chemical constituents are homogeneous at all depths because of thorough turbulent mixing. Sampling performed in 2006 confirms the thorough mixing (see Subsections 2.3.1.2.1 and 2.3.3.1).

Backwater areas exhibit a very different flow regime because of the lack of circulation in these waters, especially during nonflood periods. Stagnation is common during low-flow periods. The backwater areas are influenced by temperature and tend to slightly stratify during periods of warm weather (Figure 2.3-22, Sheet 2 of 16) (Reference 5).

Wind apparently has little effect upon circulation in these backwater areas because they are protected by topographic relief and heavy vegetation, especially in the limited floodplain areas. Lower than normal dissolved oxygen concentrations result from decomposition of organic materials and poor circulation (Figure 2.3-22, Sheet 7 of 16).

Flooding conditions greatly alter the normal hydrologic setting. Washover from the river channel portion of the reservoir during high flow tends to flush waters from the upper backwaters toward the lower portion of the reservoir. During these periods, extremely turbid conditions prevail throughout the impoundment due to the import of river-borne sediments and the resuspension of lake sediments (Reference 5).

2.3.1.3.2 Surface Water Impoundments

The Lee Nuclear Site has three man-made impoundments: (1) the Make-Up Pond B, (2) the Make-Up Pond A, and (3) the Hold-Up Pond A. These features, along with the constructed earthen dams and site structures, are shown in Figure 2.3-5. Bathymetry studies of the impoundments were conducted in the fall of 2006. Temperature distributions and stratification of waters of these impoundments are discussed in Subsection 2.3.3.1.

The average annual pan evaporation rate for the region (1950 – 1992) is 51.8 inches (in.), with monthly averages ranging from 1.46 in. in January to 6.92 in. in July. Pan evaporation is usually greater than the actual evaporation from nearby land surfaces. A widely accepted coefficient of pan evaporation to the actual evaporation is approximately 0.7, thus an annual evaporation of approximately 32 in. is approximated (Reference 23).

The annual yield and dependability of the on-site surface water impoundments were not studied in depth, however, measured water levels in the on-site impoundments (Subsection 2.3.1.3.2) during 2006 and 2007 suggested variations of less than 5 percent of the cumulative full impoundment storage volumes at the site.

Current patterns were not studied in these impoundments, as they are not subject to significant flow changes due to their limited size and their drainage areas. Similarly, further study was not performed to assess these impoundments for frequency distribution of current speed, direction, or persistence.

2.3.1.3.2.1 Make-Up Pond B

The Make-Up Pond B was formed by constructing an earthen dam that impounds McKowns Creek west of Lee Nuclear Station. This reservoir was constructed in the late 1970s in the initial construction phase of the Cherokee Nuclear Station. This impoundment is divided into two subbasins by a previously constructed dam across the northern part of the reservoir. Very little to no sediment accumulation is observed within this impoundment.

The Make-Up Pond B crest elevation is 590 ft. with a low elevation west of the spillway bridge at about 588 ft. above msl. The Make-Up Pond B has a normal impoundment elevation of 570 ft. above msl (spillway elevation) and occupies approximately 11 percent of the total drainage area of McKowns Creek. Bathymetry exhibited a maximum depth of 59.5 ft., a mean depth of 31.4 ft., an estimated volume storage of appproximately 3994 ac-ft and a surface area of 154 ac. (Figure 2.3-6, Sheet 2). Usable storage is estimated as 3955 ac-ft.

During 2006 – 2007, water levels in the Make-Up Pond B varied 0.34 ft., representing approximately 52 ac-ft or approximately 1.3 percent of the total storage volume. It should be noted that the Make-Up Pond B was receiving waters from dewatering activities, thus affecting the water balance. These activities were conducted to remove water from the original excavation at the Lee Nuclear Site which was full of water prior to site characterization. All of this water was pumped to the Make-Up Pond B.

Inflow from rainfall and runoff contribute approximately 2291 gallons per minute (gpm) to the impoundment. Site observations and aerial photographs indicate the Make-Up Pond B retains water to near full pond level under natural conditions.

2.3.1.3.2.2 Make-Up Pond A

The Make-Up Pond A was also constructed in the late 1970s during the initial construction phase of the Cherokee Nuclear Station. The basin is situated east of the proposed Lee Nuclear Station reactor locations and was formed by constructing an earthen dam across a backwater arm of Ninety-Nine Islands Reservoir. Similar to the Make-Up Pond B, subbasins are created in the Make-Up Pond A due to submerged dams or causeways connected by former surface roads. Very little to no sediment accumulation is observed within this impoundment.

The Make-Up Pond A crest elevation varies from 557.5 ft. to a low point of 555 ft. (Reference 8). At the time of the survey, the impoundment elevation was approximately 546.1 ft. above msl with full impoundment elevation at 547 ft. This is a relatively small surface water impoundment with a surface area of approximately 61.88 ac. Bathymetry exhibited a maximum depth of 57.2 ft., mean depth of 26.1 ft., and estimated volume storage of 1425 ac-ft (Figure 2.3-6, Sheet 3). During 2006 – 2007, water levels in the Make-Up Pond A varied 1.95 ft., representing approximately 114 ac-ft or 8.0 percent of the total storage volume.

Rainfall and runoff contribute on average 629 gpm to the impoundment. Based on site observations and review of available historical aerial photographs, the Make-Up Pond A retains water to near full impoundment level under natural conditions.

2.3.1.3.2.3 Hold-Up Pond A

The Hold-Up Pond A is a small impoundment located directly north of the proposed reactor locations (Figure 2.3-6, Sheet 4). Two dams were built in the late 1970s to form this impoundment. The crest elevation of the dam is approximately 539 ft. above msl. with current normal pond elevation of approximately 535 ft. above msl (Reference 8). Very little to no sediment accumulation was observed in this impoundment. The surface area of this impoundment is 4.2 ac. and the total storage volume at full pond is 52 ac-ft. Rainfall and runoff contribute on average 15 gpm to the impoundment. Based on site observation and review of available historical aerial photographs, the Hold-Up Pond A retains water to near full impoundment level under natural conditions.

2.3.1.3.3 Upstream Dams and Reservoirs

There have been dams built in the Upper Broad River basin drainage area since the construction of Cherokee Falls Dam in 1826. The primary functions of the larger storage reservoirs are water supply and hydroelectric power. Ninety-Nine Islands Dam, Cherokee Falls Dam, and Gaston

Shoals Dam are in the vicinity of the site and all are used for hydroelectric power. Most of the dams within the Upper Broad River basin were not constructed for flood control.

According to the USACE NID, there are approximately 131 dams (five recreational dams are listed as breached) upstream from the Lee Nuclear Site (Reference 9). Five large dams (see below) are upstream from the site and represent approximately 86 percent of the total storage capacity for the Broad River basin. There are two additional smaller dams (Cherokee Falls and Gaston Shoals) immediately upstream of the site on the Broad River; however, they possess less than 2 percent of the total storage capacity for the basin. Both of these dams are essentially run-of-the-river structures used for hydroelectric power, not for flood control. Cherokee Falls Dam is currently not operating and is a low-head structure without much volume/storage.

In addition, according to the *Federal Register* (Reference 10), USACE and the Cleveland County Sanitary District are proposing to construct an upstream dam and reservoir on the First Broad River (a tributary of the Broad River) approximately 1 mi. north of Lawndale, North Carolina (about 22 mi. north of the Lee Nuclear Site). Additional information related to this proposed dam location is presented in the FSAR Subsection 2.4.1.2.3.3).

Lake Whelchel is located approximately 8 mi. northwest of the Lee Nuclear Site on the Broad River in Cherokee County, South Carolina. This dam is an earthen design that was constructed in 1964 and modified in 1989. The dam creates a reservoir that is used as a water supply source for the city of Gaffney, South Carolina. The dam and associated reservoir are owned and operated by the city of Gaffney. The normal pool elevation of the reservoir is 670 ft. above msl (Reference 4) with a surface area of approximately 177 ac. and a normal storage of 5800 ac-ft. No hydroelectric power plant is associated with this dam.

Kings Mountain Reservoir (Moss Lake Dam) is located in Cleveland County, North Carolina, approximately 16 mi. northeast of the Lee Nuclear Site. Discharge waters from this dam are released to Buffalo Creek. The dam was constructed in 1973 and created Kings Mountain Reservoir, which is used as a water supply source for the city of Shelby, North Carolina, as well as several smaller communities. In addition, the reservoir is utilized for recreational activities, such as boating and fishing. Moss Lake Dam is an earthen structure-constructed dam that is 840-ft. long and has a height of 99 ft. (Reference 9). The normal pool elevation of the Kings Mountain Reservoir is 736 ft. above msl (Reference 4) with a surface area of approximately 1329 ac. and a normal storage of 44,400 ac-ft. No hydroelectric power plant is associated with this dam.

Lake Adger (also Turner Shoals) is located on the Green River, approximately 44 mi. northwest of the Lee Nuclear Site, in Polk County, North Carolina. The dam and associated hydroelectric plant were constructed in 1925 and are currently owned and operated by Hydro, LLC. In addition, the reservoir (Lake Adger) is used for recreational activities such as boating and fishing. Lake Adger Dam is a concrete multiple arch design that is 689-ft. long and has a height of 90 ft. (Reference 9). The normal pool elevation of Lake Adger is 912 ft. above msl (Reference 11) with a surface area of approximately 460 ac. and an estimated normal storage of 11,700 ac-ft.

Lake Lure is located on the Broad River in Rutherford County, North Carolina, approximately 46 mi. northwest of the Lee Nuclear Site. The dam and associated hydroelectric plant were constructed in 1927 and are currently owned and operated by the Town of Lake Lure. In addition, the reservoir is used for recreational activities such as boating and fishing. Lake Lure Dam is a concrete multiple arch design that is 480-ft. long and has a height of 124 ft. (Reference

9). The normal pool elevation of Lake Lure is 991 ft. above msl (Reference 4) with a surface area of approximately 740 ac. and a normal storage of 32,295 ac-ft.

Lake Summit is located on the Green River in Henderson County, North Carolina, approximately 52 mi. northwest of the Lee Nuclear Site. The dam and associated hydroelectric plant were constructed in 1920 and are currently owned and operated by Duke Energy. In addition, the reservoir is utilized for recreational activities such as boating and fishing. Lake Summit Dam is a single concrete arch design with a concrete buttress structure that is 254-ft. long (Reference 11) and has a height of 130 ft. (Reference 9). The normal pool elevation of Lake Summit is 2012.6 ft. above msl (Reference 4) with a surface area of approximately 276 ac. and a normal storage of 8440 ac-ft.

2.3.1.3.4 Downstream Dams and Reservoirs

There are two significant reservoirs located downstream from the Lee Nuclear Site: Ninety-Nine Islands Reservoir and the Lockhart Reservoir. Similar to the Cherokee Falls and Gaston Shoals dams, Ninety-Nine Islands and Lockhart dams are run-of-the-river structures and are not used for flood control. Dams located further downstream include Neal Shoals Dam (approximately 50 mi.) and Parr Shoals Dam (approximately 52 mi.).

As shown on Figure 2.3-2, Lockhart Dam is located in Union County, South Carolina, on the Broad River, 3 mi. south of the confluence with the Pacolet River and approximately 19 mi. south to southeast of the Lee Nuclear Site. The normal pool elevation of the Lockhart Reservoir is around 395 ft. above msl with a surface area of approximately 300 ac. and a normal storage of 2400 ac-ft. The Lockhart Dam and its associated hydroelectric power plant were constructed in 1921 (Reference 12) and are currently owned and operated by Lockhart Power Company of Lockhart, South Carolina.

Completed in 1905, the Neal Shoals Dam is located in Chester and Union counties. The normal pool elevation of Neal Shoals Reservoir is around 325 ft. above msl. with a surface area of approximately 550 ac. and a normal storage of 1350 ac-ft.

2.3.1.4 Estuaries and Ocean

This subsection does not apply to the Lee Nuclear Site because there are no estuaries or oceans in the vicinity or region that could be affected by construction or operational activities.

2.3.1.5 Groundwater

This subsection discusses regional and local groundwater conditions and their influence on groundwater characteristics in the vicinity of the Lee Nuclear Site. In order to gather additional site-specific information, a detailed geohydrological investigation was conducted on the Lee Nuclear Site in 2006. The objective of this investigation was to collect groundwater information, including the following:

- The areal extent of aquifers, recharge and discharge areas, elevation and depth, and geologic formations.
- Piezometric contour maps and hydraulic gradients (historical and current).

- Flow travel times.
- Soil properties, including permeabilities or transmissivities, storage coefficients or specific yields, total and effective porosities, clay content, and bulk densities.
- Interactions between site surface and ground waters.
- Historical and seasonal trends in groundwater elevation or piezometric levels (interactions between different aquifers).
- Recharge rates, soil moisture characteristics, and moisture content in vadose zone.
- Existence of any local aquifers designated or proposed to be designated as “sole source aquifers.”

2.3.1.5.1 Physiographic Setting

The Lee Nuclear Site is located within the Piedmont physiographic province, a southwest to northeast-oriented province of the Appalachian Mountain System (Figure 2.3-7). The Piedmont province is 80- to 120-mi. wide and situated between the Blue Ridge province, a mountainous region to the northwest, and the Atlantic Coastal Plain province to the southeast. The Piedmont province is the nonmountainous portion of the older Appalachians. Its surface is the result of degradation because the underlying rocks are deformed. The surface is rarely parallel to the beds of rocks, and the original surface is not preserved anywhere.

So far as this extensive region has unity, it is found in the results of repeated uplifts, involving for the most part greater altitude and stronger relief than that of adjacent regions. The most pronounced differences in present topography are due to differences in rocks, either in their material constitution or in structural features made during older uplifts. Most of the province boundaries may be defined in terms of rocks and structures as well as those of topography.

The Piedmont surface in the subregion ranges from 400 to 1000 ft. above msl. The typical landscape of the Piedmont province is a rolling surface of gentle slopes with minimal relief (averaging about 50 ft.) cut or bounded by valleys of steeper slope and greater depth, often by several hundred feet. Near the larger streams, tributaries cut through deep and steep valleys that (when traced headward) become wide, shallow, and of gentle gradient. The deeper valleys are those of rejuvenated streams. The principal stream in the Kings Mountain Belt (Figure 2.3-8) is the Broad River. The regional southeastward drainage of the Upper Broad River basin is reflected in the trend of the Broad River. The Broad River is incised 200 to 250 ft. below the summit levels of the Piedmont. The Broad River valley is narrow with little or no floodplain development and its tributary streams cut downward to the level of the Broad River where they have caused locally rugged topography (Reference 13).

2.3.1.5.2 Regional and Local Geology

A complex mosaic of igneous and metamorphic rocks underlies the vast majority of the Broad River basin. Most of the rocks in the Piedmont province are medium- to high-grade metamorphic rocks such as schist, gneiss, and amphibolites. These rocks are generally stratified and compositionally layered with distinct foliation. In addition, lineaments and fault systems are common in the region, and several major thrust sheets are present in the basin. Numerous granitic plutons and stocks have intruded older metamorphic rocks and are often marked by areas of higher topography, because of the massive, resistant nature of these intrusive rocks. The Lee Nuclear Site is located within the Kings Mountain Belt of the Piedmont province (Figures 2.3-7 and 2.3-8), which contains a complex series of deformed rocks consisting of felsic and mafic schists, gneisses, quartzites, conglomerates, and marble, generally considered to be of Precambrian and early Paleozoic age (References 5 and 13).

With the exception of later diabase dikes, the Lee Nuclear Site overlies rocks of the Battleground Formation (Figures 2.3-8 and 2.3-9). The Battleground Formation comprises rocks primarily felsic to intermediate in composition (dacite to andesite protoliths), volcaniclastic sequences with intrusions of similar composition (meta granodiorite to metatonalite, metadiorite and meta gabbro), and interfingered, marine-influenced metasedimentary sequences. Petrographic examination of thin sections obtained from the Lee Nuclear Site revealed the following rock types: mica schist, meta quartz diorite, meta dacite porphyry, and meta basalt (FSAR Section 2.5). Geologic maps show the distribution of rock types, which tend to have locally erratic outcrop and subsurface distribution patterns, but regionally trend northeast to southwest (Reference 14).

Based on recent and past subsurface investigations at the Lee Nuclear Site, there are no active faults in the general location of the site. According to published documents from the USGS, there are several inactive faults within the vicinity of the site, with the closest being approximately 2 mi. west to southwest of the Lee Nuclear Site (Reference 14).

A variation of approximately 100 ft. in the top of continuous rock elevations is due to differential weathering patterns created by the joint characteristics found in the rock. This weathering action has created a soil overburden, which is classified as being of silt and silty sand composition (Reference 5). Detailed regional and site-specific geological information is presented in FSAR Section 2.5.

2.3.1.5.3 Soil Properties

Throughout the Piedmont province, bedrock is overlain by a mantle of unconsolidated material known as regolith. The regolith includes, where present, the soil zone, a zone of weathered and decomposed bedrock known as saprolite, and alluvium. Saprolite, the product of chemical and mechanical weathering of underlying bedrock, is typically composed of clay and coarser granular material that may reflect the texture of the rock from which it was formed. Typically, the formation of soils is attributed to the in-place weathering of the underlying rock and the deposition of material transported by water and laid down as clay, silt, sand, or large rock fragments (Reference 16).

Crystalline rocks are commonly weathered in the Piedmont province because of the warm, humid conditions. Iron oxide-stained kaolinite and other aluminosilicate clay minerals are the dominant constituents of upland soils in many areas. Modern fluvial sediments generally occupy only the active beds and small floodplains of local streams and rivers.

Site-specific soils in the area surrounding the power block include fill, residuum, and saprolite. Fill materials are located in former drainage ways, which have been built up to yard grade elevation. Based on geotechnical analysis of saturated and unsaturated (vadose zone) materials (Table 2.3-4), soil characteristics were determined. For fill material, a mean total porosity of 41 percent with a range from 33 percent to 55 percent was calculated. Based on the difference between total porosity and residual water content, the effective porosity was estimated to be 31 percent. Fill materials have been borrowed from other areas of the site, and they typically comprise unconsolidated materials similar to native soil. However, because of disturbance during transport, they may display different hydrogeological characteristics.

Based on data available from the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), residuum in the vicinity of the power block consists predominantly of Tatum silty clay loam and Tatum very fine sandy loam with variable slope and erosion (Figure 2.3-10). Tatum soils are typically composed of a surficial 0 – 8 in. of silty clay loam or very fine sandy loam (CL, CL-ML, ML) overlying clay, silty clay, and silty clay loam (CH, MH) overlying shallow, weathered bedrock or silt loam. Clay content in Tatum soils ranges from 12 to 60 percent. Moist bulk densities were reported between 1.30 and 1.60 grams per cubic centimeter (g/cc). The saturated hydraulic conductivity of Tatum soils is reported by the NRCS to be moderately permeable: 4 to 14 micrometers per second (μm/s) (4 to 14 x 10^{-4} centimeters per second [cm/s]). Tatum soils are not prone to flooding and exhibit erosion factors (K_f) that range from 0.32 to 0.43. The soils are highly corrosive to both concrete and steel (Reference 16). Based on geotechnical analysis of the residuum, a mean total porosity of 48 percent with a range from 46 percent to 51 percent was determined for these materials. The effective porosity was conservatively estimated to be 17 percent.

The mean total porosity measured in saprolite was 44 percent. A range from 30 to 54 percent was determined for these materials. Based on geotechnical analyses, the effective porosity was conservatively estimated to be 22 percent. Partially weathered rock was estimated to have an effective porosity of 18 percent.

2.3.1.5.4 Topography

The Broad River basin area of the Piedmont province is a plateau of forested, rolling hills with tight, dissected river valleys that generally contain small floodplains. The undisturbed topography of the Lee Nuclear Site is generally characterized by rounded hilltops and narrow valleys with elevations ranging from 511 ft. at the Broad River to around 810 ft. along the ridgeline of McKowns Mountain, located west of the power block area and south of the Make-Up Pond B. The tributaries of the Broad River generally follow a dendritic pattern before draining to the Broad River and, eventually, the Atlantic Ocean.

Prior construction activities at the site resulted in significant movement of materials (approximately 8.7 million cubic yards [cu. yd.]) to cut and fill the site to a yard grade elevation of 588 ft. above msl. Further excavation of approximately 10 ft. to 65 ft. in the vicinity of the reactor location resulted in removal of approximately 1 million cu. yd. of material. During construction activities between 1977 and 1982, site topography overlying the area of the power block area changed from hills and valleys to a relatively flat upland setting punctuated by a massive excavation to competent rock.

Numerous springs and seeps identified during the 1973 investigation were cut or filled in order to level the natural drainage ways and flatten the construction yard. Those springs were located within valley draws that directed surface runoff away from the reactor area. The springs had expected discharges ranging from 1.9 to 3 gpm (Reference 13). Surface conditions surrounding as many as 20 springs identified during the Cherokee Nuclear Station site investigation appear to have been altered so that no flow-through discharge occurs. Based on site observations, a network of storm drains and buried piping had been installed to manage some of the surface water runoff. While some stormwater control structures remain on-site, no as-built drawings for the existing storm drain system for the former Cherokee Nuclear Station were available for review.

2.3.1.5.5 Regional Hydrogeology

The Piedmont aquifer system is basically a two-layered slope-aquifer system. The shallow water table aquifer is composed of the saprolite and residual soil which is typically low yielding. The underlying bedrock aquifer consists of weathered and unweathered crystalline igneous and metamorphic rocks that store and transmit water through fractures. The shallow aquifer is unconfined, meaning that the upper surface of the saturated zone is not effectively separated from the ground surface by a low-permeability clay layer. The bedrock fracture system is a network of discontinuities that increases in prevalence upward through the crystalline rock as it transitions into saprolite. Because of the permeability of the transition zone, the bedrock aquifer is also considered unconfined and not effectively isolated. Thus, the saprolite and bedrock zones function as one interconnected aquifer system (Reference 18).

Groundwater occurs almost everywhere throughout the Piedmont province; however, it is not a single, widespread aquifer. Groundwater occurs in various local aquifer systems and compartments that have similar characteristics and are hydraulically connected. Groundwater recharge in this area is derived from infiltration by local precipitation or infiltration from nearby surface water. Additionally, with the construction of the on-site impoundments, recharge also occurs from these surface waters. The U.S. Environmental Protection Agency (EPA) Sole Source Aquifer Protection Program does not identify any sole-source aquifers in South Carolina.

The surface materials in many locations are relatively impermeable, with the result that only 22 to 33 percent of annual precipitation contributes to recharging to the water table (Reference 5). Approximately 32 in. of water is lost to evaporation. Groundwater is contained in the pores that occur in the weathered material (residual soil, saprolite) above the relatively unweathered rock and within the fractures in the igneous and metamorphic rock. The depth to the water table depends on climate, topography, rock type, and rock weathering. The water table varies from ground surface elevation in valleys to more than 100 ft. below the surface on sharply rising hills. The groundwater level normally declines during the late spring, summer, and early fall months as a result of evaporation and transpiration by plants, and throughout most of the fall when rainfall is typically low. The groundwater level rises in the late fall and winter when the evaporation potential is reduced (Reference 5).

The fractures, relic rock textures, and directional differences in permeability or ease of groundwater movement may significantly affect the local groundwater flow direction. Groundwater recharging in the Piedmont province is achieved by the addition of precipitation water, first to the shallow soil and saprolite aquifer and then to the uppermost fracture zone. Recharge mostly occurs on upland topographic highs or at least above the slopes of stream valleys. Water does not generally move to great depths, but it is directed almost laterally by reduced permeabilities of crystalline rock with lower fracture density.

2.3.1.5.6 Groundwater Occurrence and Usage

Groundwater supplies in the Piedmont physiographic province of South Carolina occur in three types of hydrogeologic environments. These are the unweathered and fractured igneous and metamorphic rocks, the overlying saprolite and residuum, and to a lesser extent, alluvial valley-fill deposits. Most public water supply wells are completed in fractured igneous and metamorphic rocks, often referred to as "crystalline bedrock," while some private wells are simply dug or bored into the overlying saprolite. Yields of 4 to 170 gpm have been recorded from 30 South Carolina ambient groundwater quality network wells in the Piedmont bedrock (Reference 19). Regional groundwater studies consulted during the Cherokee Nuclear Station site investigation indicate that most domestic wells are not drilled to develop maximum yield, are generally less than 150-ft. deep, and have flow rates ranging from 3 to 150 gpm with a median flow rate of 7 gpm.

Shallow wells are supplied by groundwater from residual soils or from the upper decomposed parts of the bedrock. Many drilled wells of moderate depth are supplied by groundwater from joints in the crystalline rocks. The water quality is typically good, and it is generally low in minerals, except for iron in some cases. Figure 2.3-11 illustrates the typical interrelationships between topography, lithology, the water table, and groundwater movement in the Piedmont province.

The crystalline rocks yield small amounts of water to domestic users, small cities, and low-volume water-demanding industries. According to the South Carolina Department of Health and Environmental Control's (SCDHEC's) 2005 water-use data, no groundwater usage was reported for aquaculture, industry, irrigation, mining, golf courses, or water supply. According to a private water well report from SCDHEC, there were 1076 reported residential wells completed in Cherokee County from January 1985 to June 2006 (Reference 15). However, with the exception of total depth, details of well completions and yield estimates were not included in the SCDHEC report.

The Lee Nuclear Site is not expected to use groundwater as a source of water for any purpose. Water for temporary fire protection, concrete batching, and other construction uses will be obtained from the Draytonville Water District. Additional information related to local and on-site groundwater use is presented in Subsection 2.3.2.2.

2.3.1.5.7 Site Geohydrology

Site geohydrology data were gathered prior to commencement of the previous Cherokee Nuclear Station construction activities (through the early 1970s) and during those construction activities (late 1970s to the early 1980s). Conditions at the Lee Nuclear Site have been altered by the construction-related excavation and site grading.

Prior to the construction activities for the Cherokee Nuclear Station, a subsurface investigation was conducted, and water-level measurements were obtained to develop an understanding of the groundwater setting. A groundwater table elevation map, developed to represent site conditions at that time, is presented in Figure 2.3-12. Initial potentiometric surface data collected from July, August, and September 1973 indicated that site groundwater flows primarily toward the north, east, and southeast from the reactor area, which generally mimicked the preconstruction site topography. A north to south trending groundwater divide was apparent west of the reactor area and east of the nuclear service water reservoir, now identified as the Make-Up Pond B.

According to the previous Cherokee Nuclear Site groundwater investigation, measured depths to groundwater beneath ridges ranged from about 40 to 80 ft. below ground surface. The groundwater table was reportedly at or near the surface in valleys and draws, as was evidenced by observed springs. Near the locations of the reactor buildings, the groundwater table varied between depths of 10 and 60 ft. below ground surface with potentiometric surface elevations ranging from around 570 to 605 ft. above msl (Reference 13).

As discussed previously, construction activities on the site in the late 1970s resulted in significant alterations to site topography. Because of the relationship between topography and depth to water, changes to the potentiometric surface were monitored with a network of observation wells across the site. A review of historical data identified groundwater levels in observation wells prior to and during the construction. Based on well data, construction dewatering from the site excavation was initiated around January 1977. Between November 1977 and March 1978, approximately 5.74 million gal. of water were reportedly pumped from the water table aquifer through dewatering wells over the 5-month period. These wells were pumped at average rates ranging from 38 to 65 gpm with well depths from 200 to 280 ft. below ground surface. The effect of construction dewatering was assessed on the basis of historical groundwater measurements collected across the site during construction dewatering activities. The apparent drawdown in the observation wells, caused by the cumulative dewatering activities, is shown on in Figure 2.3-13. The dewatering activities did not affect observation wells outside the area shown on the figure. In addition, the nearest residential well, the Mullinax well located approximately 5000 ft. south of the center of the excavation, was not affected by construction dewatering activities. Five wells located on and adjacent to the site were gauged on a monthly basis between 1976 and 1985, providing limited-term historical water-level data. No distinct trends were observed from groundwater data collected between 1976 and 1985, except for the dewatering activities discussed above.

In March 2006, a groundwater investigation was initiated as part of the subsurface study to evaluate hydrogeologic conditions for the Lee Nuclear Site. The main dewatering of the existing excavation preceded the subsurface investigation, and although maintenance dewatering of the excavation continues, site hydrologic conditions are assumed to be similar to those during the former Cherokee Nuclear Station construction activities, based on a comparison of Cherokee Nuclear Station hydrogeologic data to data collected as part of the Lee Nuclear Site characterization. Based on data collected during dewatering, approximately 740 million gal. of water were pumped from the excavation from December 19, 2005, through September 7, 2006. The apparent high-water-level mark (elev. 578.72 ft. msl), as indicated by stains observed on the concrete structures, was measured in 2006 following the dewatering of the site. Comparing the apparent water level in this impoundment as shown on the 2005 aerial photograph with the topographic survey conducted in 2006, the high-water-level mark appeared to be a reasonable estimate of the high-water elevation of the impoundment, and the best indicator of steady-state conditions.

The hydrogeologic investigation of the site was initiated in March 2006. Fifteen borings were drilled into crystalline bedrock, and monitoring wells were installed in the partially weathered rock intervals. In July 2006, nine additional monitoring wells were installed to evaluate shallow groundwater conditions across the site. Details regarding well construction are presented in Table 2.3-5.

Following well development, water levels were measured monthly from April 2006 to April 2007 (Table 2.3-5) to characterize seasonal trends in groundwater levels and to identify preferential flow pathways surrounding the Lee Nuclear Site. The hydrograph for this groundwater data is presented in Figure 2.3-14. Surface waters at four locations were also gauged as part of the monitoring program. These locations included the Make-Up Pond B, a water retention impoundment below the Make-Up Pond B, the Make-Up Pond A, and the Hold-Up Pond A. Based on data collected during this year of study, groundwater levels fluctuate an average of 4.4 ft. with the highest groundwater elevations measured in observation wells between January and April 2007 and the lowest groundwater elevations between September and November 2006. This trend appears to correlate with both the river flow and rainfall patterns indicating that both groundwater levels and river flow are governed by local precipitation volume.

The maximum observed seasonal water-level fluctuation was 9 ft. at monitoring well MW-1212, located near the apparent groundwater divide west of the nuclear island. Water levels showed continuous decline in areas downgradient of the excavation, as recharge entering the power block area from the south was continuously intercepted by the excavation and discharged to the Make-Up Pond B during the dewatering activities. Potentiometric surface maps were developed and are presented as Figure 2.3-15, Sheets 1 to 7.

Following the completion of construction dewatering and the return of groundwater to equilibrium conditions, the potentiometric surface beneath the reactor buildings is expected to rebound to a maximum elevation of approximately 579 ft. above msl (Figure 2.3-15, Sheet 8).

Cross-sections of the Lee Nuclear Site are presented in Figure 2.3-16, Sheets 1 to 4, and depict the relationship between groundwater beneath the site and the surface water bodies surrounding the site. Groundwater flow in the Piedmont province is typically restricted to the topographic area underlying the slope that extends from a divide to an adjacent stream. Ultimately, groundwater is discharged to the Broad River, the groundwater sink for the site, and the surrounding area.

2.3.1.5.8 Permeability

The permeability of a material is a measure of its ability to transmit water. Generally within the Piedmont province, the soil-saprolite zone has a low permeability. Also, fractures within the competent bedrock become sparse and poorly connected at increasing depths, thus limiting crystalline bedrock permeability. Fracture permeability occurs consistently in the transition zone, including the uppermost part of bedrock. Therefore, this zone often exhibits the highest consistent permeability.

During the investigation associated with the Cherokee Nuclear Station in the early 1970s, one hundred thirty-five field and laboratory tests were conducted to characterize soil and rock permeability. Fifty-five packer tests were conducted in soil and rock intervals in 17 soil borings across the site. An additional 42 field and 38 laboratory tests were performed to evaluate soil permeability. The recent investigation for the Lee Nuclear Station supplements the earlier investigation by providing the results of an additional 11 packer tests in bedrock materials, 16 slug-out tests across the site, and one multiwell (four wells) aquifer pump test performed within the apparent groundwater preferential flow path from the reactor building area toward the Broad River to the north. The test results are summarized and provided in Figure 2.3-17.

Based on the combined results from the 1973 investigation, packer tests, multiwell pump tests, geotechnical laboratory analyses, and field tests, and those from the 2006 slug tests, packer tests, and multiwell pump tests, the following conclusions are made regarding aquifer permeability at the Lee Nuclear Site, noting that maintenance dewatering is ongoing and may affect the recent aquifer test results:

- Reported vertical soil hydraulic conductivity of soil and saprolite ranges from 2.45×10^{-8} cm/s to a maximum value of 2.55×10^{-4} cm/s and exhibits a geometric mean of 2.91×10^{-6} cm/s and a median of 2.10×10^{-6} cm/s. Vertical hydraulic conductivity generally increases with depth.

- Reported horizontal hydraulic conductivity of soil and saprolite ranges from approximately 10^{-6} cm/s (i.e.,the lower limit of the test range) to a maximum value of 2.26×10^{-3} cm/s with a geometric mean of 5.52×10^{-5} cm/s and a median of 6.38×10^{-5} cm/s.

- Reported hydraulic conductivities measured in the partially weathered rock, or transition zone, range from approximately 10^{-6} cm/s to a maximum value of 9.89×10^{-3} cm/s with a geometric mean value of 9.36×10^{-5} cm/s and a median of 1.54×10^{-4} cm/s. Higher hydraulic conductivities are generally reported in moderately hard, closely jointed felsic gneiss with weathered zones, with the highest hydraulic conductivities observed in intervals of metaquartzdiorite.

- Reported hydraulic conductivities representing the upper 100 ft. of the unconsolidated saturated interval - composed of fill material, soil, saprolite, and partially weathered rock - range from 2.21×10^{-4} cm/s to 3.90×10^{-3} cm/s with a geometric mean of 8.61×10^{-4} cm/s and a median hydraulic conductivity for the unconsolidated material of 4.10×10^{-4} cm/s.

- Fill materials placed in former valleys during site grading are currently groundwater aquifer materials in some areas. Slug tests conducted in 2006 and 2007 characterized these materials to have hydraulic conductivities ranging from 4.22×10^{-5} cm/s to 1.03×10^{-3} cm/s. The geometric mean is 2.26×10^{-4} cm/s and the median hydraulic conductivity for the fill material is 1.81×10^{-4} cm/s.

2.3.1.5.9 Groundwater Movement

Within the preferential flow pathway that extends northward from the reactor buildings toward the Hold-Up Pond A and the Broad River (Figure 2.3-16, Sheet 3), groundwater appears to flow through each of the aquifer materials referenced above. The depth of groundwater circulation in the Piedmont area is difficult to define and may be erratic, dependent upon the presence of interconnected rock fractures and gradient. However, based on analysis of groundwater levels at the cluster well locations, vertical gradients are generally in the downward direction, consistent with the topographic slope to the Broad River, indicating that groundwater recharge is occurring and groundwater movement generally parallels topography. Groundwater in storage moves from areas of recharge (impoundments, ridges, mounds, and cooling tower pads) to areas of discharge (impoundments, creeks, and, ultimately, the Broad River).

The rate of flow (i.e., the velocity) of groundwater depends on (1) the permeability and effective porosity of the medium through which it is moving and (2) the hydraulic gradient. Average interstitial groundwater velocity within the water table aquifer was determined using a form of the Darcy equation as follows:

$$V = K(dh/dl)/\eta_e$$

Where: V = average groundwater velocity (ft. per year [ft/yr])

K = hydraulic conductivity (cm/s converted to ft/yr)

dh/dl = groundwater gradient (ft/ft)

η_e = effective porosity

During the current construction dewatering and site investigation, groundwater is drawn toward the excavation as shown on the potentiometric surface maps (Figure 2.3-15). Following the completion of construction dewatering and the return to static conditions, the potentiometric surface beneath the reactor buildings is expected to rebound to a maximum elevation of approximately 579 ft. above msl, the maximum operational groundwater level.

The projected groundwater flow direction is to the north with an average gradient projected to be approximately 0.034 ft/ft along a preferential flow path from the reactor buildings to the Hold-Up Pond A (Figure 2.3-15, Sheet 8 and Figure 2.3-16, Sheet 3). This groundwater flow path represents the shortest travel distance to a potential exposure point, a distance of 1340 ft. An alternative travel path from the reactor buildings to the Broad River through the partially weathered rock was also evaluated. This alternative flow path, though greater in distance at 1935 ft., results in faster travel time to the point of exposure due to a slightly greater groundwater gradient (0.036 ft/ft) and a greater hydraulic conductivity. Groundwater velocities calculated for the soil and saprolite zone, partially weathered rock zone, and fill material of the surficial hydrogeologic unit at the Lee Nuclear Site are listed in Table 2.3-6. Velocities ranged from 56 ft. per year (ft/yr) in the saprolite/soil zone to 290 ft/yr in the partially weathered rock. The flow velocity within the fill material was found to be 70 ft/yr. As such, travel times for water to migrate from the reactor areas to points of exposure are 6.7 years and greater for the alternative flow path from the reactor building to the Broad River through the bedrock.

Soil distribution coefficients (Kd) for radiological isotopes (i.e., Co_{60}, Cs_{137}, Fe_{55}, I_{129}, Ni_{63}, Pu_{239}, Tc_{99}, U_{235}) were determined from soil and water samples collected along the preferred groundwater flow path. This information is discussed in detail in FSAR Subsection 2.4.13 to assist in the development of calculations for fate and transport analyses in the event of an accidental release of radioactive effluent to groundwater.

While the groundwater is not intended to be used at the Lee Nuclear Site, consideration is given to the movement of groundwater beneath the site in response to potential pumping associated with dewatering. Based on permeability characteristics beneath the site and an understanding of typical wells in the vicinity, a radius of influence can be estimated. For unconfined aquifers, such as those encountered in the Piedmont province, the radius of influence can be determined using the following equation provided by the Departments of the Army, the Navy, and the Air Force in Publication TM 5-818-5:

$$R = 3\, \Delta H\, (K \times 10^4)^{1/2}$$

Where: R = the radius of influence of a pumping well in ft.

ΔH = the drawdown within the well in ft., and

K = the hydraulic conductivity of the aquifer in cm/s

Though most domestic wells in the vicinity of the Lee Nuclear Site are completed to depths more shallow than 150 ft. below ground surface, this depth provides a conservative estimate of the potential reach of these wells producing at full capacity. Assuming the hydraulic conductivities consistent with partially weathered rock, as listed in Table 2.3-6, the radius of influence is less than 1700 ft. (0.32 mi.) from these wells. The maximum radius of influence for the excavation is less than 1500 ft. (0.28 mi.). The calculated radius of influence is consistent with historical drawdown observations.

Based on site reconnaissance of the area, the closest domestic water supply well is located approximately 5000 ft. (0.95 mi.) south of the nuclear island. The influence of the surrounding impoundments (i.e., the Make-Up Pond B and the Make-Up Pond A) would further buffer the potential draw created from off-site pumping or on-site pumping, if needed. No off-site wells are considered capable of reversing groundwater flow beneath the site, or vice versa, based on the geographic positions of these wells (i.e., the distance of the domestic wells) and the character of these wells (i.e., the typical low-flow rates and the relatively shallow completion depths).

2.3.2 WATER USE

This subsection describes surface water and groundwater in the vicinity of the Lee Nuclear Station that could affect or be affected by the construction and operation of Lee Units 1 and 2. In addition, a detailed assessment of water use within the vicinity of the facility, types of consumptive and non-consumptive water uses, identification of their locations, and evaluation of water withdrawals and returns is provided.

2.3.2.1 Surface Water

The Lee Nuclear Site is located on the west bank of the Broad River approximately 2.6 mi. south to southeast (downstream) of Cherokee Falls and approximately 1 mi. north to northwest (upstream) of the hydroelectric station. The surface water in the vicinity of the Lee Nuclear Station consists of the Broad River and three on-site, man-made impoundments. A detailed discussion of these water bodies is provided in Subsection 2.3.1.3.2.

2.3.2.1.1 Surface Water Use

According to available SCDHEC information on water use for 2005 (Reference 21), average surface water usage (public and industrial) in Cherokee County was 8.4 million gallons per day (Mgd) (13 cfs) (see Table 2.3-7).

No surface water usage in Cherokee County was reported for domestic self-supplied systems, aquaculture, golf courses, irrigation, livestock, mining, or thermoelectric power uses. According to SCDHEC, water use for hydroelectric power was 1116 Mgd (1730 cfs) in 2005 for Cherokee County (Reference 21). Detailed data pertaining to surface water use in 2000 in Cherokee County and adjacent counties are presented in Tables 2.3-11, 2.3-12, and 2.3-13 (Reference 22). USGS 2000 data do not reference hydroelectric power water use; however, these data were included in the 1995 data set. According to USGS, 2037 Mgd (3157 cfs) of instream water was used for hydroelectric power in 1995 for Cherokee County (Reference 21).

The drainage area for the Broad River adjacent to the site is approximately 1550 sq. mi. (Table 2.3-1, Figure 2.3-3). Surface water-use details for the Broad River basin watershed within 60 mi. of the Lee Nuclear Site are presented in Tables 2.3-8, 2.3-9, 2.3-10, 2.3-11, and 2.3-12 (Reference 22).

Total 2005 water withdrawals from Cherokee, Chester, Greenville, Spartanburg, Union, and York counties, South Carolina, are listed in Table 2.3-8. Table 2.3-13 provides information on the upstream and downstream surface water users which could affect station operations or be affected by station operations. Additional surface water users not included in the table are located within 20 to 50 mi. from the site; however, these additional intakes are relatively small in terms of water use and/or are located outside the watershed or on tributaries that join the Broad River downstream from the site.

Nineteen permitted surface water intakes at sixteen separate facilities are located in the Upper Broad River basin watershed upstream from the Lee Nuclear Site (Table 2.3-13). The closest surface water intake is the Gaffney Board of Public Works (BPW) intake located 8 mi. upstream on the Broad River. In addition to the existing intakes, Duke Energy anticipates modernizing and expanding the Cliffside Steam Station (19 mi. upstream from the site in Cleveland County, North Carolina), which will use the existing surface water intake from the Broad River.

Three permitted surface water intakes, two of which are for public water supply, are located downstream from the Lee Nuclear Site (Figure 2.3-18). The closest of these is the city of Union, South Carolina, which withdraws water from the Broad River 21 mi. downstream from the site and has a maximum withdrawal rate of 23.8 Mgd (36.9 cfs). The Carlisle Cone Mills is approximately 30 mi. downstream and the V.C. Summer Nuclear Station is approximately 52 mi. downstream of the Lee Nuclear Site (Table 2.3-13).

2.3.2.1.2 Recreational and Navigational Use

The Broad River is host to various recreational activities, including canoeing, kayaking, boating, and fishing. Boat ramp access and canoe portages are available above and below Ninety-Nine Islands Reservoir. The Broad River and its major tributaries are shallow, and there are numerous dams without locks. Therefore, these waters are not used as navigational waterways.

There are several recreational areas on the Broad River within the vicinity of the Lee Nuclear Site. These sites include fishing areas, canoe access and portage trails, and recreational parks. The largest of these sites is the Cherokee Ford Recreation Area, located approximately 0.5 river mi. upstream from Cherokee Falls Dam (Figure 2.3-19).

In May 1991, the Broad River from Ninety-Nine Islands Dam to the confluence with the Pacolet River (approximately 15 river mi.) was officially recognized by the South Carolina General Assembly as the Broad State Scenic River. The riparian forest is home to diverse plant and animal life, including the state-listed endangered wild ginger. Eagles, ospreys, and other birds frequent the river corridor (Reference 7 and Figure 2.3-19).

2.3.2.1.3 On-Site Surface Water Use

Since their construction, the on-site impoundments have not been used for any industrial purpose. There is no current use of the surface water impoundments.

2.3.2.1.4 Future Surface Water Use

A review of SCDHEC and South Carolina Bureau of Water published information did not reveal any significant future water supply planning activities specific to the Broad River. The Upper Broad River basin area within South Carolina (above Ninety-Nine Islands Dam) is only about 50 sq. mi., and the only significant water supply reservoir is Lake Whelchel, which supplies water to the city of Gaffney and surrounding areas (Subsection 2.3.1.3.3).

To characterize projected demand on water supply for the region surrounding the Lee Nuclear Site, North Carolina water supply data were reviewed. In January 2001, the North Carolina Department of Environment and Natural Resources (NCDENR) published a report entitled, "North Carolina State Water Supply," in compliance with 1989 state legislation mandating state and local water suppliers to develop a statewide plan. The state water supply plan (1) provides a comprehensive assessment of water supply needs, water use, and water availability across the state; (2) identifies the major water supply issues facing the citizens and elected officials of North Carolina now and in the near future; and (3) provides guidance for sound water supply planning. The state water supply plan is a compilation of over 500 local water supply plans (LWSP) developed by local government water systems to assess their water supply needs over a 20-year period (Reference 25). No major metropolitan areas are located in the basin, and from 1990 to 1997 year-round population in four counties in the basin grew by more than 10 percent (Reference 26).

An estimated 56 percent increase in water demand is projected from 1997 to 2020 for the North Carolina portion of the Broad River basin. This projected demand is based on past growth trends from 1990 to 1997. The year-round population in four counties in the basin grew by more than 10 percent, even though there are no major metropolitan areas within the basin. The public water demand was around 40 cfs, thus the projected public water demand in 2020 is around 63 cfs, a 23 cfs increase. Because the North Carolina portion of the Broad River basin is just upstream from the site, an additional 23 cfs water demand is added to the hydrologic analysis for projected Broad River water use. In addition, Duke Energy anticipates modernizing and expanding the Cliffside Steam Station (19 mi. upstream from the site in Cleveland County, North Carolina), which will use the existing surface water intake that withdraws from the Broad River.

The North Carolina Division of Water Resources (NCDWR) requires water systems to maintain adequate water supplies and manage water demands to ensure that average daily use does not exceed 80 percent of the available supply. The 1997 data indicate that one of the 15 LWSP systems had an average demand above this threshold. The Cleveland County Sanitary District's (CCSD) LWSP projects 2020 demand would exceed 80 percent of their capacity (Reference 26). To address this supply issue, USACE and CCSD have proposed to construct an upstream dam and reservoir on the First Broad River, as discussed in Subsection 2.3.1.3.3 and FSAR Subsection 2.4.1.2.3.

The Lee Nuclear Station will withdraw 78 cfs (Table 2.3-14) or 3 percent of the mean annual flow of the Broad River. The plant will return 18 cfs (Table 2.3-15) as discharge consisting of blowdown and treated wastewater. The cooling towers will consume 55 cfs (Table 2.3-14) or 2 percent of the mean annual flow as loss to evaporation and drift.

Withhold from Public Disclosure Under 10 CFR 2.390(a)(9)
(see COL Application Part 9)

2.3.2.2 Groundwater

The regional and local hydrogeologic settings are discussed in Subsection 2.3.1.5. Additional groundwater information is presented in FSAR Subsection 2.4.12.

According to SCDHEC 2005 water-use data (Reference 21), groundwater produced for water supply in counties located in the Piedmont aquifer system is reported to be approximately 79 Mgd (122.5 cfs). This can be compared to some Upper Coastal Plain counties that withdraw up to several thousand Mgd of groundwater.

2.3.2.2.1 Local Groundwater Use

According to SCDHEC 2005 water-use data, 1.02 million gal. of groundwater were used for thermoelectric power generation in Cherokee County. No groundwater usage in Cherokee County for domestic self-supplied systems, aquaculture, golf courses, irrigation, livestock, mining, or hydroelectric power was reported in the 2005 SCDHEC data (Reference 21). According to a private well report from SCDHEC, based on data from January 1985 to June 2006, the number of reported private wells in Cherokee County was 1076 (Reference 15). The USGS and state water-use data were reviewed, and groundwater withdrawals are presented in Tables 2.3-8, 2.3-9, 2.3-10, 2.3-11, and 2.3-12 (Reference 22). Groundwater withdrawals for Cherokee and surrounding counties in South Carolina (Table 2.3-8) only account for 4.7 Mgd (7.3 cfs), and the majority (85 percent) of that volume is pumped from Spartanburg County, approximately 25 mi. west of the Lee Nuclear Site.

Based on information received from the USGS, SCDHEC, and local agencies, as well as a field reconnaissance effort, local groundwater use in the vicinity is predominantly from domestic wells. The majority of the residences within a 2-mi. radius of the site appear to have their own water wells. A review of the addresses associated with these well reports, coupled with a site reconnaissance, [

][Well Information] The Cherokee Nuclear Station Construction Permit ER identified 50 domestic water wells and provided construction details including well diameter, well depth, and depth to water (Table 2.3-16, Figure 2.3-20). Construction details for the 50 wells are anticipated to be relatively unchanged. According to the Draytonville Water District Board Chairman, municipal water supply lines are present in the area surrounding the Lee Nuclear Site, but some nearby residents continue to use their wells for potable water. The future use of self-supplied groundwater is expected to decline as residents increase their dependence on the municipal water supply.

2.3.2.2.2 On-Site Groundwater Use

There is currently a small (3 gpm yield) well supplying potable water to a temporary trailer onsite. There is currently no other groundwater use at the site. Existing water wells were observed on-site prior to the site investigation. These wells were believed to have been utilized during the Cherokee construction activities for use in dewatering the site. These wells were used during the site investigation to obtain supplemental water level data.

2.3.3 WATER QUALITY

The following subsections provide detailed water quality information regarding the surface water and groundwater in the vicinity of the Lee Nuclear Site. The purpose of gathering water quality data in the vicinity of the plant is to characterize the current physical and chemical aqueous environments at the site in order to identify those parameters or conditions that potentially could impact plant operations or that could be affected by station construction or operations.

Water quality for surface water and groundwater in South Carolina is governed by the SCDHEC. The Water Classifications and Standards (Regulation 61-68) establish a system and rules for managing and protecting the quality of South Carolina's surface water and groundwater. The regulation also establishes the state's official classified water uses for all waters of the state and the general rules and specific numeric and narrative criteria for protecting classified and existing water uses (Reference 24).

2.3.3.1 Surface Water Quality

2.3.3.1.1 Basinwide Water Quality

Sixty-seven percent of the streams in the North Carolina portion of the Broad River basin are rated as “fully supporting,” which indicates the water quality in these streams fully supports recreation and water-use activities. Twenty-six percent of the streams are listed as fully supporting but threatened, which indicates the water quality results for these streams fell within the parameters of the fully supporting category, but the water quality conditions are marginal. Three percent of the streams are listed as partially supporting or impaired. Four percent of the streams in the watershed were not evaluated during this study (Reference 28).

Water quality problems reported include sedimentation, oxygen-consuming wastes, nutrients, stream color, and fecal coliform bacteria, with sedimentation being the most significant. The streams listed as impaired (partially supporting) are Walnut Creek, Catheys Creek, Beaverdam Creek, Hickory Creek, Hollands Creek, Brushy Creek, Buffalo Creek, and Lick Creek. The study results indicate that these streams were affected by non-point sources of pollution, possibly agricultural activities in the area. Samples collected in more urbanized areas were reported to be affected by wastewater treatment plants, runoff from construction activities, and possibly local industrial wastewater discharges (Reference 28).

Streams with water quality violations include the First Broad River, Second Broad River, Buffalo Creek, Sugar Branch, and the Broad River. Water quality exceeded the standards for total iron (First Broad River, Second Broad River, Sugar Branch, Buffalo Creek, and Broad River), total copper (First Broad River, Second Broad River, and Buffalo Creek), turbidity (First Broad River, Broad River, and Buffalo Creek), and pH (First Broad River). Fecal coliform levels were above the state evaluation levels in the samples collected from these five streams (Reference 2).

Section 303(d) of the Clean Water Act (CWA) requires states to develop a list of waters that do not meet water quality standards or those that have impaired uses. Listed waters must be prioritized, and a management strategy or total maximum daily load (TMDL) must subsequently be developed for all listed waters.

Three locations within the Broad River basin watershed in North Carolina are listed on the 2006 North Carolina 303(d) Impaired Waters List (Reference 30). Two locations on Catheys Creek and one location on Hollands Creek are listed. Both streams received a C classification, which indicates the best use of the water is for (1) aquatic life propagation and maintenance of biological integrity (including fishing and fish); (2) wildlife; (3) secondary recreation; (4) agriculture; and (5) any other use except for primary recreation or use as a source of water supply for drinking, culinary, or food processing purposes. One location on Catheys Creek is listed as overall impaired use, with agriculture and municipal pretreatment (indirect dischargers) as potential sources of pollution. The second location on Catheys Creek and the location on Hollands Creek are listed as impaired use for aquatic life with minor municipal point sources and urban runoff/storm sewers as potential sources of pollution (Reference 2).

For South Carolina, a watershed water quality assessment for the Broad River basin was completed in 2001 by the SCDHEC Bureau of Water (Reference 1). The watershed water quality assessment categorized streams and lakes in the Broad River basin in South Carolina by how well they support aquatic life or recreational use. The stream segments of the Upper Broad River basin are predominantly classified as freshwater. Waters of this class are described as freshwaters suitable for primary and secondary contact recreation and as a source for drinking water supply after conventional treatment in accordance with the requirements of the Department, suitable for fishing and the survival and propagation of a balanced indigenous aquatic community of fauna and flora, and suitable also for industrial and agricultural uses (Reference 24).

For aquatic life use, the watershed water quality assessment looked at sampling results for dissolved oxygen, pH, heavy metals, priority pollutants, chlorine, and ammonia. A water body was considered fully supported for aquatic life use if (1) no more than 10 percent of the sampling results for pH or dissolved oxygen were outside the water quality standards, and (2) no sample results exceeded the acute aquatic life standards for any of the following: heavy metals, priority pollutants, chlorine, or ammonia. A water body was considered partially supported for aquatic life if between 11 and 25 percent of the pH or dissolved oxygen values were outside the standards, or if the acute aquatic life standards for heavy metals, priority pollutants, chlorine, or ammonia were exceeded in no more than 10 percent of the samples. Water bodies with more than 25 percent of their dissolved oxygen or pH samples outside the water quality standards or more than 10 percent of their heavy metals, priority pollutants, chlorine, or ammonia samples above the standards were considered to be nonsupportive for aquatic life (Reference 1).

For recreational use, the study looked at the number of fecal coliform bacteria samples greater than 400/100 ml (Figure 2.3-24). If no more than 10 percent of the samples were greater than 400/100 ml, then the water body was considered to be fully supported for recreational use. Water bodies with between 11 and 25 percent of the fecal coliform bacteria samples above the standard were considered partially supported. Water bodies with greater than 25 percent of the fecal coliform bacterial samples above the standard were considered to be nonsupportive (Reference 1).

The 2001 South Carolina water quality assessment lists one lake and four monitoring stations upstream from the Lee Nuclear Site as fully supported sites for aquatic life use. These four monitoring stations are on Suck Creek (Site B-296), Ross Creek (Site B-789), Bowens River (Site B-788), and Buffalo Creek (Site B-740). Lake Cherokee (Site B-343) is listed as a fully supported site for aquatic life use and as a fully supported site for recreational use (Reference 1).

The 2001 water quality assessment also lists six monitoring stations upstream from the Lee Nuclear Site as impaired sites. Canoe Creek (Site B-088) is listed as partially supportive for aquatic life use because of dissolved oxygen values outside the standards. The assessment report also describes a decreasing pH trend that has been observed for Canoe Creek. Because of the presence of fecal coliform, Canoe Creek is listed as recreational use nonsupportive. Peoples Creek (Site B-211), Furnace Creek (Site B-100), Doolittle Creek (Site B-323), Buffalo Creek (Sites B-119 and B-057), and Cherokee Creek (Site B-056) are all listed as nonsupportive for recreational use because of fecal coliform values. Both Peoples Creek and Doolittle Creek show decreasing pH trends; Doolittle Creek also shows a decrease in dissolved oxygen and an increase in fecal coliform values. A portion of Buffalo Creek (Site B-057) is listed as partially supportive for aquatic life use because of copper values above the state water quality standards. The assessment report states that both sites on the Buffalo Creek show trends of increasing fecal coliform values. Cherokee Creek shows trends of decreasing pH. Macroinvertebrate water quality indicators determined Cherokee Creek is partially supportive for aquatic life use. The Broad River, upstream (Site B-042) and downstream (Site B-044) of the Lee Nuclear Site, is listed in the assessment as partially supported for recreational use because of fecal coliform, and showed a trend of increasing turbidity (Reference 1).

The watershed water quality assessment reported that the Broad River (Station B-044, located near the Irene Bridge approximately 7 mi. downstream from the Lee Nuclear Site, see Figure 2.3-24) had improved in aquatic life use between 1995 and 1999, with decreases in cadmium, lead, chromium, zinc, and copper concentrations. However, this area of the Broad River had also decreased in recreational use quality due to increased fecal coliform values (Reference 1).

In South Carolina, several sampling locations on the Broad River, upstream and downstream of the Lee Nuclear Site, and on tributaries of the Broad River, upstream of the site, are listed on the 2006 SCDHEC §303(d) List of Impaired Waters. The sampling results indicated that in 2006, the Broad River and its upstream tributaries, Buffalo and Cherokee creeks, were in the §303(d) List of Impaired Waters for copper, chlorophyll a, and/or pH values that were above the South Carolina water quality standards. One sampling location on Cherokee Creek was included on the §303(d) List of Impaired Waters because study of the macroinvertebrate community indicated a decline in water quality characteristics. Lake Whelchel, located 2.7 mi. north of Gaffney, South Carolina, was also listed as an impaired water body because of high chlorophyll a values (Reference 31). Table 2.3-22 presents a summary of the 2006 §303(d) List of Impaired Waters for the Upper Broad River in South Carolina.

2.3.3.1.2 Local Surface Water Quality

The Broad River is the primary source of process and cooling water for the Lee Nuclear Station. Makeup water is withdrawn from the Broad River above Ninety-Nine Islands Dam, while cooling tower blowdown discharge is diffused into the river at the upstream face of the Ninety-Nine Islands Dam near the intakes for the hydroelectric generating units. The Make-Up Pond B, located on the western portion of the Lee Nuclear Site, is planned to be a secondary source of cooling water during low water periods. Data from the surface water sampling events characterized the quality and stability of these waters (Figure 2.3-21).

Ten sampling stations were identified (Stations 101 through 110) within the Broad River, the backwater areas of Ninety-Nine Islands Reservoir, and the on-site impoundments at the Lee Nuclear Site. Grab water samples were collected and analyzed quarterly for a period of one year. Surface water sampling events were conducted in February, May, August, and November of 2006. Field measurements were obtained for pH, temperature, conductivity, and dissolved oxygen. Samples were collected and submitted to the Duke Energy Analytical Laboratory (SCDHEC Laboratory ID No. #99005) for laboratory analysis of the parameters listed in Table 2.3-17.

The 2006 surface water sampling results were compared to the analytical and field results of similar water quality studies performed in 1973 – 1974. Surface water samples were collected from September 1973 to September 1974 by Duke Power Company prior to initial site construction activities for the former Cherokee site. Approximately 900 grab water samples were collected from 23 stations on the Broad River upstream and downstream of the site, within the backwater areas of the Broad River near the site, and nearby impoundments and creeks. Duke Power Company also monitored water quality from April 1989 to June 1990 at the Ninety-Nine Islands Hydroelectric Station at stations located above and below the dam (Reference 3). Many of the same analytical parameters were included in both the recent and historical studies: temperature, dissolved oxygen, conductivity, pH, total dissolved solids (TDS), TSS, chlorophyll a, ammonia, total phosphate, chloride, sulfate, total alkalinity, turbidity, total and fecal coliform, copper, iron, magnesium, manganese, sodium, calcium, potassium, cadmium, chromium, nickel, mercury, and zinc. The analytical results from these studies have established baseline water quality characteristics for the Broad River system. While seasonal and climatic impacts on water quality are only observed in part during such investigations, general characterizations can be made regarding water quality in the vicinity of the Lee Nuclear Site.

Sample stations from the 1970s Cherokee Nuclear Station site and the recent studies are located in many of the same areas of the Broad River. Surface water sample stations and sample depths from the 2006 investigation, and the corresponding historical sample stations are presented in Table 2.3-18. For the Lee Nuclear Site investigation, Stations 101, 102, 105, 107, and 109 represent waters within the main channel of the Broad River. Stations 104 and 106 represent the backwaters of the Broad River north and east of the site. Stations 103, 108, and 110 represent waters within the on-site impoundments.

Field parameters such as water temperature, pH, dissolved oxygen, and conductivity were compared to characterize surface water conditions and stability. Surface water temperatures were heavily influenced by ambient air temperatures in both investigations. Samples collected near the surfaces of water bodies were typically at or nearly the same as ambient air temperatures. Additionally, apparent mixing in lotic waters resulted in relatively constant temperatures with depth in the Broad River and its backwater areas, while a thermocline was observed in the deeper on-site impoundments (i.e., the Make-Up Pond B and Make-Up Pond A). Surface water temperatures within the Broad River observed during the 1970s study ranged from 41 to 86°F with a mean of 62°F. Recent water temperatures ranged from 45.3 to 85.8°F with a mean of 60.2°F for all samples. Based on quarterly sampling events in 2006 at Stations 101, 102, 107, and 109 within the main channel of the Broad River, the mean water temperature was 62°F. No appreciable differences in ambient temperatures or surface water temperatures were noted between the two studies (Figure 2.3-22, Sheets 1-3).

Similarly, recent pH and alkalinity measurements appear to be relatively consistent with those reported for the Cherokee study. Field-measured pH of the Broad River and backwater areas ranged from 5.3 to 8.2 with a mean pH slightly above 7 standard units, while the Cherokee study exhibited a similar pH range. The SCDHEC quality standards for fresh waters are 6.0 to 8.5 standard units. Waters of the Broad River and its backwater areas were observed in both the 1990s and 2006-2007 studies to be more acidic in spring and summer and more alkaline in fall and winter. Total alkalinity in the Broad River and its backwater areas averaged 23 mg/L and ranged from 16 to 27 mg/L, suggesting a poorly buffered water system with low resistance to a change in pH (Figure 2.3-22, Sheets 4-5). Historical alkalinity values suggest even poorer buffering capacity in the past.

During the 1970s sampling study, dissolved oxygen levels in the Broad River ranged from 0 to 14 mg/L. During the recent study, dissolved oxygen levels in the Broad River ranged from 4.5 to 12.0 mg/L and were well-mixed with depth. Winter dissolved oxygen was highest because colder waters retain oxygen more efficiently than warmer waters. The recent observations are generally consistent with the historical findings for the Broad River. Dissolved oxygen in the on-site impoundments approached anoxic conditions with depth (Figure 2.3-22, Sheets 6-9). The deeper impoundment waters also exhibited a general increase in dissolved metals (e.g., iron and manganese) and specific conductance with depth, suggesting release from the sediments below the thermocline. This is characteristic of waterbodies with an anoxic hypolimnion (characterized by low oxygen levels in the colder, dense, deep water layers in a thermally stratified lake). The depth to the hypolimnion during the summer quarter sample for both the Make-Up Pond B and the Make-Up Pond A was approximately 36 ft. below surface (Figure 2.3-22, Sheets 3 and 8).

Variable flow conditions are also expected to affect water quality. Sediment concentrations can generally be correlated with river discharge, however comparisons of TSS and iron with discharge of the Broad River from both sets of sampling data yield no distinct correlation (Figure 2.3-22, Sheets 10-11).

Some water-quality parameters indicated an improvement in river water quality relative to that studied in the 1970s, including average values for chlorophyll a, fecal coliform, and total coliform (Figure 2.3-22, Sheets 12-16). Historic chlorophyll a was elevated in the backwater area on the north side of the Broad River (Station 104).

Piper diagrams (Figure 2.3-23, Sheets 1-2) were used to characterize historical and recent surface water quality near the Lee Nuclear Site. Water samples recently collected from the Broad River and from backwater areas of Ninety-Nine Islands Reservoir are characterized as sodium-potassium type with mixed and bicarbonate anions, a water type similar to that observed during the earlier study. Water samples recently collected from the impoundments were characterized as calcium and bicarbonate type.

An evaluation summary of the recent surface water analytical results is presented in Table 2.3-19, which provides the mean, range, temporal, and spatial variations observed during the surface water sampling program. While ambient water quality characteristics are generally unremarkable, a few ambient water quality constituents were elevated to levels potentially exceeding South Carolina's threshold criteria for freshwater aquatic life, warranting further discussion below.

The freshwater aquatic life criteria maximum concentration (CMC) is an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed briefly without resulting in an unacceptable effect. EPA derives acute criteria from 48- to 96-hour tests of lethality or immobilization. The CMC is one of the six parts of aquatic life criterion; the other parts are the (1) criterion continuous concentration (CCC), (2) acute averaging period, (3) chronic averaging period, (4) acute frequency of allowed exceedence, and (5) chronic frequency of allowed exceedence (Reference 24). The CMC is used for comparison to assess ambient water quality conditions.

Iron

The CMC for iron for the Broad River is 1 mg/L. Surface water samples had iron concentrations between 0.04 mg/L and 1.67 mg/L, excluding samples collected from the bottom of the deeper impoundments. The mean iron concentration in the main channel of the Broad River was 0.85 mg/L, and the mean iron concentration in backwater areas of the Broad River was 1.22 mg/L. Four of 23 samples (17 percent) collected from the main channel of the Broad River exceeded the 1 mg/L threshold, although the maximum iron concentration of these was 1.11 mg/L. The Make-Up Pond A (Station 108) bottom sample had a maximum iron concentration of 28.5 mg/L, and the Make-Up Pond B (Station 110) bottom sample had a maximum iron concentration of 20.2 mg/L, while shallow samples did not exceed the CMC. The high iron concentrations in the samples collected from deeper waters of the impoundments may be due to reducing conditions present at the bottom of a stratified impoundment.

The Cherokee study reported a maximum iron concentration of 9.6 mg/L (October 1973) with an average of 0.51 mg/L (Reference 5). The water quality study conducted as part of the Ninety-Nine Islands Dam licensing process documented a maximum iron concentration of 10.6 mg/L with an average of 2.7 mg/L, also exceeding the CMC. Although exceeding CMC levels, high iron is characteristic of Piedmont waters deriving from soil minerals.

Copper

Surface water samples collected near the Lee Nuclear Site had concentrations of total recoverable copper ranging from below the reporting limit of 2.0 µg/L to 4.97 µg/L, with a mean concentration of 2.22 µg/L. Thirty-five of the 55 samples had results below the reporting limit. Only one sample exceeded the 3.8 µg/L CMC. Copper concentrations reported in the 1974 Cherokee investigation were as high as 120 µg/L, exceeding the CMC threshold in 31 of 64 samples (a 48 percent exceedence rate).

Zinc

Two of the 55 samples (3.6 percent) collected for analysis of total recoverable zinc were above the CMC of 37 µg/L. These two samples were collected from the Hold-Up Pond A and are not representative of water quality within the Broad River.

With regard to copper and zinc concentrations in waters of the Broad River, most heavy metal criteria for fresh water are calculated from formulas using water hardness. Hardness values vary greatly nationwide (from zero into the hundreds), with South Carolina representing the lower end of the range (statewide average value is approximately 20 mg/L). Water hardness values near the site ranged from 15.0 to 54.3 mg/L-$CaCO_3$, although hardness did not exceed 25 mg/L in the Broad River and backwater areas. The average hardness of surface waters surrounding the site was 23.8 mg/L-$CaCO_3$. Generally, as hardness decreases metal toxicity increases.

Cadmium

Surface water results for samples collected from water bodies near the Lee Nuclear Site were below the reporting limit of 0.5 µg/L for cadmium. The 1970s study also reported no detection of cadmium in waters of the Broad River. However, because the CMC is lower than the reporting limit, cadmium concentrations could potentially exceed the CMC.

2.3.3.2 Groundwater Quality

2.3.3.2.1 Regional Groundwater Quality

For North Carolina, the NCDENR Water Resource Division (WRD) and Division of Water Quality (DWQ) have published several groundwater quality and usage studies; however, most of these studies focused on the Coastal Plain areas where groundwater resources are more abundant and the majority of the state's population resides. A USGS document entitled, "Piedmont and Blue Ridge Aquifers," notes that the quality of water from these areas is generally suitable for drinking and other uses practically everywhere (Reference 20). Except for fluoride, iron, manganese, and sulfate (locally), concentrations of dissolved constituents seldom exceed state and federal drinking water standards. Wells yielding water containing large concentrations of these constituents possibly penetrate mineralized zones, although large iron concentrations may be due to the action of iron-fixing bacteria. Oxidation and filtration usually alleviate problems of large iron and manganese concentrations and render the water potable. Rarely, radioactive minerals occur in concentrations sufficient to create water quality problems.

For South Carolina, the SCDHEC Bureau of Water has established a statewide groundwater monitoring program to obtain and characterize baseline water-quality parameters. Groundwater samples collected from the Piedmont area were generally calcium-rich and bicarbonate-rich type water; however, because of lithologic differences within the Piedmont province, variations in groundwater composition do exist. According to the "South Carolina Ambient Groundwater Quality Monitoring Network Annual Report, 2004 Summary," prepared by the SCDHEC Bureau of Water, similar chemical compositions were found in the saprolite/bedrock well pairs located within the Broad River basin drainage area (Reference 19). In general, the bedrock wells had higher silica concentrations, and the saprolite wells had higher iron concentrations. The secondary contaminant standards for iron and manganese were exceeded in a small portion of the wells. None of these wells was located within the portion of the Broad River basin upstream of the Lee Nuclear Site.

2.3.3.2.2 Local Groundwater Quality

Groundwater samples were collected from 10 monitoring wells located on the Lee Nuclear Site. Samples were collected quarterly, for a period of 1 year, in May, August, and November 2006, and February 2007. Figure 2.3-15 shows the locations of the observation and monitoring wells. Laboratory analytical results from the 2006-2007 groundwater sampling events are summarized in Table 2.3-20, which provides the mean, range, temporal and spatial variations observed during the groundwater sampling program.

In an earlier study, domestic wells, springs, and well borings located on or near the former Cherokee Nuclear site were sampled, and the samples were analyzed for many of the same parameters as those in the recent study. These parameters included TDS, alkalinity, hardness, iron, calcium, magnesium, chloride, sulfate, turbidity, and specific conductance. The results from the recent groundwater investigation were generally consistent with the Cherokee Nuclear Station Construction Permit sampling results (see Table 2.3-21). Based on an analysis of water quality using piper diagrams, groundwater is characteristically similar to waters of the on-site impoundments: calcium carbonate-type and consistent with typical Piedmont province groundwaters (Figure 2.3-23, Sheet 3).

2.3.3.3 Factors Affecting Water Quality

Several upstream factors have the potential to affect water quality at the Lee Nuclear Site. The potential sources of pollution include wastewater discharges, power plants, pipelines, bulk petroleum storage facilities, agricultural and farm runoff, underground storage tank sites, and industrial or manufacturing facilities.

Potential pollution sources in USGS Hydrological Unit 03050105 (Upper Broad River basin watershed) for the Lee Nuclear Site have been identified and divided into three categories: (1) National Pollutant Discharge Elimination System (NPDES) Program under SCDHEC; (2) Nonpoint Source Management (NSM) Program, also overseen by SCDHEC; and (3) other potential pollution sources that have been identified by EPA (References 1, 27, and 28).

A map showing USGS Hydrological Unit 03050105 and its relevant South Carolina subbasins (50, 90, 100, and 110) is presented in Figure 2.3-2.

2.3.3.3.1 NDPES Program

Within the North Carolina portion of the Upper Broad River basin watershed, permitted discharges were identified into the First Broad River, the Second Broad River, and the Green River. There are 11 permitted dischargers in the First Broad River subbasin, including the towns of Shelby and Boiling Springs, wastewater treatment plants, and PPG Industries. There are three permitted dischargers that release greater than 0.5 Mgd (0.78 cfs) of effluent to the Second Broad River watershed. These are the wastewater plants for the towns of Spindale and Forest City, and the Cone Denim, LLC textile mill. R.J.G. Inc.'s Six Oaks Complex has the only permit to discharge on the Green River (above the Summit Dam). The Bright's Creek Golf Club development has a temporary construction discharge permit; however, once the facility is operational, it is expected to have a nondischarge permit (Reference 2).

Within the South Carolina portion of the Upper Broad River basin watershed, 16 facilities have NPDES permits. Ten NPDES facilities are within Hydrological Subbasin Unit 03050105-090, where the Lee Nuclear Site is located, and another six NPDES-permitted facilities are located in Hydrological Subbasin Units 03050105-050, -100, and -110. Some of these sites are shown on Figure 2.3-24. NPDES-permitted facilities in the vicinity of the site were compared to the EPA Envirofacts Data Warehouse list to determine if additional discharge permits have been issued since publication of the 2001 SCDHEC document. A compilation of permit numbers/status/flow rates, facility information, receiving streams, limitations, distances to the Lee Nuclear Site, and other information for each NPDES-permitted facility within USGS Hydrological Subbasin Units 03050105-90, -100, and -110 is listed in Table 2.3-23.

2.3.3.3.2 NSM Program

As referenced above, NSM facilities involve land fills, land application systems, and mining activities, and they require permits from SCDHEC. There are 11 SCDHEC-permitted NSM facilities within Hydrological Subbasin Unit 03050105-090, including six landfills, two land application facilities, and three mining operations. Four additional NSM facilities are located in Hydrological Subbasin Units 03050105-100 and -110 (Reference 1). A compilation of permit number/type/status, facility information, nearest water bodies, limitations, distance to the Lee Nuclear Site, and other information for each NSM facility within Hydrological Subbasin Units 03050105-90, -100, and -110 is listed in Table 2.3-24. Other nonpoint sources of potential water contamination include farm sources. While these sources do not require permits, it is generally perceived that these facilities significantly contribute to the coliform levels observed in surface waters.

2.3.3.3.3 Other Potential Pollution Sources

Several potential pollution sources are located upstream from the Lee Nuclear Site and Ninety-Nine Islands Reservoir, and they could affect the water quality of the Broad River or its many tributaries. These potential sources include dams, power plants, pipelines, bulk petroleum and agriculture storage facilities, gasoline stations (i.e., underground storage tanks), animal farms, and industrial/manufacturing facilities, as well as other public and private operations. Public records, internet sources, USGS topographic and other reference maps, aerial photographs, and notes from several visits to areas surrounding the vicinity (6-mi. radius) of the site were reviewed to document other pollution sources. Based on information gathered during the review process, five major pollution sources were identified as having a potential effect on the waters used at the Lee Nuclear Station during plant operations. These sources include:

- Dams and reservoirs.
- Power plants.
- Pipelines.
- Hazardous waste generators.
- Toxic release inventory sites.

The listed major pollution sources are discussed in the following subsections. Table 2.3-25 provides information on the other potential pollution sources that could affect water quality near the Lee Nuclear Site, specifically within USGS Hydrological Unit 0305015.

2.3.3.3.3.1 Dams and Reservoirs

As presented in Subsection 2.3.1.3.3, the NID reported that 131 dams are located upstream from the Lee Nuclear Site. Five large upstream dams contain approximately 86 percent of the total storage capacity for the Broad River basin. Two smaller dams (Cherokee Falls and Gaston Shoals) are immediately upstream of the site; however, they possess less than 2 percent of the total storage capacity for the basin. Both of these dams are essentially run-of-river structures and are used for hydroelectric power rather than flood control. Cherokee Falls Dam is a low-head structure without much volume/storage (200 ac-ft). Five recreational dams are listed on the NID as breached. Large-volume discharges or structural failures have the potential to affect water quality by increasing sedimentation loads.

2.3.3.3.3.2 Power Plants

Two natural gas-fired combustion turbine power plants are within 20 mi. of the Lee Nuclear Site. The Calpine Broad River Energy Center is located approximately 5 mi. northwest of the site, and the Duke Energy Mill Creek Combustion Turbine Station (Reference 29) is located approximately 9.5 mi. northeast of the site. Natural gas is the primary fuel, with fuel oil as a secondary fuel source.

Withhold from Public Disclosure Under 10 CFR 2.390(d)(1)
(see COL Application Part 9)

2.3.3.3.3.3 Pipelines

Nine major pipelines operated by three separate entities are located within 5 mi. of the Lee Nuclear Station. Pipelines that present the greatest risk of pollution to the water resources expected to support station operations are those that transport liquid petroleum products.

[

]SRI

Transco operates the Williams Gas Pipeline, which is actually four pipelines located in the same right-of-way approximately 4 mi. northwest of the site. All transport natural gas (FSAR Section 2.2).

In addition to these major pipelines, numerous lines operated by Piedmont Natural Gas deliver natural gas to residential, commercial, and industrial consumers (FSAR Section 2.2).

2.3.3.3.3.4 Hazardous Waste Generators

A review of the EPA Envirofacts Data Warehouse list for the area within the watershed and upstream of the Lee Nuclear Site within Cherokee County indicated that 71 sites are registered hazardous waste generators. Two sites (Bommer Industries and Core Molding Technologies), the closest being 7 mi. from the site, were listed as large-quantity hazardous waste generators. The remaining sites were either listed as small quantity, conditionally exempt, or universal waste generating facilities. See Figure 2.3-25 and Table 2.3-25 for additional information.

2.3.3.3.3.5 Toxic Release Inventory Sites

A review of the EPA Envirofacts Data Warehouse list for the area within the watershed and upstream of the Lee Nuclear Site within Cherokee County indicated that 20 sites submitted Toxic Release Inventory reports to the EPA from 1990 to 2004. The closest site on the EPA list is approximately 4 mi. from the Lee Nuclear Site. See Figure 2.3-25 and Table 2.3-25 for additional information.

2.3.4 REFERENCES

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TABLE 2.3-1 (Sheet 1 of 2)
DESCRIPTION OF UPPER BROAD RIVER BASIN WATERSHEDS

Watershed Name	Basin	Subbasin	Drainage Area (sq. mi.)	Drainage Area Above Ninety-Nine Islands Dam (sq. mi.)
Upper Broad River Basin (3050105) of North Carolina				
Upper Broad River and Lake Lure	03050105	030801	184	184
Second Broad River	03050105	030802	513	513
Green River	03050105	030803	137	137
First Broad River	03050105	030804	426	426
Buffalo Creek	03050105	030805	181	163
North Pacolet	03050105	030806	73	0
Upper Broad River Basin (3050105) of South Carolina				
Broad River	03050105	050	26	26
Broad River	03050105	090	129	65
Buffalo Creek	03050105	100	16	16
Cherokee Creek	03050105	110	23	23
Kings Creek	03050105	120	52	0
Thicketty Creek	03050105	130	157	0
Bullock Creek	03050105	140	118	0

TABLE 2.3-1 (Sheet 2 of 2)
DESCRIPTION OF UPPER BROAD RIVER BASIN WATERSHEDS

Watershed Name	Basin	Subbasin	Drainage Area (sq. mi.)	Drainage Area Above Ninety-Nine Islands Dam (sq. mi.)
North Pacolet River	03050105	150	49	0
South Pacolet River	03050105	160	91	0
Pacolet River	03050105	170	115	0
Lawsons Fork Creek	03050105	180	85	0
Pacolet River	03050105	190	102	0
Totals			2477	1553

Source (SC): Reference 1

Source (NC): Reference 2

See Figure 2.3-2

TABLE 2.3-2
USGS GAUGING STATIONS ON THE BROAD RIVER

Station Name	Station Number	Location	Drainage Area (sq. mi.)	2005 Annual Mean Flow (cfs)
Broad River near Boiling Springs, NC	02151500	Lat. 35°12'35", Long. 81°41'50", on right bank half mile upstream from Sandy Creek, 3 miles downstream from Second Broad River, and 3.5 miles SW of Boiling Springs, Cleveland County.	864	NIA
Broad River near Blacksburg, SC	02153200	Lat 35°07'26", Long 81°35'17", at upstream side of bridge on SC Highway 18, 1.2 mi upstream of Buffalo Creek, 1.2 mi downstream of Gaston Shoals Reservoir, 3.2 mi west of Blacksburg, and at mile 275.2.	1290	1802
Broad River near Gaffney, SC	02153500	Water-stage recorder, Lat. 35°05'20", Long. 81°34'20", at a bridge on US Hwy. 29, 0.3 mile upstream from Cherokee Creek, 4.4 miles downstream from Gaston Shoals Dam, and 4.5 miles ENE of Gaffney, Cherokee County.	1490	NIA
Broad River below Cherokee Falls	02153551	Water-stage recorder, Lat. 35°01'52", Long. 81°29'34", at left bank of tailrace below Ninety-Nine Islands Reservoir, 3.1 mi. downstream of Cherokee Falls, and 0.3 mi. upstream of Kings Creek.	1550	2532
Broad River near Carlisle, SC	02156500	Water-stage recorder, Lat. 34°35'46", Long. 81°25'20", on right bank at downstream side of bridge on State Highway 72, 1.3 mi upstream from Sandy River, 2.0 mi downstream from Seaboard Coast Line Railroad bridge, 2.5 mi east of Carlisle, 5.0 mi downstream from Neal Shoals Dam, and at mile 226.0., Union County.	2790	3892

Source: Reference 5 and Reference 6

NIA = No Information Available

TABLE 2.3-3 (Sheet 1 of 2)
BROAD RIVER MONTHLY FLOW AND TEMPERATURE VARIABILITY

Year	Monthly Mean Stream Flow Recorded in Cubic Feet Per Second (CFS)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1998											1098	1253
1999	2021	2040	1812	1851	1422	964	796	517	538	925	1137	1338
2000	1619	1840	2142	1997	1301	713	591	518	678	669	1129	890
2001	865	985	1727	1318	793	801	1020	589	764			
2002										865	1592	3312
2003	1441	2747	6686	8733	7433	5608	5051	4983	1838	1619	2094	2727
2004	1744	3100	1637	2104	1439	2626	1503	1219	8764	2219	3541	4710
2005	2615	2229	3930	3162	1926	2489	5418	1998	1356	2658	997	2031
2006	2659	1773	1516	1382	1100	1394	982	1254	2054			
Mean of Monthly Discharge	1850	2100	2780	2940	2200	2090	2190	1580	2280	1490	1660	2370
Max :	2659	3100	6686	8733	7433	5608	5418	4983	8764	2658	3541	4710
Min:	865	985	1516	1318	793	713	591	517	538	669	997	890

Notes:

Average annual flow: 2538 cfs (1926-2006)

Maximum monthly flow: 8764 cfs

Minimum monthly flow: 517

Source:

USGS 02153551 Broad River Below Cherokee Falls, SC (1998 to 2006)

Cherokee County, South Carolina

Hydrological Unit Code 03050105

Latitude 35°01'52", Longitude 81°29'34" NAD27

Drainage area 1,550 square miles

Gauge datum 412.20 feet above sea level NGVD29

Missing data - No information available from USGS

Maximum and Minimum Monthly Average Flows
1998 - 2006

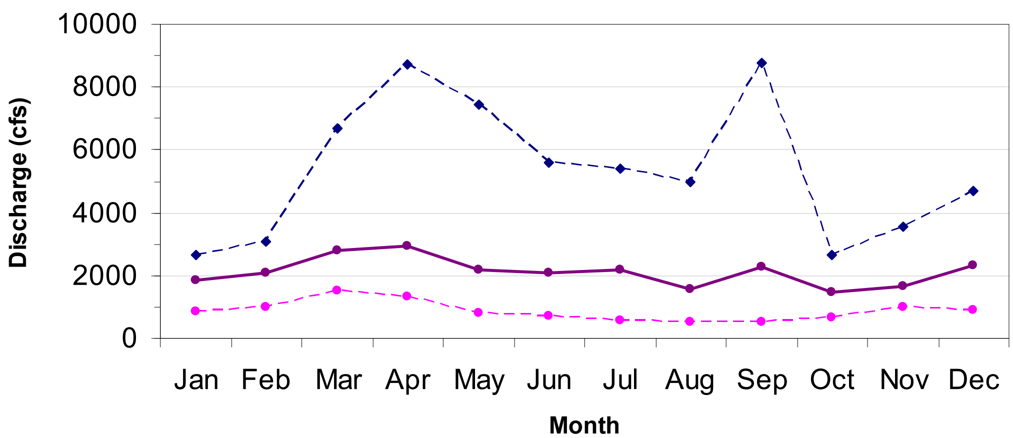

TABLE 2.3-3 (Sheet 2 of 2)
BROAD RIVER MONTHLY FLOW AND TEMPERATURE VARIABILITY

Year	Monthly Mean Water Temperature (deg.C)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1996										16.9	11.3	7.55
1997	7.89	9.30	14.2	15.8	19.5	22.5	27.2	26.6	23.6	18.0	9.77	6.60
1998	7.40	8.77	11.3					27.2	25.4	19.1	13.4	9.81
1999	7.29	9.38	11.1	18.6	21.3	25.3	28.3	29.1	24.3	18.1	13.3	8.42
2000	6.87	8.33	14.0	16.5	23.7			27.9	23.6	18.4	11.9	
2001	4.92	9.86	11.7	18.3	23.3	26.4	27.0	28.3	23.6	17.3	12.7	10.6
2002	6.07	9.57	12.8	20.9	22.8	28.1	29.6	28.3	25.5	20.0		
2003		8.02	13.1	15.5	19.6	23.5	25.9	25.5		18.1	14.8	7.37
2004	6.83	6.83	13.4	17.5	24.4	26.0		26.4			14.0	7.54
2005	8.05	8.33	11.1	16.6	21.0				25.7	19.6	12.4	6.67
2006	8.42	8.51	13.0	19.8	22.2			28.5	24.3			
Mean of Monthly Temperature	7.10	8.70	12.6	17.7	22.0	25.4	27.7	27.5	24.5	18.4	12.6	8.10
Max :	8.4	9.9	14.2	20.9	24.4	28.1	29.6	29.1	25.7	20.0	14.8	10.6
Min:	4.9	6.8	11.1	15.5	19.5	22.5	25.9	25.5	23.6	16.9	9.8	6.6

Notes:

Average monthly temperature: 17.7°C

Average monthly maximum temperature: 19.6°C

Average monthly minimum temperature: 15.7°C

Maximum monthly temperature: 29.6°C

Minimum monthly temperature: 4.9°C

Union County, South Carolina

Hydrological Unit Code 03050106

Latitude 34°35'46", Longitude 81°25'20" NAD27

Drainage area 2,790.00 square miles

Gauge datum 290.79 feet above sea level NGVD29

Missing data - No information available

Source:

USGS 02156500 Broad River Near Carlisle, SC (1996 to 2006)

No Incomplete Data is used for Statistical Calculation

Maximum and Minimum Monthly Temperatures
1996 - 2006

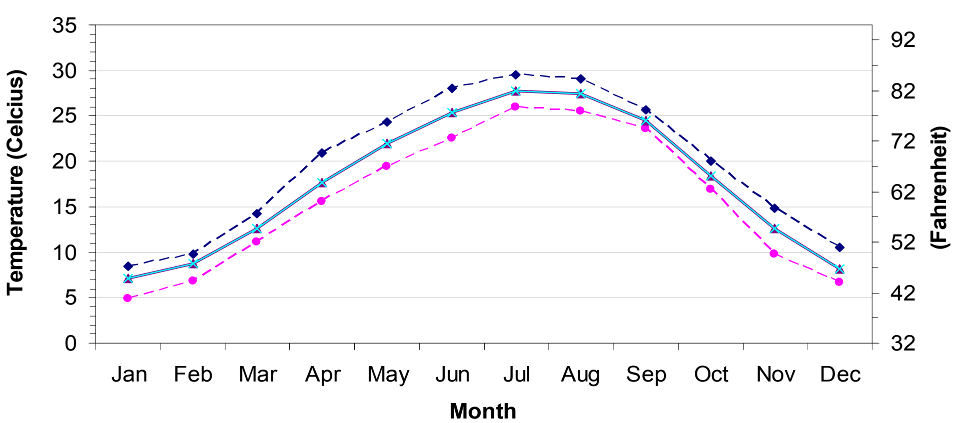

TABLE 2.3-4 (Sheet 1 of 2)
SOIL CHARACTERIZATION SURROUNDING LEE NUCLEAR STATION

Boring	Depth	Layer Type	Specific Gravity (Gs, g/cc)	Dry Density (pcf)	Total Porosity (n)
1026	9–11	Fill	2.55	98.4	38%
1026	12–14	Fill	2.74	104.6	39%
1026	34–36	Fill	2.74	77.7	55%
1028	39–41.1	Fill	2.74	99.5	42%
1033	10–12	Fill	2.74	105.6	38%
1045	9–10.2	Fill	2.67	110.7	33%
1068	10–12	Fill	2.62	99.5	39%
1068	24–26	Fill	2.71	97.4	42%
1070	9–11	Fill	2.89	101.0	44%
1070	19–21	Fill	2.73	102.2	40%
1070	29–31	Fill	2.69	102.9	39%
1070	44–45.7	Fill	2.69	104.1	38%
1028	79–81	Residuum[2]	2.69	82.7	51%
1046	24–26	Residuum	2.75	93.0	46%
1000	28–30	Saprolite	2.68	116.5	30%
1000	30–31.4	Saprolite	2.75	94.0	45%
1037	19–21	Saprolite	2.72	100.7	41%
1037	29–31	Saprolite	2.70	87.5	48%
1037	43–45	Saprolite	2.73	91.8	46%
1037	59–61	Saprolite	2.73	93.0	45%
1045	14–16	Saprolite	2.67	103.6	38%
1046	44–46	Saprolite	2.68	91.3	46%
1047	14–16	Saprolite	2.70	96.4	43%
1047	24–26	Saprolite	2.67	104.3	37%
1048	14–16	Saprolite	2.75	81.2	53%
1048	24–26	Saprolite	2.76	78.8	54%

Fill		StDev
Mean n	41%	5%
Min n	33%	
Max n	55%	
Mean G_s	2.71	g/cc
Mean ρd	100.3	pcf
Residuum		**StDev**
Mean n	48%	6%
Min n	46%	
Max n	51%	
Mean G_s	2.72	g/cc
Mean ρd	87.9	pcf
Saprolite		**StDev**
Mean n	44%	6%
Min n	30%	
Max n	54%	
Mean G_s	2.71	g/cc
Mean ρd	94.9	pcf

TABLE 2.3-4 (Sheet 2 of 2)
SOIL CHARACTERIZATION SURROUNDING LEE NUCLEAR STATION

	Moist Unit Weight[1] above Water Table (pcf)	Saturated Unit Weight (pcf)	Unit Weight of Water Lost by Gravity (pcf)	Saturated Volumetric Water Content	Saturated Gravimetric Water Content	Effective Porosity (n_e)
FILL Silty Sand/Sandy Silt (ML/SM)	111	119	8	41%	21%	**31%**
RESIDUAL SOIL[2] Silty Sand/Sandy Silt (ML/SM)	113	118	5	48%	25%	**17%**
SAPROLITE Silty Sand (SM)	117	123	6	44%	22%	**22%**
PWR[1] Texture Varies	135	140	5	44%	20%	**18%**

1 PWR = Partially Weathered Rock

2 Residuum = Residual Soil

pcf = pounds per cubic foot

62.4 pcf = unit weight of water; 1 g/cc = specific gravity of water

TABLE 2.3-5 (Sheet 1 of 12)
WELL CONSTRUCTION AND WATER TABLE ELEVATIONS (FT ABOVE MSL)

	Reference Elevations		Well Construction Depths							Additional Info	
Well I.D.	GL Elev (ft)	TOC Elev (ft)	Boring Depth	TD from TOC	B/Screen	T/Screen	T/Sand	T/Seal	Material	DTW WD	Date Plugged
MW-1200	591.93	593.99	41	41.93	40	25	23	20	2-inch PVC Sch40	23.0	NA
MW-1201	589.91	592.12	102.5	103.81	101.5	86.5	84.5	82.5	2-inch PVC Sch40	37.0	NA
MW-1201A	590.07	592.11	48	49.78	47	37	36	34	2-inch PVC Sch40	37.0	NA
MW-1202	587.47	589.68	78.5	79.82	77.5	62.5	58	55	2-inch PVC Sch40	20.6	NA
MW-1203	589.51	591.87	77	77.67	75	60	58	55	2-inch PVC Sch40	22.5	NA
MW-1204	609.92	612.42	115	116.59	114	99	97	95	2-inch PVC Sch40	37.1	NA
MW-1204A	609.93	612.42	50	51.82	49	39	37	35	2-inch PVC Sch40	37.1	NA
MW-1205	609.99	612.59	124	125.33	123	108	106	104	2-inch PVC Sch40	43.9	NA
MW-1206	589.66	591.51	68.5	69.89	67.5	52.5	50	47.5	2-inch PVC Sch40	31.7	NA
MW-1206A	589.75	591.43	43	44.09	42	32	31	29	2-inch PVC Sch40	31.7	NA
MW-1207	589.03	591.39	108	110.02	107	92	90	88	2-inch PVC Sch40	29.2	NA
MW-1207A	588.91	591.05	43	44.68	42	32	31	29	2-inch PVC Sch40	29.2	NA
MW-1208	587.77	590.00	79	78.92	76.5	61.5	59	56	2-inch PVC Sch40	47.0	NA
MW-1209	586.91	588.91	106	106.28	104	89	87	84.6	2-inch PVC Sch40	16.3	NA
MW-1209A	586.93	589.03	28	29.45	27	17	16	14	2-inch PVC Sch40	16.3	NA
MW-1210	589.78	592.27	101.5	103.10	101.5	86.5	84.5	82.5	2-inch PVC Sch40	16.5	NA
MW-1210A	589.42	591.66	30	32.06	29	19	18	16	2-inch PVC Sch40	16.5	NA
MW-1211	589.88	591.63	39	39.94	37.5	22.5	20.5	18	2-inch PVC Sch40	21.5	NA
MW-1212	610.24	612.29	47.5	48.88	46.5	31.5	29.5	26.5	2-inch PVC Sch40	31.0	NA
MW-1213	NA	NA	78.30	NA	NA	NA	NA	NA	NA	18.0	4/11/06
MW-1214	605.00	606.51	44.5	44.74	43	28	26	23	2-inch PVC Sch40	14.0	NA

TABLE 2.3-5 (Sheet 2 of 12)
WELL CONSTRUCTION AND WATER TABLE ELEVATIONS (FT ABOVE MSL)

	Reference Elevations		Well Construction Depths							Additional Info	
Well I.D.	GL Elev (ft)	TOC Elev (ft)	Boring Depth	TD from TOC	B/Screen	T/Screen	T/Sand	T/Seal	Material	DTW WD	Date Plugged
MW-1215	590.22	592.13	101.5	101.20	100	40	38	35.5	6-inch PVC	35.0	NA
MW-1216	588.01	590.69	29.0	31.31	28.0	18	17	15	2-inch PVC Sch40	18.0	NA
MW-1217	587.64	590.10	24.0	24.85	24.0	14	13	11	2-inch PVC Sch40	10.5	NA
MW-1218	588.12	590.18	16.0	18.31	15.0	5	4	2	2-inch PVC Sch40	17.5	NA
DW2	588.94	589.67	NIA	~150	NIA	NIA	NIA	NIA	6-inch Metal	NIA	NA
DW3	590.56	591.34	NIA	~107.5	NIA	NIA	NIA	NIA	6-inch PVC	NIA	NA
DW4	591.22	591.51	NIA	~130	NIA	NIA	NIA	NIA	6-inch PVC	NIA	NA
DW5	587.73	589.20	NIA	>201	NIA	NIA	NIA	NIA	6-inch Metal	NIA	NA

TOC Elev. = top of casing elevations obtained from professional surveyors (McKim & Creed)

GL Elev. = ground level elevations obtained from professional surveyors (McKim & Creed)

Latitude, Longitude: Obtained using hand-held Garmin Rino 120 GPS unit

Northing/Easting: Obtained from professional surveyors (McKim & Creed)

Wells designated "A" wells are the shallow cluster wells.

Location 1213 was completed as a boring only. MW-1215 is the aquifer test pumping well.

DTW WD = Depth to water while drilling

NIA = No Information Available

NA = Not Applicable

NM = Not Measured

DW Wells completed during Cherokee activities, records not available, possibly used for dewatering

TABLE 2.3-5 (Sheet 3 of 12)
WELL CONSTRUCTION AND WATER TABLE ELEVATIONS (FT ABOVE MSL)

	Location Information				Reference Elevations		Well Construction Elevations				
Well I.D.	Latitude	Longitude	Northing	Easting	GL Elev	TOC Elev	T/Sand Elev.	T/Screen Elev.	B/Screen Elev.	Boring Depth Elev.	Date Complete d
MW-1200	35.03776	-81.51582	1166348.442	1845571.069	591.93	593.99	568.93	566.93	551.93	550.93	4/10/06
MW-1201	35.03872	-81.51247	1166689.304	1846578.824	589.91	592.12	505.41	503.41	488.41	487.41	4/14/06
MW-1201A	NM	NM	1166693.529	1846576.539	590.07	592.11	554.07	553.07	543.07	542.07	7/18/06
MW-1202	35.03962	-81.50948	1167018.978	1847472.030	587.47	589.68	529.47	524.97	509.97	508.97	4/14/06
MW-1203	35.03874	-81.50824	1166702.120	1847838.422	589.51	591.87	531.51	529.51	514.51	512.51	4/11/06
MW-1204	35.03719	-81.50761	1166141.154	1848033.400	609.92	612.42	512.92	510.92	495.92	494.92	4/14/06
MW-1204A	NM	NM	1166133.724	1848034.258	609.93	612.42	572.93	570.93	560.93	559.93	7/17/06
MW-1205	35.03582	-81.50665	1165631.431	1848304.849	609.99	612.59	503.99	501.99	486.99	485.99	4/15/06
MW-1206	35.03862	-81.50948	1166655.908	1846689.086	589.66	591.51	539.66	537.16	522.16	521.16	4/18/06
MW-1206A	NM	-81.50948	1166656.288	1846693.299	589.75	591.43	558.75	557.75	547.75	546.75	7/17/06
MW-1207	35.03912	-81.51216	1166849.173	1846668.764	589.03	591.39	499.03	497.03	482.03	481.03	4/24/06
MW-1207A	NM	NM	1166846.232	1846673.410	588.91	591.05	557.91	556.91	546.91	545.91	7/18/06
MW-1208	35.04006	-81.51243	1167188.532	1846583.513	587.77	590.00	528.77	526.27	511.27	508.77	4/13/06
MW-1209	35.03431	-81.50742	1165084.761	1848071.547	586.91	588.91	499.91	497.91	482.91	480.91	4/18/06
MW-1209A	NM	NM	1165076.658	1848072.885	586.93	589.03	570.93	569.93	559.93	558.93	7/17/06
MW-1210	35.03496	-81.50956	1165321.305	1847439.208	589.78	592.27	505.28	503.28	488.28	488.28	4/16/06
MW-1210A	NM	NM	1165312.832	1847436.803	589.42	591.66	571.42	570.42	560.42	559.42	7/17/06
MW-1211	35.03460	-81.51307	1165197.583	1846406.261	589.88	591.63	569.38	567.38	552.38	550.88	4/11/06
MW-1212	35.03508	-81.51621	1165365.927	1845452.195	610.24	612.29	580.74	578.74	563.74	562.74	4/10/06
MW-1213	35.03876	-81.51229	NM	NM	NA	NA	NA	NA	NA	NA	NA
MW-1214	35.03181	-81.51050	1164177.882	1847153.830	605.00	606.51	579.00	577.00	562.00	560.50	4/11/06

TABLE 2.3-5 (Sheet 4 of 12)
WELL CONSTRUCTION AND WATER TABLE ELEVATIONS (FT ABOVE MSL)

	Location Information				Reference Elevations		Well Construction Elevations				
Well I.D.	Latitude	Longitude	Northing	Easting	GL Elev	TOC Elev	T/Sand Elev.	T/Screen Elev.	B/Screen Elev.	Boring Depth Elev.	Date Complete d
MW-1215	35.03876	-81.51230	1166710.545	1846624.819	590.22	592.13	552.22	550.22	490.22	488.72	4/17/06
MW-1216	35.03452	-81.51129	1165171.882	1846927.273	588.01	590.69	571.01	570.01	560.01	559.01	7/19/06
MW-1217	35.03419	-81.51109	1165042.463	1846983.878	587.64	590.10	574.64	573.64	563.64	563.64	7/19/06
MW-1218	35.03368	-81.51059	1164859.672	1847139.635	588.12	590.18	584.12	583.12	573.12	572.12	7/18/06
DW2	35.03489	-81.51162	1165319.974	1846821.466	588.94	589.67	NIA	NIA	NIA	NIA	~1977
DW3	35.03521	-81.51028	1165408.943	1847234.503	590.56	591.34	NIA	NIA	NIA	NIA	~1977
DW4	35.03412	-81.51358	1165035.485	1846277.086	591.22	591.51	NIA	NIA	NIA	NIA	~1977
DW5	NM	NM	1167933.393	1847896.940	587.73	589.20	NIA	NIA	NIA	NIA	~1977

TOC Elev. = top of casing elevations obtained from professional surveyors (McKim & Creed)

GL Elev. = ground level elevations obtained from professional surveyors (McKim & Creed)

Latitude, Longitude: Obtained using hand-held Garmin Rino 120 GPS unit

Northing/Easting: Obtained from professional surveyors (McKim & Creed)

Wells designated "A" wells are the shallow cluster wells located around 5 feet from the cluster twin well.

Location 1213 was completed as a boring only. MW-1215 is the aquifer test pumping well.

DTW WD = Depth to water while drillng

NIA = No Information Available

NA = Not Applicable

NM = Not Measured

DW Wells completed during Cherokee activities, records not available, possibly used for dewatering

TABLE 2.3-5 (Sheet 5 of 12)
WELL CONSTRUCTION AND WATER TABLE ELEVATIONS (FT ABOVE MSL)

	Reference Elev.		4/18/06		5/14/06		5/23/06		5/29/06		6/6/06	
Location	TOC	GL	DTW	WT Elev	DTW	WT Elev	DTW	WT Elev	DTW	WT Elev	DTW	WT Elev
MW-1200	593.99	591.93	31.80	562.19	32.77	561.22	32.77	561.2	32.90	561.1	33.13	560.9
MW-1201	592.12	589.91			35.17	556.95	35.17	557.0	35.35	556.8	35.60	556.5
MW-1201A	592.11	590.07										
MW-1202	589.68	587.47	23.90	565.78	24.76	564.92	24.76	564.9	24.86	564.8	24.99	564.7
MW-1203	591.87	589.51	20.60	571.27	21.40	570.47	21.40	570.5	21.51	570.4	21.65	570.2
MW-1204	612.42	609.92	39.80	572.62	40.25	572.17	40.25	572.2	40.33	572.1	40.36	572.1
MW-1204A	612.42	609.93										
MW-1205	612.59	609.99	46.90	565.69	47.28	565.31	47.28	565.3	47.33	565.3	47.20	565.4
MW-1206	591.51	589.66			33.43	558.08	33.43	558.1	33.63	557.9	33.89	557.6
MW-1206A	591.43	589.75										
MW-1207	591.39	589.03			33.74	557.65	33.74	557.6	33.93	557.5	34.17	557.2
MW-1207A	591.05	588.91										
MW-1208	590.00	587.77	41.30	548.70	42.25	547.75	42.25	547.8	42.37	547.6	42.46	547.5
MW-1209	588.91	586.91			19.55	569.36	19.55	569.4	19.62	569.3	19.57	569.3
MW-1209A	589.03	586.93										
MW-1210	592.27	589.78	19.50	572.77	20.17	572.10	20.17	572.1	20.51	571.8	20.64	571.6
MW-1210A	591.66	589.42										
MW-1211	591.63	589.88	27.50	564.13	27.99	563.64	27.99	563.6	28.11	563.5	28.21	563.4
MW-1212	612.29	610.24	35.45	576.84	36.62	575.67	36.62	575.7	36.81	575.5	37.17	575.1
MW-1214	606.51	605.00	16.80	589.71	18.01	588.50	18.01	588.5	18.25	588.3	18.61	587.9
MW-1215	592.13	590.22			35.14	556.99	35.14	557.0	35.34	556.8	35.56	556.6
MW-1216	590.69	588.01										

TABLE 2.3-5 (Sheet 6 of 12)
WELL CONSTRUCTION AND WATER TABLE ELEVATIONS (FT ABOVE MSL)

	Reference Elev.		4/18/06		5/14/06		5/23/06		5/29/06		6/6/06	
Location	TOC	GL	DTW	WT Elev	DTW	WT Elev	DTW	WT Elev	DTW	WT Elev	DTW	WT Elev
MW-1217	590.10	587.64										
MW-1218	590.18	588.12										
DW2	589.67	588.94	33.80	555.87	37.11	552.56	37.11	552.56	37.56	552.11	37.75	551.92
DW3	591.34	590.56	22.50	568.84	23.59	567.75	23.59	567.75	24.65	566.69	24.63	566.71
DW4	591.51	591.22										
DW5	589.20	587.73										
SG-1		568.23			0.98	569.21						
SG-2		547.81			1.40	546.41						
SG-3		536.09			2.40	533.69						
SG-4		525.64			1.40	524.24						

TOC = top of casing elevation

DTW = depth to water

GL = ground level elevation

WT Elev = water table elevation (ft above msl)

BLANK - no data

SG-1 = DTW value is height above reference elevation

TABLE 2.3-5 (Sheet 7 of 12)
WELL CONSTRUCTION AND WATER TABLE ELEVATIONS (FT ABOVE MSL)

	Reference Elev.		6/12/06		7/15/06		7/21/06		8/15/06		9/11/06	
Location	TOC	GL	DTW	WT Elev	DTW	WT Elev	DTW	WT Elev	DTW	WT Elev	DTW	WT Elev
MW-1200	593.99	591.93	33.29	560.7	34.13	559.9	34.31	559.68	34.95	559.0	36.64	557.3
MW-1201	592.12	589.91	35.80	556.3	36.80	555.3	36.97	555.15	37.55	554.6	38.19	553.9
MW-1201A	592.11	590.07					38.60	553.51	36.69	555.4	37.10	555.0
MW-1202	589.68	587.47	25.10	564.6	25.73	563.9	25.82	563.86	26.28	563.4	26.81	562.9
MW-1203	591.87	589.51	21.78	570.1	22.51	569.4	22.65	569.22	23.14	568.7	24.70	567.2
MW-1204	612.42	609.92	40.45	572.0	41.06	571.4	41.17	571.25	41.58	570.8	42.14	570.3
MW-1204A	612.42	609.93					33.54	578.88	33.06	579.4	33.44	579.0
MW-1205	612.59	609.99	47.25	565.3	47.66	564.9	47.75	564.84	47.98	564.6	48.50	564.1
MW-1206	591.51	589.66	34.10	557.4	35.10	556.4	35.29	556.22	35.89	555.6	36.51	555.0
MW-1206A	591.43	589.75					35.31	556.12	35.92	555.5	36.54	554.9
MW-1207	591.39	589.03	34.39	557.0	35.39	556.0	35.54	555.85	36.21	555.2	36.84	554.5
MW-1207A	591.05	588.91					34.77	556.28	35.39	555.7	36.03	555.0
MW-1208	590.00	587.77	42.62	547.4	43.18	546.8	43.38	546.62	43.69	546.3	44.20	545.8
MW-1209	588.91	586.91	19.62	569.3	20.10	568.8	20.20	568.71	20.51	568.4		
MW-1209A	589.03	586.93					17.72	571.31	17.78	571.3	18.27	570.8
MW-1210	592.27	589.78	20.95	571.3	21.67	570.6	21.91	570.36	22.26	570.0	22.61	569.7
MW-1210A	591.66	589.42					20.42	571.24	20.81	570.8	21.25	570.4
MW-1211	591.63	589.88	28.33	563.3	28.62	563.0	28.80	562.83	28.85	562.8	28.73	562.9
MW-1212	612.29	610.24	37.42	574.9	38.69	573.6	38.90	573.39	39.62	572.7	40.14	572.2
MW-1214	606.51	605.00	18.91	587.6	20.31	586.2	20.62	585.89	21.38	585.1	22.04	584.5
MW-1215	592.13	590.22	35.75	556.4	36.73	555.4	36.91	555.22	37.50	554.6	38.15	554.0
MW-1216	590.69	588.01					25.00	565.69	25.96	564.7	26.92	563.8

TABLE 2.3-5 (Sheet 8 of 12)
WELL CONSTRUCTION AND WATER TABLE ELEVATIONS (FT ABOVE MSL)

	Reference Elev.		6/12/06		7/15/06		7/21/06		8/15/06		9/11/06	
Location	TOC	GL	DTW	WT Elev	DTW	WT Elev	DTW	WT Elev	DTW	WT Elev	DTW	WT Elev
MW-1217	590.10	587.64					22.19	567.91	23.33	566.8	24.41	565.7
MW-1218	590.18	588.12					16.63	573.55	17.22	573.0	17.77	572.4
DW2	589.67	588.94	37.73	551.94	38.90	550.77	39.41	550.26	40.03	549.64	40.42	549.25
DW3	591.34	590.56	25.24	566.10	26.24	565.10	26.88	564.46	26.90	564.44	27.33	564.01
DW4	591.51	591.22			23.82	567.69	23.91	567.60	23.94	567.57		
DW5	589.20	587.73							58.35	530.85	58.72	
SG-1		568.23			0.84	569.07					1.02	569.25
SG-2		547.81			1.70	546.11					1.6	546.21
SG-3		536.09			2.48	533.61					1.7	534.39
SG-4		525.64			1.20	524.44					1.38	524.26

TOC = top of casing elevation
DTW = depth to water
GL = ground level elevation
WT Elev = water table elevation (ft above msl)
BLANK - no data
SG-1 = DTW value is height above reference elevation

TABLE 2.3-5 (Sheet 9 of 12)
WELL CONSTRUCTION AND WATER TABLE ELEVATIONS (FT ABOVE MSL)

	Reference Elev.		9/14/06		10/10/06		11/14/06		12/20/06		1/17/07	
Location	TOC	GL	DTW	WT Elev	DTW	WT Elev	DTW	WT Elev	DTW	WT Elev	DTW	WT Elev
MW-1200	593.99	591.93	35.67	558.3	35.99	558.00	36.44	557.55	35.03	558.96	32.20	561.79
MW-1201	592.12	589.91			38.88	553.24	39.44	552.68	40.35	551.77	40.74	551.38
MW-1201A	592.11	590.07			38.12	553.99	37.90	554.21	39.04	553.07	39.64	552.47
MW-1202	589.68	587.47	26.82	562.9	27.19	562.49	27.67	562.01	28.02	561.66	28.06	561.62
MW-1203	591.87	589.51	23.64	568.2	23.93	567.94	24.17	567.70	23.97	567.90	23.59	568.28
MW-1204	612.42	609.92	41.95	570.5	42.37	570.05	42.68	569.74	42.95	569.47	42.81	569.61
MW-1204A	612.42	609.93	33.17	579.2	33.58	578.84	33.71	578.71	34.75	577.67	35.16	577.26
MW-1205	612.59	609.99	48.23	564.4	48.61	563.98	48.76	563.83	49.20	563.39	49.22	563.37
MW-1206	591.51	589.66			37.27	554.24	37.83	553.68	38.60	552.91	38.96	552.55
MW-1206A	591.43	589.75			37.31	554.12	37.85	553.58	38.62	552.81	38.98	552.45
MW-1207	591.39	589.03			36.88	554.51	38.16	553.23	38.90	552.49	39.25	552.14
MW-1207A	591.05	588.91			37.64	553.41	37.38	553.67	38.10	552.95	38.44	552.61
MW-1208	590.00	587.77			44.73	545.27	45.02	544.98	45.73	544.27	45.89	544.11
MW-1209	588.91	586.91	20.85	568.1	21.22	567.69	21.44	567.47	21.75	567.16	21.67	567.24
MW-1209A	589.03	586.93	18.01	571.0	18.46	570.57	18.80	570.23	20.02	569.01	20.21	568.82
MW-1210	592.27	589.78	22.18	570.1	23.06	569.21	22.54	569.73	22.67	569.60	21.66	570.61
MW-1210A	591.66	589.42	21.11	570.5	21.64	570.02	21.49	570.17	21.55	570.11	20.74	570.92
MW-1211	591.63	589.88	28.12	563.5	28.70	562.93	28.21	563.42	27.86	563.77	26.83	564.80
MW-1212	612.29	610.24	40.15	572.1	40.25	572.04	40.03	572.26	37.78	574.51	33.44	578.85
MW-1214	606.51	605.00	22.02	584.5	22.40	584.11	22.35	584.16	21.05	585.46	20.01	586.50
MW-1215	592.13	590.22			38.89	553.24	39.43	552.70	40.28	551.85	40.65	551.48
MW-1216	590.69	588.01	26.91	563.8	27.49	563.20	27.89	562.80	26.92	563.77	25.75	564.94

TABLE 2.3-5 (Sheet 10 of 12)
WELL CONSTRUCTION AND WATER TABLE ELEVATIONS (FT ABOVE MSL)

	Reference Elev.		9/14/06		10/10/06		11/14/06		12/20/06		1/17/07	
Location	TOC	GL	DTW	WT Elev	DTW	WT Elev	DTW	WT Elev	DTW	WT Elev	DTW	WT Elev
MW-1217	590.10	587.64	24.33	565.8	24.47	565.63	24.49	565.61	24.14	565.96	22.47	567.63
MW-1218	590.18	588.12	8.60	581.6	17.88	572.30	17.77	572.41	16.63	573.55	15.10	575.08
DW2	589.67	588.94	40.12	549.55	40.64	549.03	40.44	549.23	40.11	549.56	38.99	550.68
DW3	591.34	590.56	25.92	565.42	27.88	563.46	26.50	564.84	26.54	564.80	24.57	566.77
DW4	591.51	591.22	23.32	568.19	23.88	567.63	23.51	568.00	23.05	568.46	21.93	569.58
DW5	589.20	587.73	58.62	530.58	58.84	530.36	58.92	530.28	59.12	530.08	59.08	530.12
SG-1		568.23			0.68	568.91	0.97	569.20	0.95	569.18	1.00	569.23
SG-2		547.81			1.95	545.86	1.87	545.94	1.47	546.34	1.25	546.56
SG-3		536.09			2.34	533.75	1.74	534.35	1.37	534.73	1.78	534.31
SG-4		525.64			1.47	524.17	1.38	524.26	0.00	525.64	1.38	524.27

TOC = top of casing elevation
DTW = depth to water
GL = ground level elevation
WT Elev = water table elevation (ft above msl)
BLANK - no data
SG-1 = DTW value is height above reference elevation

TABLE 2.3-5 (Sheet 11 of 12)
WELL CONSTRUCTION AND WATER TABLE ELEVATIONS (FT ABOVE MSL)

	Reference Elev.		2/19/07		3/13/07		4/1907	
Location	TOC	GL	DTW	WT Elev	DTW	WT Elev	DTW	WT Elev
MW-1200	593.99	591.93	32.00	561.99	28.88	565.11	31.26	562.73
MW-1201	592.12	589.91	40.91	551.21	41.14	550.98	41.46	550.66
MW-1201A	592.112	590.02	39.69	552.42	40.04	552.07	40.36	551.75
MW-1202	589.68	587.47	27.82	561.86	27.810	561.88	28.00	561.68
MW-1203	591.87	589.51	23.00	568.87	22.79	569.08	23.20	568.67
MW-1204	612.42	609.92	42.12	570.28	41.85	570.57	41.96	570.46
MW-1204A	612.42	609.93	34.71	577.71	35.06	577.36	35.00	577.42
MW-1205	612.59	609.99	48.59	564.00	48.56	564.03	48.39	564.20
MW-1206	591.51	589.66	39.22	552.29	39.46	552.05	39.82	551.69
MW-1206A	591.43	589.75	39.25	552.18	39.50	551.93	39.85	551.58
MW-1207	591.39	589.03	39.50	551.89	39.72	551.67	40.08	551.31
MW-1207A	591.05	588.91	38.71	552.34	38.92	552.13	39.29	551.76
MW-1208	590.00	587.77	45.77	544.23	45.89	544.11	45.92	544.08
MW-1209	588.91	586.91	20.92	567.99	20.79	568.12	20.61	568.30
MW-1209A	589.03	586.93	18.72	570.31	18.70	570.33	18.15	570.88
MW-1210	592.27	589.78	21.33	570.94	20.85	571.42	20.94	571.33
MW-1210A	591.66	589.42	20.24	571.42	19.83	571.83	19.93	571.73
MW-1211	591.63	589.88	27.06	564.57	26.53	565.10	26.83	564.80
MW-1212	612.29	610.24	34.08	578.21	31.21	581.08	33.91	578.38
MW-1214	606.51	605.00	18.68	587.83	17.72	588.79	17.32	589.19
MW-1215	592.13	590.22	40.84	551.29	41.06	551.07	41.40	550.73
MW-1216	590.69	588.01	24.66	566.03	23.91	566.78	24.24	566.45

TABLE 2.3-5 (Sheet 12 of 12)
WELL CONSTRUCTION AND WATER TABLE ELEVATIONS (FT ABOVE MSL)

	Reference Elev.		2/19/07		3/13/07		4/1907	
Location	TOC	GL	DTW	WT Elev	DTW	WT Elev	DTW	WT Elev
MW-1217	590.10	587.64	21.46	568.64	20.33	569.77	20.97	569.13
MW-1218	590.18	588.12	14.76	575.42	13.69	576.49	14.19	575.99
DW2	589.67	588.94	38.94	550.73	37.62	552.05	38.17	551.50
DW3	591.34	590.56	24.77	566.57	23.14	568.20	23.26	568.08
DW4	591.51	591.22	22.66	568.85	21.72	569.79	18.19	573.32
DW5	589.20	587.73	58.95	530.25	58.65	530.55	58.49	530.71
SG-1		568.23	0.98	569.21	1.00	569.23	1.17	569.40
SG-2		547.81	1.23	546.58	1.23	546.58	1.06	546.75
SG-3		536.09	1.86	534.23	1.81	534.28	1.70	534.39
SG-4		525.64	1.38	524.27	1.50	524.14	1.34	524.30

TOC = top of casing elevation
DTW = depth to water
GL = ground level elevation
WT Elev = water table elevation (ft above msl)
BLANK - no data
SG-1 = DTW value is height above reference elevation

TABLE 2.3-6
AQUIFER CHARACTERISTICS

Material	Hydraulic Conductivity (K) Minimum	Geometric Mean	Median	Conservative Estimate	Maximum	Source
Saprolite/Soil Kv	2.45×10^{-8}	2.91×10^{-6}	2.10×10^{-6}	4.4×10^{-5}	2.55×10^{-4}	1973 investigation laboratory analyses.
Saprolite/Soil K_h	9.67×10^{-7}	5.52×10^{-5}	6.38×10^{-5}	3.2×10^{-4}	2.26×10^{-3}	1973 investigation field tests and 2006 slug tests.
Bedrock – PWR K_h	9.67×10^{-7}	9.36×10^{-5}	1.54×10^{-4}	1.4×10^{-3}	9.89×10^{-3}	1973 investigation packer tests and 2006 slug, aquifer, and packer tests.
Unconsolidated Material	2.21×10^{-4}	8.61×10^{-4}	4.10×10^{-4}	2.6×10^{-3}	3.90×10^{-3}	1973 aquifer tests and 2006 pumping well.
Fill Material	4.22×10^{-5}	2.26×10^{-4}	1.81×10^{-4}	6.2×10^{-4}	1.03×10^{-3}	2006 slug tests.

Units are in centimeters per second (cm/s).

PWR - Partially weathered rock.

K_v - Vertical hydraulic conductivity.

K_h - Horizontial hydraulic conductivity.

Conservative Estimate - The geometric mean of samples exceeding the median.

Conservative Estimate for Bedrock K_h was obtained from results of 2006 pump test.

Bold Conservative Estimates - These numbers were used below to calculate the groundwater velocity.

Unconsolidated material - fill material, soil, saprolite, and partially weathered rock

Material	Hydraulic Conductivity K (cm/s)	Effective Porosity n_e (%)	Groundwater Gradient dh/dl (ft/ft)	Groundwater Velocity V ft/yr	Groundwater Exposure Travel Time
Fill Material	6.2×10^{-4}	31	0.034	70	A release at the base of the Liquid Radwaste Tank #2 containment structure (elevation 556.5 ft. above msl) through the layer of partially weathered rock is the pathway with the shortest travel time to exposure (i.e., the Broad River at a distance of 1935 ft.), of 6.7 years. Other likely pathways through soil and saprolite and fill are shorter, (1340 ft. to the Hold-Up Pond A), but take a longer travel time of 20.3 years.
Saprolite/Soil	3.2×10^{-4}	20	0.034	56	
Bedrock - PWR	1.4×10^{-3}	18	0.036	290	

TABLE 2.3-7
SCDHEC 2005 WATER USAGE FOR CHEROKEE COUNTY, SOUTH CAROLINA

Usage	Quantity	
	Mgd	cfs
Public Supply	7.02	10.9
Industrial	1.38	2.14

Source: Reference 21

TABLE 2.3-8
SCDHEC 2005 WATER USAGE FOR CHEROKEE, CHESTER, GREENVILLE, SPARTANBURG, UNION, AND YORK COUNTIES, SOUTH CAROLINA

	Total Withdrawals					
	Groundwater		Surface Water		Total	
County Name	Mgd	cfs	Mgd	cfs	Mgd	cfs
Cherokee, SC	0.003	0.005	8.39	13.0	8.40	13.0
Chester, SC	0.07	0.11	3.55	5.50	3.62	5.61
Greenville, SC	0.34	0.53	66.6	103	67.0	104
Spartanburg, SC	4.01	6.22	41.6	64.5	45.6	70.7
Union, SC	0.008	0.012	4.88	7.56	4.89	7.58
York, SC	0.27	0.42	93.1	144	93.4	145

Note: Withdrawal totals excluded hydroelectric power usage.

Source: Reference 21

TABLE 2.3-9
2000 WATER USE TOTALS BY COUNTY IN THE UPPER BROAD RIVER BASIN WATERSHED

	Total Withdrawals					
	Groundwater		Surface Water		Total	
County Name	Mgd	cfs	Mgd	cfs	Mgd	cfs
Cherokee, SC	0.44	0.68	15.4	23.9	15.9	24.6
Chester, SC	1.80	2.79	4.6	7.1	6.4	9.9
Greenville, SC	3.03	4.70	53.3	82.6	56.3	87.1
Spartanburg, SC	4.01	6.22	57.0	88.3	61.0	94.4
Union, SC	0.25	0.39	8.2	12.7	8.5	13.2
York, SC	8.52	13.2	209	324	217	335.7
Buncombe, NC	8.77	13.6	33.7	52.3	42.5	65.8
Burke, NC	3.09	4.79	21.0	32.5	24.1	37.3
Catawba, NC	6.18	9.58	1182	1832	1188	1838
Cleveland, NC	2.51	3.89	189	293	192	297
Gaston, NC	7.67	11.9	965	1495	972	1504
Henderson, NC	3.7	5.74	13.4	20.8	17.1	26.5
Lincoln, NC	3.77	5.84	6.15	9.53	9.9	15.3
McDowell, NC	4.39	6.80	4.09	6.34	8.5	13.2
Polk, NC	1.24	1.92	1.48	2.29	2.7	4.2
Transylvania, NC	1.88	2.91	22.1	34.2	23.9	36.9

NOTES:

1. Greenville, Union, and York counties within the Broad River basin watershed are not part of the drainage basin for the Broad River adjacent to the site.

2. Cherokee, Cleveland, Polk, and Rutherford counties compose the majority of the area in the Broad River Watershed above the site.

3. Total withdrawals for aquaculture and mining were 0 Mgd for all counties.

Source: Reference 22

TABLE 2.3-10
2000 PUBLIC SUPPLY WATER USE TOTALS BY COUNTY IN THE UPPER BROAD RIVER BASIN WATERSHED

County Name	Public Supply Withdrawals					
	Groundwater		Surface Water		Total	
	Mgd	cfs	Mgd	cfs	Mgd	cfs
Cherokee, SC	0.07	0.11	11.6	18.0	11.7	18.1
Greenville, SC	0.16	0.25	48.2	74.7	48.3	74.9
Spartanburg, SC	0.37	0.57	47.3	73.3	47.6	73.8
Union, SC	0.00	0.00	4.25	6.59	4.25	6.59
York, SC	1.73	2.68	13.0	20.1	14.7	22.8
Buncombe, NC	1.40	2.17	23.3	36.1	24.7	38.2
Burke, NC	0.20	0.31	18.7	29.0	18.9	29.3
Catawba, NC	0.98	1.52	17.1	26.5	18.1	28.0
Cleveland, NC	0.11	0.17	13.7	21.2	13.8	21.3
Gaston, NC	1.74	2.70	27.0	41.9	28.8	44.6
Henderson, NC	0.30	0.47	8.15	12.6	8.45	13.1
Lincoln, NC	0.06	0.09	5.15	7.98	5.21	8.08
McDowell, NC	0.59	0.91	1.98	3.07	2.57	3.98
Polk, NC	0.39	0.60	0.84	1.30	1.23	1.91
Transylvania, NC	0.48	0.74	1.12	1.74	1.60	2.48

NOTES:

1. Greenville, Union, and York counties within the Upper Broad River basin watershed are not part of the drainage area for the Broad River adjacent to the site.

2. Cherokee, Cleveland, Polk, and Rutherford counties compose the majority of the area in the Upper Broad River basin watershed above the site.

Source: Reference 22

TABLE 2.3-11
2000 DOMESTIC WATER USE TOTALS BY COUNTY IN THE UPPER BROAD RIVER BASIN WATERSHED

	Domestic Withdrawals					
	Groundwater		Surface Water		Total	
County Name	Mgd	cfs	Mgd	cfs	Mgd	cfs
Cherokee, SC	0.37	0.57	0	0	0.37	0.57
Greenville, SC	2.87	4.45	0	0	2.87	4.45
Spartanburg, SC	3.53	5.47	0	0	3.53	5.47
Union, SC	0.25	0.39	0	0	0.25	0.39
York, SC	6.4	9.92	0	0	6.4	9.92
Buncombe, NC	6.79	10.5	0	0	6.79	10.5
Burke, NC	2.57	3.98	0	0	2.57	3.98
Catawba, NC	4.33	6.71	0	0	4.33	6.71
Cleveland, NC	1.73	2.68	0	0	1.73	2.68
Gaston, NC	5.27	8.17	0	0	5.27	8.17
Henderson, NC	3.21	4.98	0	0	3.21	4.98
Lincoln, NC	2.77	4.29	0	0	2.77	4.29
McDowell, NC	2.18	3.38	0	0	2.18	3.38
Polk, NC	0.83	1.29	0	0	0.83	1.29
Transylvania, NC	1.31	2.03	0	0	1.31	2.03

NOTES:

1. Greenville, Union, and York counties within the Upper Broad River Watershed are not part of the drainage area for the Broad River adjacent to the site.

2. Cherokee, Cleveland, Polk, and Rutherford counties compose the majority of the area in the Upper Broad River basin watershed above the site.

Source: Reference 22

TABLE 2.3-12
2000 INDUSTRIAL WATER USE TOTALS BY COUNTY IN THE UPPER BROAD RIVER BASIN WATERSHED

	Industrial Withdrawals					
	Groundwater		Surface Water		Total	
County Name	Mgd	cfs	Mgd	cfs	Mgd	cfs
Cherokee, SC	0	0	2.3	3.57	2.3	3.57
Greenville, SC	0	0	0.76	1.18	0.76	1.18
Spartanburg, SC	0.11	0.17	3.71	5.75	3.82	5.92
Union, SC	0	0	3.64	5.64	3.64	5.64
York, SC	0.39	0.60	86.1	133	86.5	134
Buncombe, NC	0.45	0.70	2.38	3.69	2.83	4.39
Burke, NC	0	0	0	0	0	0
Catawba, NC	0	0	0	0	0	0
Cleveland, NC	0.02	0.03	2.4	3.72	2.42	3.75
Gaston, NC	0	0	3.07	4.76	3.07	4.76
Henderson, NC	0	0	0.12	0.19	0.12	0.19
Lincoln, NC	0.39	0.60	0	0	0.39	0.60
McDowell, NC	1.5	2.33	0.96	1.49	2.46	3.81
Polk, NC	0	0	0	0	0	0
Transylvania, NC	0.05	0.08	18.73	29.0	18.8	29.1

NOTES:

1. Greenville, Union, and York counties within the Upper Broad River basin watershed are not part of the drainage basin for the Broad River adjacent to the site.

2. Cherokee, Cleveland, Polk, and Rutherford counties compose the majority of the area in the Upper Broad River basin watershed above the site.

Source: Reference 22

TABLE 2.3-13 (Sheet 1 of 2)
AREA SURFACE WATER INTAKES IN THE UPPER BROAD RIVER WATERSHED

Facility	County, State	Distance		Source	Withdrawal Capacity		Consumptive Use[a]		Use Type
		mi.[b]	Direction		Mgd	cfs	Mgd	cfs	
Gaffney BPW	Cherokee, SC	8	Upstream	Lake Whelchel	12	18.6	NIA	NIA	Public Supply
Gaffney BPW	Cherokee, SC	9	Upstream	Broad River	[c]	[c]	NIA	NIA	Public Supply
CNA Holdings, Inc. – Ticona-Shelby	Cleveland, NC	12	Upstream	Buffalo Creek	1.15	1.78	0.290	0.45	Industrial
Shelby	Cleveland, NC	13	Upstream	Broad River	10 [d]	15.5	0	0	Public Supply
Northbrook Carolina Hydro, LLC – Stice Shoals Plant	Cleveland, NC	14	Upstream	First Broad River	[e]	[e]	[e]	[e]	Instream Hydro
Martin Marietta Materials, Inc	Cleveland, NC	16	Upstream	Storm Water Quarry	0.23	0.36	0	0	Industrial
Kings Mountain	Cleveland, NC	17	Upstream	Moss Lake	37.6	58.3	1.611	2.50	Public Supply
Cleveland County Country Club	Cleveland, NC	18	Upstream	Lake/Pond	1.15	1.79	0.047	0.07	Golf Course
Shelby	Cleveland, NC	19	Upstream	First Broad River	18	28	2.424	4	Public Supply
Duke Energy Corp. – Cliffside Steam Station	Cleveland, NC	19	Upstream	Broad River	288	446	75	116	Industrial
Duke Energy Corp. – Cliffside Steam Station (planned)[f]	Cleveland, NC	19	Upstream	Broad River	32	50	20.645	32	Industrial
Cleveland-Caroknit	Cleveland, NC	25	Upstream	First Broad River	1	1.55	0.017	0.03	Industrial
Mako Marine International (formerly ITG/Burlington Industries – J.C. Cowan Plant)	Rutherford, NC	26	Upstream	Second Broad River	3	4.65	0.07	0.11	Industrial
Cleveland County Sanitary District	Cleveland, NC	27	Upstream	First Broad River	6	9.63	3.364	5.21	Public Supply
Cleveland County Sanitary District (planned)	Cleveland, NC	27	Upstream	Knob Creek	6	9.3	3.445	5.3	Public Supply
Forest City	Rutherford, NC	31	Upstream	Second Broad River	12	18.60	1.483	2.30	Public Supply

TABLE 2.3-13 (Sheet 2 of 2)
AREA SURFACE WATER INTAKES IN THE UPPER BROAD RIVER WATERSHED

Facility	County, State	Distance		Source	Withdrawal Capacity		Consumptive Use[a]		Use Type
		mi.[b]	Direction		Mgd	cfs	Mgd	cfs	
Broad River Water Authority (formerly Rutherfordton-Spindale)	Rutherford, NC	33	Upstream	Broad River	13	20.15	4.733	7.34	Public Supply
Northbrook Carolina Hydro, LLC – Turner Shoals Plant	Polk, NC	43	Upstream	Green River	(e)	(e)	(e)	(e)	Instream Hydro
Duke Energy Corp. – Tuxedo Hydro	Henderson, NC	52	Upstream	Lake Summit	(e)	(e)	(e)	(e)	Instream Hydro
Kenmure Country Club	Henderson, NC	54	Upstream	King Creek	0.82	1.26	0.97	1.50	Golf Course
V.C. Summer Nuclear Station	Fairfield, SC	52	Downstream	Lake Monticello	3.1	4.81	NIA	NIA	Industrial
V.C. Summer Nuclear Station (Planned)	Fairfield, SC	52	Downstream	Lake Monticello	NIA	NIA	NIA	NIA	Industrial
Carlisle Cone Mills	Union, SC	30	Downstream	Broad River	8.1	12.56	NIA	NIA	Public Supply
City of Union	Union, SC	21	Downstream	Broad River	23.8	36.89	NIA	NIA	Public Supply

a) Consumptive use based on reported withdrawals and returns from 1999 registration and 2002 LWSP reports.

b) Distance provided is a linear distance and not river miles.

c) The Gaffney BPW (Board of Public Works) system is authorized 18 Mgd and uses Lake Whelchel for storage.

d) The Shelby Broad River intake is used as a temporary emergency supply intake.

e) Instream hydro facilities maximum use rate not reported. Instream water use indicates water is returned directly to source. Additional hydro facilities are present within watershed, but no withdrawal permits exist.

f) Additional Cliffside Steam Plant use rate is based on anticipated expansion of 1 unit. “Planned” figures include the consumption of the existing Cliffside Unit 5 (15 cfs) and the planned expansion Unit (17 cfs).

See Figure 2.3-18 NIA - No Information Available Source: Reference 1, Reference 25, Reference 28.

TABLE 2.3-14
ESTIMATED SURFACE WATER WITHDRAWAL AND CONSUMPTION FOR STATION OPERATIONS

Broad River Flow Rates[a]		Average Withdrawal[b]		Percentage Withdrawal	Maximum Withdrawal[b]		Percentage Withdrawal
cfs	gpm	gpm	cfs		gpm	cfs	
Mean Annual Flow 2538 cfs (1926 – 2006)	1,139,054	35,030	78	3%	60,001	134	5%
7Q10 479 cfs (1926 – 2006)	214,975	35,030	78	16%	NA	NA	NA

Broad River Flow Rates[a]		Average Consumption[b]		Percentage Consumption	Maximum Consumption[b]		Percentage Consumption
cfs	gpm	gpm	cfs		gpm	cfs	
Mean Annual Flow 2538 cfs (1926 – 2006)	1,139,054	24,813	55	2%	28,723	64	3%
7Q10 479 cfs (1926 – 2006)	214,975	24,813	55	12%	NA	NA	NA

a) Broad River flow rates were compiled from USGS measurements recorded at the Gaffney Gauge (USGS Gauge #2153500), the Blacksburg Gauge (#2153200) and Boiling Springs Gauge (#2151500) for annual flows and from the Cherokee Falls Gauge (#2153551) for monthly flows (see Figure 2.3-2).

b) Average and maximum raw water withdrawals obtained from Environmental Report Figure 3.3-1. Maximum consumption was based on two unit maximum CWS tower evaporation (28,026 gpm), two unit maximum tower drift (3 gpm), two unit average SWS tower evaporation (368 gpm), two unit average SWS tower drift (1 gpm), and two unit maximum consumptive use of demin water.

TABLE 2.3-15
ESTIMATED DISCHARGE VOLUME FROM STATION OPERATIONS

Broad River Flow Rates[a] cfs	Broad River Flow Rates[a] gpm	Average Discharge[b] gpm	Average Discharge[b] cfs	Percentage Discharge	Maximum Discharge[b] gpm	Maximum Discharge[b] cfs	Percentage Discharge
Average Annual Mean 2538 cfs (1926 – 2006)	1,139,054	8,216	18	1%	28,778	64	3%
7Q10 479 cfs (1926 – 2006)	214,975	8,216	18	4%	28,778	64	13%

a) Broad River flow rates were compiled from USGS measurements recorded at the Gaffney Gauge (USGS Gauge #2153500), the Blacksburg Gauge (#2153200) and Boiling Springs Gauge (#2151500) for annual flows and from the Cherokee Falls Gauge (#2153551) for monthly flows (see Figure 2.3-2).

b) Average and maximum plant discharges obtained from Figure 3.3-1.

Withhold from Public Disclosure Under 10 CFR 2.390(a)(6) & (a)(9)
(see COL Application Part 9)

TABLE 2.3-16 (Sheet 1 of 2)
HISTORICAL DOMESTIC WELLS IN VICINITY OF SITE

Withhold from Public Disclosure Under 10 CFR 2.390(a)(6) & (a)(9)
(see COL Application Part 9)

TABLE 2.3-16 (Sheet 2 of 2)
HISTORICAL DOMESTIC WELLS IN VICINITY OF SITE

TABLE 2.3-17 (Sheet 1 of 3)
ANALYTICAL PARAMETERS AND METHODS

Reference Method	Surface Water Component/Test Description
EPA310.1/SM2320B	Alkalinity (Total Inflection Point)
SM2320 B	Alkalinity, Total
EPA 200.7	Aluminum (Direct Injection, Non-Filtered) by ICP
EPA 350.1	Ammonia (Soluble, Colorimetric)
EPA 200.8/6020	Arsenic (Total Recoverable) by ICP-MS (Digested)
EPA 200.8/6020	Barium (Total Recoverable) by ICP-MS (Digested)
405.1	BOD-5
EPA 200.7	Boron (Direct Injection, Non-Filtered) by ICP
EPA 200.8/6020	Cadmium (Total Recoverable) by ICP-MS (Digested)
EPA 200.7	Calcium (Direct Injection, Non-Filtered) by ICP
SM5220 D	Chemical Oxygen Demand
EPA 300.0	Chloride (IC)
EPA 200.8/6020	Chromium (Total Recoverable) by ICP-MS (Digested)
EPA 200.8/6020	Copper (Total Recoverable) by ICP-MS (Digested)
SM 9221	Escherichia Coli
SM 9221	Fecal Coliform
SM 2340B	Hardness by Calculation
EPA 200.7/6010B	Iron by ICP (Digested)
EPA 200.8/6020	Lead (Total Recoverable) by ICP-MS (Digested)
EPA 200.7	Magnesium (Direct Injection, Non-Filtered) by ICP
EPA 200.8/6020	Manganese (Total Recoverable) by ICP-MS (Digested)
EPA 245.1/7470A	Mercury (CVAA) -Water
EPA 200.8/6020	Nickel (Total Recoverable) by ICP-MS (Digested)
EPA 353.2	Nitrite + Nitrate (Soluble, Colorimetric)
EPA 365.1	O-PHOSPHATE (Soluble, Colorimetric)
EPA 200.7	Potassium (Direct Injection, Non-Filtered) by ICP
EPA 200.8/6020	Selenium (Total Recoverable) by ICP-MS (Digested)
SM4500SI-F	Silica (as Silicon - Colorimetric)
EPA 200.8/6020	Silver (Total Recoverable) by ICP-MS (Digested)
EPA 200.7	Sodium (Direct Injection, Non-Filtered) by ICP
EPA 300.0	Sulfate (IC)
EPA 351.2	Total Kjeldahl Nitrogen (Colorimetric)
160.1	Total Dissolved Solids
EPA 365.1	Total Phosphorus (Colorimetric)
EPA 160.2	Total Suspended Solids (EPA)
EPA 200.8/6020	Zinc by (Total Recoverable) ICP-MS (Digested)

TABLE 2.3-17 (Sheet 2 of 3)
ANALYTICAL PARAMETERS AND METHODS

Reference Method	Groundwater Component/Test Description
SM2320 B	Alkalinity, Bicarbonate
SM2320 B	Alkalinity, Total
EPA 200.7/6010B	Aluminum by ICP (Digested)
EPA 350.1	Ammonia (Colorometric)
EPA 200.8/6020	Arsenic (Total) by ICP-MS (Digested)
EPA 200.8/6020	Barium (Total) by ICP-MS (Digested)
405.1	BOD-5
EPA 200.7/6010B	Boron (Total) by ICP (Digested)
EPA 200.8/6020	Cadmium (Total) by ICP-MS (Digested)
EPA 200.7	Calcium by ICP
SM4500-CO2	Carbon Dioxide
SM5220 D	Chemical Oxygen Demand
EPA 300.0	Chloride (IC)
EPA 200.8/6020	Chromium (Total) by ICP-MS (Digested)
EPA 200.8/6020	Copper (Total) by ICP-MS (Digested)
SM 9221	Escherichia Coli
SM 9221	Fecal Coliform
SM 9221	Fecal Strep
SM 2340B	Hardness by Calculation
EPA 200.7/6010B	Iron (Total) by ICP (Digested)
EPA 200.8/6020	Lead (Total) by ICP-MS (Digested)
EPA 200.7	Magnesium by ICP
EPA 200.8/6020	Manganese (Total) by ICP-MS (Digested)
EPA 245.1/7470A	Mercury (CVAA) -Water
EPA 200.8/6020	Nickel (Total) by ICP-MS (Digested)
EPA 300.0	Nitrate (IC)
EPA 300.0	Nitrite (IC)
EPA 365.1	O-Phosphate (Colorimetric)
9040B	pH
EPA 200.7/6010B	Potassium by ICP (Digested)
EPA 200.8/6020	Selenium (Total) by ICP-MS (Digested)
EPA 200.7/6010B	Silicon (Total) by ICP (Digested)
EPA 200.8/6020	Silver (Total) by ICP-MS (Digested)
EPA 200.7/6010B	Sodium by ICP (Digested)
EPA 300.0	Sulfate (IC)
EPA 351.2	Total Kjeldahl Nitrogen (Colorimetric)

TABLE 2.3-17 (Sheet 3 of 3)
ANALYTICAL PARAMETERS AND METHODS

Reference Method	Groundwater Component/Test Description
SM 9221	Total Coliform
160.1	Total Dissolved Solids
EPA 365.1	Total Phosphorus (Colorimetric)
EPA 160.2	Total Suspended Solids (EPA)
EPA 200.8/6020	Zinc (Total) by ICP-MS (Digested)

TABLE 2.3-18
SURFACE WATER SAMPLING LOCATIONS

Station ID	Location	Sample Collection Depth	Corresponding Historical Station I.D.
101	Broad River – North of the site	Surface (0.3m/Mid-depth)	NA
102	Broad River – Upstream of the site	Surface (0.3m/Mid-depth)	#7, #8
103	Impoundment – Hold-Up Pond A (HUPA)	Surface (0.3m)	NA
		Bottom	
104	Backwater – North of the Broad River	Surface (0.3m)	#9, #10
105	Broad River – East of the site	Surface (0.3m/Mid-depth)	#11
106	Backwater – West of the Broad River	Surface (0.3m)	#12, #13
107	Broad River – Downstream of the Ninety-Nine Islands Dam	Surface (0.3m)	#15
108	Impoundment – Make-Up Pond A (MUPA)	Surface (0.3m)	#21
		Bottom	(Intermittent Creek)
109	Broad River – Upstream of the Ninety-Nine Islands Dam	Surface (0.3m/Mid-depth)	#14
110	Impoundment – Make-Up Pond B (MUPB)	Surface (0.3m)	#23
		Bottom	(McKowns Creek)

See Figure 2.3-21

Source: Reference 5

TABLE 2.3-19 (Sheet 1 of 6)
2006 SURFACE WATER ANALYTICAL RESULTS

Station Description	Station Location	Depth/Type	Date/Time	Daily Discharge	Alkalinity (Total Inflection Point) meq/L	Alkalinity, Total mg/L	Aluminum mg/L	Ammonia mg-N/L	Arsenic ug/L	Barium ug/L	BOD-5 mg/L	Boron mg/L	Cadmium ug/L	Calcium mg/L	Chemical Oxygen Demand mg/L	Chloride mg/L	Chlorophyll a mg/m^3	Chromium ug/L	Copper ug/L	Enterococci Enterococci/ 100mL	ESCHERICHIA COLI E.coli/ 100mL	FECAL COLIFORM FC/ 100mL	FECAL STREPTACOCCI FS/ 100mL	Hardness*** mg/L-$CaCO_3$	Iron mg/L	Lead ug/L	Magnesium mg/L	Manganese ug/L	Mercury ug/L	Nickel ug/L	$NO^2 + NO^3$ mg-N/L	Ortho-phosphate mg-P/L	Potassium mg/L	Selenium ug/L	Silica (as Silicon) mg-Si/L	Silver ug/L	Sodium mg/L	Sulfate mg/L	TKN mg-N/L	Total Coliform TC/ 100mL	Total Dissolved Solids mg/L	Total Phosphorus mg-P/L	Total Suspended Solids mg/L	Turbidity NTU	Zinc ug/L
101	Broad River, channel	0.3 m	2/27/06	1480	0.36	< 20	0.106	0.074	< 2.00	16.3	< 2.0	< 0.100	< 0.50	3.69	< 50	7.09	7.00	< 1.00	< 2.00			30		15.28	0.560	< 2.00	1.476	33.8	< 0.10	< 2.00	0.60	0.050	1.570	< 2.00	5.7	< 0.50	9.56	4.49	0.17		64	0.085	7.0	7.5	1.58
		0.3 m	5/1/06	1160	0.41	25	0.148	0.093	< 2.00	18.1	< 2.0	< 0.100	< 0.50	3.74	< 50	9.63	3.69	1.04	< 2.00	6		30	500	15.75	0.748	< 2.00	1.555	52.4	< 0.10	< 2.00	0.46	0.062	1.890	< 2.00	5.9	< 0.50	11.3	5.87	0.29	130		0.106	9.0	6.8	12.1
		Mid-depth	5/1/06	1160	0.41	23	0.176	0.088	< 2.00	19.4	< 3.4	< 0.100	< 0.50	3.77	< 50	9.58	2.03	1.20	2.20	13		23	900	15.89	0.985	< 2.00	1.571	57.6	< 0.10	< 2.00	0.46	0.062	1.860	< 2.00	5.9	< 0.50	11.3	5.85	0.30	70		0.111	13.0	11	10.2
		0.3 m	8/23/06	1180	0.46	25	0.195	0.20	2.18	20.6	< 3.1	< 0.100	< 0.50	4.24	< 50	10.77	4.22	1.16	2.76	52	23	50		18.25	0.846	< 2.00	1.865	46.5	< 0.10	< 2.00	0.50	0.094	2.510	< 2.00	6.5	< 0.50	16.0	9.77	0.27	1986	78	0.143	11.0	9.1	2.32
		0.3 m	11/1/06	1930	0.48	23	0.103	0.06	< 2.00	19.8	< 1.7	< 0.100	< 0.50	4.51	130	8.77	2.78	< 1.00	< 2.00		25	17			0.819	< 2.00	1.857	40.3	< 0.042	< 2.00	0.37	0.029	2.520	< 2.00	6.2	< 0.50	12.4	8.03	0.37		72	0.074	6.0	11	2.55
102	Broad River, channel	0.3 m	2/27/06		0.44	< 20	0.086	0.051	< 2.00	15.9	< 2.0	< 0.100	< 0.50	3.67	< 50	2.02	3.15	< 1.00	< 2.00			13		15.19	0.422	< 2.00	1.464	25.8	< 0.10	< 2.00	0.45	0.030	1.560	< 2.00	5.1	< 0.50	8.5	2.63	0.19		58	0.059	3.0	5.2	1.24
		0.3 m	5/1/06		0.40	23	0.139	0.085	< 2.00	18.6	< 2.0	< 0.100	< 0.50	3.74	61	9.35	2.51	1.03	< 2.00	4		23	500	15.72	0.768	< 2.00	1.552	53.9	< 0.10	< 2.00	0.44	0.059	1.860	< 2.00	6.0	< 0.50	10.8	5.05	0.25	80		0.095	10.0	9.5	7.14
		Mid-depth	5/1/06		0.40	20	0.173	0.30	< 2.00	19.0	< 2.0	< 0.100	< 0.50	3.77	56	9.49	1.92	1.15	2.06	7		30		15.88	0.913	< 2.00	1.570	56.6	< 0.10	< 2.00	0.45	0.057	1.870	< 2.00	5.9	< 0.50	11.0	5.43	0.31	80		0.104	12.0	8.7	9.85
		0.3 m	8/23/06		0.46	25	0.268	0.17	2.06	22.4	3.3	< 0.100	< 0.50	4.27	< 50	9.32	2.62	1.68	3.35	126	35	80		18.39	1.11	< 2.00	1.874	54.0	< 0.10	< 2.00	0.51	0.107	2.430	< 2.00	6.6	< 0.50	15.7	9.34	0.34	> 2420	98	0.144	20.0	11	4.96
		0.3 m	11/1/06		0.5	25	0.141	0.06	< 2.00	20.5	< 1.7	< 0.100	< 0.50	4.55	120	10	1.39	1.11	< 2.00		33	50			1.07	< 2.00	1.876	49.4	< 0.042	< 2.00	0.28	0.032	2.550	< 2.00	6.3	< 0.50	13.7	8.58	0.34		74	0.081	11.0	11	1.76
103	HUPA	0.3 m	2/27/06		0.45	24	< 0.050	0.029	< 2.00	18.8	< 2.0	< 0.100	< 0.50	8.17	< 50	0.54	5.02	< 1.00	2.09			< 2		25.18	0.137	< 2.00	1.161	15.5	< 0.10	< 2.00	0.17	< 0.005	3.230	< 2.00	< 0.5	< 0.50	0.716	4.69	0.36		60	0.019	1.0	2.1	46.1
		0.3 m	5/1/06		0.49	22	0.054	0.062	< 2.00	17.7	< 2.4	< 0.100	< 0.50	8.95	< 50	0.55	4.67	< 1.00	2.50	7		17	9	27.35	0.092	< 2.00	1.214	11.1	< 0.10	< 2.00	0.09	< 0.005	3.300	< 2.00	< 0.5	< 0.50	0.791	4.92	0.39	30		0.012	2.0	1.4	20.6
		0.3 m	8/22/06		0.53	32	< 0.050	0.09	< 2.00	16.5	< 2.6	< 0.100	< 0.50	9.68	< 50	0.58	5.02	< 1.00	< 2.00	< 1	< 1	< 2		29.52	0.127	< 2.00	1.296	16.6	< 0.10	< 2.00	0.04	< 0.005	3.610	< 2.00	0.5	< 0.50	0.911	4.55	0.40	866	56	0.011	2.0	1.8	8.68
		0.3 m	10/31/06		0.49	25	0.122	< 0.020	< 2.00	12.7	4	< 0.100	< 0.50	9.12	94	0.47	22.9	< 1.00	< 2.00		3	4			0.167	< 2.00	1.243	18.7	< 0.2	< 2.00	0.07	< 0.005	3.650	< 2.00	0.8	< 0.50	0.812	4.35	0.56		40	0.014	6.0	4.4	10.2
		Bottom (5m)	2/27/06		0.45	23	0.089	0.038	< 2.00	20.7	< 2.0	< 0.100	< 0.50	8.12	< 50	0.50		< 1.00	2.47			< 2		25.04	0.262	< 2.00	1.157	20.2	< 0.10	< 2.00	0.20	< 0.005	3.190	< 2.00	< 0.5	< 0.50	0.692	4.71	0.38		42	0.020	4.0	4.7	50.3
		Bottom	5/1/06		0.49	24	0.067	0.027	< 2.00	21.1	< 4.0	< 0.100	< 0.50	8.89	< 50	0.56	8.65	< 1.00	2.45	14		8	27	27.17	0.161	< 2.00	1.206	17.3	< 0.10	< 2.00	0.03	< 0.005	3.300	< 2.00	< 0.5	< 0.50	0.766	5.08	0.42	30		0.015	6.0	2.5	25.4
		Bottom (4m)	8/22/06		0.54	29	< 0.050	0.10	< 2.00	27.9	< 2.6	< 0.100	< 0.50	9.92	< 50	0.63		< 1.00	< 2.00					30.27	0.156	< 2.00	1.335	42.7	0.27	< 2.00	0.05	< 0.005	3.640	< 2.00	0.6	< 0.50	0.966	4.67	0.60		36	0.015	4.0	2.4	8.50
		Bottom (4.5m)	10/31/06		0.49	24	0.125	0.04	< 2.00	12.7	3.4	< 0.100	< 0.50	9.19	< 50	0.47		< 1.00	< 2.00						0.169	< 2.00	1.249	19.4	< 0.2	< 2.00	0.02	< 0.005	3.660	< 2.00	0.9	< 0.50	0.818	4.81	0.54		30	0.014	6.0	4	9.86
104	Broad River, backwater N	0.3 m	2/27/06		0.33	26	0.146	0.035	< 2.00	18.8	5.0	< 0.100	< 0.50	4.38	< 50	8.31	70.3	< 1.00	< 2.00			< 2		18.13	0.834	< 2.00	1.749	125	< 0.10	< 2.00	0.04	< 0.005	1.770	< 2.00	5.6	< 0.50	8.12	4.40	0.62		60	0.301	18.0	19	1.45
		0.3 m	5/1/06		0.56	27	0.210	0.033	< 2.00	22.9	6.2	< 0.100	< 0.50	5.58	< 50	9.90	90.5	1.35	2.30	23		13	30	22.26	1.48	< 2.00	2.026	320	< 0.10	< 2.00	0.01	0.007	2.060	< 2.00	4.5	< 0.50	10.9	4.17	0.81	80		0.073	30.0	15	10.3
		0.3 m	8/23/06		0.43	25	0.243	0.089	< 2.00	25.8	4.0	< 0.100	< 0.50	3.90	< 50	9.67	54.3	1.42	2.03	5	9	11		16.40	1.36	< 2.00	1.616	196	< 0.10	< 2.00	0.05	0.006	2.650	< 2.00	5.5	< 0.50	12.0	7.27	1.10	1986	62	0.061	26.0	16	1.99
		0.3 m	11/1/06		0.44	21	0.172	0.024	< 2.00	17.4	< 1.7	< 0.100	< 0.50	3.67	< 17	9.94	39.7	1.14	< 2.00		4	2			1.27	< 2.00	1.598	108	< 0.042	< 2.00	0.06	< 0.005	2.350	< 2.00	4.6	< 0.50	13.2	7.78	0.87		54	0.098	19.0	21	1.68

TABLE 2.3-19 (Sheet 2 of 6)
2006 SURFACE WATER ANALYTICAL RESULTS

					Alkalinity (Total Inflection Point)	Alkalinity, Total	Aluminum	Ammonia	Arsenic	Barium	BOD-5	Boron	Cadmium	Calcium	Chemical Oxygen Demand	Chloride	Chlorophyll a	Chromium	Copper	Enterococci	ESCHERICHIA COLI	FECAL COLIFORM	FECAL STREPTACOCCI	Hardness***	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	$NO^2 + NO^3$	Ortho-phosphate	Potassium	Selenium	Silica (as Silicon)	Silver	Sodium	Sulfate	TKN	Total Coliform	Total Dissolved Solids	Total Phosphorus	Total Suspended Solids	Turbidity	Zinc
					meq/L	mg/L	mg/L	mg-N/L	ug/L	ug/L	mg/L	mg/L	ug/L	mg/L	mg/L	mg/L	mg/m^3	ug/L	ug/L	Enterococci/ 100mL	E.coli/ 100mL	FC/ 100mL	FS/ 100mL	mg/L-$CaCO_3$	mg/L	ug/L	mg/L	ug/L	ug/L	ug/L	mg-N/L	mg-P/L	mg/L	ug/L	mg-Si/L	ug/L	mg/L	mg/L	mg-N/L	TC/ 100mL	mg/L	mg-P/L	mg/L	NTU	ug/L
Station Description	Station Location	Depth/Type	Date/Time	Daily Discharge																																									
105	Broad River, channel	0.3 m	2/27/06		0.37	22	0.097	0.091	< 2.00	15.2	< 2.0	< 0.100	< 0.50	3.61	< 50	7.72	4.70	< 1.00	< 2.00			4		14.99	0.484	< 2.00	1.451	31.09	< 0.10	< 2.00	0.44	0.051	1.530	< 2.00	5.8	< 0.50	9.23	3.64	0.15		52	0.079	5.0	5.7	1.41
		0.3 m	5/1/06		0.38	16	0.176	0.096	< 2.00	20.4	< 4.0	< 0.100	< 0.50	3.88	60	9.32	4.70	1.29	< 2.00	23		220	300	16.12	0.982	< 2.00	1.564	55.3	< 0.10	< 2.00	0.45	0.060	1.870	< 2.00	6.0	< 0.50	9.89	4.47	0.29	900		0.109	11.0	6.3	10.7
		Mid-depth	5/1/06		0.38	17	0.208	0.50	< 2.00	21.1	< 2.4	< 0.100	< 0.50	3.86	75	9.44	3.9	1.34	2.65	17		240	110	16.08	1.10	< 2.00	1.563	59.7	< 0.10	< 2.00	0.45	0.059	1.840	< 2.00	6.1	< 0.50	9.84	4.49	0.31	500		0.111	14.0	6.3	11.71
		0.3 m	8/23/06		0.46	26	0.199	0.17	2.01	20.3	< 3.1	< 0.100	< 0.50	4.21	< 50	9.54	1.015	1.37	2.75	13	44	50		18.17	0.914	< 2.00	1.859	50.6	< 0.10	< 2.00	0.49	0.087	2.540	< 2.00	6.5	< 0.50	15.9	9.11	0.41	2420	90	0.124	11.0	9.7	1.71
		0.3 m	11/1/06		0.46	22	0.127	0.059	< 2.00	19.1	< 1.7	< 0.100	< 0.50	4.43	< 17	8.72	0.961	< 1.00	< 2.00		20	30			0.921	< 2.00	1.833	39.7	< 0.042	< 2.00	0.25	0.028	2.520	< 2.00	6.1	< 0.50	11.7	7.6	0.36		76	0.075	8.0	8.7	1.51
106	Broad River, backwater S	0.3 m	2/27/06		0.40	23	0.182	0.053	< 2.00	17.1	< 2.0	< 0.100	< 0.50	3.82	< 50	8.85	26.1	1.22	< 2.00			8		15.88	1.32	< 2.00	1.544	82.5	< 0.10	< 2.00	0.22	0.007	1.650	< 2.00	5.1	< 0.50	9.5	4.66	0.53		52	0.094	18.0	25	2.17
		0.3 m	5/1/06		0.43	21	0.237	0.069	< 2.00	21.9	< 4.0	< 0.100	< 0.50	4.31	< 50	9.29	27.6	1.57	2.12	20		23	30	17.61	1.67	< 2.00	1.663	150.9	< 0.10	< 2.00	0.24	0.012	1.980	< 2.00	5.3	< 0.50	10.3	4.78	0.57	23		0.102	25.0	14	9.54
		0.3 m	8/23/06		0.46	27	0.177	0.14	< 2.00	19.2	< 3.1	< 0.100	< 0.50	4.06	< 50	7.57	14.8	< 1.00	2.39	2	17	70		17.57	0.819	< 2.00	1.806	70.8	< 0.10	< 2.00	0.39	0.060	2.480	< 2.00	6.4	< 0.50	14.9	9.59	0.45	1414	76	0.098	10.0	9.6	1.51
		0.3 m	11/1/06		0.43	20	0.183	< 0.020	< 2.00	18.3	< 1.7	< 0.100	< 0.50	4.12	54	9.29	36.6	1.18	< 2.00		9	30			1.03	< 2.00	1.738	40.0	< 0.042	< 2.00	0.17	0.012	2.540	< 2.00	5.6	< 0.50	11.3	6.42	0.41		64	0.111	14.0	14	2.45
107		0.3 m	2/27/06		0.36	21	0.099	< 0.020	< 2.00	15.1	< 2.0	< 0.100	< 0.50	3.62	< 50	7.25	4.65	< 1.00	< 2.00			4		14.99	0.506	< 2.00	1.445	30.75	< 0.10	< 2.00	0.38	0.047	1.510	< 2.00	5.8	< 0.50	8.88	3.84	0.19		66	0.079	5.0	6.1	1.77
	Broad River, channel below dam	0.3 m	5/1/06		0.38	17	0.218	0.11	< 2.00	19.9	< 4.0	< 0.100	< 0.50	3.75	< 50	8.22	4.33	1.44	2.31	23		50	240	15.81	0.998	< 2.00	1.565	60.4	< 0.10	< 2.00	0.43	0.090	1.830	< 2.00	5.9	< 0.50	9.50	4.56	0.25	110		0.139	15.0	5.2	8.30
		0.3 m	8/23/06		0.45	26	0.264	0.17	2.00	21.6	3.3	< 0.100	< 0.50	4.16	< 50	9.66	2.51	1.60	4.97	10	15	50		18.01	1.11	< 2.00	1.850	58.6	< 0.10	2.95	0.48	0.073	2.510	< 2.00	6.4	< 0.50	15.1	7.92	0.39	> 2420	92	0.109	13.0	10	6.89
		0.3 m	11/1/06		0.45	21	0.143	0.031	< 2.00	17.7	3.6	< 0.100	< 0.50	4.29	90	8.51	1.18	< 1.00	< 2.00		17	11		18.04	0.825	< 2.00	1.780	29.3	< 0.042	< 2.00	0.23	0.029	2.500	< 2.00	6.2	< 0.50	11.4	7.22	0.31		76	0.066	10.0	9.7	1.59
108	MUPA	0.3 m	2/27/06		0.88	51	< 0.050	0.066	< 2.00	15.7	< 2.0	< 0.100	< 0.50	9.55	< 50	0.86	2.67	< 1.00	< 2.00			< 2		38.12	0.053	< 2.00	3.469	71.6	< 0.10	< 2.00	0.11	< 0.005	3.130	< 2.00	1.7	< 0.50	4.89	0.18	0.42		66	0.009	1.0	1.3	1.41
		0.3 m	5/1/06		0.88	49	< 0.050	0.074	< 2.00	12.5	< 2.7	< 0.100	< 0.50	9.77	< 50	2.11	1.34	< 1.00	< 2.00	< 2		< 2	< 2	39.03	0.049	< 2.00	3.557	16.56	< 0.10	< 2.00	0.03	< 0.005	3.180	< 2.00	0.8	< 0.50	5.06	2.69	0.41	< 2		0.009	1.0	0.84	6.61
		0.3 m	8/22/06		0.87	51	< 0.050	0.10	< 2.00	13.4	< 2.6	< 0.100	< 0.50	9.27	< 50	2.28	1.50	< 1.00	< 2.00	< 1	4	2		38.91	0.037	< 2.00	3.829	15.05	< 0.10	< 2.00	< 0.01	< 0.005	3.440	< 2.00	1.1	< 0.50	5.57	2.81	0.40	687	64	0.007	1.0	0.95	< 1.00
		0.3 m	10/31/06		0.87	42	< 0.050	0.07	< 2.00	16.3	< 1.7	< 0.100	< 0.50	8.99	< 50	2.13	2.14	< 1.00	< 2.00		2	4			0.067	< 2.00	3.89	47.28	< 0.2	< 2.00	0.09	< 0.005	3.450	< 2.00	1.3	< 0.50	5.56	2.63	0.46		32	0.008	< 4.0	0.98	< 1.00
		Bottom (17m)	2/27/06		1.66	81	0.102	3.2	< 2.00	133	22	< 0.100	< 0.50	12.7	< 50	0.53		< 1.00	< 2.00			< 2		48.35	22.5	< 2.00	4.064	6933	< 0.10	< 2.00	0.05	0.020	3.290	< 2.00	6.4	< 0.50	5.01	4.71	4.1		98	0.211	54.0	34	3.97
		Bottom (9m)	5/1/06		0.98	49	< 0.050	0.049	< 2.00	28.7	< 2.4	< 0.100	< 0.50	10.5	< 50	9.60		< 1.00	< 2.00	< 2		4	< 2	41.29	0.129	< 2.00	3.649	1067	< 0.10	< 2.00	0.05	< 0.005	3.280	< 2.00	2.3	< 0.50	5.03	5.85	0.61	4		0.013	2.0	0.71	17.0
		Bottom (16.5m)	8/22/06		1.78	98	< 0.050	4.5	< 2.00	148	3.4	< 0.100	< 0.50	14.3	< 50	0.74		< 1.00	< 2.00					54.31	28.5	< 2.00	4.496	7458	< 0.10	< 2.00	0.03	0.034	3.630	< 2.00	7.4	< 0.50	5.42	0.13	5.2		98	0.228	62.0	26	2.63
		Bottom (12m)	10/31/06		1.11	51	< 0.050	0.023	< 2.00	38.5	< 1.7	< 0.100	< 0.50	12.2	< 50	2.04		< 1.00	< 2.00						0.103	< 2.00	3.859	3151	< 0.2	< 2.00	0.02	< 0.005	3.430	< 2.00	2.5	< 0.50	5.22	1.88	0.77		66	0.04	5.0	3.6	1.95

TABLE 2.3-19 (Sheet 3 of 6)
2006 SURFACE WATER ANALYTICAL RESULTS

Station Description	Station Location	Depth/Type	Date/Time	Daily Discharge	Alkalinity (Total Inflection Point) meq/L	Alkalinity, Total mg/L	Aluminum mg/L	Ammonia mg-N/L	Arsenic ug/L	Barium ug/L	BOD-5 mg/L	Boron mg/L	Cadmium ug/L	Calcium mg/L	Chemical Oxygen Demand mg/L	Chloride mg/L	Chlorophyll a mg/m^3	Chromium ug/L	Copper ug/L
109	Broad River, channel	0.3 m	5/1/06		0.39	22	0.173	0.28	< 2.00	21.0	< 2.4	< 0.100	< 0.50	3.91	< 50	9.45	9.29	1.32	2.11
		Mid-depth	5/1/06		0.39	20	0.203	0.35	< 2.00	21.2	< 2.4	< 0.100	< 0.50	3.90	< 50	9.40	3.69	1.27	2.36
		0.3 m	8/23/06		0.45	26	0.191	0.16	< 2.00	19.3	< 3.1	< 0.100	< 0.50	4.20	< 50	9.67	3.20	1.02	2.61
		0.3 m	11/1/06		0.46	22	0.126	0.044	< 2.00	19.2	2.5	< 0.100	< 0.50	4.37	87	8.48	2.72	< 1.00	< 2.00
110	MUPB	0.3 m	2/27/06		0.60	31	< 0.050	0.079	< 2.00	14.8	< 2.0	< 0.100	< 0.50	7.39	< 50	1.65	7.26	< 1.00	< 2.00
		0.3 m	5/1/06		0.64	34	< 0.050	0.028	< 2.00	13.5	< 2.7	< 0.100	< 0.50	7.99	< 50	1.87	1.82	< 1.00	3.27
		0.3 m	8/22/06		0.62	36	< 0.050	< 0.020	< 2.00	13.0	< 2.6	< 0.100	< 0.50	7.68	< 50	1.92	1.34	< 1.00	< 2.00
		0.3 m	10/31/06		0.64	29	< 0.050	< 0.020	< 2.00	14.6	3.8	< 0.100	< 0.50	7.72	< 50	1.79	4.38	< 1.00	< 2.00
		Bottom (16m)	2/27/06		0.68	37	< 0.050	0.50	< 2.00	33.8	< 2.0	< 0.100	< 0.50	7.28	< 50	1.80		< 1.00	< 2.00
		Bottom (13m)	5/1/06		0.62	35	0.051	0.53	< 2.00	15.7	< 2.5	< 0.100	< 0.50	7.82	< 50	1.83	3.10	< 1.00	< 2.00
		Bottom (17m)	8/22/06		1.10	62	< 0.050	2.6	< 2.00	93.4	11	< 0.100	< 0.50	8.97	< 50	0.59		< 1.00	< 2.00
		Bottom (16.5m)	10/31/06		0.75	36	< 0.050	0.41	< 2.00	33.4	< 1.7	< 0.100	< 0.50	8.16	< 50	1.77		< 1.00	< 2.00

Station Description	Station Location	Depth/Type	Date/Time	Enterococci Enterococci/100mL	ESCHERICHIA COLI E.coli/100mL	FECAL COLIFORM FC/100mL	FECAL STREPTACOCCI FS/100mL	Hardness*** mg/L-$CaCO_3$	Iron mg/L	Lead ug/L	Magnesium mg/L	Manganese ug/L	Mercury ug/L	Nickel ug/L	$NO^2 + NO^3$ mg-N/L	Ortho-phosphate mg-P/L	Potassium mg/L	Selenium ug/L	Silica (as Silicon) mg-Si/L	Silver ug/L	Sodium mg/L	Sulfate mg/L	TKN mg-N/L	Total Coliform TC/100mL	Total Dissolved Solids mg/L	Total Phosphorus mg-P/L	Total Suspended Solids mg/L	Turbidity NTU	Zinc ug/L
109	Broad River, channel	0.3 m	5/1/06	14		130	240	16.30	0.993	< 2.00	1.589	61.1	< 0.10	< 2.00	0.42	0.056	1.850	< 2.00	6.1	< 0.50	10.0	4.46	0.44	900		0.118	10.0	6.2	10.3
		Mid-depth	5/1/06	23		30	110	16.27	0.840	< 2.00	1.586	61.9	< 0.10	< 2.00	0.43	0.059	1.870	< 2.00	6.1	< 0.50	9.93	4.60	0.39	240		0.121	12.0	6.1	12.6
		0.3 m	8/23/06	4	34	50		18.11	0.855	< 2.00	1.850	47.88	< 0.10	< 2.00	0.49	0.084	2.540	< 2.00	6.5	< 0.50	15.9	9.76	0.37	> 2420	76	0.119	10.0	9.6	1.55
		0.3 m	11/1/06		31	50			0.896	< 2.00	1.815	39.61	< 0.042	< 2.00	0.24	0.03	2.480	< 2.00	6.1	< 0.50	11.5	7.25	0.29		72	0.071	8.0	11	1.53
110	MUPB	0.3 m	2/27/06			2		27.96	0.213	< 2.00	2.311	91.5	< 0.10	< 2.00	0.05	< 0.005	2.310	< 2.00	3.5	< 0.50	3.69	3.41	0.55		50	0.013	2.0	1.6	< 1.00
		0.3 m	5/1/06	2		< 2	2	29.86	0.083	9.04	2.407	22.76	< 0.10	< 2.00	0.01	< 0.005	2.440	< 2.00	2.9	< 0.50	4.00	3.54	0.41	7		0.009	2.0	1.3	29.4
		0.3 m	8/22/06	< 1	2	< 2		29.85	0.044	< 2.00	2.596	15.48	< 0.10	< 2.00	0.02	< 0.005	2.570	< 2.00	3.1	< 0.50	4.33	3.65	0.39	488	50	0.007	1.0	0.59	< 1.00
		0.3 m	10/31/06		< 1	2			0.062	< 2.00	2.599	46.36	< 0.2	< 2.00	0.05	< 0.005	2.500	< 2.00	3.1	< 0.50	4.23	3.47	0.44		64	0.008	< 4.0	1.5	< 1.00
		Bottom (16m)	2/27/06			< 2		27.81	0.872	< 2.00	2.336	1543	< 0.10	< 2.00	0.05	< 0.005	2.250	< 2.00	3.8	< 0.50	3.60	2.79	0.70		54	0.013	4.0	4.5	< 1.00
		Bottom (13m)	5/1/06	< 2		< 2	< 2	29.42	0.182	2.94	2.405	27.90	< 0.10	< 2.00	0.09	< 0.005	2.360	< 2.00	3.0	< 0.50	3.84	3.41	0.47	< 2		0.011	3.0	1.3	10.19
		Bottom (17m)	8/22/06					33.55	20.2	< 2.00	2.709	4636	< 0.10	< 2.00	0.05	0.012	2.510	< 2.00	6.0	< 0.50	3.89	0.30	3.0		62	0.046	42.0	12	1.03
		Bottom (16.5m)	10/31/06						2.68	< 2.00	2.583	1498	< 0.2	< 2.00	0.08	< 0.005	2.46	< 2.00	3.7	< 0.50	4.03	2.42	0.86		54	0.016	< 4.0	3.3	< 1.00

TABLE 2.3-19 (Sheet 4 of 6)
2006 Surface Water Analytical Results

		Field Results				Analytical Results										
		Temperature	pH	Spec Cond	DO	Alkalinity (Total Inflection Point)	Alkalinity, Total	Aluminum	Ammonia	Arsenic	Barium	BOD-5	Boron	Cadmium	Calcium	Chemical Oxygen Demand
Sample Location	Units:	°F	Std	µS/cm	mg/L	meq/L	mg/L	mg/L	mg-N/L	ug/L	ug/L	mg/L	mg/L	ug/L	mg/L	mg/L
All Surface Water Samples																
Average		60.2	7.23	98.8	7.44	0.58	30.4	0.12	0.30	2.00	25.3	3.22	0.10	0.50	6.33	54.7
Minimum		45.3	5.32	55.3	0.20	0.33	16.0	0.05	0.02	2.00	12.5	1.70	0.10	0.50	3.61	17.0
Maximum		85.8	9.37	326	12.0	1.78	98.0	0.27	4.50	2.18	148	22.0	0.10	0.50	14.3	130
Standard Deviation		13.0	0.64	40.8	3.32	0.29	15.4	0.07	0.80	0.03	25.3	2.96	-	-	2.85	18.3
# of samples collected		270	270	270	270	55	55	55	54	55	55	55	55	55	55	55
# of samples < Rpt Limit		0	0	0	0	0	2	17	4	51	0	42	55	55	0	47
Surface Water																
Broad River																
Average		62.0	7.08	95.4	9.08	0.42	22.0	0.16	0.14	2.01	19.2	2.60	< 0.1	< 0.5	4.01	60.7
Minimum		45.3	5.32	72.5	6.65	0.36	16.0	0.09	<0.02	<2	15.1	1.70	< 0.1	< 0.5	3.61	<17
Maximum		82.1	7.61	120	12.0	0.50	26.0	0.27	0.50	2.18	22.4	4.00	< 0.1	< 0.5	4.5	130
Standard Deviation		12.8	0.65	17.5	1.60	0.04	2.95	0.05	0.12	0.04	2.03	0.75	-	-	0.31	24.9
# of samples collected		100	100	100	100	23	23	23	23	23	23	23	18	18	23	23
# of samples < Rpt Limit		0	0	0	0	0	2	0	1	19	0	19	23	23	0	15
Backwater																
Average		62.4	7.35	89.3	9.36	0.44	23.8	0.19	0.06	<2	20.2	3.46	< 0.1	< 0.50	4.23	46.4
Minimum		46.8	5.58	76.10	4.71	0.33	20.0	0.15	<0.02	<2	17.1	1.70	< 0.1	< 0.50	3.67	<17
Maximum		81.6	8.17	107.6	11.8	0.56	27.0	0.24	0.14	<2	25.8	6.20	< 0.1	< 0.50	5.58	54.0
Standard Deviation		14.3	0.72	11.2	2.31	0.06	2.87	0.03	0.04	-	3.06	1.64	-	-	0.59	12.0
# of samples collected		17	17	17	17	8	8	8	8	8	8	8	6	6	8	8
# of samples < Rpt Limit		0	0	0	0	0	0	0	1	8	0	5	8	8	0	7
Shallow Samples																
Impoundments			**All Impoundments**													
Average		58.1	7.33	102.13	6.16	0.66	35.5	0.06	0.05	<2	15.0	2.59	< 0.1	< 0.50	8.69	53.7
Minimum		46.1	5.54	55.27	0.20	0.45	22.0	0.05	<0.02	<2	12.5	1.70	< 0.1	< 0.50	7.39	<50
Maximum		85.8	9.37	325.80	10.50	0.88	51.0	0.12	0.10	<2	18.8	4.00	< 0.1	< 0.50	9.77	94.0
Standard Deviation		12.6	0.62	51.95	3.66	0.17	10.5	0.02	0.03	-	2.06	0.70	-	-	0.85	12.7
# of samples collected		153	153	153	153	12	12	12	12	12	12	12	9	9	12	12
# of samples < Rpt Limit		0	0	0	0	0	0	10	2	12	0	10	12	12	0	11
Bottom Samples																
Impoundments																
Average						0.89	45.8	0.07	1.00	<2	50.6	4.89	< 0.1	< 0.50	9.84	<50
Minimum						0.45	23.0	0.05	0.02	<2	12.7	1.70	< 0.1	< 0.50	7.28	<50
Maximum						1.78	98.0	0.13	4.50	<2	148	22.0	< 0.1	< 0.50	14.34	<50
Standard Deviation						0.45	23.9	0.03	1.54	-	47.0	5.95	-	-	2.19	-
# of samples collected						12	12	12	12	12	12	12	9	9	12	12
# of samples < Rpt Limit						0	0	7	0	12	0	8	12	12	0	12

TABLE 2.3-19 (Sheet 5 of 6)
2006 Surface Water Analytical Results

	Analytical Results														
	Chloride	Chlorophyll a	Chromium	Copper	Enterococci	Escherichia Coli	Fecal Coliform	Fecal Streptacocci	Hardness	Iron	Lead	Magnesium	Manganese	Mercury	Nickel
Sample Location	mg/L	mg/m^3	ug/L	ug/L	Enterococci / 100mL	E.coli/100mL	FC/100mL	FS/100mL	$mg/L\text{-}CaCO_3$	mg/L	ug/L	mg/L	ug/L	ug/L	ug/L
All Surface Water Samples															
Average	5.67	11.33	1.11	2.22	15	16	31	188	23.8	1.94	2.15	2.05	527	0.11	2.02
Minimum	0.47	0.96	1.00	2.00	1	1	2	2.00	15.0	0.04	2.00	1.16	11.1	0.04	2.00
Maximum	10.8	90.5	1.68	4.97	126	44	240	900	54.3	28.5	9.04	4.50	7458	0.27	2.95
Standard Deviation	4.00	19.1	0.18	0.49	25	14	49	255	9.90	5.37	0.96	0.85	1527	0.05	0.13
# of samples collected	55	45	55	54	27	20	48	16	43	55	55	55	55	55	55
# of samples < Rpt Limit	0	0	34	34	6	2	10	3	0	0	53	0	0	54	54
Surface Water															
Broad River															
Average	8.76	3.40	1.17	2.35	24	28	55	363	16.5	0.85	<2	1.67	47.7	< 0.10	NA
Minimum	2.02	0.96	1.00	<2	4	15	4	110	15.0	0.42	<2	1.45	25.8	< 0.10	< 2.00
Maximum	10.8	9.29	1.68	4.97	126	44	240	900	18.4	1.11	<2	1.88	61.9	< 0.10	2.95
Standard Deviation	1.71	1.93	0.21	0.67	32	9	62	264	1.23	0.20	-	0.16	11.5	-	NA
# of samples collected	23	23	23	23	14	10	23	8	19	23	23	23	23	18	18
# of samples < Rpt Limit	0	0	8	11	0	0	0	0	0	0	23	0	0	23	22
Backwater															
Average	9.10	45.0	1.24	2.11	13	10	20	30	18.0	1.22	<2	1.72	136	< 0.10	< 2.00
Minimum	7.57	14.8	<1	<2	<2	4	<2	30	15.9	0.82	<2	1.54	40.0	< 0.10	< 2.00
Maximum	9.94	90.5	1.57	2.39	23	17	70	30	22.3	1.67	<2	2.03	320	< 0.10	< 2.00
Standard Deviation	0.83	25.3	0.20	0.16	11	5	22	-	2.26	0.30	0.00	0.15	88.5	0.00	0.00
# of samples collected	8	8	8	8	4	4	8	2	6	8	8	8	8	6	6
# of samples < Rpt Limit	0	0	2	4	0	0	1	0	0	0	8	0	0	8	8
Shallow Samples															
Impoundments															
Average	1.40	5.00	<1	2.16	2	2	4	4	31.75	0.09	2.59	2.46	32.37	< 0.10	< 2.00
Minimum	0.47	1.34	<1	<2	<1	<1	<2	<2	25.18	0.04	<2	1.16	11.10	< 0.10	< 2.00
Maximum	2.28	22.91	<1	3.27	7	4	17	9	39.03	0.21	9.04	3.89	91.5	< 0.10	< 2.00
Standard Deviation	0.73	5.95	-	0.38	2	1	4	4	5.41	0.06	2.03	1.06	26.2	NA	-
# of samples collected	12	12	12	12	6	6	12	3	9	12	12	12	12	0	9
# of samples < Rpt Limit	0	0	12	9	4	2	5	1	0	0	11	0	0	12	12
Bottom Samples															
Impoundments															
Average	1.76	5.87	<1	2.08	6	NA	3	10	35.2	6.33	2.08	2.59	2078	NA	< 2.00
Minimum	0.47	3.10	<1	<2	<2	NA	<2	<2	25.0	0.10	<2	1.16	15.0	< 0.10	< 2.00
Maximum	9.60	8.65	<1	2.47	14	NA	8	27	54.3	28.5	2.94	4.50	7458	0.27	< 2.00
Standard Deviation	2.55	3.93	-	0.18	7	NA	2	14	10.4	10.7	0.27	1.21	2810	NA	-
# of samples collected	12	2	12	12	3	NA	6	3	9	12	12	12	12	9	9
# of samples < Rpt Limit	0	0	12	10	2		4	2	0	0	11	0	0	11	12

TABLE 2.3-19 (Sheet 6 of 6)
2006 Surface Water Analytical Results

	Analytical Results														
	NO2 + NO3	Ortho-phosphate	Potassium	Selenium	Silica (as Silicon)	Silver	Sodium	Sulfate	TKN	Total Coliform	Total Dissolved Solids	Total Phosphorus	Total Suspended Solids	Turbidity	Zinc
Sample Location	mg-N/L	mg-P/L	mg/L	ug/L	mg-Si/L	ug/L	mg/L	mg/L	mg-N/L	TC/100mL	mg/L	mg-P/L	mg/L	NTU	ug/L
All Surface Water Samples															
Average	0.23	0.03	2.53	2.00	4.36	0.50	7.98	4.99	0.64	752	64.1	0.07	11.5	8.05	7.59
Minimum	0.01	0.01	1.51	2.00	0.50	0.50	0.69	0.13	0.15	2	30.0	0.01	1.00	0.59	1.00
Maximum	0.60	0.11	3.66	2.00	7.40	0.50	16.0	9.77	5.20	2420	98.0	0.30	62.0	34.0	50.3
Standard Deviation	0.19	0.03	0.65	-	2.22	-	4.66	2.34	0.88	909	17.3	0.06	12.4	6.98	10.2
# of samples collected	54	54	55	55	55	55	55	55	55	27	38	55	53	55	55
# of samples < Rpt Limit	0	22	0	55	4	55	0	0	0	2	0	0	1	0	7
Surface Water															
Broad River															
Average	0.42	0.06	2.09	< 2.00	6.07	< 0.50	11.70	6.26	0.30	1048	74.6	0.10	10.2	8.32	5.44
Minimum	0.23	0.03	1.51	< 2.00	5.10	< 0.50	8.46	2.63	0.15	70	52.0	0.06	3.00	5.20	1.24
Maximum	0.60	0.11	2.55	< 2.00	6.60	< 0.50	16.0	9.77	0.44	>2420	98.0	0.14	20.0	11.0	12.6
Standard Deviation	0.09	0.02	0.40	-	0.33	-	2.47	2.17	0.08	1036	12.7	0.03	3.71	2.11	4.31
# of samples collected	23	23	23	18	23	18	23	23	23	14	14	23	23	23	23
# of samples < Rpt Limit	0	0	0	23	0	23	0	0	0	0	0	0	0	0	0
Backwater															
Average	0.15	0.01	2.19	< 2.00	5.33	< 0.50	11.3	6.13	0.67	876	61.3	0.12	20.0	16.7	3.88
Minimum	<0.01	<0.005	1.65	< 2.00	4.50	< 0.50	8.12	4.17	0.41	23	52.0	0.06	10.0	9.60	1.45
Maximum	0.39	0.06	2.65	< 2.00	6.40	< 0.50	14.9	9.59	1.10	1986	76.0	0.30	30.0	25.0	10.3
Standard Deviation	0.13	0.02	0.37	0.00	0.61	-	2.14	1.96	0.24	980	8.55	0.08	6.61	4.80	3.74
# of samples collected	8	8	8	6	8	6	8	8	8	4	6	8	8	8	8
# of samples < Rpt Limit	0	1	0	8	0	8	0	0	0	0	0	0	0	0	0
Shallow Samples															
Impoundments															
Average	0.06	<0.005	3.07	< 2.00	1.65	< 0.50	3.38	3.41	0.43	347	53.56	0.01	2.25	1.56	10.68
Minimum	<0.01	<0.005	2.31	< 2.00	<0.5	< 0.50	0.72	0.18	0.36	<2	32.00	0.01	1.00	0.59	<1
Maximum	0.17	<0.005	3.65	< 2.00	3.50	< 0.50	5.57	4.92	0.56	866	66.00	0.02	6.00	4.40	46.13
Standard Deviation	0.05	-	0.48	-	1.17	0.00	1.98	1.28	0.06	385	11.70	-	1.60	0.99	14.40
# of samples collected	12	12	12	9	12	9	12	12	12	6	9	12	12	12	12
# of samples < Rpt Limit	0	12	0	12	2	12	0	0	0	1	0	0	0	0	5
Bottom Samples															
Impoundments															
Average	0.06	0.01	3.08	< 2.00	3.13	< 0.50	3.27	3.40	1.47	12	60.0	0.05	16.3	8.25	11.1
Minimum	0.02	<0.005	2.25	< 2.00	<0.5	< 0.50	0.69	0.13	0.38	<2	30.0	0.01	2.00	0.71	<1
Maximum	0.20	0.03	3.66	< 2.00	7.40	< 0.50	5.42	5.85	5.20	30	98.0	0.23	62.0	34.0	50.3
Standard Deviation	0.05	0.01	0.53	-	2.42	-	1.91	1.90	1.66	16	24.5	0.08	22.4	10.7	14.5
# of samples collected	12	12	12	9	12	9	12	12	12	3	9	12	12	12	12
# of samples < Rpt Limit	0	9	0	12	2	12	0	0	0	1	0	0	1	0	2

Mid-depth = approximate half-way point between surface and bottom depth. See Figure 2.3-21 for station locations.

TABLE 2.3-20 (Sheet 1 of 2)
STATISTICAL SUMMARY OF 2006-2007 GROUNDWATER ANALYTICAL RESULTS

Parameter	Units	Average	Min	Max	St.Dev	n	n < RL
Temperature	°C	17.0	15.5	18.4	0.68	40	0
pH	pH Units	6.08	4.92	7.61	0.70	40	0
Specific Conductance	μS/cm	141	31	327	74.0	40	0
Dissolved Oxygen	mg/L	4.96	0.17	16.3	3.32	40	0
Field Turbidity (NTU)	NTU	13.0	0	116	21.5	39	0
Alkalinity, Bicarbonate	mg/L	60.2	5	130	33.2	31	1
Alkalinity, Total	mg/L	68.5	16	170	39.2	31	0
Aluminum	mg/L	0.33	0.05	2.26	0.55	30	11
Ammonia	mg-N/L	0.39	0.03	1.40	0.28	40	0
Arsenic	μg/L	2	2	2	0	40	40
Barium	μg/L	81.3	12.7	512	102	40	0
BOD-5	mg/L	2.59	2	3.50	0.49	40	39
Boron	mg/L	0.10	0.10	0.10	0.00	40	40
Cadmium	μg/L	0.56	0.50	1.50	0.19	40	36
Calcium	mg/L	12.6	2.44	27.0	7.32	40	0
Carbon Dioxide	mg/L	76.5	0.10	300	67.3	31	6
Chemical Oxygen Demand	mg/L	50.2	20	150	26.9	40	31
Chloride	mg/L	2.15	0.63	3.59	0.63	40	0
Chromium	μg/L	2.84	1	21	3.46	39	2
Copper	μg/L	3.59	2	28	5.77	40	29
Escherichia Coliform	/100ML	1	1	1	0	10	10
Fecal Coliform	/100ML	4	2	10	3.41	40	40
Fecal Streptacocci	/100ML	1.30	0	10	1.66	40	37
Hardness	mg/L-$CaCO_3$	41.9	8.57	91.3	23.5	40	0
Iron	mg/L	0.41	0.01	5.33	0.97	38	3
Lead	μg/L	2.03	2	3.10	0.18	40	38
Magnesium	mg/L	2.55	0.60	7.38	1.61	40	0
Manganese	μg/L	165	4.33	1139	298	40	0
Mercury	μg/L	0.15	0.10	0.20	0.05	40	38
Nickel	μg/L	2.16	2	4.80	0.53	40	35
Nitrate	mg/L	0.94	0.10	5.69	1.27	40	15
Nitrite	mg/L	0.10	0.10	0.21	0.02	40	38
o-Phosphate	mg-P/L	0.09	0.01	0.30	0.06	40	0
pH (Lab)	pH units	6.41	5.60	11	1.12	32	0
Potassium	mg/L	2.49	0.46	10.68	2.24	20	0
Selenium	μg/L	2	2	2	0	40	40
Silicon	mg/L	16.9	12.8	26.5	2.47	40	0
Silver	μg/L	0.51	0.50	1.07	0.09	40	39

TABLE 2.3-20 (Sheet 2 of 2)
STATISTICAL SUMMARY OF 2006-2007 GROUNDWATER ANALYTICAL RESULTS

Parameter	Units	Average	Min	Max	St.Dev	n	n < RL
Sodium	mg/L	10.3	5.84	19.5	3.62	20	0
Sulfate	mg/L	3.84	0.61	22.2	4.75	40	0
TKN	mg-N/L	0.47	0.10	1.80	0.35	40	4
Total Coliform	/100ML	304	1	2420	730	30	13
Total Dissolved Solids	mg/L	107	56	190	38.2	32	0
TP	mg-P/L	0.08	0.02	0.32	0.05	40	0
TSS	mg/L	21.4	4	196	38.5	40	20
Zinc	μg/L	7.79	1	82.3	15.3	40	2

Average = arithmetic mean
RL = Reporting Limit

TABLE 2.3-21
COMPARISON OF HISTORICAL AND RECENT GROUNDWATER ANALYTICAL RESULTS

		pH (Std Units)	Dissolved Solids	Alkalinity Bicarbonate as $CaCO_3$	Total Hardness mg/L - $CaCO_3$	Iron	Calcium	Magnesium	Chloride	Sulfate	Turbidity (NTU)	Specific Conductance (µS/cm)
Historical Data	Mean:	6.71	102	56.9	52.6	0.53	13.1	4.56	1.37	1.40	9.59	128
	Minimum:	5.8	24	12	7.10	0.10	0.40	0.20	0.04	0.18	0	30
	Maximum:	7.8	488	256	299	1.3	88.4	18.7	5.12	6.00	42	610
	Std.Dev.	0.6	105	54.2	66.0	0.6	20.7	3.97	1.46	1.78	11.7	131
Recent Data	Mean:	6.08	107	60.2	41.9	0.41	12.6	2.55	2.15	3.84	13.0	141
	Minimum:	4.92	56.0	5.00	8.57	0.01	2.44	0.6	0.6	0.61	0.00	31.0
	Maximum:	7.61	190	130	91.3	5.33	27.0	7.38	3.59	22.2	116	327
	Std.Dev.	0.70	38.2	33.19	23.5	0.97	7.32	1.61	0.6	4.75	21.5	74.0

Historical data collected during 1970s environmental study for Duke Cherokee Nuclear Station site.

Recent data collected 2006–2007 on a quarterly basis from 10 monitoring wells surrounding the existing site excavation.

Units are mg/L unless noted otherwise.

TABLE 2.3-22
LIST OF IMPAIRED WATERS OF THE UPPER BROAD RIVER

BASIN	HUC	LOCATION	STATION	COUNTY	USE	CAUSE
BROAD	30501051601	BROAD RVR AT SC 18 4 MI. NE GAFFNEY	B-042	CHEROKEE	REC	CU
BROAD	30501050805	BUFFALO CK AT SC 5 1 MI. W OF BLACKSBURG	B-057	CHEROKEE	AL	CU
BROAD	30501051602	CHEROKEE CREEK AT SC 329	B-679	CHEROKEE	AL	BIO
BROAD	30501051602	LAKE WHELCHEL 2.7 MI. N OF GAFFNEY	RL-01029	CHEROKEE	AL	PH
BROAD	30501051602	LAKE WHELCHEL 2.7 MI. N OF GAFFNEY	RL-01029	CHEROKEE	AL	CHLA

REC Recreational Use Support (Swimming)
AL Aquatic Life Use Support

CU Copper
BIO Macroinvertebrate
CHLA Chlorophyll A
PH Hydrogen Ion Concentration

Source: Reference 31

See Figure 2.3-24

TABLE 2.3-23
NPDES SITES - USGS HYDROLOGICAL UNIT 03050105, UPPER BROAD RIVER BASIN, SOUTH CAROLINA

Watershed ID	Permit Number	Permit Status	County	Facility Name	Facility Type	Receiving Stream	Permitted Flow (MGD)	Limitation	Distance/ Direction (to site) mi.
03050105-050	SC0002429	Active	Spartanburg	Spartan Mills	Major Industrial	Little House Creek	M/R	Water Quality	21 (SE)
03050105-090	SC0002755	Active	Cherokee	SC Distributors, Inc.	Minor Domestic	Broad River	0.04	Effluent	2 (SE)
03050105-090	SC0003182	Active	Cherokee	Milliken & CO./ Magnolia Plant	Major Industrial	Broad River	3.10 (PH I)	Effluent	6 (SE)
03050105-090	SC0003182	Active	Cherokee	Milliken & CO./ Magnolia Plant	Major Industrial	Broad River	3.89 (PH II)	Effluent	6 (SE)
03050105-090	SCG250199	Active	Cherokee	Core Molding Technologies	Major Industrial	Broad River	M/R	Effluent	7 (SE)
03050105-090	SC0035947	Active	Cherokee	Champion Products (National Textiles)	Major Industrial	Broad River	2.0	Effluent	4.5 (SE)
03050105-090	SC0047091	Active	Cherokee	City of Gaffney/ Peoples Creek Plant	Major Domestic	Broad River	4.0	Water Quality	5.5 (SE)
03050105-090	SC0047457	Active	Cherokee	Town of Blacksburg/ Canoe Creek Plant	Major Domestic	Broad River	0.68	Water Quality	5.2 (SE)
03050105-090	SCG830024	Active	Cherokee	Colonial Pipeline	Major Industrial	Peoples Creek	M/R	Effluent	3.5 (SE)
03050105-090	SCR000134	Active	Cherokee	Alcoa Building Products	Major Industrial	Peoples Creek	M/R	Effluent	7 (SE)
03050105-090	SCR003352	Active	Cherokee	Spring Industries, inc. Limestone Plant	Major Industrial	Peoples Creek	M/R	Effluent	7.5 (SE)
03050105-090	SCG250167	Active	Cherokee	Hamrick Mills	Major Industrial	Peoples Creek	M/R	Effluent	7 (SE)
03050105-100	SC0042196	Active	Cherokee	Sharma Petroleum, LLC	Minor Industrial	Buffalo Creek	0.0075	Water Quality	7 (S)
03050105-100	SCG730484	Active	Cherokee	B&W Enterprises/ Bailey Mine	Mining	Buffalo Creek	M/R	Effluent	6.8 (S)
03050105-100	SCG250043	Inactive	Cherokee	TNS Mills, Inc. Blacksburg Plant (Closed)	Minor Industrial	Buffalo Creek	M/R	Effluent	6 (S)
03050105-100	SC0032433	Active	Cherokee	Broad River Truck Stop	Minor Domestic	Buffalo Creek Tributary	0.01	Water Quality	6.5 (SE)
03050105-110	SCG645045	Active	Cherokee	BPW/Victor Gaffney WTP	Minor Domestic	Providence Branch	1.02	Water Quality	Not Listed

M/R - Monitoring and Reporting
Source: Reference 1

TABLE 2.3-24
POTENTIAL NONPOINT POLLUTION SOURCES - USGS HYDROLOGIC UNIT 03050105, UPPER BROAD RIVER BASIN, SOUTH CAROLINA

Watershed ID	Permit Number	Permit Type	County	Facility Name	Facility Type	Status	Nearest Waterbody	Distance/ Direction (to stream) mi.	Distance/ Direction (to site) mi.
03050105-090	DWP-918, DWP-908	Landfill	Cherokee	City of Gaffny Landfill	Domestic	Closed	Broad River	0.5 (E)	9 (SE)
03050105-090	CWP-22	Landfill	Cherokee	City of Gaffny Landfill	Domestic	Unknown	Broad River	1	9 (SE)
03050105-090	1110011-6001 (SCD001411040)	Landfill	Cherokee	City of Gaffny Landfill	Industrial	Closed	Broad River	1	7.5 (SE)
03050105-090	None Listed	Landfill	Cherokee	Blacksburg Dump - Metromont	Domestic	Closed	Unknown	Unknown	Unkonwn
03050105-090	111001-5101	Landfill	Cherokee	Cherokee Recycling Center	Recycling	Active	Peoples Creek	1	7.5 (ESE)
03050105-090	IWP-142	Landfill	Cherokee	Duke Power Burial Site	Industrial	Unknown	Make-Up Pond B	>0.5 (NE)	1 (NE)
03050105-090	ND0070980	Land Application	Cherokee	Sprayfield Peeler Rug Company	Industrial	Active	Sarratt Creek	0.5 (SE)	14.5 (SE)
03050105-090	ND0069451	Land Application	York	Sprayfield Screen Printers	Industrial	Active	Guyonmoore Creek	0.5 (SW)	7 (W)
03050105-090	0042-21	Mining	Cherokee	Randolph Broad River Plant	Sand	Active	Broad River	>0.2 (S)	1 (S)
03050105-090	0869-21	Mining	Cherokee	Thomas Sand Co. Blacksburg Plant	Sand	Active	Broad River	>0.1(SE)	9.5 (SE)
03050105-090	1070-21	Mining	Cherokee	Ray Brown Enterprises No. 3 Sand mine	Sand	Active	Broad River	>0.2 (W)	10 (SE)
03050105-100	IWP-179 (SCD001700863)	Landfill	Cherokee	Monsanto Textiles Company	Industrial	Active	Buffalo Creek	>0.2 (W)	8.2 (SSW)
03050105-110	1110011-1101	Landfill	Cherokee	Cherokee County Landfill	Domestic	Closed	Lake Whelchel	1 (SW)	7.5 (SE)
03050105-110	0113-21	Mining	Cherokee	Boren Brick Red Clay Pit	Clay	Active	Cherokee Creek	0.5 (S)	5.5 (SE)
03050105-110	0114-21	Mining	Cherokee	Boren Brick Shale Pit	Shale	Active	Cherokee Creek	0.5 (N)	5 (SE)

Source: Reference 1

TABLE 2.3-25 (Sheet 1 of 6)
OTHER POTENTIAL POLLUTION SOURCES LISTED IN EPA ENVIROFACTS DATA WAREHOUSE CHEROKEE COUNTY, SOUTH CAROLINA

	FACILITY NAME/ADDRESS	Permitted Discharges to Water	Toxic Releases Reported	Hazardous Waste Handler	Active or Archived Superfund Report	Air Releases Reported
1	ACCURATE PLATING INCORPORATED 150 BEAVER RIDGE RD GAFFNEY, SC 29340			X		
2	ADVANCED ENVIRONMENTAL OPTIONS INC 345 WINDSLOW AVE GAFFNEY, SC 29341			X		
3	ALCOA BUILDING PRODUCTS 100 CELLWOOD PLACE GAFFNEY, SC 29340	X	X	X		X
4	B&W ENTERPRISE NA/BAILEY MINE 1050 BLACKSBURG HIGHWAY BLACKSBURG, SC 29702	X				
5	BIC CORPORATION 1 COMMERCE DRIVE GAFFNEY, SC 29340		X	X		X
6	BOMMER INDUSTRIES INCORPORATED GAFFNEY 584 PEACHOID RD GAFFNEY, SC 29340		X	X		X
7	BROAD RIVER ENERGY CENTER 1124 VICTORY PAGE TRAIL ROAD GAFFNEY, SC 29340		X	X		X
8	BROWN PACKING COMPANY 116 WILLIS STREET GAFFNEY, SC 29342					X
9	BROWN PACKING COMPANY INCORPORATED 227 BOYD STREET GAFFNEY, SC 29340	X				
10	BURNS CHEVROLET INCORPORATED 2315 NORTH LIMESTONE STREET GAFFNEY, SC 29340			X		X
11	CAROLINA COLLISION 400 W FREDRICK ST GAFFNEY, SC 29341			X		
12	CAROLINA TIRE 1466 113 CHEROKEE AVENUE GAFFNEY, SC 29340-2453			X		
13	CARQUEST AUTO PARTS OF GAFFNEY 1113 CHEROKEE AVE GAFFNEY, SC 29340			X		
14	CHEROKEE COUNTY COGENERATION PARTNERS L P 132 PEOPLES CREEK ROAD GAFFNEY, SC 29342			X		X
15	CHEROKEE ELECTRIC MOTORS 318 S GRANARD ST GAFFNEY, SC 29340			X		

TABLE 2.3-25 (Sheet 2 of 6)
OTHER POTENTIAL POLLUTION SOURCES LISTED IN EPA ENVIROFACTS DATA WAREHOUSE CHEROKEE COUNTY, SOUTH CAROLINA

	FACILITY NAME/ADDRESS	Permitted Discharges to Water	Toxic Releases Reported	Hazardous Waste Handler	Active or Archived Superfund Report	Air Releases Reported
16	CHEROKEE FINISHING CO 509 W BUFORD ST GAFFNEY, SC 29340			X		
17	CHEROKEE FINISHING COMPANY SPARTAN MILLS 418 CHANDLER DR. GAFFNEY, SC 29340-3952		X	X		X
18	COKER INTERNATIONAL LLC-CLOSED 859 VICTORY TRAIL ROAD GAFFNEY, SC 29340					X
19	CORE MOLDING TECHNOLOGIES 24 COMMERCE DRIVE GAFFNEY, SC 29340	X	X	X		X
20	DRAGON PLATING & ANODIZING INCORPORATED 254 HENDERSON ST GAFFNEY, SC 29341			X		X
21	DUKE POWER GASTON SHOALS HYDRO 437 DRAVO RD BLACKSBURG, SC 29702			X		
22	DW STACY COMPANY INCORPORATED 452 HYATT ST GAFFNEY, SC 29341			X		
23	F & R ASPHALT COMPANY PLT #3 520 GAFFNEY FERRY ROAD GAFFNEY, SC 29340					X
24	FASHION ENGRAVERS INC 220 E FREDERICK ST GAFFNEY, SC 29340			X		
25	FASHION TECHNOLOGIES INCORPORATED 373 HUNTINGTON DRIVE GAFFNEY, SC 29341			X		
26	FASHION TECHNOLOGIES INCORPORATED PLANT 1 302 HYATT STREET GAFFNEY, SC 29341		X	X		X
27	FOWLERS RADIATOR SHOP 2928 CHEROKEE GAFFNEY, SC 29340			X	X	
28	FREIGHTLINER CUSTOM CHASSIS CORPORATION 552 HYATT ST. GAFFNEY, SC 29341	X	X	X		X
29	GAFFNEY MAINTENANCE SHOP CITY OF 503 RUTLEDGE ST GAFFNEY, SC 29340			X		
30	GAFFNEY SENIOR HIGH SCHOOL 805 E FREDERICK GAFFNEY, SC 29340			X		

TABLE 2.3-25 (Sheet 3 of 6)
OTHER POTENTIAL POLLUTION SOURCES LISTED IN EPA ENVIROFACTS DATA WAREHOUSE CHEROKEE COUNTY, SOUTH CAROLINA

	FACILITY NAME/ADDRESS	Permitted Discharges to Water	Toxic Releases Reported	Hazardous Waste Handler	Active or Archived Superfund Report	Air Releases Reported
31	HAMILTON PAX INCORPORATED 1204 HUNTINGTON DR GAFFNEY, SC 29342			X		
32	HAMRICK INDUSTRIES I 85 PLANT 742 PEACHOID ROAD GAFFNEY, SC 29341	X				X
33	HAMRICK INDUSTRIES INCORPORATED 178 HYATT STREET GAFFNEY, SC 29341		X			X
34	HAMRICK MILLS MUSGROVE PLANT 150 HAMRICK ST GAFFNEY, SC 29340	X		X		X
35	HAMRICK MILLS:HAMRICK PLANT 2526 CHEROKEE AVE GAFFNEY, SC 29342	X		X		X
36	HANSON BRICK BLACKSBURG PLANT 550 YORK ROAD BLACKSBURG, SC 29702	X	X			X
37	HESS AMERICA 427 HYATT STREET GAFFNEY, SC 29341		X	X		X
38	INDUSTRIAL CONTAINER RECYCLING INCORPORATED 360 OSEE STREET BLACKSBURG, SC 29702		X	X		X
39	JET CLEANERS NUMBER 2 705 CHEROKEE GAFFNEY, SC 29340			X		
40	KUSAN COMPANY SOUTHEASTERN KUSAN BEECH STREET EXTENSION GAFFNEY, SC 29340		X			
41	LIMESTONE COLLEGE 1115 COLLEGE DR GAFFNEY, SC 29340			X		
42	LOWENSTEIN M CORP SUMMIT PLANT 6TH ST GAFFNEY, SC 29340			X		
43	M&T SERVICES INCORPORATED 577 YORK RD BLACKSBURG, SC 29702			X		
44	MARVIN BISHOP PONTIAC BUICK GM 1417 N LIMESTONE ST GAFFNEY, SC 29340			X		
45	MEDLEY FARMS NPL SITE BURNT GIN ROAD GAFFNEY, SC 29342	X			X	
46	MILLIKEN & CO MAGNOLIA FINISHING PLANT HIGHWAY 5 & I-85 & MILLIKEN ROAD BLACKSBURG, SC 29702	X	X	X		X

TABLE 2.3-25 (Sheet 4 of 6)
OTHER POTENTIAL POLLUTION SOURCES LISTED IN EPA ENVIROFACTS
DATA WAREHOUSE CHEROKEE COUNTY, SOUTH CAROLINA

	FACILITY NAME/ADDRESS	Permitted Discharges to Water	Toxic Releases Reported	Hazardous Waste Handler	Active or Archived Superfund Report	Air Releases Reported
47	MILLIKEN CHEMICAL CYPRESS PLANT HIGHWAY 5 AND INTERSTATE 85 BLACKSBURG, SC 29702		X	X		X
48	MILLIKEN GAFFNEY MANUFACTURING 110 RAILROAD AVENUE GAFFNEY, SC 29340			X		X
49	MONSANTO TEXTILES CO HWY I-85 BLACKSBURG, SC 29702			X		
50	NATIONAL TEXTILES LLC 859 VICTORY TRAIL ROAD GAFFNEY, SC 29340	X	X	X		
51	NEWARK ELECTRONICS GAFFNEY DISTRIBUTION 217 WILCOX AVENUE GAFFNEY, SC 29341-2799			X		
52	OVERNITE TRANSPORTATION CO 129 PLEASANT SCHOOL RD GAFFNEY, SC 29341			X		
53	OXFORD OF GAFFNEY 419 13TH STREET GAFFNEY, SC 29340			X		
54	PALMETTO SCREENS INCORPORATED 221 LEAGAN DR BLACKSBURG, SC 29702			X		
55	PEACHTREE FORD 1238 FLOYD BAKER BOULEVARD GAFFNEY, SC 29340			X		
56	PEACHTREE FORD MERCURY 714 CHESNEE HWY GAFFNEY, SC 29341			X		
57	PEELER RUG COMPANY 1224 CHAMPION FERRY RD GAFFNEY, SC 29340	X		X		X
58	PENSKE TRUCK LEASING 116 WILLIS STREET GAFFNEY, SC 29341			X		
59	PIEDMONT INDUSTRIES 1287 LOVE SPRINGS ROAD COWPENS, SC 29330-9619			X		
60	PINE RIDGE WEAVERS 914 CHAMPION FERRY RD GAFFNEY, SC 29341			X		
61	PROGRESSIVE SCREEN ENGRAVING 2215 BEECH ST EXT GAFFNEY, SC 29340			X		X
62	QUICK AS A WINK 463 201 N GRANARD ST GAFFNEY, SC 29340			X		

TABLE 2.3-25 (Sheet 5 of 6)
OTHER POTENTIAL POLLUTION SOURCES LISTED IN EPA ENVIROFACTS DATA WAREHOUSE CHEROKEE COUNTY, SOUTH CAROLINA

	FACILITY NAME/ADDRESS	Permitted Discharges to Water	Toxic Releases Reported	Hazardous Waste Handler	Active or Archived Superfund Report	Air Releases Reported
63	RAY BROWN/BROWN #3 SAND MINE SQUAW VALLEY ROAD GAFFNEY, SC 29702	X				
64	REED RICO 867 WILCOX AVE GAFFNEY, SC 29341			X		
65	RMT INCORPORATED MEDLEY FARM NPL SITE 887 BURNT GIN RD GAFFNEY, SC 29340			X		
66	ROMEO RIM INCORPORATED PLANT 3 131 CORPORATE DRIVE GAFFNEY, SC 29342		X	X		X
67	RUDER TRANSPORTATION SVC 503 W RUTLEDGE GAFFNEY, SC 29342			X		
68	SANDERS BROTHERS METALS 1709 OLD GEORGIA HIGHWAY GAFFNEY, SC 29342-0188			X		X
69	SC DEPARTMENT OF EDUCATION CHEROKEE BUS SHOP 3144 UNION HIGHWAY GAFFNEY, SC 29340			X		
70	SC DISTRIBUTORS INCORPORATED 1406 CHEROKEE FALLS RD CHEROKEE FALLS, SC 29702	X				
71	SCARNG GAFFNEY E FREDERICK ST GAFFNEY, SC 29340			X		
72	SCARNG GAFFNEY 410 HAMPSHIRE DR GAFFNEY, SC 29341-2819			X		
73	SCDOT GAFFNEY 1868 OLD GEORGIA HWY GAFFNEY, SC 29340			X		
74	SHARMA PETROLEUM LLC I-85 & HIGHWAY 5 SOUTH BLACKSBURG, SC 29702	X				
75	SHERWIN WILLIAMS COMPANY 202 S LIMESTONE ST GAFFNEY, SC 29340			X		
76	SOUTHERN LOOM REED 226 HYATT ST GAFFNEY, SC 29341			X		X
77	SPRING CITY KNITTING CO/GAFFNEY PLT LITTLE MEMORIAL CHURCH RD GAFFNEY, SC 29340			X		

TABLE 2.3-25 (Sheet 6 of 6)
OTHER POTENTIAL POLLUTION SOURCES LISTED IN EPA ENVIROFACTS DATA WAREHOUSE CHEROKEE COUNTY, SOUTH CAROLINA

	FACILITY NAME/ADDRESS	Permitted Discharges to Water	Toxic Releases Reported	Hazardous Waste Handler	Active or Archived Superfund Report	Air Releases Reported
78	SPRINGS INDUSTRIES INCORPORATED LIMESTONE PLANT 1206 CHEROKEE AVE. GAFFNEY, SC 29340	X	X	X		X
79	TIMKEN COMPANY GAFFNEY BEARING PLANT 100 TIMKEN ROAD GAFFNEY, SC 29340-9732	X	X	X		X
80	UNION BUTTERFIELD CORPORATION 268 BELTLINE RD. GAFFNEY, SC 29341		X	X		X
81	UNITED CITIES GAS CO 1305 N LOGAN ST GAFFNEY, SC 29340			X		
82	UNITED UTIL/BRIARCREEK S/D #I ON A TRIB. OF SPENCER'S BRANCH GAFFNEY, SC 29342	X				
83	UNITED UTILS/BRIARCREEK SD #II .6MI N OF INTRS OF SPENCERS CR GAFFNEY, SC 29342	X				
84	UPSTATE BODY SHOP & DETAIL 1018 N LOGAN ST GAFFNEY, SC 29341			X		
85	UPSTATE CAROLINA MEDICAL CENTER 1530 N LIMESTONE ST GAFFNEY, SC 29340			X		
86	VICS TIRE & AUTO 120 E FREDERICK ST GAFFNEY, SC 29340			X		
87	WALLACE WHITE PONTIAC BUICK GMC 630 HAMPSHIRE DRIVE GAFFNEY, SC 29342			X		
88	WALMART SUPERCENTER 638 165 WALTON DR GAFFNEY, SC 29341			X		

See Figure 2.3-25

2.4 ECOLOGY

The Lee Nuclear Site is located within the Piedmont physiographic province of South Carolina (Reference 1). The Piedmont (from a French word meaning “foot of the mountains”) consists of a 100-mile (mi.)-wide belt between the Blue Ridge Mountains to the northwest and the Sandhills to the southeast. Gently rolling hills support a variety of natural vegetation types, including many disturbed by human intervention.

Many habitat types in South Carolina are strongly associated with certain geographic areas or physiographic regions within the state. “Ecoregions” denote areas of general similarity in ecosystems and in the type, quality, and quantity of environmental resources.

The Lee Nuclear Site and the surrounding area are within the Kings Mountain Geological Belt ecoregion (Reference 2). Unlike other areas of the Piedmont, hills in this area tend to be more rugged with northeast to southwest trending ridges. In addition to forestry and agriculture, as discussed below, mining also strongly influenced its early development.

The region is largely forested with oak-hickory-pine stands of highly variable floristic composition. Active and abandoned agricultural fields and pastures are also common. Native Virginia pine is abundant. (Refer to Appendix A for the scientific names of plants and animals mentioned in this section.)

Cotton plantations established soon after European colonization of North America changed much of the native hardwood and pine forests into cropland. As these lands were abandoned, vegetation began a natural process of plant succession. Succession describes the natural process whereby forested land once cleared by man for pasture or cropland (or other forces such as wildfires, storms, or insect infestations) slowly regenerates back into forest based on seeds carried to the area from elsewhere and from the seeds and spores that lay dormant in the soil over time until conditions permit them to successfully sprout or germinate.

In most cases, forest succession takes from 75 – 100 years in the Piedmont and is relatively orderly and, therefore, predictable. In the case at the Lee Nuclear Site and elsewhere in the Piedmont, upland succession after clearing starts with native grasses and sedges, is followed by pine forest, and ends with an oak-hickory climax forest on dry ridges and well drained, gentle slopes. On more moist sites and north facing slopes, mixed hardwood communities dominated by beech are more typical of climax stands. By definition, climax forests are stable, self-perpetuating, and long-lived.

In addition to natural succession, man introduced loblolly pine as a cash crop on monotypic pine plantations in the Piedmont during the 19th century. This pine now dominates large areas and is sustained by continuing logging and replanting that prevent development of a natural climax forest of oak and hickory.

South Carolina is drained by three major river systems, one of which is the Broad River. Figure 2.3-3 shows the Broad River and its major tributaries. The Lee Nuclear Site is on the west bank of the Broad River, which originates in the western North Carolina mountains and flows southeasterly to a point near Gaffney, South Carolina (7.5 mi. northwest of the Lee Nuclear Site). The Broad River then turns south toward Columbia, South Carolina, where it is joined by the Saluda River to form the Congaree River (Reference 3).

The Broad-Saluda-Congaree system is part of the Santee River basin that drains 34 percent of the state at an average rate of 7.5 billion gallons per day (Reference 4). Figure 2.3-1 shows the Broad and Santee river basins.

2.4.1 TERRESTRIAL ECOLOGY

The primary reference for this subsection is the Cherokee Nuclear Station environmental report (Cherokee ER) issued by Duke Power Company on October 13, 1975 (Reference 5). The Cherokee ER summarizes ecological field data collected at the site prior to the start of construction, as well as the literature reviewed by its authors. It is supplemented by the U.S. Nuclear Regulatory Commission's (NRC's) final environmental impact statement (Cherokee EIS) on issuance of a construction permit for the original facility (Reference 6).

In addition to reviewing the fieldwork for the Cherokee project, reconnaissance visits to the site were made in March, April, June, and October 2006. The purposes of these visits were fourfold.

First, the ecological resources at the site were qualitatively assessed by observation during field reconnaissance visits for comparison to the characterizations in the Cherokee ER and Cherokee EIS. This report comments on current features of the Lee Nuclear Site where recent observations recorded during the reconnaissance visits in 2006 differ from or contribute new information to the earlier descriptions. Because no new quantitative field data were collected during these visits, detailed species lists and other discussions in the Cherokee ER and Cherokee EIS are omitted from this report. Instead, this report focuses on the overall quality of on-site habitats and on changes that have occurred within them since the earlier studies.

Second, numerous areas on-site that appeared to consist of suitable habitat for several species of uncommon plants were thoroughly searched and visually inspected (see Subsection 2.4.1.3.1.1).

Third, a draft ecological type map of the property was prepared between visits to the Lee Nuclear Site. This map was based on false color infrared aerial photographs taken in 1999, which were the most recent available (Reference 7). During the April and June visits, numerous forest stands were investigated to verify the apparent signatures of various cover types on the aerial photographs to ground-truth the draft map and compile botanical descriptions of the dominant plants occupying each cover type. Figure 2.3-21 is a topographic map showing land areas and bodies of water on the Lee Nuclear Site and in its immediate vicinity.

Fourth, an on-site meeting with representatives of the U.S. Army Corps of Engineers (USACE) was held on June 26, 2006. The purposes of this meeting were (1) to tour the property and view potential wetlands, (2) to discuss with USACE the issue of jurisdictional versus nonjurisdictional wetlands, and (3) based on the above, to secure USACE's future agreement with the preliminary wetland determination forwarded to them for review and concurrence after the on-site meeting.

2.4.1.1 Existing Cover Types

A variety of vegetative communities in various stages of ecological succession occupied the site in 1975 (Reference 5). It was then almost entirely forested, but the stands were all secondary growth (Reference 6). Timber stands on-site were of several ages, and individual stands were usually even-aged. These previous terrestrial ecological conditions were extensively altered by grading and construction for the Cherokee Nuclear Station. As a result, some of the current terrestrial cover on the site is man-induced, reflecting the impact of these activities on terrestrial cover. The nature of this past construction and the current cover types that resulted from it are described in this subsection, along with those current cover type areas that were less influenced by this early construction.

Like they were in 1975, the forest communities are now distributed in a mosaic of small and large stands across the property. Ecotones, or the area where two or more stands intermix, are normally highly diverse communities sharing the vegetative characteristics of the stands on either side. Numerous ecotones continue to occur due to the juxtaposition of stands of varying age and size on the site. This further adds to its overall biodiversity and habitat value and quality.

Major plant communities identified in the Cherokee ER included active and abandoned agricultural fields and pasture, pine scrub, moist pine forest, mixed mesophytic hardwood forest, hardwood-mountain laurel forest, oak-hickory forest, and wetlands and alluvial thickets and forest (Reference 5).

The property was designated as a site for a nuclear power generation facility in the early 1970s. The NRC issued a construction permit to Duke Power Company in 1975. Extensive development of the site occurred thereafter and continued until 1982, when construction ended and the site was sold.

Duke Power Company cleared and graded approximately 750 acres (ac.) of the 1900-ac. site. This area, identified as the core construction area, is designated primarily as the Open/Field/Meadow (OFM) cover type on Figure 2.4-1. The Upland Scrub (USC) type commonly occurs around the periphery of the core construction area, representing early successional encroachment into the area. Also included in the 750 ac. total are two nonalluvial wetlands mapped as Nonjurisdictional Wetland (NJW) on Figure 2.4-1. Both were created as a result of earlier construction activities at the site.

Duke Power Company paved access roads, cleared vegetation and leveled the ground for construction laydown and parking areas, and built foundations for temporary storage buildings and warehouses in the core construction area. Some of these buildings, as well as the partially completed containment structure for the first nuclear reactor unit, remained on the site and have been demolished in connection with development of the new facility.

Duke Power Company also constructed dams to form the nuclear service water pond, now referred to as the Make-Up Pond B, and the former storm water retention pond, now referred to as the Hold-Up Pond A. Damming what was formerly McKowns Creek, then a perennial stream, formed the Make-Up Pond B. A small stream and backwater of the Broad River were dammed to form the Hold-Up Pond A. Damming a backwater of the Broad River formed the on-site Make-Up Pond A. These now appear as the Open Water (OW) type on Figure 2.4-1. Combined with small stock ponds that already existed on the property, OW now totals approximately 249 ac. in surface area.

Land clearing and constructing facilities removed stands of productive upland habitat. While other stands on the site remain undisturbed, clearing, construction, and flooding of the impoundments also reduced the overall carrying capacity of the site for terrestrial species. It did not, however, necessarily reduce its overall biological diversity because (1) seasonal and permanent upland residents of the site continue to inhabit less disturbed habitats outside of the core construction area as well as the core area itself and (2) biologically productive lentic aquatic habitat in the form of impoundments replaced stands of upland forest. Lentic is a term that refers to still or standing water aquatic habitats (e.g., impoundments and lakes) as opposed to lotic habitat that denotes flowing water (e.g., streams and rivers).

After cancelling the Cherokee project, Duke Power Company sold the property to others who continued to use the site. Field reconnaissance suggests that clearings were maintained through mowing and cattle grazing. Pastures were seeded with fescue, an introduced grass. Reconnaissance further revealed use of several abandoned buildings for hay storage, numerous shotgun casings suggesting recreational use by upland bird hunters, and use of the Make-Up Pond B and Make-Up Pond A for recreational angling.

Finally, reconnaissance confirmed the continued existence on-site of the vegetation types identified in the Cherokee ER. These types are also common and widespread elsewhere in the Piedmont (Reference 6). However, many of the individual stands were regrouped into nine terrestrial and two aquatic types, as shown on Figure 2.4-1, in part to reflect the effects of construction in the core area.

Figure 2.4-1 is an ecological type map based on interpretation of aerial photographs obtained from the U.S. Geological Survey (USGS) (Reference 7) and subsequent ground-truthing. The figure shows the current spatial distribution of vegetation types and water-based habitats. Coverage of the site is summarized by the total acres occupied by each type in Table 2.4-1. Figure 2.4-1 also shows that terrestrial cover in the vicinity of the site is predominantly forest and open field land.

Each of the on-site terrestrial types is discussed in the following subsections. Unless otherwise referenced, the species mentioned are those observed during field reconnaissance in 2006 rather than review of the literature.

The open water and stream channel types are discussed as aquatic habitats in Subsection 2.4.2.

2.4.1.1.1 Alluvial and Other Wetlands

Wetlands are areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (Reference 8). Thus, a wetland typically demonstrates the following three characteristic components (Reference 9):

- Water, either at the surface or within the root zone.
- Unique soil conditions differing from adjacent uplands.
- Hydrophytic vegetation and the absence of flood-intolerant species.

Wetlands generally include swamps, marshes, bogs, and similar areas.

At the Lee Nuclear Site, wetlands occupy a total of 42.8 ac. or 2.3 percent of the site (Figure 2.4-1). They are currently represented by Alluvial Wetland, Nonalluvial Wetland, and Nonjurisdictional Wetland that total 2.3 ac. (0.12 percent), 8.1 ac. (0.43 percent), and 32.4 ac. (1.7 percent) of the total site area, respectively (Table 2.4-1).

Alluvial Wetlands (AW). Alluvial wetlands are associated with waterways. As mentioned earlier, the Lee Nuclear Site is bordered to the north and east by the Broad River but now supports little alluvial wetland. Alluvial wetlands that existed earlier in the southern portion of the site were inundated in the 1970s by impounding a backwater of the river to form the existing Make-Up Pond A.

One small area of alluvial wetland currently exists on the northern border of the site (Figure 2.4-1) near the proposed water intake structure on the river. Here cottonwood, sycamore, sugarberry, sweet gum, and green ash form the canopy. Box elder, black willow, and buttonbush are found in the understory. False nettle, river oats, and cane occupy the shaded herbaceous layer of this wetland.

Sedges, common needlerush, arrow-arrum, and floating aquatics such as the exotic Uraguayan primrose occur in open backwaters of the river adjacent to these alluvial wetlands.

Nonalluvial Wetlands (NAW). Several small nonalluvial wetlands occur on the site. These wetlands are associated with small streams, backwaters of impoundments, and other man-made and natural depressions. Most are jurisdictional wetlands, meaning that they are wetlands under the regulatory jurisdiction of USACE. The USACE regulates dredging, filling, or any other physical alteration of such wetlands pursuant to the Section 404 permit program under the federal Clean Water Act (Reference 15).

Wetlands not under the regulatory jurisdiction of USACE are discussed below as Nonjurisdictional Wetlands.

Nonalluvial wetlands usually have only a partial canopy cover with dominance by cottonwood, box elder, and black willow. Buttonbush, alder, swamp dogwood, and elderberry are dominant shrubs at the Lee Nuclear Site, along with dwarfed black willow. Common needlerush, sedges, and false nettle are the dominant species in the herb/grass layer.

Nonjurisdictional Wetland (NJW). Two nonalluvial wetlands are mapped as “nonjurisdictional” on Figure 2.4-1. Both were created as a result of construction activities at the site in the early 1970s and are not wetlands under the regulatory jurisdiction of USACE.

One nonjurisdictional wetland is a depression surrounding the planned locations of the original reactors in the central portion of the core construction area. From the time it was excavated to the present, the depression accumulated rainwater and runoff from the surrounding micro-watershed and appears as a flooded depression on available aerial photography. Duke Energy dewatered the depression in order to further explore subsurface foundation conditions and facilitate demolition of the old containment structure. Dewatering to remove seasonal rainwater continues.

The other nonjurisdictional wetland area is a small depression north of the existing containment structure that is dominated by cottonwood, black willow, and common needlerush. Examination of soil borings from this area revealed it to be nonhydrophytic clay more typical of upland soil than wetland soil. The latter is typically darker in color and often contains oxidized plant rhizomes and other wetland indicators.

During the June 2006 on-site inspection discussed in Subsection 2.4.1, USACE biologists examined both of these possible wetlands and concluded that they are not jurisdictional under the 1987 delineation standards (Reference 10) and Section 404 regulations (Reference 15). Written confirmation of this determination was provided by USACE on September 24, 2007. Accordingly, no Section 404 permit is required to allow further construction in these areas.

2.4.1.1.2 Mixed Hardwood (MH)

The mixed hardwood cover type is the richest, most biologically diverse plant community at the Lee Nuclear Site. As listed in Table 2.4-1, this community occupies a total of 410.3 ac. or 21.6 percent of the site.

Of special note biologically because of varying overstory species are mixed hardwood stands that occur at the Lee Nuclear Site on bluffs overlooking the Broad River. On the north side of the site, a series of steep bluffs support communities dominated by chestnut oak (on drier bluffs) with red oak, white oak, and tulip poplar.

Black oak, shortleaf pine, and Shumard oak occupy lower slopes near the river and floodplain. White ash, cottonwood, sweet gum, and cucumber magnolia are also canopy layer components. Some of the chestnut oaks exceeded 2 feet (ft.) in diameter at breast height (hereafter “DBH” or diameter measured or estimated about 4.5 ft. above the ground). One Shumard oak was nearly 4 ft. DBH while several pines overtopped the hardwood canopy and were each about 20 inches (in.) DBH. Redbud, chalk maple, dogwood, American holly, and eastern red cedar are dominants in the understory layer.

In the shrub layer, pawpaw, cane, and at one steep bluff, showy, montane ericaceous shrubs such as great laurel, deer-tongue laurel, and mountain laurel occur. The herbaceous layer has been invaded by Japanese honeysuckle and is not particularly noteworthy. Some clumps of Piedmont heartleaf also occupy the ericaceous bluff.

Just below the Ninety-Nine Islands Dam on the west side of the river, a series of steep, rocky bluffs are also vegetated with rich, mixed hardwood communities. Here, as at the above site, a mixture of oaks (with white oak most abundant), tulip poplar, and scattered shortleaf pine occur. Unlike the above stand, canopy trees are much smaller, averaging less than 20 in. DBH. Upslope, dogwood and sourwood populate the understory with dense thickets of ericaceous shrubs (such as great laurel, deer-tongue laurel, wild azalea, and mountain laurel) on the steepest and rockiest portions of the bluff.

Along the river at the base of the bluff, silverbell is very common in the understory with thickets of cane in the shrub layer. The herbaceous layer is generally less dense on the bluff with scattered pipsissewa, partridgeberry, and Piedmont heartleaf in and around the mountain laurel thickets. One shallow, rich ravine, however, has a colony of mayapple.

On slopes and in ravines on the northwestern side of McKowns Mountain, young to mid-age chestnut oak less than 20 in. DBH are dominant in the canopy on dry, rocky soil. Tulip poplar, red oak, white oak, and beech are more common on the lower slopes near the Make-Up Pond B. Dogwood and ironwood populate the understory. The shrub layer is relatively open here, as is the herbaceous layer. Piedmont heartleaf, American hepatica, Christmas fern, rattlesnake plantain, and such dry site species as black-edged sedge and whip nutrush are widely scattered along the slopes of the mountain.

In ravines forming backwaters of the Make-Up Pond B on the southwest side of the core construction area, American beech, tulip poplar, white oak, red oak, and white ash dominate the canopy with mountain laurel occasionally common in the shrub layer of beech-dominated ravines. Here, pipsissewa, partridgeberry, Piedmont heartleaf, and black-edged sedge are also common in the herb layer.

A stand of mixed hardwoods in a ravine just northeast of the site entrance gate is dominated by beech up to 2 ft. DBH and smaller red maple with a very open understory.

Finally, near the southwestern corner of the site, there are several small, rich ravines with beech, white oak, and red oak in the canopy and an understory layer of chalk maple. In one ravine, field reconnaissance revealed a population (estimated to be about 25 plants) of the state-listed southern adder's tongue fern (see also Subsection 2.4.1.3.1.1) growing in association with Christmas fern, mayapple, violet wood sorrel, false Solomon's seal, Solomon's seal, rattlesnake fern, and Canada horsebalm.

2.4.1.1.3 Mixed Hardwood-Pine (MHP)

The mixed hardwood-pine cover type occupies 307.3 ac. or 16.18 percent of the Lee Nuclear Site (Table 2.4-1). In particular, the northwestern portion of the site is occupied by a large expanse of cut-over mixed hardwood-pine with a diverse mixture of hardwood species along creeks. Here, tulip poplar, white ash, and white oak are the dominant species. All are approximately less than 1 ft. DBH.

The shrub layer contains scattered mountain laurel, while the herbaceous layer is populated by Jack-in-the-pulpit, Christmas fern, southern lady fern, Piedmont heartleaf, black cohosh, mayapple, sessile-leaved bellwort, false Solomon's seal, coastal plain sedge, reflexed sedge, and white-edged sedge.

In ravines on the backwaters of the Make-Up Pond B near the core area of the site, tulip poplar, sweet gum, red maple, and white oak grow with shortleaf and loblolly pine. Most of these stands are disturbed with trees predominantly less than 2 ft. DBH.

2.4.1.1.4 Open Areas, Fields and Meadows (OFM)

As a result of clearing, maintenance by mowing, and grazing carried out at the site after Duke Power Company sold the site in the 1980s, the core construction area remains today predominantly as a large clearing. It is covered with bare soil, paved roadways and parking lots, abandoned building foundations, and patches of annual and perennial grasses, forbs, and shrubs.

Found elsewhere on the property are old abandoned agricultural fields and improved fescue pastures. Fescue is a genus of more than 300 species of tufted grass commonly planted to supplement native grass in pastures. In total, the open areas, fields and meadows cover type now occupies 421.6 ac. or 22.19 percent of the Lee Nuclear Site (Table 2.4-1). It is the largest single cover type on the property.

Shrubs and a limited number of small coniferous and deciduous trees now encroach into the core area along its edges as the upland scrub cover type (see Subsection 2.4.1.1.8). Reuse of this portion of the site requires only a limited amount of clearing of pioneering species of limited habitat value.

2.4.1.1.5 Open Pine-Mixed Hardwood (OPMH)

The open pine-mixed hardwood cover type occupies about 65.3 ac. or 3.44 percent of the Lee Nuclear Site (Table 2.4-1). It occurs primarily in the southwestern portion of the site. Reconnaissance in 2006 indicates that relatively large stands of the pine-mixed hardwood cover type (see Subsection 2.4.1.1.7) appear to have had most of the hardwoods and some of the canopy pines removed by selective logging. The resulting community is dominated by widely-spaced loblolly pine, 1 - 2 ft. DBH, with an open understory only partially vegetated by mixed hardwood species such as white oak, sweet gum, and red maple. The shrub and herbaceous layers in this type are sparse.

2.4.1.1.6 Pine (P)

The pine cover type consists of stands of pure pine occupying about 16 ac. or 0.84 percent of the Lee Nuclear Site (Table 2.4-1). Most of these stands are dominated by introduced loblolly pine with scattered shortleaf or Virginia pine. The pine stands are young to mid-aged. Some of the loblolly stands appear to have been planted.

2.4.1.1.7 Pine-Mixed Hardwood (PMH)

Unlike pure pine stands, the pine-mixed hardwood cover type is widespread at the Lee Nuclear Site as scattered stands and occupies about 227.1 ac. or almost 12 percent of the site (Table 2.4-1). Loblolly and shortleaf pine dominate this cover type with a mixture of hardwood species also in the canopy, depending mainly on local soil moisture conditions.

White oak, red oak, tulip poplar, sweet gum, and red maple are the canopy co-dominants with the pines. This cover type is clearly second-growth in which canopy trees are generally young, 1 – 2 ft. DBH.

2.4.1.1.8 Upland Scrub (USC)

The upland scrub cover type at the Lee Nuclear Site includes mainly early successional pine-mixed hardwood stands, open, partially forested stands, and dwarfed forest species growing usually on poor soil. It occupies a total of 156.9 ac. or about 8.3 percent of the site (Table 2.4-1), mainly around the peripheries of the previously cleared core construction area.

Most stands of this type are dominated by loblolly pine, Virginia pine, eastern red cedar, sumac, blackberry, and the exotic lespedeza. The latter is often planted in disturbed areas as an erosion control measure.

2.4.1.2 Wildlife Resources

Forests with diverse plant species and well-developed vertical structure like those at the Lee Nuclear Site offer numerous ecological niches that potentially support diverse wildlife populations. Most of the undeveloped portion of the Lee Nuclear Site outside the core construction area consists of upland hardwood and mixed hardwood-pine forests. Usually, as upland forests increase in age, their vertical structure composed of herb, forb, shrub, midstory, and canopy species also increases in diversity.

Upland forests harbor numerous nesting birds and serve as stop-over habitat for neotropical migrants and short-distance migrants, especially when located adjacent to a river such as the Broad River at the Lee Nuclear Site. Likewise, upland forests constitute habitat for numerous large and small mammals and other resident ground dwellers as well as largely arboreal species such as bats and flying squirrels. Of special significance in hardwood stands is the production of nuts, acorns, and other foodstuffs, collectively termed “mast.” Mast is consumed by a variety of wildlife. Older stands also sustain trees with cavities of varying size that are important as wildlife dens, roosts, and loci for rearing broods.

While preparing the Cherokee ER, field crews surveyed vegetation, reptiles and amphibians, mammals, and birds on a scheduled basis from autumn 1973 through summer 1974 (Reference 5). They also conducted an extensive literature review on the potential occurrence of members of these groups. The literature review and field observation suggested a very diverse wildlife population that probably continues to inhabit the site in stands not cleared or otherwise disturbed during initial construction (Table 2.4-2).

No attempt is made in this report to describe invertebrate species that might inhabit the site. Invertebrates are expected to include common species existing in a variety of eastern forests (Reference 6).

2.4.1.2.1 Mammals

Because of larger body size and, therefore, general observability, the most common mammals during 1973 – 1974 were opossum, raccoon, eastern gray squirrel, eastern fox squirrel, eastern cottontail rabbit, and white-tail deer, not necessarily in that order (Reference 5). All are protected game species in South Carolina and yearlong residents of the site.

The white-tail deer was also the largest mammal to occur at the site in the 1970s, with observation of a single specimen (Reference 5). Observation of groups of 2 – 6 animals during field reconnaissance in 2006 suggests that the species is now much more abundant at the site than it was in the 1970s.

Black bear in the mountains of South Carolina appear to have been expanding their range and increasing in numbers over the past several decades (Reference 11). The mountain population of South Carolina is located primarily in Oconee, Pickens, Greenville, and Spartanburg counties (Reference 12), to the immediate west of Cherokee County.

Black bear is a protected game species in the state. However, hunting is allowed only in Hunt Unit 1, which comprises Oconee, Pickens, and Greenville counties. Because Cherokee County is adjacent to and immediately east of Spartanburg County, within the known and expanding range of the species, black bear may be assumed to occur in the vicinity of the Lee Nuclear Site. The perimeter of the property is fenced and breaches in the existing fence, when discovered by security, are repaired. This suggests that black bear are unlikely to reside at the site.

With the exception of the opossum and black bear, all of the mammals mentioned in the above discussion, or indications of their presence on-site, were observed during the 2006 field reconnaissance. Current use of the site by beaver, a species expected to occur in the 1970s but not observed then, was also confirmed.

Mammal trapping in 1973 – 1974 also revealed the presence of numerous small mammals, including a variety of common yearlong residents such as rice rat, white-footed mouse, shorttail shrew, and a variety of voles (Reference 5). The Cherokee EIS also reported capture of feral housecats and domestic dogs (Reference 6), unobserved during recent field reconnaissance.

2.4.1.2.2 Birds

As is the case with mammals, the Lee Nuclear Site has a potentially diverse avifauna with 241 species possibly occurring there in 1973 – 1974 (Table 2.4-2). However, certain groups of birds, like those that are water-related or water-dependent, were underrepresented during the 1970s field survey. For example, observation of 14 of the 77 (18 percent) expected water-dependent species contrasts to observation of 90 of 164 (55 percent) expected species that mainly inhabit uplands (Reference 5). In addition to waterfowl, other common groups of birds observed or expected to occupy the Lee Nuclear Site in 1973 – 1974 are listed in Table 2.4-3.

Since then, construction of the Make-Up Pond B, Hold-Up Pond A, and Make-Up Pond A increased open water aquatic habitat on the site at the expense of vegetated upland habitat. Thus, water-dependent birds are probably now more common on the Lee Nuclear Site than they were in the 1970s. The mallard duck and the wood duck were reported as the only species of waterfowl observed on or in the vicinity of the site in the 1970s (Reference 5). These species were observed during the field reconnaissance in 2006.

Canada geese were also observed during field reconnaissance loafing on a small, exposed island immediately below Ninety-Nine Islands Dam, and a brood of goslings was observed swimming in that area. Also observed in the Make-Up Pond A (formerly a backwater of the Broad River) was a pair of double-crested cormorants, a species of potential occurrence in the 1970s but not observed then, and a great blue heron.

These observations further support a conclusion that water-dependent birds, uncommon on-site in the 1970s, are probably more likely to occur there now because of additional open water habitat. Upland species probably continue to occupy on-site habitats now as they have in the past.

2.4.1.2.2.1 Shorebirds

Only 2 of 21 (10 percent) of the shorebirds expected at the site occurred there during the 1970s (Reference 5). They were the killdeer and spotted sandpiper. The killdeer, while technically a banded plover, is typically found in fields and pastures, often far from water. The cleared portion of the core construction area at the Lee Nuclear Site provides suitable habitat for this species, which was also observed there during field reconnaissance in 2006.

The spotted sandpiper breeds along fresh water such as ponds and creeks like the Broad River and over-winters along southern coasts, including the South Carolina coast. It is a very common species throughout most of the continental United States and, as in the 1970s, could be either a seasonal migrant or breeding season resident on the site. Although the Broad River and on-site impoundments provide suitable breeding habitat, reconnaissance in 2006 failed to reveal the species.

2.4.1.2.2.2 Colonial Nesting Waterbirds

By definition, “colonial nesting waterbirds” is a collective term describing a large variety of birds that share two common characteristics: (1) they gather in large groups, called colonies, to breed; and (2) they feed primarily or exclusively on aquatic organisms (Reference 13). Like other water-dependent birds, colonial nesters are underrepresented in the avifauna observed at the site in the 1970s.

Common members of the group observed during 1973 – 1974 at the Lee Nuclear Site were herring gull, ring-billed gull, great blue heron, little blue heron, and green heron (Reference 5). No nesting colonies of any of these species were found then on or in the vicinity of the Lee Nuclear Site.

With the exception of a great blue heron loafing in the Make-Up Pond A, field reconnaissance in 2006 failed to note the presence of any other species of this group or of any colonial nesting sites.

2.4.1.2.2.3 Upland Game Birds

Four species of upland game birds were expected to occupy the site in the 1970s (Reference 5). They are wild turkey, bobwhite quail, American woodcock, and common snipe.

The bobwhite, a yearlong resident at the Lee Nuclear Site, is normally abundant in brushland, abandoned fields, and open pine forests, but it avoids dense forest cover.

The woodcock and snipe are inland sandpipers that inhabit moist woodlands, marshes, and river banks. Both are migratory and primarily overwinter in locales like the Lee Nuclear Site area.

Although not observed on-site in 1973 – 1974, wild turkey, typically an occupant of open woodlands and forest clearings, were observed at two locations during the 2006 field reconnaissance. In contrast, the bobwhite was a common yearlong resident in the 1970s. They continue to reside on-site and were observed by workers there in 2006. None were observed during field reconnaissance visits in 2006, probably because of human activity in and adjacent to the large clearing in the core construction area and noise during reconnaissance periods.

2.4.1.2.2.4 Perching Birds

Generally considered as “birds of the field and forest,” perching birds of the Order Passeriformes are typically medium to small landbirds that occupy a wide range of habitat types. All are well adapted for perching, as the name suggests, with three toes in front on each foot and one long toe behind.

Most insectivorous species, as well as some fruit and seed eaters, are highly migratory. Common examples include most warblers. In addition to breeding habitat, locations adjacent to a stream, like the Lee Nuclear Site, are important migratory stopovers for species that breed further north.

Other species are yearlong residents of the site. Included in this group are eastern phoebe, blue jay, Carolina chickadee, tufted titmouse, Carolina wren, mockingbird, American robin, eastern bluebird, and cardinal, all observed during field reconnaissance in 2006.

Passeriforms were also well represented in the 1973 – 1974 data with observation of 52 percent of the 125 species that probably occurred there, based on a literature review (Reference 5). The site still offers a variety of upland habitats. This suggests that most members of the group expected to occur or observed there in the 1970s probably continue to occur there now.

2.4.1.2.2.5 Birds of Prey

Birds of prey include vultures, hawks, falcons, eagles, and owls. Like Passeriforms, they were well represented in the 1973 – 1974 data with observation of 52 percent of the 21 species that probably occurred at the site (Reference 5).

Common species include turkey vulture, black vulture, red-tailed hawk (observed during field reconnaissance), red-shouldered hawk, and American kestrel. All are nonmigratory habitat generalists, and most take live prey such as birds and small mammals. Some, like the vultures, are also scavengers.

Openings at the site provide suitable hunting-scavenging areas, and adjacent forest stands offer nesting habitat for these species and others. Thus, they probably reside there now.

The osprey, expected to occur at the site in the 1970s but not then observed, now breeds there. During the 2006 field reconnaissance, an osprey was observed trying to construct a nest on top of the meteorological tower at the site. To prevent nesting from interfering with collecting meteorological data, Duke Energy constructed a nesting platform on a nearby electrical transmission pole along the western edge of the Make-Up Pond A and moved the partially complete nest from the tower to the pole. The osprey abandoned the tower and completed the nest on the pole.

2.4.1.2.2.6 Woodpeckers

Woodpeckers are mainly nonmigratory in the Carolina Piedmont, as elsewhere. As yearlong residents of a site, they are a group highly likely to be represented in observational data. At the Lee Nuclear Site, observations in 1973 – 1974 revealed 75 percent of the species that possibly occur there (Reference 5).

Common species observed during field reconnaissance in 2006 were downy woodpecker, hairy woodpecker, red-bellied woodpecker, pileated woodpecker, and common flicker. All have a strong, sharply pointed bill for chipping and digging into tree trunks or branches to harvest woodboring insects. Additionally, flickers, unlike other woodpecker species, are often seen on the ground where they eat ants.

The prevalence of upland forests at the Lee Nuclear Site is reflected in the number of woodpecker species inhabiting the site. However, the red-cockaded woodpecker was also included as a possible resident (Reference 5). This species is largely confined to open, park-like stands of longleaf pine throughout its range. The absence of this specific habitat type at the Lee Nuclear Site was confirmed during field reconnaissance in 2006 and suggests that the species probably should not have been included on the original list, which was apparently based on range considerations alone. Further, a 1970s visit to the site by NRC staff members also failed to reveal any suitable red-cockaded woodpecker habitat (Reference 6).

2.4.1.2.3 Reptiles and Amphibians

Reptiles and amphibians found at the Lee Nuclear Site in the 1970s are listed in Table 2.4-4.

Unlike water-dependent species of birds, discussed in Subsection 2.4.1.2.2.2, water-dependent or fully aquatic reptiles and amphibians appear to predominate over terrestrial species at the Lee Nuclear Site. Nine of the 13 species (69 percent) listed in Table 2.4-4 are fully or partially aquatic. However, it should be noted that water-dependent species are seasonally more observable, both visually and through recognition of their unique mating calls, than are many of the terrestrial species.

For example, many of the water-dependant species are restricted to the immediate vicinity of seasonal wetlands or other small ephemeral pools, where repeated visits are likely to reveal their presence. Others, especially frogs, have distinctive mating calls. Recognizing these calls renders visual observation unnecessary. This is not the situation with upland dwellers such as many turtles, lizards, snakes, and salamanders, which are capable of hiding under logs and in the leaf litter and require diligent searching and visual recognition to confirm their presence on a site.

Despite this limitation, it is clear that a number of these species were common and probably relatively abundant at the Lee Nuclear Site when tallied in the 1970s. Field reconnaissance in 2006 revealed no evidence suggesting that these populations are less diverse now than they were then. In fact, two species observed during the 2006 field reconnaissance were expected to occur but not observed at the site in the 1970s (Reference 5). They are eastern coachwhip, also then observed at the site, and eastern or common kingsnake, expected but not then tallied. Both are common terrestrial inhabitants of eastern forests, although the kingsnake tends to occupy stream margins and other wet areas, presumably to feed on water snakes and turtle eggs (Reference 14).

2.4.1.3 Other Important Terrestrial Species

Important terrestrial species are (1) state or federally listed (or proposed for listing) threatened or endangered species; (2) commercially or recreationally valuable species; (3) species essential to the maintenance and survival of species that are rare or commercially or recreationally valuable; (4) species critical to the structure and function of the local terrestrial ecosystem; and (5) potential biological indicators used to monitor the effects of the proposed facilities on the terrestrial environment. Each of these groups is discussed individually in the following subsections.

2.4.1.3.1 Listed Threatened and Endangered Species

The U.S. Department of the Interior Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) share responsibility under the Endangered Species Act (ESA) of 1973, as amended (Reference 16), for the conservation and recovery of federally listed threatened and endangered species. Except for sea turtle nesting habitat, NMFS has the principal responsibility for oceanic species and those using coastal waters, including coastal rivers. All others, including migratory birds, freshwater inhabitants, and other terrestrial species are under the jurisdiction of USFWS.

By letter dated April 3, 2006, Duke Energy initiated informal consultation pursuant to Section 7 of the ESA. That letter requested information on any species under the jurisdiction of USFWS that might occur in the vicinity of the Lee Nuclear Site. By letter dated May 23, 2006, USFWS responded.

As shown in Table 2.4-5, the dwarf-flowered heartleaf (also called the dwarf-flowered wild ginger) and pool sprite, both federally listed as threatened (FT), and Schweinitz's sunflower, listed as endangered (FE), are the federal plant species of interest in the project area. In addition to these species, USFWS named the Georgia aster, a candidate species (FC), and the prairie birdsfoot-trefoil, Biltmore greenbriar, American kestrel, loggerhead shrike, southeastern myotis bat, and robust redhorse fish as species of special concern (FSC). FC and FSC species are not afforded full protection under the ESA.

At the state level, SCDNR has responsibility under the South Carolina Nongame and Endangered Species Conservation Act (Reference 17) for the protection of endangered and threatened species. Included in these categories are those not of special concern nationally that are in imminent danger of extirpation in the state (i.e., endangered or SE) or that are likely to become an endangered species in the state within the foreseeable future (i.e., threatened or ST).

By letter dated April 3, 2006, Duke Energy initiated informal consultation with SCDNR (refer to Appendix B for copies of all correspondence mentioned in this subsection). That letter requested information on any species under the jurisdiction of SCDNR that might occur in the vicinity of the Lee Nuclear Site. By letter dated April 14, 2006, SCDNR responded. SCDNR's response lists one plant, the dwarf-flowered heartleaf, with the potential to occur in Cherokee County. It is threatened at both the state and federal levels. Other state-level designations used in this subsection are regional concern (RC), and state concern (SC).

There are no other federally or state listed endangered or threatened species thought to occur within the county. However, consulting SCDNR species lists for Cherokee and York counties (References 20 and 21) revealed additional species with the remote potential to occur in the project area (Table 2.4-5). Most are plants, but the list also includes one mammal (the southeastern myotis bat); two frogs (northern cricket frog and pickerel frog); one fish (Carolina darter); and one mussel (paper pondshell).

Consideration of the availability of suitable habitat at the Lee Nuclear Site based on field reconnaissance limits the possibility that many of these species actually occupy the site. Of the 60 species listed in Table 2.4-5, unavailability of habitat reduces the list to 11 plants, one mammal, two birds, one frog, one fish, and one mussel. Each of these species is discussed in greater detail below, except for the robust redhorse fish and paper pondshell mussel. As aquatic species, they are discussed in Subsection 2.4.2.

2.4.1.3.1.1 Plants

Each of the plant species of special interest and with suitable habitat at the Lee Nuclear Site is individually evaluated below. Shown in the heading is its federal or state status.

Dwarf-flowered Heartleaf (FT and ST). The dwarf-flowered heartleaf is found only in the upper Piedmont regions of North and South Carolina (Reference 22). It is the only state or federally listed endangered or threatened species known to occur within Cherokee County. Twenty-four populations occur in an eight-county area. The single population in Cherokee County numbers about 150 plants. In addition to its known range, USFWS also speculates that the species may occur in other isolated locations in North Carolina.

Dwarf-flowered heartleaf is an evergreen herb. Soil type is the most important habitat requirement of the species (Reference 22). It needs acidic Pacolet, Madison gravelly sand loam, or Musella fine sandy loam to grow. Given these types of soil, the plant occupies bluffs and nearby slopes, boggy areas adjacent to the headwaters of creeks and streams, and hillsides and ravines.

Timber harvest, urbanization, conversion of woodland to pasture, pond and reservoir construction, trash, and insecticide use are threatening the remaining South Carolina populations, only four of which receive some level of protection (Reference 22).

Although populations of this species are known in the vicinity of the Lee Nuclear Site, the dwarf-flowered heartleaf has never been reported on Kings Mountain Belt soils, such as those found at the site. Field reconnaissance in 2006 of numerous north facing slopes, ravines, and coves adjacent to water at the site revealed none. However, several occurrences of a closely related species, the more common Piedmont heartleaf, were found. This species receives no regulatory protection.

Georgia Aster (FC and SC). Georgia aster is a perennial, colonial herb that is a relict species of the post oak savannah-prairie communities that existed in the Carolina Piedmont prior to widespread fire suppression (Reference 23). Listed as a species “of concern” by USFWS, it now occupies a variety of dry habitats in areas adjacent to roads; along woodland borders; in dry, rocky woods; and within utility rights-of-way on low acidic or highly alkaline soil where current land management mimics natural disturbance.

According to the soil survey for Cherokee County (Reference 24), two small islands of circumneutral to basic Mecklenburg and Iredell soil occur near the northern border of the Lee Nuclear Site. Field reconnaissance in this and other areas failed to reveal any Georgia aster. However, several specimens of the closely related Piedmont aster, common in the Piedmont of South Carolina, were observed.

Ashy Hydrangea (SC). This species is a shrub known from mountain bluffs in the southern Blue Ridge. It is extremely rare in the Piedmont. Two steep bluffs within the boundaries of the Lee Nuclear Site appeared to offer suitable habitat for this species. However, field reconnaissance in these areas in 2006 failed to reveal the plant.

Common or Creeping Spikerush (SC). Creeping spikerush is a dark green, colonial aquatic plant in the sedge family. It is found in marshes and on pond edges. It is rare in South Carolina, having been reported only from York County to the immediate east of Cherokee County. Habitat for the spikerush occurs at the Lee Nuclear Site, but field reconnaissance failed to reveal its presence.

Creel’s Azalea (SC). Creel’s azalea is a deciduous rhododendron that occurs in the Piedmont and Inner Coastal Plain of South Carolina. It is generally found in dry, open, mixed hardwoods. Habitat for the shrub exists at the Lee Nuclear Site, but field reconnaissance failed to reveal its presence.

Nodding Onion (SC). Nodding onion occurs widely throughout the United States as far east as New York state and south to Texas and Georgia (Reference 25). Nodding onion is found in dry, open woods on basic and circumneutral soils in South Carolina. It requires well drained soil and sun to only partial shade.

A population of the plant occurs in the vicinity of the Lee Nuclear Site in Cherokee County. Marginal habitat for the plant occurs in rich woods and on open bluffs at the site, but field reconnaissance revealed no occurrences of this species.

Smooth Sunflower (SC). The smooth sunflower is known to inhabit eastern coastal states from New York in the north to South Carolina in the south (Reference 26). It is a perennial herb/forb that inhabits sparse woodlands, shrublands, and open herbaceous rock outcrops occurring on ridge and valley shales and Blue Ridge metashales of the central Appalachian Mountains at elevations from 1000 to 2600 ft. Habitats generally occur on steep slopes with south to west aspects.

Although stunted trees of several species such as chestnut oak, Virginia pine, and pignut hickory are common, shale barrens are strongly characterized by their open physiognomy and by a suite of uncommon and rare plants found almost exclusively in these habitats. This habitat is available elsewhere in Cherokee County but was not observed at the Lee Nuclear Site. Accordingly, presence of the smooth sunflower, while confirmed at locations in Cherokee County in the vicinity of the Lee Nuclear Site, is unlikely on-site and field reconnaissance failed to reveal its presence.

Southern Adder's Tongue Fern (SC). Southern adder's-tongue fern is found in shady, circumneutral ravines and creek floodplains in the Piedmont of South Carolina.

It is a small, flowerless fern often less than 2-in. tall. Field reconnaissance revealed a population of about 25 plants in a rich ravine above an old, man-made stock pond on the southwestern portion of the Lee Nuclear Site (see Figure 2.4-1). Here, Christmas fern, black cohosh, false Solomon's seal, and Piedmont heartleaf also occur with the fern under a cut-over beech-mixed hardwood forest.

Not previously recorded for Cherokee or York counties, this observation represents a range extension or expansion for the species.

Virginia Bunchflower (SC). This species is found on rich bluffs with acidic soil in the Piedmont of South Carolina. Field reconnaissance, however, revealed none on any of the bluffs searched at the Lee Nuclear Site.

American Ginseng (RC). American ginseng is found in rich, open ravines, bluffs, and coves in the Piedmont and the mountains of South Carolina. Several rich mixed hardwood bluffs and ravines occur on the Lee Nuclear Site, but field reconnaissance failed to reveal its presence.

Canada Moonseed (SC). Moonseed is a woody climbing vine (also termed a liana) normally found on rich bluffs and in floodplain forests along woodland streams. It is widely distributed from Canada along the eastern coast of the United States to Georgia and inland to Arkansas. Its roots, collected in autumn by natural herbalists, are reportedly used as a diuretic, to relieve stomach and arthritic pain, and to treat blood disorders (Reference 27).

Canada moonseed occurs immediately across the Broad River from the Lee Nuclear Site based on recorded occurrence in records maintained by SCDNR. Due to the presence of suitable habitat and the abundance of other lianas at the site, this species is a possible resident. However, field reconnaissance in 2006 failed to confirm its presence.

2.4.1.3.1.2 Mammals (Southeastern Myotis Bat [FSC] [SC])

The southeastern myotis is a medium sized bat with a wingspan of about 10 in. It occurs locally throughout the southeastern United States (Reference 28).

The bat uses a variety of roost sites throughout its range. It typically hibernates in caves but occupies hollow trees near water from late spring through fall. It may also use abandoned buildings. Summer habitat may be located more than 300 mi. from hibernacula (Reference 29).

Southeastern myotis are thought to forage mainly over ponds, lakes, and slow-moving streams, flying close to the water surface to catch insects. Because of the presence on the Lee Nuclear Site of suitable roosting trees, abandoned buildings, and open-water habitat, as well as the site's proximity to the Broad River, the bats possibly occur on-site seasonally.

During field reconnaissance in 2006, the interiors of several abandoned buildings on the site were examined. This examination failed to reveal the presence of any bats or any indications of their presence, such as accumulated guano, suggesting that bats regularly use the structures.

2.4.1.3.1.3 Birds

Each of the birds of special interest with suitable habitat at the Lee Nuclear Site is individually evaluated below. Shown in the heading is its federal or state status.

American Kestrel (SC). Also called the sparrow hawk, this species is the smallest (jay-sized) and most delicate falcon that inhabits continental North America, where it is widely distributed (Reference 30). It typically inhabits open areas where it is commonly observed hovering or perched on wires hunting insects and small mammals that it captures on the ground rather than in midair like other falcons. It has also adapted well to humans and even nests in large cities where it preys chiefly on the house sparrow.

The kestrel is a common yearlong resident of the southeastern United States, including South Carolina where it winters in the Piedmont and Coastal Plain and nests in the upper Piedmont and mountains (Reference 18).

The kestrel was included on the list of birds that potentially occurred on the Lee Nuclear Site in the 1970s (Reference 5). Additionally, its status as a probable yearlong resident was confirmed by observations recorded during scheduled fall, winter, and spring sampling periods in 1973 and 1974. Because large clearings and abandoned fields on the site provide suitable nesting and hunting habitat, it should be considered a possible breeder and a probable winter resident. Its presence was not confirmed during field reconnaissance in 2006.

Loggerhead Shrike (SC). This species, a predatory songbird, is referred to in the vernacular as the "butcher bird" due to its habit of impaling its prey, usually a small bird, mouse, or insect, on a thorn or barbed wire fence which facilitates tearing it apart. It was included as a possible resident at the site in the 1970s (Reference 5).

Like the kestrel discussed above, its status as a yearlong resident was confirmed by observations recorded during all four seasonal sampling periods in 1973 and 1974. Also, like the kestrel, it inhabits open or lightly wooded areas, brushy fields, hedgerows, and woodland edges throughout North America, including western deserts (Reference 30).

The site continues to offer suitable habitat as it did during the 1970s. Accordingly, the shrike should also be considered a probable permanent resident at the Lee Nuclear Site, although its presence was not confirmed during field reconnaissance in 2006.

2.4.1.3.1.4 Reptiles and Amphibians (Northern Cricket Frog [SC])

The cricket frog ranges throughout the central plains states from western Texas north to South Dakota and from the Florida panhandle north to southeastern New York, except for the Coastal Plain from Virginia to Florida and the northern Appalachians (Reference 31). Its range includes the Piedmont of South Carolina, and it occurs in York County according to SCDNR (Reference 21).

Within its range, the cricket frog inhabits sunny, shallow ponds with abundant vegetation in the water or on the shores. Slow moving, algae-filled water courses with sunny banks are the preferred habitat. Deep water is generally avoided. Males are typically found calling from floating mats of vegetation and organic debris.

This frog is thought to be in decline by most herpetologists. No detailed inventory of the site was conducted for this species. Its distinctive mating call was not heard during field reconnaissance in 2006. Therefore, although unconfirmed, it is a possible inhabitant of the site due to the availability of suitable habitat.

2.4.1.3.2 Species of Commercial or Recreational Value

Forests at the Lee Nuclear Site contain harvestable timber in limited commercial quantities. Some stands were apparently harvested before and after Duke Power Company sold the site. However, having reacquired the property, Duke Energy is likely to prohibit commercial timber harvest in the future.

South Carolina is divided into eleven game zones. The Lee Nuclear Site is located within Game Zone 4 where the SCDNR sets and regulates the methods of harvest, bag limits, and other requirements for hunting on wildlife management areas and for deer on private land (Reference 32).

SCDNR's regulations (Reference 32) legally classify bobcat, red fox, gray fox, opossum, raccoon, otter, mink, weasel, striped skunk, muskrat, and beaver as furbearers subject to commercial harvest by hunting and trapping. All of these species are likely to inhabit the site, based on the availability of suitable habitat, but are also common elsewhere in the immediate area. Possessing a valid trapping license in addition to a valid hunting license allows one to commercially trap or hunt furbearers from January 1 to March 1 of each year. Duke Energy intends to prohibit recreational hunting and trapping on-site in the future.

Furbearer hunting seasons for the species discussed in the previous paragraph vary by game zone and are subject to annual adjustment. Coyotes may be hunted during daylight hours throughout the year.

Legally protected game potentially occurring at the Lee Nuclear Site include bear, beaver, bobcat, deer, fox, mink, muskrat, opossum, otter, rabbit, raccoon, skunk, squirrel, weasel, waterfowl (geese and ducks), bobwhite quail, mourning dove, rails, American coot, gallinule, ruffed grouse, American crow, wild turkey, common snipe, and American woodcock.

Limited waterfowl hunting by local residents probably occurs along the Broad River. However, waterfowl are apparently not heavily hunted in the state. SCDNR, for example, reports harvest of less than 3600 specimens by 1632 hunters throughout the state on wildlife management areas during the 2005 – 2006 hunting season (Reference 33).

Harvest of nine-banded armadillo, a species with no regulatory protection, requires a hunting license. Similarly, the crow is protected by the federal Migratory Bird Treaty Act. Harvesting requires a hunting license and a free Migratory Bird Permit (Reference 32) from the state. Hunting feral hog also requires a license but no closed seasons or weapons restrictions apply to private land.

After Duke Power Company sold the property, subsequent owners, among other uses such as grazing cattle, apparently hunted upland birds and other game as evidenced by spent shotgun shells observed at numerous locations during field reconnaissance in 2006. Now that Duke Energy controls the site, trapping and fur harvesting that might have occurred there, and recreational hunting and fishing will cease.

2.4.1.3.3 Essential Species

NRC also includes as important species those that are essential to the maintenance and survival of species that are rare or commercially or recreationally valuable. As discussed above, rare terrestrial species at the Lee Nuclear Site are limited to a single observed plant (southern adder’s tongue fern), considered a species of special concern, and a small number of mammals, birds, and frogs that possibly occur at the site based on the availability of suitable habitat, but whose presence was not confirmed by reconnaissance in 2006 or field sampling in the 1970s.

Unless a plant is an epiphyte or a true parasite, few plants have direct relationships with other plants that are essential to maintaining their populations or to their long-term survival. Epiphytes grow on the surface of trees and other plants for mechanical support. Unlike parasites, epiphytes do not draw nutrients from the host plant, but absorb water and food from the air directly though their stems and leaves. The southern adder’s tongue fern is neither an epiphyte nor a parasite.

Plants may, however, have relationships with insects, bats, or birds that pollinate their flowers. In most cases, such relationships, even if obligatory, are poorly understood. There is no information that any other species in the area is essential to the continued survival of the fern.

None of the rare mammals, birds, or frogs possibly occurring at the Lee Nuclear Site is known to have a clearly established and essential trophic relationship to any other specific species comparable to that of wolves and deer elsewhere in North America. Trophic relationship or level refers to the position that an organism occupies in a food chain. Nor are these species confined to a specific habitat type like that of the red-cockaded woodpecker in open longleaf pine forests elsewhere in the southeastern United States.

The southeastern myotis bat, for example, feeds on a variety of insects that it captures while flying over water. Both the shrike and kestrel utilize a variety of prey species, as do frogs. Like the fern, there is no definitive information that any other species in the area is essential to the continued survival of these federally or state listed species assuming the presence in the area of generally suitable habitat conditions.

Commercial harvest of forest products and recreational hunting are not now significant economic or recreational activities at the Lee Nuclear Site and are likely to be totally curtailed in the future. The commercial and recreational species of interest on-site are also common in the area. In no case is the continued existence of any of the species on the site essential to maintaining commercial timber harvest and recreational hunting immediately adjacent to the site or elsewhere in the area where the species of interest are common.

2.4.1.3.4 Critical Species

NRC also includes as important species those that are critical to the structure and function of the local terrestrial ecosystem. As discussed above, the Kings Mountain Geological Belt ecoregion is largely forested with oak-hickory-pine stands of highly variable floristic composition. Active and abandoned agricultural fields and pastures are also common.

Most of the species at the Lee Nuclear Site other than those that are rare in the Piedmont region are common in southeastern forests and the streams that flow through them. The rare species on-site are also more abundant elsewhere. Regionally, the plant communities are highly variable and offer habitat for a wide variety of common and less-than-common animal species that vary in abundance depending primarily on local physiography.

Because of the wide variety of ecological communities within the region, the abundance of individual species, especially plants, can vary significantly from location to location where different species serve similar ecological roles in the community. Accordingly, there is no evidence suggesting that any individual species is critical to structure or function at the ecosystem level.

2.4.1.3.5 Biological Indicators

The U.S. Environmental Protection Agency (EPA) describes biological indicators as groups or types of biological resources that can be used to assess environmental conditions (Reference 34). Typically, such organisms at or near a site, like but not limited to federally or state listed species and other rare species, can be selected to characterize the current ecological status of the site or to track or predict significant change in the future.

In the case of the Lee Nuclear Site, terrestrial organisms that inhabit the site are common inhabitants of southeastern forests. There is little population information available for those that are less common, like the state listed southern adder's tongue fern, to track possible changes in their status in the future other than to note that the site population, discovered during field reconnaissance in 2006, suggests expansion of the known range of the species. Thus, there are no species at the site that might function as true bioindicators.

2.4.1.3.6 Nuisance Species

NRC describes nuisance species as those of concern because they are disease vectors or pests. There are a large number of terrestrial wildlife species that can be pests in urban/suburban or even rural settings. Included are raccoon, deer, bear, moles, voles, beaver, feral hog, gophers, snakes, crows, pigeons, starling, nutria, and others. Some of these species now inhabit the site.

Once the fence at the Lee Nuclear Site is completely repaired, large and medium size mammals such as deer and beaver are essentially captured within the site. Unless controlled, populations of both can cause substantial damage, not only to ornamental plants but also to the habitat. Deer reproduce rapidly and can over-browse shrub and herb layers. Field reconnaissance in 2006 suggests that isolated forest stands at the site may now be subject to minor over-browsing.

Beaver naturally dam flowing waterways and wetlands to create ponds in which they build lodges for over-wintering and breeding. In so doing, they plug culverts and can cause localized damage and roadway flooding. Should beaver and deer populations on-site show substantial increases in the near future, control of these species may then become necessary.

Nuisance species or pests include insects such as mosquitoes, ticks, wasps, bees, termites, bark beetles, and fire ants. For example, the most significant forest pest in the Carolina Piedmont is the southern pine beetle (Reference 5), known to breed in shortleaf pine, loblolly pine, scrub pine, and pitch pine, all of which occur at the Lee Nuclear Site.

Field reconnaissance in 2006 failed to reveal any evidence such as large numbers of dead or dying trees or forest stands with obvious signs of stress indicating serious infestations of species like bark beetles (normally associated with elms or pines) or other forest pests. With the possible exception of mosquitoes that can transmit the West Nile virus and ticks potentially carrying Lyme disease, there appear to be no serious disease vectors on the site, based on reconnaissance visits.

2.4.1.4 Important Terrestrial Habitats

Important terrestrial habitats include (1) wildlife sanctuaries, refuges, and preserves; (2) habitats identified by state or federal agencies as unique, rare, or of priority for protection; (3) wetlands and floodplains; and (4) land areas identified as critical habitat for species listed as threatened or endangered by USFWS. Each of these groups is discussed in more detail below.

2.4.1.4.1 Wildlife Sanctuaries, Refuges, and Preserves

Extensive literature and map reviews revealed the presence of no designated wildlife sanctuaries, wildlife refuges, or wildlife preserves in the vicinity of the site.

2.4.1.4.2 Unique and Rare Habitats or Habitats with Priority for Protection

Extensive literature and map reviews and field reconnaissance in 2006 revealed the presence of no unique and rare habitats, or habitats with priority for protection on the site.

2.4.1.4.3 Critical Habitat

As discussed earlier, the dwarf-flowered heartleaf is the only federally listed species thought to occur in Cherokee County. There is no designated critical habitat for the species anywhere in its range (Reference 35).

2.4.1.4.4 Travel Corridors

Wildlife managers recognize travel corridors as either local (e.g., a path followed by species such as the white-tail deer in the course of daily travel from bedding sites to food plots or water sources), regional (e.g., narrow bands of preferred habitat that link core areas of limited size and that are used seasonally by widely ranging wildlife species such as elk, cougar, and grizzly bear), and migratory (e.g., fly-ways used by neotropical and other migratory birds when traveling intercontinentally between nesting and over-wintering habitats).

Local travel corridors like deer trails exist at the Lee Nuclear Site and are likely to be most common in undisturbed habitat outside the core construction area of the site. Similarly, the Broad River is probably used as a travel corridor and rest stop by migratory songbirds and other birds during spring and fall migration.

Although some of the potential wildlife species in the area, such as the black bear, have fairly large home ranges, most are residents and nonmigratory. Additionally, the site is located within a largely rural area where habitat fragmentation due to human intervention is not yet significant. Perimeter fencing also prevents travel through the site by most large terrestrial vertebrates. Thus, the site probably does not represent a significant or important regional wildlife travel corridor.

2.4.1.4.5 Recreation Areas

Table 2.4-6 lists ecologically oriented recreational areas in the vicinity of the Lee Nuclear Site (Reference 36). They include designated outdoor recreation areas, hiking trails, campgrounds, public fishing sites and piers, heritage preserves, boat ramps, and wildlife viewing areas.

No state wildlife management areas or other public hunting areas, national wildlife refuges, or national forests occur in the immediate vicinity of the site.

2.4.1.4.6 Environmentally Sensitive Areas

With the exception of the areas listed in Table 2.4-6, there are no environmentally sensitive areas on or in the vicinity of the Lee Nuclear Site.

2.4.2 AQUATIC ECOLOGY

The primary reference for this section is the Cherokee Nuclear Station ER issued by Duke Power Company on October 13, 1975 (Reference 5). The Cherokee ER summarizes ecological field data collected at the site prior to the start of construction as well as a literature review conducted at that time. It is supplemented by the Cherokee EIS on issuance of a construction permit for the original facility (Reference 6).

Reconnaissance visits to the site were made during March, April, June, and October 2006. A meeting with representatives of USACE was held at the Lee Nuclear Site on June 26, 2006. Among others, one purpose of this meeting was to tour the property and view potential wetlands and stream channels qualifying as "waters of the United States" and, therefore, under USACE's regulatory jurisdiction. This issue is discussed in greater detail in Subsection 2.4.2.6.

The Cherokee ER summarized ecological field data collected at the site from October 1973 through March 1974, prior to the start of construction, as well as the literature reviewed by its authors (Reference 5). It documents systematic sampling of fish, benthos, aquatic macrophytes, periphyton, zooplankton, and phytoplankton in the Broad River and its tributary streams, the Ninety-Nine Islands Reservoir, and two small on-site creeks and their tributaries that were later flooded by constructing the Make-Up Pond B and other existing impoundments.

To supplement this information, more recent literature was reviewed in 2006. In addition to the above, Duke Energy implemented a 1-year field study designed to characterize fishery and macroinvertebrate resources. Constructing Ninety-Nine Islands Dam in the Broad River at the site as part of the existing hydroelectric plant turned the river at the site into Ninety-Nine Islands Reservoir. Ninety-Nine Islands Reservoir now extends upstream from Ninety-Nine Islands Dam past the site to a location just south of Cherokee Falls before the channel reassumes more river-like habitat conditions. Duke Energy selected five sampling stations in Ninety-Nine Islands Reservoir at the site and single locations both above Ninety-Nine Islands Reservoir (near Cherokee Falls) and below Ninety-Nine Islands Dam. Additionally, fish were sampled by electrofishing in three on-site impoundments (Make-Up Pond B, Make-Up Pond A, and Hold-Up Pond A) in April 2006. Electrofishing is an investigative or fishery management technique that involves passing an electric current through the water to draw fish to the surface, where they can be captured alive in a dip net.

Fish were sampled by electrofishing in Ninety-Nine Islands Reservoir in February, April, July, and October 2006. In addition, two experimental monofilament gill nets were set perpendicular to the shore at the two Ninety-Nine Islands Reservoir backwater locations in the afternoon and were retrieved the next morning. These nets are termed "experimental" because each net consists of a series of different mesh sizes to capture smaller and larger fish in the same net. Such nets are typically used for scientific study but not for commercial fishing.

Fish in the Broad River downstream of Ninety-Nine Islands Reservoir were sampled by electrofishing on the same schedule as that used in Ninety-Nine Islands Reservoir. In April, catostomids (suckers) were electrofished during their spawning run at the upstream location near Cherokee Falls.

Macroinvertebrates were sampled in the river in April, August, and October 2006. A visual assessment of the substrate and habitat type was performed at each sample station. In addition, a bioclassification was derived for each location. This bioclassification gave equal consideration to the number of Ephemeroptera-Plecoptera-Trichoptera (EPT) taxa and the biotic index value. Most EPT taxa are very intolerant of pollution. In general, a high EPT count indicates good water quality. The biotic index is the average pollution tolerance of all collected organisms based on previously assigned index values. It is based on a scale of 0 –10 with 10 representing the poorest quality water.

A score was assigned to the EPT value and to the mean biotic index. The mean of these two scores was used to assign a bioclassification ranging from poor (value = 1) to excellent (value = 5) water quality. Bioclassification results are further discussed in Subsection 2.4.2.5.6.

Dissolved oxygen, water temperature, and specific conductance were measured in the field at each station. Water samples for conductivity analysis were collected and returned to the laboratory for measurement.

Eleven sites upstream, within the Ninety-Nine Islands Reservoir, and below the site were surveyed for freshwater mussels by scuba diving, snorkeling, and batiscope.

2.4.2.1 Aquatic Habitats

Ninety-Nine Islands Reservoir is the source of plant water as well as the receiving waterbody for liquid effluents. It is the principal aquatic environment affected by constructing and operating a plant at the Lee Nuclear Site (Reference 6). While of importance locally for limited recreational potential and for water supply, neither the river nor Ninety-Nine Islands Reservoir is a significant aquatic habitat in a regional context.

Duke Power Company also constructed dams to form the existing Make-Up Pond B and Hold-Up Pond A. Damming what was formerly McKowns Creek, a perennial stream, and an intermittent stream flowing into a backwater of the Broad River, formed the Make-Up Pond B and Hold-Up Pond A, respectively. Damming a backwater of the Broad River formed the on-site Make-Up Pond A. Figure 2.4-1 shows the Broad River, Ninety-Nine Islands Reservoir, on-site impoundments, and wetlands.

Forty fish species, about 300 species and subspecies of phytoplankton and periphyton, at least 72 species of zooplankton, 36 species of aquatic macrophytes, and at least 140 species of benthic invertebrates occupied these habitats in the 1970s (Reference 5).

2.4.2.1.1 Broad River

The Broad River immediately upstream of the Ninety-Nine Islands Dam, where it is also known as Ninety-Nine Islands Reservoir, is generally wide, shallow, and turbid, and it carries a large bed load composed chiefly of uniform sand (Reference 6). Above and below Ninety-Nine Islands Reservoir, dominant streambed forms of the Broad River channel are riffles cut in bedrock alternating with deeper pools. Habitat ranges from slow-flowing pools to riffle/pool segments. Cover is provided by fallen trees, logs, and snags with overhanging shoreline vegetation and trees along undercut mud and sand banks. Field reconnaissance in 2006 revealed no significant changes to the river channel or banks that could be expected to significantly alter the ecological characteristics of this riparian habitat since first studied in the 1970s. These observations were confirmed by the visual assessment of substrate performed during macroinvertebrate sampling in 2006. Therefore, similar diversity and distribution of species to that recorded at the site in the 1970s should occur now in these habitats.

2.4.2.1.2 Ninety-Nine Islands Reservoir

Ninety-Nine Islands Reservoir is a typical run-of-the-river hydroelectric reservoir that retains few lake characteristics because it has been largely filled with silt. Ninety-Nine Islands Reservoir extends upriver a distance in excess of 4 mi. from the Ninety-Nine Islands Dam to a point south of the Cherokee Falls Dam, where substrate characteristics generally appear more river-like than reservoir-like. In the lower end the reservoir has three distinct hydrographic areas that have developed due to sedimentation patterns since the dam was built early in the last century. Flow through the Ninety-Nine Islands Reservoir is dominated by flow through the Broad River channel, which divides the reservoir into two backwater regions, one to either side of the main river channel. The backwaters are the only lentic habitats that now exist in the reservoir. The river-dominated main channel area is characterized by a strong current with a shallow sand and gravel bed extending through the center of the reservoir between the two backwaters (Reference 5).

See Subsection 2.3.1.3.1.2 for a detailed description of Ninety-Nine Islands Reservoir morphology.

The backwaters are even less influenced by main-channel sediment transport (Reference 5) but usually exhibit shallower water. The Cherokee ER also documents an abundant and productive biologic community of fishes and plankton more typical of lakes and ponds than in the river channel. A more limited population of benthos, periphyton, and aquatic macrophytes exists due to unsuitable substrate, limited light penetration from turbidity, and fluctuating water levels due to operation of the hydrostation.

2.4.2.1.3 On-site Impoundments and Ponds

As discussed above, Duke Power Company constructed dams to form the existing Make-Up Pond B, Hold-Up Pond A, and Make-Up Pond A. The Make-Up Pond B now receives water from McKowns Creek and the McKowns Creek watershed. The Make-Up Pond A now receives water primarily as runoff from the surrounding area on the site. The Hold-Up Pond A is fed mainly by culverts that carry stormwater runoff from the core construction area of the site. Additional information concerning the Make-Up Pond B, Make-Up Pond A, and Hold-Up Pond A is presented in Subsection 2.3.1.3.

Also located on the site are several small ponds constructed by previous landowners, presumably for watering livestock. The total surface extent of these ponds is about 32 ac.

Aerial photographs also document the presence of nonalluvial emergent wetlands associated with the impoundments (see Subsection 2.4.1.1.1).

2.4.2.2 Fisheries Resources

The river and stream environments at the Lee Nuclear Site support large populations of small fish (Reference 5). Commonly collected in the 1970s were bluehead chub and several species of shiners. Deeper pools supported populations of larger fish such as sunfish, bass, catfish, shad, and carp.

2.4.2.2.1 Broad River Fisheries

In addition to fish collections made by others and discussed in the literature, the results of electrofishing and gillnetting in the river and Ninety-Nine Islands Reservoir near the site by Duke Energy in 2006 are described. The fish species collected during these efforts are listed in Table 2.4-7. Figure 2.4-2 shows the proximity to the site of each sampling station where recent and earlier fish collections were made.

The collection results for the various efforts are very similar, with 34 of the 51 species (67 percent) common to three or more of the studies summarized in Table 2.4-7 and 26 of the 51 species (51 percent) common to the collections of 1973 – 1974 and those made in 2006, or 32 years later.

Calculating similarity according to a simplified version of Odum's Similarity Index (SI = 2C/[A+B]) (Reference 39) for the earliest and latest collections where A = the number of species in Sample 1, B = the number of species in Sample 2, and C = the number of species common to both samples yields an SI value of about 71 percent. On a scale where 0 indicates complete lack of similarity and 100 percent indicates completely identical samples, 71 percent is a medium to high degree of similarity. This indicates a relatively stable species composition in the fish population in the river over time. In addition, 32 of the species in Table 2.4-7 were also recorded by SCDNR at other sample stations upstream and downstream of the Lee Nuclear Site (Reference 38). This further suggests that many of the species at the site are also widely distributed and common elsewhere in the Broad River.

Five species captured in the 1970s were not collected again thereafter. Four of the five (rosyside dace, highback chub, highfin shiner, and swallowtail shiner) are minnows and one (creek chubsucker) is a sucker.

The absence of species collected during the 1970s from later collections could represent a contraction of the range of the species in question, misidentification of specimens in the original collection, or differences in the specific microhabitat characteristics at individual sampling stations. Figure 2.4-2 demonstrates that the studies summarized in Table 2.4-7 shared only one common sample site, an indication that microhabitat could be an important influence.

SCDNR collected the smallmouth buffalo in the river near the site (Reference 38). This species is an exotic and had not been previously known to occur in the Broad River. Its presence probably represents a range extension of the species.

In the most recent collections, the most productive sampling stations were Station 453 (1401 captures) and Station 462 (1007 captures), while Station 463 (231 captures) and Station 460 (261 captures) were least productive (Table 2.4-8), again suggesting differences based primarily on microhabitats.

The data in Tables 2.4-7 and 2.4-8 indicate that habitats in the Broad River at the site continue to support a rich and diverse fish community with Cyprinidae (minnows and carp) contributing the most species with 16, followed by Castostomidae (suckers) with 13, Centrarchidae (sunfish and bass) with 10, and Ictaluridae (bullheads and catfish) with 6. According to SCDNR, this degree of richness is generally comparable to what was previously known from the Broad River and rivers of similar size in the South Carolina Piedmont (Reference 38). The agency also notes that species richness and diversity is generally higher at downstream stations than at upstream sites like the Lee Nuclear Site.

Of fish collected in the Ninety-Nine Islands Reservoir during 2006, members of the Centrarchid family are most numerous. Centrarchids accounted for 2455 of 3621 specimens captured (or 68 percent of the total catch). As listed in Table 2.4-8, most of the Castostomids, Cyprinids, and Ictalurids were captured below the Ninety-Nine Islands Dam at the confluence of the Broad River and King's Creek. Comparing numbers captured at Stations 460 and 463 within Ninety-Nine Islands Reservoir (see Figure 2.4-2), Centrarchid species (sunfish and bass) appear equally distributed above and below the new make-up water intake on the north side of the site.

Only Cyprinids, among the other families captured, exceeded 10 percent of the total catch. The small number of specimens other than Centrarchids in the sample makes other analysis of temporal and spatial distribution of Ninety-Nine Islands Reservoir fish difficult except for the general observation that there appears to be little variation in capture by family between the four seasonal sampling periods. This suggests a lack of any significant variation in temporal distribution.

The relatively small size of Ninety-Nine Islands Reservoir and the apparent general homogeneity of habitats suggest lack of significant seasonal or spatial variations. There are two possible exceptions. The first could occur during periods of extreme low flow when all the resident species could seek deeper pools. Inhabitants of such pools would then re-disperse throughout Ninety-Nine Islands Reservoir with the return of normal flow. The second possible exception occurs during the spring when suckers migrate upstream to spawn in more river-like habitat south of Cherokee Falls.

2.4.2.2.2 On-Site Impoundments and Ponds

Duke Energy also collected fish from the on-site impoundments in 2006 by electrofishing (Table 2.4-9).

As was observed in the Broad River, bluegill was the most common species in on-site impoundments, followed by largemouth bass and redbreast sunfish. This assemblage of fish is typical of lentic habitats in the Carolina Piedmont. As noted in Subsection 2.4.2.5.3, these species are also popular game fish in the Carolina Piedmont.

The smaller Hold-Up Pond A was the least diverse impoundment, with a total of only three species of fish, while the larger Make-Up Pond B was the most diverse with 11 (92 percent) of the total number of 12 species captured. Total catch rates, however, were roughly the same in all with 447, 555, and 421 fish per hour in the Hold-Up Pond A, Make-Up Pond A, and Make-Up Pond B, respectively.

Duke Energy earlier dewatered the flooded excavation surrounding the original containment structure built in the core construction area. Before dewatering, Duke Energy collected fish in order to relocate them to the Make-Up Pond B. Of the 3111 specimens of four common species collected, 2964 (95 percent) were bluegill, 136 (4 percent) were largemouth bass, six (<1 percent) were redbreast sunfish, and five (<1 percent) were black crappie.

2.4.2.3 Macroinvertebrates

Table 2.4-10 summarizes the results of previous and current benthic macroinvertebrates collection activities in the Broad River near the site. Macroinvertebrates are larger-than-microscopic invertebrate animals that include aquatic insects, crustaceans (crayfish and others), mollusks (clams and mussels), gastropods (snails), oligochaetes (worms), and others.

Macroinvertebrate diversity varies in the above data, probably reflecting collections made in different microhabitats within the river, different seasonal sampling times, river flow rates, water quality parameters, and possible advances or realignments in taxonomy between the early 1970s and the present time. However, the most probable reason for these variations is that the field methods used now are substantially different from those used in the 1970s.

The habitats sampled at Locations 453 and 465 (see Figure 2.4-2) were generally similar, consisting of locations near islands in the river with large riffle areas, tree root masses, leaf packs, and small sand/cobble substrates. Locations 459, 460, and 463 within Ninety-Nine Islands Reservoir were also similar to each other in habitat, which was limited by steep banks, some root masses along the bank, and organic matter on the bottom.

Water quality also varied among the locations. Temperatures ranged from as low as 16.7°C (62.1°F) in April to 31°C (87.8°F) in August. Dissolved oxygen concentrations ranged from 6.6 milligrams per liter (mg/L) in August to 10.4 mg/L in April and were often slightly higher at the locations upstream and downstream of Ninety-Nine Islands Reservoir. Specific conductance was lowest in April and highest in August. Like temperature, specific conductance showed no notable spatial differences.

The total number of macroinvertebrates collected varied in 2006 among seasons and locations. The highest number for all locations combined occurred in April. The lowest number occurred in August and increased in October.

The total numbers of taxa were consistently higher at Locations 465 (upstream below Cherokee Falls) and 453 (downstream of Ninety-Nine Islands Dam) than within Ninety-Nine Islands Reservoir itself. Total taxa ranged from 18 at Location 463 in August to 86 at Location 465 in April. These numerical differences reflect the fact that aquatic insect larvae have yet to emerge in April and are available for collecting but have hatched by August and no longer occupy aquatic habitat.

With over 100 genera in both the early and late collections (Reference 37), the samples also indicate a relatively diverse and abundant macroinvertebrate fauna typical of Piedmont rivers. The above data also yield a similarity index of 39 percent for the earliest and latest collections. While lower than that for fish (see Subsection 2.4.2.2.1), 39 percent is at the lower end of the medium range. This suggests a degree of similarity and stability in the taxonomic make-up of the macroinvertebrate population over time that is remarkably high considering the differences in sampling methodology associated with comparing earlier and later samples, discussed above.

2.4.2.4 Mussels

The Cherokee ER discussed sampling for mollusks in the river and reported snails but no mussels near the site (Reference 5). Sampling in 1987 also collected snails (Reference 37) but only one species of mussel, *Corbicula* spp., a nonnative Asiatic clam generally considered an aquatic nuisance species (see Subsection 2.4.2.5.7). Field reconnaissance in 2006 also revealed the species in the Make-Up Pond B.

Early records for *Corbicula* in the late 1930s and early 1940s exist for the Sacramento and San Joaquin River systems in California and the Columbia River system in Washington (Reference 40). From there this species rapidly invaded the Colorado, Tennessee, and Ohio River systems, spreading east along the Gulf States to the Florida panhandle by 1960 and to southern Florida by 1967. It was first reported for the Mobile River in 1962, where it was described as “abundant,” and was first reported for the Savannah River in 1972. It reached Virginia that same year but may not have invaded the upper Broad River until later. Thus, it may not have inhabited the river at the site in the 1970s.

SCDNR surveyed native mussels in the lower and upper sections of the Broad River during its aquatic resources inventory in the summer of 2002 (Reference 38). SCDNR collected no mussels at its sample station below Ninety-Nine Islands Reservoir and only small numbers of the eastern elliptio mussel and the yellow lance mussel at a station on the river above Cherokee Falls.

SCDNR generally found mussels more abundant and diverse in the lower river than in the upper sections (Reference 38).

Physical habitat differences may have contributed to SCDNR's finding of fewer mussels in the upper river. The lower river is generally less turbid and has less silt than the upper sections. Agricultural practices and multiple sand-mining operations may also contribute to the high level of siltation in the upper sections. Silt often causes freshwater mussels to suffocate by clogging their gills. Additionally, the frequency of impoundments, which may have a deleterious effect on mussels, is greater in the upper section of the river. Dams negatively affect mussel communities by direct loss of habitat due to impoundment, altering flow and temperature, and changing substrate composition (Reference 38).

In addition to the above, dams may negatively impact mussels by interrupting the upstream movement of fish hosts that carry the glochidia (mussel larvae). Conversely, dams can benefit mussel populations because they often hold back sediments and thus the pesticides and other chemicals that are sequestered on the silt particles. These particles often settle out above the dam which helps minimize the negative influence on the mussel populations directly below the dam.

Table 2.4-11 lists the four mussel species collected in the project area during the 2006 field reconnaissance.

The eastern elliptio mussel and the Carolina lance mussel occurred adjacent to the site and the paper pondshell mussel and eastern floater mussel occurred on the site. The paper pondshell occurred in the on-site Make-Up Pond A, and the eastern floater was in the Make-Up Pond A and Make-Up Pond B. The Make-Up Pond A produced more than 50 live specimens of the latter species. Several live specimens and several shells were encountered in the Make-Up Pond B. Mussels are, therefore, abundant in the impoundments and scarce in the river. This suggests that the impoundments offer suitable habitat for the lentic species while the Ninety-Nine Islands Reservoir and the river lack habitat that supports lotic species.

The eastern elliptio and Carolina lance occurred in very low numbers. One live specimen of the former species occurred in the tailrace below Ninety-Nine Islands Dam. The latter species was represented by a single shell collected from the Ninety-Nine Islands Reservoir and Cherokee Falls tailraces and a single live specimen, also found in the Ninety-Nine Islands Reservoir tailrace. Accordingly, mussels are relatively abundant in the impoundments and scarce in the river. This suggests that the impoundments offer suitable habitat for the lentic species while the less desirable habitat and turbidity in Ninety-Nine Islands Reservoir and the river do not support typical lotic species more abundant elsewhere.

SCDNR reported the yellow lance mussel from a station above Cherokee Falls. The species is rare in Piedmont streams and was not found on or near the site. In contrast, the Carolina lance occurred in the Ninety-Nine Islands Reservoir. The species occupies a wide variety of lotic habitats and occasionally lakes and reservoirs. It is not protected at either the state or federal level.

Similarly, the eastern elliptio is one of the most common mussels along the Atlantic Seaboard. It is a very tolerant species found in ponds and stable, slow-moving streams throughout much of the Carolina Piedmont and Coastal Plain. The species is similarly unprotected at both the state and federal levels. Given that this tolerant species appears relatively uncommon in the Broad River, it is highly unlikely that more sensitive species occupy the river in the area of the site.

The paper pondshell mussel occurs widely throughout the Mississippi River basin and along the Atlantic Slope, typically in lentic habitats such as lakes and ponds. It is listed as a species of concern in South Carolina. Like most freshwater mussels, the paper pondshell requires a fish to complete its life cycle. Some mussels require a specific host fish. Others, like the paper pondshell, use a variety of fish species. In the wild, male mussels release sperm into the water column. The sperm are drawn into the females as they filter water for food. The fertilized eggs reside within pouches (marsupia) of the modified gills of the fish and develop into glochidia. In the case of the paper pondshell, common species found in the Make-Up Pond A (see Table 2.4-9) host glochidia. Included are pumpkinseed, warmouth, bluegill, largemouth bass, and black crappie (Reference 52).

The eastern floater mussel is also a common species in numerous lentic habitats and in the nearby streams and rivers. The species is unprotected at both the state and federal levels.

2.4.2.5 Other Important Aquatic Species and Habitats

Important aquatic species include (1) species listed (or proposed for listing) by a state or federal agency as threatened or endangered, (2) species identified as commercially or recreationally valuable, (3) species that are essential to the maintenance and survival of rare, or commercially or recreationally valuable species, (4) species that are critical to the structure and function of the local ecosystem, (5) species that may serve as biological indicators to monitor the effects of the proposed facilities on the aquatic environment, and (6) species identified as an aquatic nuisance.

Each of these groups is individually discussed in the following subsections.

2.4.2.5.1 Federally Listed Threatened and Endangered Species

USFWS reports no federally listed threatened or endangered aquatic species that have the potential to occur in Cherokee County. However, USFWS's response to Duke Energy's request for information on threatened and endangered species (see Subsection 2.4.1.3.1) mentions a fish of special concern, the robust redhorse that SCDNR stocked in the Broad River downstream of the Lee Nuclear Site (see Table 2.4-5 for a list of endangered and other noteworthy species potentially occurring in the vicinity of the site).

The Cherokee ER reported collecting seven specimens of the robust redhorse during scheduled sampling periods at Sample Station 15 (Reference 5), located at the confluence of the Broad River and King's Creek immediately downstream from Ninety-Nine Islands Reservoir (see Figure 2.4-2). However, further identification by Duke Power Company using additional taxonomic experts revealed that the report was a result of misidentification due to incomplete understanding of the taxonomy of the species at the time.

The result of that correction does not appear in the Cherokee EIS (Reference 6). Therefore, the Cherokee EIS also erroneously includes robust redhorse as a species occurring near the Lee Nuclear Site. Similarly, the Federal Energy Regulatory Commission (FERC) reported collecting the smallfin redhorse and also misidentified that species as Moxostoma robustum (Reference 37), the scientific name now assigned the robust redhorse. Smallfins represented from approximately 2 to 9 percent of the total catch. Again, subsequent identification and advances in taxonomy determined this to be an erroneous identification. Accordingly, there is no authenticated record of the robust redhorse from the Broad River near the Lee Nuclear Site.

The robust redhorse is a large, long-lived member of the sucker or Catostomid family (Reference 41). It was discovered in the Yadkin River of North Carolina in 1869, but not recaptured and recognized until 1991 in the Oconee River, Georgia. Historically, it was found in large Atlantic Slope rivers from the Altamaha in Georgia to the Pee Dee in North Carolina. Currently, wild populations are known to exist in the Oconee River (Georgia), the Savannah River (Georgia and South Carolina), and the Pee Dee River (North Carolina). Small populations have been established by stocking in the Ocmulgee, Broad, and Ogeechee rivers in Georgia. Robust redhorse fingerlings were stocked into the Broad River below Neal Shoals and Parr Shoals reservoirs during the fall of 2004 (Reference 42). The SCDNR projects that stocking is expected to continue each year until a self-sustaining population is achieved.

The Robust Redhorse Conservation Committee (RRCC) was established in lieu of listing the species under the ESA (Reference 16). RRCC is a cooperative, voluntary partnership formed under a memorandum of understanding between state and federal resource agencies, private industry, and the conservation community. Duke Energy is a member of RRCC.

Factors such as reduced habitat quality due to erosion and sedimentation from land disturbances, habitat loss and disruption of spawning migrations resulting from impoundments and dams, subsistence fishing during colonial times, and the lack of rules against sport fishermen catching robust redhorse probably contribute to the rarity of the fish.

Robust redhorse once fed on native freshwater mussels that were abundant in Piedmont rivers, but it now survives mostly by eating introduced Asiatic clams in addition to other invertebrates. Soil erosion, both from development and farming, washes into rivers and covers the gravelly bottom needed for both robust redhorse eggs and bottom-dwelling mussels. Thus, sedimentation adversely impacts the fish and its preferred food supply.

The flathead catfish, introduced from the Mississippi River basin to most Atlantic slope river systems, has been theorized to prey on robust redhorse as well as most other fish species. Lack of robust redhorse in a Piedmont river can also be seen as an indicator of ecological degradation (Reference 43).

Like Ninety-Nine Islands Dam, none of the downstream Broad River dams are equipped with fish passage devices. It is unlikely that the robust redhorse is capable of extending its range in the Broad River upstream to Ninety-Nine Islands Reservoir. Realistically, the possibility is remote unless the species is stocked there.

2.4.2.5.2 State Listed Threatened and Endangered Species

While SCDNR lists no aquatic species of special concern for Cherokee County (Reference 20), the Carolina darter occurs on the list for adjacent York County (Reference 21). In addition, SCDNR collected the fantail darter in the Broad River at Site 6, downstream of the Lee Nuclear Site (Reference 38). This species is listed by SCDNR as a fish of special concern (Reference 44).

Carolina Darter. The Carolina darter is a member of the perch family (Percidae). The species inhabits small streams in areas of low current velocity characterized by mud, sand, and bedrock substrates. It is a documented resident of small streams in the Piedmont province of the Yadkin, Pee Dee, Catawba, Broad, and Saluda drainages in South Carolina (Reference 45). Carolina darter is a species of special concern within the state because the geographical isolation of known populations makes them vulnerable to stream-side development, pollution, and habitat alteration.

Fantail Darter. This species, also a Percid, is found in stream riffles with gravel bottoms. It may also occur in shallow areas away from the main current in large streams (Reference 46).

SCDNR collected this darter only downstream of Ninety-Nine Islands Reservoir (Reference 38). One specimen of the species was collected adjacent to the Lee Nuclear Site at Sample Station 463 (see Table 2.4-8 and Figure 2.4-2) during the 2006 winter fish sampling program. It also occurred during the sampling at this same locale in 1974–1976.

2.4.2.5.3 Species of Commercial or Recreational Value

Overall, bluegill was the most abundant fish species reported in Table 2.4-8, with 61 percent of the total catch, followed by several species of shiners and largemouth bass. The Cherokee ER reported the bluehead chub and several species of shiners were common to the river channel with various sunfish, including bluegill, the largemouth bass, and catfish common to deeper pools (Reference 5).

This diversity and abundance indicate a typical Piedmont warm-water recreational stream fishery comprising primarily Centrarchid (bluegill, redbreast and redear sunfish, smallmouth and largemouth bass, and black crappie) and Ictalurid (white and channel catfish and suckers) species (Reference 38). These species are popular game fish in the Carolina Piedmont and are included in the results summarized above and listed in Tables 2.4-7 and 2.4-8.

Despite the presence of game fish, the section of the river above Ninety-Nine Islands Reservoir is not an area of high recreational fishing interest due to turbidity, remoteness, and sand and gravel within the watershed, but is undoubtedly fished by local residents.

According to SCDNR, the Broad River below Ninety-Nine Islands Dam also possesses a smallmouth bass fishery that is unique to Piedmont rivers in the state (Reference 38). Smallmouth bass were introduced into the Broad River by the SCDNR, in 1984, to increase and diversify sport fishing. Since their introduction, a small fishery has developed. Based on reports from anglers, fishing for smallmouth bass is generally good. The species was also earlier collected from the Ninety-Nine Islands Reservoir tailrace (Reference 37).

No commercial fisheries currently operate in this section of the Broad River.

2.4.2.5.4 Essential Species

Important aquatic species also include those that are essential to the maintenance and survival of species that are rare, or commercially or recreationally valuable. As discussed above, rare aquatic species at the Lee Nuclear Site are limited to five species of fish, two of which (V-lip redhorse and fantail darter) are known to occur at the site but only in very low numbers, one (Carolina darter) that is not likely to occur at the site, and two (robust redhorse and highfin carpsucker) that are possible inhabitants of the river but never collected there. Of the later two species, the robust redhorse is very unlikely to ever inhabit the river at the site unless it is stocked there (see Subsection 2.4.2.5.1).

None of these species are known to have a clearly established and essential trophic relationship to any other specific species in the area. In addition, none of these species are of commercial or recreational importance.

2.4.2.5.5 Critical Species

Species that are critical to the structure and function of the local ecosystem are also included as important species. Most of the species at the Lee Nuclear Site other than those that are rare in the Piedmont region are common in other southeastern streams. Most of the rare species at the site are also more abundant elsewhere.

The aquatic habitats at the Lee Nuclear Site are locally important but not regionally significant. They support a wide variety of common and less-than-common aquatic species that vary in abundance depending primarily on local conditions. Because the habitats at the Lee Nuclear Site are widespread within the region, the abundance of individual aquatic species can vary significantly from location to location where different species serve similar ecological roles in the aquatic community. Accordingly, there is no evidence suggesting that any individual species is critical to structure or function at the ecosystem level.

2.4.2.5.6 Biological Indicators

The relative health of the Broad River at the Lee Nuclear Site was investigated by reviewing water quality data. The Listing of Impaired Waters developed by the South Carolina Department of Health and Environmental Control (Reference 48) identifies two points along the Broad River in Cherokee County that do not currently meet state water quality standards for fecal coliform bacteria after application of required controls for point and nonpoint source pollutants.

Water bodies are listed by point locations. However, the impairment is considered to extend for some distance upstream and/or downstream of the point listed. One point location on the Broad River is at SC18, 4 mi. northeast of Gaffney, South Carolina, and the other point location is at SC211, 12 mi. southeast of Gaffney (Reference 48). The first point is about 10 river-miles upstream of Ninety-Nine Islands Dam and the second point is about 7.2 river-miles downstream. At these distances, it is unlikely that fecal coliforms impair water quality at the site. As is also discussed in Subsection 2.3.3, no samples collected at the site in 2006 contained fecal coliforms exceeding the limit fully supporting recreational use of the river.

The presence, condition, and numbers of the types of fish, insects, algae, plants, and other aquatic life can provide accurate information about the health of a specific water body such as a river, stream, lake, or wetland (Reference 34). No known biological indicators of water quality such as aquatic vegetation, macroinvertebrates, or fish have been systematically studied in the Broad River at the Lee Nuclear Site, except for the collections by Duke Energy in 2006 described below.

Because of their abundance and their sensitivity to environmental effects, macroinvertebrates are the most widely used species in biomonitoring programs for assessing water quality. They are susceptible to degradation of water, sediment, and habitat and, therefore, serve as good indicators of localized environmental conditions because they cannot escape their immediate habitat. As discussed above, diversity varies substantially in the Broad River, but the abundant macroinvertebrate fauna found near the Lee Nuclear Site is typical of Piedmont rivers.

In this case, bioassessment scores for the 2006 samples ranged from poor to good. These scores followed the same spatial patterns as total taxa and EPT taxa, with relatively high scores at Locations 453 and 465 above and below Ninety-Nine Islands Reservoir, while Locations 459, 460, and 463 within Ninety-Nine Islands Reservoir consistently scored lower. Because water quality was generally comparable between all locations, the range in bioassessment scores probably reflects variability between lower quality habitat in Ninety-Nine Islands Reservoir and higher quality habitat at the upstream and downstream sampling locations.

SCDNR also uses many species of fish as general biomonitors to determine the relative health of rivers in the state. For example, darters and suckers are especially intolerant of environmental stresses, such as polluted water, and are utilized as biological indicators. The sensitive Piedmont darter and seagreen darter were collected approximately 3 – 4 mi. below Ninety-Nine Islands Reservoir in the Broad River. Both the fantail and Piedmont darter were collected at the site during the 2006 field reconnaissance. The presence of such intolerant species in the river, even in low numbers, also suggests that water quality in the river at the site and downstream is good.

Mussels are normally very susceptible to pollution and are often used as bioindicators. However, as discussed in Subsection 2.4.2.4, few mussels inhabit the upper reach of the Broad River near the Lee Nuclear Site. Because the primary uses of an indicator are to characterize current status and to track, or predict significant change, lack of suitable habitat to support abundant mussel populations in the river renders mussels a poor choice to serve as an indicator.

2.4.2.5.7 Nuisance Species

Occurrence of the common carp, a potential nuisance species, is documented throughout the Broad River, including at the site (Table 2.4-7). However, it has not become a nuisance, and SCDNR has implemented no specific management strategies targeting the species.

Corbicula spp. is a nonnative Asiatic clam and an aquatic nuisance species. *Corbicula* exists throughout the Broad River system but SCDNR does not consider it to be a nuisance species above Ninety-Nine Islands Reservoir. Field reconnaissance also revealed its presence in the Make-Up Pond B. In any case, there is no known effective mitigation or control of the species.

SCDNR, in conjunction with the state's Aquatic Plant Management Council, is responsible for the management of nuisance aquatic vegetation in public waters. SCDNR reports no nuisance aquatic vegetation problems in the Broad River above Ninety-Nine Islands Reservoir. This area is remote and not known to support typical invasive species. The agency has implemented no treatments of invasive species or management strategies.

2.4.2.5.8 Other Aquatic Species of Special Interest

Other species of interest collected by SCDNR in the area of the Lee Nuclear Site include highfin carpsucker and V-lip redhorse (Reference 38).

Highfin Carpsucker. The highfin carpsucker, a Catostomid, is found mainly in large interior rivers and river impoundments where it occupies quiet water adjacent to channels over sand and gravel substrates. It prefers clean water with firm bottoms and is intolerant of turbidity and siltation (Reference 51).

SCDNR collected the species during its recent aquatic resources inventory of the Broad River (Reference 38). The highfin carpsucker was found in the downstream reaches of the Broad River.

V-lip Redhorse. This species, also a Catostomid, was previously called the slender redhorse. It is considered relatively secure throughout its range (Reference 50) although the northern parts of South Carolina represent the southern extent of its range. Though uncommon locally, it is not rare and is known to inhabit the upper Broad River drainage (Reference 38). There it occupies warm, rocky, river runs with silty to firm bottom pools. It is a species of concern because any large-scale habitat loss or catastrophic pollution event in the upper Broad River could lead to extirpation of the V-lip redhorse from the state. However, simultaneous catastrophic events throughout the entire Broad River basin in North Carolina would be extremely unlikely.

Few specimens of the species were collected and only at middle and upstream sites (Reference 38). It was collected at the same Broad River sampling stations as the highfin carpsucker discussed above.

While this population is self-sustaining, the species is not locally abundant. The V-lip may also be a candidate for future inclusion on the South Carolina Heritage Trust list of fishes of special concern because, while not considered rare, it remains uncommon (Reference 49) because it is at the southern limit of its natural range.

Paper Pondshell Mussel. The paper pondshell mussel, listed as a species of concern in South Carolina, now occupies the Make-Up Pond A. Although uncommon in many areas of the Piedmont and Coastal Plain, the species may become abundant in some lentic habitats such as lakes and impoundments, as is the situation at the Lee Nuclear Site.

2.4.2.5.9 Recreation Areas

Recreation areas in proximity to the Lee Nuclear Site are listed in Table 2.4-6.

Ninety-Nine Islands Reservoir is not officially designated for recreational use and, as mentioned earlier, is not an area of frequent recreational fishing. However, there is public boat access to the river at the Pick Hill Landing that is on the opposite side of the river from the Lee Nuclear Site. Additionally, an unnamed landing is located immediately above Ninety-Nine Islands Dam on the west side of the river at the end of South Carolina State Secondary Road 13 (off of South Carolina State Highway 105).

The 15.3-mi. section of the Broad River below Ninety-Nine Islands Reservoir to its confluence with the Pacolet River was designated a state scenic river by the South Carolina General Assembly on May 31, 1991 (Reference 47) to protect unique and outstanding river resources.

Public access to the Broad Scenic River Corridor south of Ninety-Nine Islands Reservoir is afforded by the Ninety-Nine Islands Boat Landing, located at the end of South Carolina State Rd.

43 adjacent to the hydroplant. It is operated and maintained by Duke Energy. It has a boat ramp and a wildlife observation/fishing dock.

The Broad Scenic River Advisory Council (BSRAC), in partnership with the SCDNR, published the, “Broad Scenic River Management Plan, Update 2003” (Reference 19), after studying, identifying, and exploring potential effects to the river. That plan contains management goals and recommendations that address issues, concerns, and opportunities regarding the river corridor. The Rivers Assessment section of the plan rates the Broad River as a superior resource of state-wide or greater significance in two categories: “Undeveloped” and “Utility.”

The “Undeveloped” river category represents the natural character and infrequent occurrence of man-made structures along the scenic river corridor. The Broad River had a Class 1 ranking because a very small number of structures is visible from the water.

The “Utility” category represents the ability of the river to be used as a source of energy. The Broad River has a Class 1 “Utility” ranking because the Ninety-Nine Islands Hydroelectric Station is located at the northern end of the scenic river corridor and the Lockhart Hydroelectric Station is located a few miles below the southern end of the scenic corridor.

The Rivers Assessment section also rates the Broad River as an outstanding river of regional significance in the industrial, recreational fishing, timber management, and wildlife habitat categories.

The current recreational uses of the Broad Scenic River Corridor include fishing, boating, rafting, tubing, swimming, nature study, photography, and bird watching (Reference 19). Hunting and trapping are also common outdoor activities along the river.

2.4.2.5.10 Other Environmentally Sensitive Areas

With the exception of the areas listed in Table 2.4-6, there are no other environmentally sensitive areas on or in the vicinity of the Lee Nuclear Site.

2.4.2.6 Waters of the United States

Waters of the United States are broadly defined as waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including (1) all waters which are subject to the ebb and flow of the tide; (2) the territorial sea; (3) interstate waters and wetlands; (4) all other waters (such as intrastate lakes, rivers, streams and wetlands), if their use, degradation, or destruction could affect intrastate or foreign commerce; (5) tributaries to waters or wetlands identified above; and (6) wetlands adjacent to waters identified above.

The Lee Nuclear Site is located on the west bank of the Broad River immediately upstream of the Ninety-Nine Islands Dam. The Broad River in the area above the Ninety-Nine Islands Dam is not currently navigable for interstate or foreign commerce. However, this section of the river, as well as that below Ninety-Nine Islands Dam, is currently used for recreational boating and fishing, which supports its designation as a navigable river.

The Broad River is classified as “waters of the United States” and is under the regulatory jurisdiction of USACE, which regulates discharges into such waters. Additionally, eight on-site stream channels with hydrologic connections to the river are also under USACE’s regulatory jurisdiction. These channels total approximately 1.5 mi. in length and occupy about 0.15 percent of the total area of the site (see Figure 2.4-1 and Table 2.4-1).

Based on discussions during a June 26, 2006, visit to the site by representatives of USACE, Duke Energy requested USACE review of Figure 2.4-1 and Table 2.4-1 and solicited a letter from the agency (August 14, 2006) stating USACE's agreement with the extent of jurisdictional wetlands and waters of the United States at the Lee Nuclear Site, as depicted on Figure 2.4-1. Written confirmation of this determination was provided by USACE on September 24, 2007.

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TABLE 2.4-1
ACREAGE OCCUPIED BY VARIOUS ECOLOGICAL TYPES AT THE LEE NUCLEAR SITE

Map Symbol	Ecological Type	Brief Description of Type	Acres	Percent of Total
OFM	Open/Field/Meadow	Nonforested areas dominated by grasses, herbs, or bare soil maintained by cattle grazing and/or mowing.	421.6	22.19
MH	Mixed Hardwood	Stands dominated by mixed hardwoods with little or no pine in the canopy.	410.3	21.60
MHP	Mixed Hardwood-Pine	Stands dominated by mixed hardwood with pine in the canopy.	307.3	16.18
OW	Open Water	Reservoirs and ponds constructed in uplands and Broad River backwaters.	249.4	13.13
PMH	Pine-Mixed Hardwood	Stands dominated by pine with mixed hardwood in the canopy and understory.	227.1	11.96
USC	Upland Scrub	Partially forested early successional, scrubby areas.	156.9	8.26
OPMH	Open Pine-Mixed Hardwood	Selectively cut stands with scattered pine in canopy and mixed hardwood understory.	65.3	3.44
NJW	Nonjurisdictional Wetland	Disturbed, open, man-made wetland not under regulatory authority of USACE.	32.4	1.70
P	Pine	Young to midaged pine stands/ plantations with no hardwoods in canopy.	16.0	0.84
NAW	Nonalluvial Wetland	Backwater emergent wetland associated with ponds, impoundments, and upland depressions.	8.1	0.43
SC	Stream Channel	Intermittent drainages in uplands under regulatory authority of USACE.	2.8	0.15
AW	Alluvial Wetland	Forested bottomland along Broad River floodplain.	2.3	0.12
		Total	**1899.5**	**100.00**

TABLE 2.4-2
NUMBER OF POTENTIALLY OCCURRING AND OBSERVED TERRESTRIAL WILDLIFE SPECIES AT THE LEE NUCLEAR SITE

Taxa	Number of Potentially Occurring Species	Number of Species Observed	% of Expected Actually Observed
Mammals	42	20	48
Birds	241	104	43
Reptiles and Amphibians	65	32	49

Source: Reference 5

TABLE 2.4-3
POTENTIAL AND OBSERVED BIRD GROUPS AT THE LEE NUCLEAR SITE

Bird Group	Number of Expected Species	Number of Observed Species	% of Expected Species Actually Observed
Water-Dependent			
Shorebirds	21	2	10
Colonial Nesters	19	5	26
Primarily Upland			
Upland Game Birds	2	1	50
Perching Birds	125	65	52
Birds of Prey	21	11	52
Woodpeckers	8	6	75

Source: Reference 5

TABLE 2.4-4
COMMON REPTILES AND AMPHIBIANS OBSERVED AT THE LEE NUCLEAR SITE

Taxa	Common Name	Habitat Preference
Reptiles		
Turtles	Eastern bog turtle	Open woodlands and meadows near water
Lizards	Northern fence lizard	Dry wooded hillsides
Snakes	Northern water snake	Vegetated areas near water
	Northern black racer	Terrestrial habitat generalist
	Black rat snake	Same as above
Amphibians		
Salamanders	Red-spotted newt	Clean bodies of permanent or semipermanent water
	Northern dusky salamander	Woodlands near water
	Slimy salamander	Same as above
Frogs and Toads	Fowler’s toad	Sandy soils near water
	Northern cricket frog	Sunny, shallow ponds with abundant vegetation in the water or on the shores
	Northern spring peeper	Woodlands near aquatic breeding sites
	Upland chorus frog	Variety of vegetated habitats near shallow wetlands
	Southern leopard frog	Same as above

Source: Reference 5

TABLE 2.4-5 (Sheet 1 of 4)
ENDANGERED, THREATENED, AND OTHER NOTEWORTHY SPECIES POTENTIALLY OCCURRING IN THE VICINITY OF THE LEE NUCLEAR SITE

Common Name	Reference	Federal Status(a)	State Status(b)	Habitat at the Site?	Present on the Site?
Plants					
Dwarf-flowered heartleaf	USFWS	FT	ST	Yes	Unlikely Based on Targeted Field Searches
Pool sprite	YORK	FT	ST	No	No
Prairie birdsfoot-trefoil	USFWS	FSC	NL	No	No
Schweinitz's sunflower	YORK	FE	SE	No	No
Georgia aster	CHEROKEE, YORK	FC	SC	Yes	Unlikely Based on Targeted Field Search
Ashy hydrangea	CHEROKEE		SC	Yes	No
Biltmore greenbrier	USFWS	FSC	SC	No	No
Blue grass	YORK		SC	No	No
Canada lily	YORK		SC	No	No
Common or creeping spikerush	YORK		SC	Yes	No
Creel's azalea	YORK		SC	Yes	No
Culver's-root	YORK		SC	No	No
Dwarf bulrush	YORK		SC	No	No
Dwarf skullcap	YORK		SC	No	No
Ear-leaved foxglove	YORK		SC	No	No
Early buttercup	YORK		SC	No	No
Georgia rush	YORK		SC	No	No
Granite-loving flatsedge	YORK		SC	No	No
Gravel elimia	YORK		SC	No	No
Gray-headed prairie coneflower	YORK		SC	No	No

TABLE 2.4-5 (Sheet 2 of 4)
ENDANGERED, THREATENED, AND OTHER NOTEWORTHY SPECIES POTENTIALLY OCCURRING IN THE VICINITY OF THE LEE NUCLEAR SITE

Common Name	Reference	Federal Status[(a)]	State Status[(b)]	Habitat at the Site?	Present on the Site?
Heart-leaved foamflower	YORK		SC	No	No
Mullein foxglove	YORK		SC	No	No
Narrow-leaved vervain	YORK		SC	No	No
Nodding onion	CHEROKEE		SC	Yes	No
One-flowered stichwort	YORK		SC	No	No
Pale manna grass	YORK		SC	No	No
Piedmont quillwort	YORK		SC	No	No
Prairie goldenrod	YORK		SC	No	No
Prairie rosinweed	YORK		SC	No	No
Rigid prairie goldenrod	YORK		SC	No	No
Riverbank wild-rye	YORK		SC	No	No
Rough sedge	CHEROKEE		SC	No	No
Slender naiad	YORK		SC	No	No
Smooth blue aster	YORK		SC	No	No
Smooth sunflower	CHEROKEE, YORK		SC	Yes	No
Soft grooveburr	YORK		SC	No	No
Soft-haired thermopsis	CHEROKEE		SC	No	No
Southern adder's tongue fern	Previously Unknown From Either County		SC	Yes	Yes-Observed During Field Reconnaissance
Southern nodding trillium	YORK		SC	No	No

TABLE 2.4-5 (Sheet 3 of 4)
ENDANGERED, THREATENED, AND OTHER NOTEWORTHY SPECIES POTENTIALLY OCCURRING IN THE VICINITY OF THE LEE NUCLEAR SITE

Common Name	Reference	Federal Status[(a)]	State Status[(b)]	Habitat at the Site?	Present on the Site?
Swamp white oak	YORK		SC	No	No
Turkey-beard	CHEROKEE		SC	No	No
Vasey's dogfennel	CHEROKEE		SC	No	No
Virginia bunchflower	YORK		SC	Yes	No
White walnut	YORK		SC	No	No
American ginseng	YORK		RC	Yes	No
Wild hyacinth	YORK		RC	No	No
Shoals spider-lily	YORK		NC	No	No
Sun-facing coneflower	YORK		NC	No	No
Canada moonseed	CHEROKEE			Yes	Possible – But Unobserved During Field Reconnaissance
Mammals					
Southeastern myotis bat	USFWS	FSC	SC	Yes	Possible – But Unobserved During Field Reconnaissance
Birds					
Loggerhead shrike	USFWS	FSC	SC	Yes	Probable – But Unobserved During Field Reconnaissance
American kestrel (sparrow hawk)	USFWS	FSC	NL	Yes	Probable – But Unobserved During Field Reconnaissance

TABLE 2.4-5 (Sheet 4 of 4)
ENDANGERED, THREATENED, AND OTHER NOTEWORTHY SPECIES POTENTIALLY OCCURRING IN THE VICINITY OF THE LEE NUCLEAR SITE

Common Name	Reference	Federal Status[(a)]	State Status[(b)]	Habitat at the Site?	Present on the Site?
Frogs					
Northern cricket frog	YORK		SC	Yes	Possible – But Unobserved During Field Reconnaissance
Pickerel frog	YORK		SC	No	No
Fish					
Robust redhorse	USFWS	FSC		Yes	Possible – But Highly Unlikely Due to Downstream Dams
Carolina darter	YORK		SC	No	No
Fantail darter	STATE		SC	Yes	Yes
Highfin carpsucker			SC	Yes	Possible – But Rarely Collected
V-lip redhorse	STATE		SC	Yes	Possible Due to Recent Range Extension
Mussel					
Paper pondshell	Not Previously Listed for Either County		SC	Yes	Yes-Collected During Mussel Survey

Sources: CHEROKEE County List = Reference 20; YORK County List = Reference 21; USFWS = Reference 16; STATE = Reference 17.

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a) **Federal Status:** FT = federally listed as threatened; FE = federally listed as endangered; FC = federal candidate, not yet listed; FSC = federal species of concern.

b) **State Status:** ST = state listed as threatened; SE = state listed as endangered; NC = state listed as of national concern; RC = state listed as of regional concern; SC = state listed as of state concern; NL = not listed.

TABLE 2.4-6 (Sheet 1 of 2)
ECOLOGICALLY ORIENTED PUBLIC RECREATION AREAS IN THE VICINITY OF THE LEE NUCLEAR SITE

Type of Property	Name of Property	Approximate Distance and Direction from the Site
Recreation Area	Croft State Natural Area	23 mi. SW
	Kings Mountain State Park and Kings Mountain Trail	12 mi. NE
	Andrew Jackson State Park	42 mi. SE
Campground	Lazy Daze Campground	30 mi. E
	Pinecone Campground	9 mi. NW
	New Heritage USA Campground	33 mi. E
Freshwater Fishing	Catawba River	37 mi. SE
	Jonesville Reservoir	17 mi. SW
	Lake Edwin Johnson	21 mi. W
	Lake Cherokee	3 mi. NW
	Lake Thicketty	16 mi. NW
	Lake Wylie	25 mi. E
Public Fishing Pier	Jonesville Reservoir	See above
	Lake Cherokee	See above
	Lake Blalock	21 mi. W
	Andrew Jackson State Park	See above
	Lake Wylie	See above
Heritage Preserve	Pacolet River	17 mi. SW
	Peters Creek	21 mi. SW
	Rock Hill Blackjack's	30 mi. SE
Boat Ramp	Lake Cherokee	See above
	Pick Hill Access	On NNIR
	Ninety-Nine Islands Reservoir	2 mi. SE
	Ninety-Nine Islands Canoe Portage	2 mi. SE

TABLE 2.4-6 (Sheet 2 of 2)
ECOLOGICALLY ORIENTED PUBLIC RECREATION AREAS IN THE VICINITY
OF THE LEE NUCLEAR SITE

Type of Property	Name of Property	Approximate Distance and Direction from the Site
Wildlife Viewing	Kings Mountain State Park	See above
	Pacolet River Heritage Preserve	See above
	Rock Hill Blackjack's Heritage Preserve	See above
State Wild and Scenic River	Broad River	Downstream of NNID

TABLE 2.4-7 (Sheet 1 of 3)
FISH COLLECTED IN THE BROAD RIVER NEAR THE LEE NUCLEAR SITE,
1973 – 2006

Family	Common Name	Year Collected			
		1973–74	1987	2000–02	2006
Clupeidae	Gizzard shad	X	X	X	X
	Threadfin shad	X	X	X	X
Cyprinidae	Rosyside dace	X			
	Common carp	X	X	X	X
	Silvery minnow	X	X	X	
	Highback chub	X			
	Thicklip chub		X	X	X
	Bluehead chub	X	X	X	X
	Golden shiner	X	X		X
	Highfin shiner	X			
	Greenfin shiner	X	X	X	X
	Spottail shiner	X	X	X	X
	Yellowfin shiner	X		X	
	Whitefin shiner	X	X	X	X
	Swallowtail shiner	X			
	Fieryback shiner		X	X	X
	Sandbar shiner	X	X	X	X
	Creek chub	X			X
Castostomidae	Quillback	X	X	X	X
	White sucker	X	X	X	X
	Creek chubsucker	X			
	Highfin carpsucker			X	
	Northern hogsucker	X	X	X	X
	Smallmouth buffalo			X	
	Notchlip redhorse	X	X	X	X
	Shorthead redhorse		X	X	X
	V-lip (slender) redhorse			X	X

TABLE 2.4-7 (Sheet 2 of 3)
FISH COLLECTED IN THE BROAD RIVER NEAR THE LEE NUCLEAR SITE, 1973 – 2006

Family	Common Name	Year Collected			
		1973–74	1987	2000–02	2006
	Suckermouth redhorse		X		
	Smallfin redhorse	X	X		
	Striped jumprock	X	X	X	X
	Brassy jumprock			X	X
Ictaluridae	Snail bullhead	X	X	X	X
	White catfish	X	X	X	X
	Brown bullhead	X			
	Flat bullhead	X	X	X	X
	Channel catfish		X	X	X
	Margined madtom	X	X	X	X
Poeciliidae	Mosquito fish	X		X	
Moronidae	White bass		X		X
Centrarchidae	Redbreast sunfish	X	X	X	X
	Pumpkinseed	X			X
	Warmouth	X	X		X
	Bluegill	X	X	X	X
	Redear sunfish		X	X	X
	Smallmouth bass		X	X	X
	Largemouth bass	X	X	X	X
	White crappie	X	X		X
	Black crappie	X	X	X	X
	Sunfish Hybrid				X
Percidae	Fantail darter	X	X	X	X
	Tesselated darter	X	X	X	
	Seagreen darter	X		X	

TABLE 2.4-7 (Sheet 3 of 3)
FISH COLLECTED IN THE BROAD RIVER NEAR THE LEE NUCLEAR SITE, 1973 – 2006

Family	Common Name	Year Collected			
		1973–74	1987	2000–02	2006
	Piedmont darter		X	X	X
	Yellow perch				X
	Number of Species Collected	39	37	38	39
	Percent of Total Species Listed (51)	76	73	75	78

Sources: 1973-1974 Data (Reference 5); 1987 Data (Reference 37); 2002-03 Data (Reference 38); 2006 Data (see Table 2.4-8)

TABLE 2.4-8 (Sheet 1 of 3)
FISH COLLECTED IN THE BROAD RIVER AT THE LEE NUCLEAR SITE, 2006

Family	Common Name	Number Collected February Location[a]					Number Collected April Location					Number Collected July Location					Number Collected October Location					Total
		453	458	460	462	463	453	458	460	462	463	453	458	460	462	463	453	458	460	462	463	
Catostomidae	White sucker[b]	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
	Quillback	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
	Northern hogsucker[b]	25	0	0	0	0	12	0	0	0	0	41	0	0	0	0	74	0	0	0	0	152
	Notchlip redhorse	1	0	1	0	1	6	1	1	0	0	0	2	3	0	0	6	0	0	1	0	23
	Shorthead redhorse[c]	12	0	0	0	0	8	0	0	0	0	1	0	0	0	0	0	0	0	0	0	21
	V-Lip redhorse[c]	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
	Striped jumprock[b]	21	0	0	0	0	4	0	0	0	0	5	0	0	0	0	7	0	0	0	0	37
	Brassy jumprock[c]	14	0	0	0	1	24	0	0	0	0	1	0	0	0	0	14	0	0	0	0	54
	Subtotal	77	0	1	0	2	54	1	1	0	0	48	2	3	0	0	101	1	0	1	0	292
Centrarchidae	Redbreast sunfish[b]	4	0	1	0	7	23	0	3	0	5	46	0	1	0	3	58	0	1	0	5	157
	Pumpkinseed[b]	0	16	0	5	0	0	0	0	0	1	0	8	0	1	0	0	7	0	0	0	38
	Warmouth[b]	0	0	0	2	0	0	0	0	2	0	0	2	1	1	1	0	1	3	3	0	16
	Bluegill[b]	7	150	38	333	24	32	110	82	188	58	20	98	26	118	18	70	194	58	186	40	1850
	Redear sunfish[c]	1	3	2	8	1	7	2	0	2	0	0	2	2	1	2	5	13	5	2	5	63
	Sunfish hybrid	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2
	Smallmouth bass[b]	6	0	0	0	1	8	0	0	0	0	80	0	0	0	0	64	0	0	0	2	161

TABLE 2.4-8 (Sheet 2 of 3)
FISH COLLECTED IN THE BROAD RIVER AT THE LEE NUCLEAR SITE, 2006

Family	Common Name	Number Collected February Location[a]					Number Collected April Location					Number Collected July Location					Number Collected October Location					Total
		453	458	460	462	463	453	458	460	462	463	453	458	460	462	463	453	458	460	462	463	
	Largemouth bass[b]	0	13	8	6	1	3	10	5	11	5	3	9	1	12	2	3	14	7	14	2	129
	Black crappie[b]	0	0	1	4	0	2	4	0	4	0	0	0	0	3	0	0	3	0	14	0	35
	White crappie	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3	0	4
	Subtotal	18	182	50	359	34	75	126	90	207	69	149	119	31	136	26	200	234	74	222	54	2455
Clupeidae	Gizzard shad[b]	0	0	0	0	0	6	12	0	2	0	0	0	0	1	0	0	5	0	15	13	54
	Threadfin shad[b]	0	0	0	0	0	0	0	0	14	0	0	2	0	5	0	0	1	0	9	0	31
	Subtotal	0	0	0	0	0	6	12	0	16	0	0	2	0	6	0	0	6	0	24	13	85
Cyprinidae	Thicklip chub[b]	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	4
	Whitefin shiner[b]	19	0	1	0	12	13	0	0	0	1	33	0	0	0	0	107	0	2	0	2	190
	Fireyback shiner[b]	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
	Greenfin shiner[b]	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	3
	Common carp[b]	0	0	0	5	0	0	5	1	3	2	0	1	1	1	0	0	5	0	6	3	33
	Bluehead chub[b]	8	0	0	0	0	0	0	0	0	0	6	0	0	0	0	2	0	0	0	0	16
	Golden shiner[b]	0	1	0	3	0	0	0	0	0	0	0	0	0	1	0	0	0	0	7	0	12
	Spottail shiner[b]	111	0	1	0	1	1	0	0	0	0	33	0	1	1	0	39	0	0	0	0	188
	Sandbar shiner[b]	41	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	43
	Creek chub[b]	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Subtotal	188	1	3	8	13	14	5	1	3	3	75	1	2	3	0	151	5	2	13	5	496
Ictaluridae	Snail bullhead[b]	4	0	0	0	1	29	0	0	0	0	82	0	0	0	0	79	0	0	0	0	195

TABLE 2.4-8 (Sheet 3 of 3)
FISH COLLECTED IN THE BROAD RIVER AT THE LEE NUCLEAR SITE, 2006

Family	Common Name	Number Collected February Location[a]					Number Collected April Location					Number Collected July Location					Number Collected October Location					Total
		453	458	460	462	463	453	458	460	462	463	453	458	460	462	463	453	458	460	462	463	
	White catfish[b]	0	0	0	4	0	0	8	0	3	1	0	10	0	0	1	0	2	0	0	0	29
	Channel catfish[b]	0	0	0	0	0	1	1	0	0	3	0	0	2	1	0	0	0	1	1	2	12
	Flat bullhead[b]	0	0	0	0	2	0	0	0	0	0	1	0	0	0	0	2	1	0	0	0	6
	Margined madtom[b]	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	6	0	0	0	0	21
	Subtotal	4	0	0	4	3	30	9	0	3	4	98	10	2	1	1	87	3	1	1	2	263
Percidae	Fantail darter[b]	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Tessellated darter[b]	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Yellow perch[c]	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	2
	Piedmont darter[b]	0	0	0	0	0	4	0	0	0	0	19	0	0	0	0	3	0	0	0	0	26
	Subtotal	0	0	0	0	2	4	1	0	0	0	19	0	0	0	0	3	0	0	1	0	30
	Total	**287**	**183**	**54**	**371**	**54**	**183**	**154**	**92**	**229**	**76**	**389**	**134**	**38**	**146**	**27**	**542**	**249**	**77**	**262**	**74**	**3621**
	Total Number of Species (Excluding Hybrids)	**19**	**5**	**9**	**9**	**13**	**17**	**10**	**5**	**9**	**8**	**17**	**9**	**9**	**12**	**6**	**19**	**13**	**7**	**13**	**9**	**39**

a) See Figure 2.4-2 for sample station locations.
b) Also reported in References 5 and 38.
c) Also reported in either Reference 5 or Reference 38.

TABLE 2.4-9
CATCH RATES FOR FISH COLLECTED IN IMPOUNDMENTS AT THE LEE NUCLEAR SITE, APRIL – MAY 2006

Family	Common Name	Catch Per Hour			Total Catch
		HUPA	MUPA	MUPB	
Centrarchidae	Redbreast sunfish	107		55	158
	Pumpkinseed		3		3
	Warmouth		15	16	52
	Bluegill	113	499	273	1211
	Redear sunfish			20	47
	Sunfish hybrid	10			3
	Largemouth bass	217	12	36	160
	Black crappie		25	3	34
	Subtotal	447	554	403	1668
Clupeidae	Gizzard shad			5	11
	Subtotal			5	11
Cyprinidae	Common carp			1	2
	Subtotal			1	2
Ictaluridae	Snail bullhead			1	3
	White catfish		1	1	3
	Flat bullhead			16	36
	Subtotal		1	18	42
	Total	**447**	**555**	**421**	**1710**
	Total Number of Species (Excluding Hybrids)	**34**	**6**	**11**	**12**

Locations: HUPA = Hold-Up Pond A; MUPA = Make-Up Pond A; MUPB = Make-Up Pond B.

TABLE 2.4-10 (Sheet 1 of 8)
BENTHIC MACROINVERTEBRATES COLLECTED IN THE BROAD RIVER
NEAR THE LEE NUCLEAR SITE, 1973 – 2006

Order and Family	Genus	Year Collected		
		1973–74	1987	2006
Annelida				
Rhynchobdellida				
Glossiphoniidae	*Placobdella*			X
Oligochaeta				
Haplotaxida				
Tubificida				
Naididae	*Nais*			X
	Pristinella			X
	Ripistes			X
	Slavina			X
	Stylaria			X
Tubificidae	*Branchirua*			X
	Limnodrilus			X
	Tubifex			X
Lumbriculida				
Lumbriculidae	*Lumbriculus*			X
Arthropoda				
Crustacea				
Amphipoda				
Talitridae	*Hyalella*			X
Decapoda				
Cambaridae	*Cambarus*	X		X
Isopoda				
Asellidae	*Asellus*	X		
	Caecidotea			X
Insecta				
Coleoptera				
Crysomelida	*Donacia*	X		
Dryopidae	*Helichus*			X
Dytiscidae	*Neoporus*			X
Elmidae	*Ancyronyx*		X	X
	Dubiraphia	X		
	Macronychus	X	X	X
	Optioservus	X		

TABLE 2.4-10 (Sheet 2 of 8)
BENTHIC MACROINVERTEBRATES COLLECTED IN THE BROAD RIVER NEAR THE LEE NUCLEAR SITE, 1973 – 2006

Order and Family	Genus	Year Collected 1973–74	1987	2006
	Stenelmis	X	X	X
Eubriidae	*Ectopria*		X	
Gyrinidae	*Dineutus*	X		X
	Gyrinus		X	
Haliplidae	*Peltodytes*			X
Hydrophilidae	*Sperchopsis*			X
Psephenidae	*Psephenus*	X		
Ptilodactylidae	*Anchytarsus*	X		X
Tingidae	*Corythuca*	X		
Diptera				
Ceratopogon-idea	*Palpomyia-Bezzia complex*	X	X	X
	Culicoides	X		
	Dasyhelia	X		
Chaoboridae	*Chaoborus*			X
Chironom-idea/Chiro-nominae	*Axarus*			X
	Chironomus			X
	Cladopelma		X	
	Cladotanytarsus	X		X
	Cryptochironomus	X		X
	Cryptocladopelma	X		
	Cryptosadisus	X		
	Cryptotendipes			X
	Demicryptochironomus	X		
	Dicrotendipes	X		X
	Diplocladius	X		
	Endochironomus			X
	Glyptotendipes			X
	Parachironomus		X	
	Paralauterborniella	X		X
	Paratanytarsus		X	
	Paratendipes			X
	Phaenopsectra	X		X

TABLE 2.4-10 (Sheet 3 of 8)
BENTHIC MACROINVERTEBRATES COLLECTED IN THE BROAD RIVER NEAR THE LEE NUCLEAR SITE, 1973 – 2006

Order and Family	Genus	Year Collected 1973–74	1987	2006
	Polypedilum	X	X	X
	Pseudochironomus		X	
	Rheotanytarsus	X	X	X
	Robackia			X
	Stenochironomus	X		X
	Stictochironomus		X	X
	Tanytarsus	X	X	X
	Tribelos		X	X
Chironom-idea/Dia-mesinae	*Potthastia*			X
	Diamesa		X	
Chironom-idea/Ortho-cladiinae	*Ablabesmyia*	X		
	Brillia		X	X
	Cardiocladius		X	X
	Chironomus	X	X	X
	Corynoneura	X	X	
	Cricotopus	X	X	X
	Eukiefferiella	X		X
	Metriocnemus	X		
	Microtendipes	X		
	Nanocladius	X	X	X
	Orthocladius		X	X
	Paracladopelma	X		
	Paratrichocladius		X	X
	Psectrocladius	X	X	
	Rheocricotopus		X	
	Synorthocladius			X
	Thienemanniella	X	X	X
	Trichocladius	X		
	Trissocladius	X		
	Tvetenia		X	X

TABLE 2.4-10 (Sheet 4 of 8)
BENTHIC MACROINVERTEBRATES COLLECTED IN THE BROAD RIVER NEAR THE LEE NUCLEAR SITE, 1973 – 2006

Order and Family	Genus	Year Collected		
		1973–74	1987	2006
Chironom-idea/Tany-podinae	*Ablabesmyia*			X
	Coelotanypus	X		X
	Conchapelopia	X		X
	Labrundinia			X
	Nilotanypus		X	X
	Procladius	X		X
	Rheopelopia		X	
Chaoboridae	*Chaoborus*	X		
Dixidae	*Dixa*	X		
Empididae	*Hemerodromia*	X		
Simuliidae	*Simulium*	X	X	X
Tabanidae	*Tabanus*	X		X
Tipulidae	*Antocha*	X		X
	Erioptera	X		
	Helobia	X		
	Tipula	X	X	X
Ephemeroptera				
Baetidae	*Acentrella*			X
	Ameletus	X		
	Baetis	X	X	X
	Baetisca	X		
	Caenis	X		
	Centroptilum			X
	Cloeon	X		
	Heterocloeon			X
	Plauditus			X
	Pseudocloeon		X	
Caenidae	*Caenis*		X	X
Ephemerellidea	*Danella*			X
	Ephemerella	X	X	X
	Eurylophella		X	X
	Serratella			X
Ephemeridae	*Hexagenia*	X	X	X

TABLE 2.4-10 (Sheet 5 of 8)
BENTHIC MACROINVERTEBRATES COLLECTED IN THE BROAD RIVER
NEAR THE LEE NUCLEAR SITE, 1973 – 2006

Order and Family	Genus	Year Collected 1973–74	1987	2006
Heptageniidae	*Heptagenia*		X	X
	Stenacron			X
	Stenonema	X	X	X
Leptophlebiidea	*Leptophlebia*			X
Neoephemeridea	*Neoephemera*			X
Oligoneuriidea	*Isonychia*	X	X	X
	Paraleptophlebia	X		
	Pseudiron	X		
Tricorythidae	*Tricorythodes*	X	X	X
Hemiptera				
Belostomatidae	*Belostoma*	X		
Corixidae	*Sigara*			X
Gerridea	*Gerris*	X	X	
Nepidae	*Ranatra*			X
Veliidae	*Rhagovelia*	X		
Megaloptera				
Corydalyidae	*Chauliodes*	X		
	Corydalus	X	X	X
Sialidae	*Sialis*			X
Odonata/Anisoptera				
Aehnidae	*Boyeria*		X	X
	Gomphaeschna	X		
Corduliidae	*Epicordulia*			X
	Neorocordula			X
Cordulegastridae	*Cordulegaster*		X	
Cordultidae	*Neurocordulia*		X	
Gomphidae	*Dromogomphus*	X	X	X
	Gomphus	X		X
	Hagenius			X
	Ophiogomphus	X		X
	Progomphus	X		
	Stylogomphus			X
	Stylurus		X	
Libellulidae	*Libellula*			X
Macromiidae	*Macromia*			X

TABLE 2.4-10 (Sheet 6 of 8)
BENTHIC MACROINVERTEBRATES COLLECTED IN THE BROAD RIVER
NEAR THE LEE NUCLEAR SITE, 1973 – 2006

Order and Family	Genus	Year Collected		
		1973–74	1987	2006
Odonata/Zygoptera				
Calopterygidae	*Calopteryx*			X
	Hetaerina		X	X
Coenagrionidea	*Argia*	X	X	X
	Enallagma			X
	Ischnura	X		X
Plecoptera				
Nemouridae	*Allocapnia*	X		
	Amphinemoura	X		
	Brachyptera	X		
	Leuctra	X		
	Nemoura	X		
	Oemopteryx	X		
	Taeniopteryx	X		
Perlidae	*Acroneuria*	X		X
	Eccoptura	X		
	Neoperla			X
	Paragnetina			X
	Perlesta	X	X	X
	Perlinella	X		
Peltoperidae	*Peltoperia*	X		
Perlodidae	*Isoperia*	X		
Trichoptera				
Glossosomatidae	*Glossosoma*	X		
Hydropsychidea	*Cheumatopsyche*	X	X	X
	Hydropsyche	X	X	X
	Macrostenum		X	X
Hydroptilidae	*Hydroptila*	X		X
	Stactobiella	X		
Lepidostomatidea	*Lepidostome*		X	
Leptoceridae	*Nectopsyche*			X
	Oecetis	X		X
	Triaenodes			X
Limnephilidae	*Drusinus*	X		
	Neophylax	X		

TABLE 2.4-10 (Sheet 7 of 8)
BENTHIC MACROINVERTEBRATES COLLECTED IN THE BROAD RIVER NEAR THE LEE NUCLEAR SITE, 1973 – 2006

Order and Family	Genus	Year Collected		
		1973–74	1987	2006
Molannidae	*Molanna*	X		
Philopotamidae	*Chimarra*			X
Polycentropodidea	*Cyrnellus*			X
	Neureclipsus			X
	Polycentropus	X		X
Psychomyiidae	*Lype*	X		
	Psychomyia			X
Rhyacophilidae	*Rhyacopnila*	X		
Mollusca				
Gastropoda				
Basommatophora				
Physidae	*Physella*			X
Limnophila				
Ancylidae	*Laevapex*			X
Mesogastropoda				
Hydrobiidae	*Amnicoloa*			X
Pleuroceridae	*Leptoxis*			X
Pulmonata				
Ancylidae	*Ferrissia*	X		
Lymnaeidae	*Lymnaea*	X		
Planorbidae	*Menetus*			X
Pelecypoda				
Heterodonta				
Sphaeriidae				X
Heterodontida				
Corbiculidae	*Corbicula*			X
Tricladida				
Platyhelminthes				
Turbellaria				
Tricladida				
Planariidea	*Dugesia*			X
	Phagocata	X		
Plumatellina				
Lophopodidae	*Pectinatella*	X		

TABLE 2.4-10 (Sheet 8 of 8)
BENTHIC MACROINVERTEBRATES COLLECTED IN THE BROAD RIVER
NEAR THE LEE NUCLEAR SITE, 1973 – 2006

Order and Family	Genus	Year Collected		
		1973–74	1987	2006
Paludicellidae	*Paludicella*	X		
Ctenobranchiata				
Amnicolidae	*Gilliaa*	X		
	Pyrgulopsis	X		
Rhynchobdellida				
Glossiphoniidae	*Helobdella*	X		
	Number of Taxa Collected	109	56	125
	Percent of Total Taxa Collected (201)	54	28	62

Sources: 1973-1974 Data (Reference 5); 1987 Data (Reference 38); 2006 Data (Duke Energy 2006 collection reported here)

TABLE 2.4-11
MUSSELS COLLECTED NEAR OR ON THE LEE NUCLEAR SITE, 2006

Common Name	Location Where Collected			
	MUPA	MUPB	NNIR	Broad River
Paper pondshell	X			
Eastern floater	X	X		
Eastern elliptio				X
Carolina lance			X	X

Locations: MUPA = Make-Up Pond A; MUPB = Make-Up Pond B; NNIR = Ninety-Nine Islands Reservoir; Broad River = NNIR tailrace.

2.5 SOCIOECONOMICS

This section presents the socioeconomic resources that have the potential to be affected by the construction, operation, and decommissioning of nuclear units on the Lee Nuclear Site. This section is divided into five subsections:

- Demography (Subsection 2.5.1)
- Community characteristics (Subsection 2.5.2)
- Historic properties (Subsection 2.5.3)
- Environmental justice (Subsection 2.5.4)
- Noise (Subsection 2.5.5)

For the purposes of this section, potential affected socioeconomic characteristics are discussed both spatially (i.e., site, vicinity, and regional) and temporally (e.g., 10-year incremental projections). Figure 2.0-1 illustrates the relationship between the site, 6 mi. vicinity, and 50 mi. region for the socioeconomic discussion.

2.5.1 DEMOGRAPHY

Demographic information is presented in three major categories: (1) population distribution, (2) demographic characteristics, and (3) transient populations.

2.5.1.1 Population Distribution

The Lee Nuclear Site region includes the land within 80 kilometers (km) (50 miles [mi.]) of the center point of the two proposed nuclear reactors. Population distribution within the region is estimated based upon the most recent U.S. Census Bureau decennial census data (Reference 5). Figures 2.5-1 and 2.5-2 show the population distribution in the region estimated in nine concentric circles at 2, 4, 6, 8, 10, 16, 40, 60, and 80 km (1.24, 2.5, 3.7, 5, 6.2, 10, 25, 37, and 50 mi.) from the center point between the two reactors. Population data are further divided into 16 compass directions, with each sector consisting of 22.5 degrees of the circle resulting in a radial grid as defined in NUREG-1555, "Standard Review Plans for Environmental Reviews for Nuclear Power Plants." Population sectors for 0 – 16 km (10 mi.) are shown in Figure 2.5-1 and for 16 – 80 km (50 mi.) in Figure 2.5-2. These figures display area-weighted 2007 population estimates.

2.5.1.1.1 Population Projections

Tables 2.5-1 and 2.5-2 provide population projections in 10-year increments from 2016. The population projections were calculated in 10-year increments to 40 years beyond the estimated 2016 start-up date for Lee Nuclear Station. Projections were derived from county estimates that were based on the cohort-component method (References 1 and 2).

Population projections for the years 2007, 2016, 2026, 2036, 2046, and 2056 were estimated for each sector using the following methodology:

1. Using linear regression and county projection data, an equation was derived for each county. This equation was then used in conjunction with the year 2000 county-level census data to produce a county growth ratio set for each projected year.

2. Each set was then weighted by area into sectors and summed.

3. The 2000 Census block-level data were then sorted into the radial grid, weighted by area, then summed.

4. The block-level values for each sector were multiplied by their projection ratio, described in Step 1, to produce the final population sector tables (Tables 2.5-1 and 2.5-2) (Reference 5).

For transient population data that correspond by sector, see Tables 2.5-3 and 2.5-4, and Subsection 2.5.1.3.

2.5.1.1.2 Population Data by Political Jurisdiction

Figure 2.5-2 shows the Lee Nuclear Site region, radial grid, and state and county boundaries. Table 2.5-5 identifies all the counties partially or wholly contained within the Lee Nuclear Site region. Charlotte, North Carolina is the most populated city in the region with a 2005 estimated population of 610,949 (References 4 and 110). Based on the 2005 U.S. Census Bureau estimates, the Gastonia, North Carolina; Rock Hill, South Carolina; Greenville, South Carolina; Hickory, North Carolina; and Spartanburg, South Carolina, populations are 68,964, 59,554, 56,676, 40,232, and 38,379 respectively. Many other small towns, cities, and urban areas with populations less than 25,000 are distributed within the 80-km (50-mi.) area. The cities of Concord, North Carolina, and Monroe, North Carolina, have very small portions inside the 80-km (50-mi.) area. Both of these cities have populations in excess of 25,000 and urban areas within the vicinity (References 3 and 4). Table 2.5-6 lists those regional municipalities with populations in excess of 25,000 according to the 2000 Census.

Table 2.5-3 indicates that within 16-km (10-mi.) of the site the largest current residential and transient population is located in the west-northwest direction, which includes the city of Gaffney, South Carolina. As of 2005, the population of Cherokee County, South Carolina, was 54,440 and the population of York County, South Carolina, was 183,360 (Reference 2).

2.5.1.2 Demographic Characteristics of the Region

Based on the 2007 projected population in Table 2.5-1, approximately 43,132 people live within 16 km (10 mi.) of the Lee Nuclear Site, resulting in a population density of 137.3 persons per square mile. Gaffney and Blacksburg are the nearest urban areas, and the distribution of population outside the cities and towns can be characterized as rural.

Based on the 2007 projected population in Table 2.5-1 and Table 2.5-2, approximately 2,382,474 people live within the Lee Nuclear Site region, resulting in a population density of 303.3 persons per square mile. Within the region a majority of the population is located northeast of the site, centered on Charlotte, North Carolina and its outlying bedroom communities.

Table 2.5-7 lists the population distribution in the Lee Nuclear Site region by age and sex based on U.S. Census Bureau 2000 SF1 block level data. In alignment with US population patterns, 63.9 percent of the regional population falls within the 18 to 64 age group, 25 percent of the population is 17 years and younger, and 11 percent of the population is 65 years of age or older. Racial, ethnic, and low-income populations are discussed in detail in Subsection 2.5.4. Transient populations are addressed in Subsection 2.5.1.3, and migrant populations are discussed in Subsection 2.5.4.5.

2.5.1.3 Transient Populations

Transient populations in the Lee Nuclear Site region include people attending special events, visitors to parks (both state and federal), and attendees of major tourist attractions (e.g., museums, aquariums, theme parks, retail outlet centers). These populations are not typically included in census data for permanent population. Transient populations in Table 2.5-4 assume that from 2007 through 2056 the location of major tourist attractions remain the same, approximately 40 to 60 km (25 to 50 mi.) away from the site in the west-northwest, east, and east-northeast direction.

Transient populations within the Lee Nuclear Site region are influenced by several factors. Shopping generates the most transients within 16 km (10 mi.) of the Lee Nuclear Site. Natural attractions generate most of the other visitors to the region, with the remainder being made up of attendees of special events.

The Prime Outlets in Gaffney, South Carolina, is the largest transient population contributor in the vicinity of the Lee Nuclear Site. The Prime Outlets get an average of 7671 shoppers per day or over 2.8 million visitors per year. Forty-six percent of the shoppers are from South Carolina and 54 percent are from out-of-state (Reference 11).

The nearest park to the proposed site is Kings Mountain State Park, which is located approximately 8 mi. northeast of the Lee Nuclear Site center point and has an average of 548 daily visitors. Other attractions near the Lee Nuclear Site are Cowpens National Battlefield, located approximately 18 mi. northwest with an average of 573 daily visitors; and Kings Mountain National Military Park, which is located approximately 12 mi. northwest of the site and averages 1452 daily visitors. Kings Mountain National Military Park immediately adjoins the Kings Mountain State on its northwest border. A portion of Francis Marion, Sumter National Forest, falls within the region and accounts for approximately 3000 visitors per day (References 12, 14, and 15). The average site visit length of stay in the national forest is six hours, but can range from 1 to 37 hours within the various visitor categories.

The city of McAdenville, North Carolina, located approximately 29 mi. northeast of the site hosts the largest special event in the Lee Nuclear Site region. This event, titled Christmastown USA, draws over 600,000 visitors December 1 – 26 annually (Reference 101).

The city boundaries of Charlotte, North Carolina, are approximately 30 mi. to the northeast of the Lee Nuclear site. Transient populations in Charlotte include people visiting for business purposes and those attending cultural attractions such as museums and theater.

The city of Gaffney, South Carolina, hosts several events throughout the year. These include the South Carolina Peach Festival and Christmas on Limestone. Each of these events can host between 2000 and 2500 people per day during the event. The Peach Festival can last from 5 to 10 days, and the Christmas celebration is a 1-day event.

There are three commercial passenger airports within the Lee Nuclear Site region: Charlotte-Douglas International Airport is approximately 34 mi. to the northeast and has an annual passenger count of 26.3 million. Greenville-Spartanburg International Airport is approximately 41 mi. to the southwest and has approximately 1.6 million passengers per year utilize the facility. Hickory Regional Airport is 49 mi. to the north (Reference 28). Hickory Regional Airport, although not currently serviced by any major commercial carriers, is classified as a commercial airport (References 28 and 32).

Amtrak has passenger train stations in Spartanburg, South Carolina; Charlotte, North Carolina; and Gastonia, North Carolina. Amtrak also has trackage rights on all rails within the region, meaning that there is a possibility that any rail section can be used to move passengers from one station to another (References 28 and 107).

State parks and other outdoor recreational facilities do not have a maximum capacity. Because the majority of transients within the Lee Nuclear Site region are pursuing recreational activities, assessing the projected or maximum capacity of recreational facilities is not possible.

Transient data were gathered through personal contact with businesses, companies, and local chambers of commerce within the region. Data for an area within 15 mi. of Lee Nuclear Site were collected in accordance with regulations for the Emergency Planning Zone (EPZ). Major contributors to transient population are shown in Table 2.5-8 and illustrated in Figure 2.5-3.

Transient population data by sector were summed to develop transient population projections. Each sum was multiplied by the corresponding sector growth ratio, derived from the county growth ratios described above, for each year. Because the method for collecting transient data provides point locations, some sectors have a zero value. Table 2.5-4 lists the projected transient population for each sector with a non-zero value for 2007, 2016, 2026, 2036, 2046, and 2056. The estimated start-up date for the station is 2016.

2.5.1.3.1 Special Transient Populations

Military facilities, hospitals, health facilities, and farms employing migrant workers are sources of populations defined as special transient populations and are not counted in the total transient population. Military and health facilities are discussed below, and migrant workers are discussed in Subsection 2.5.4.5.

There are no military facilities within 5 mi. of the Lee Nuclear Site center point. The closest military facility is the Charlotte/Douglas International Airport Badin Air Guard Station. This United States Air Force installation is located approximately 34 mi. to the northeast of the Lee Nuclear Site center point at the Charlotte/Douglas International Airport (Figure 2.5-4) (Reference 6).

There are 32 major hospitals and medical centers within 50 mi. of the Lee Nuclear Site. These medical facilities have a combined capacity of 5558 staffed beds and discharge more than 260,810 patients per year. The two closest major medical facilities to the Lee Nuclear Site are Upstate Carolina Medical Center in Gaffney, South Carolina, and Kings Mountain Hospital in Kings Mountain, North Carolina. These two facilities account for 167 beds, and 6391 annual discharges. The largest medical facility within the region is Carolinas Medical Center in Charlotte, North Carolina, with 743 beds and more than 41,858 patient discharges annually (References 104 and 105).

There are two nursing home facilities within 10 mi. of the Lee Nuclear Site. Brookview HealthCare Center is located in Gaffney, South Carolina, and has a 132-bed capacity. The Cherokee County Long Term Care Facility, also known as Peachtree Healthcare Center, located in Gaffney, South Carolina, has a 145-bed capacity. The city of Spartanburg, South Carolina, has several nursing home facilities.

Hospitals and specialized health facilities are also discussed in Subsection 2.5.2.7. Schools, including colleges and universities, are discussed in Subsection 2.5.2.8. There are no federal prison facilities located within the Lee Nuclear Site region (References 7 and 8). Eleven state correctional facilities are located within the Lee Nuclear Site region, three in South Carolina and eight in North Carolina (References 9 and 10). Numerous hotels and motels occur in the 50-mi. radius; most are located in populated areas such as Gaffney, South Carolina; Charlotte, North Carolina; or Spartanburg, South Carolina. Recreation facilities and major special events are described in Subsection 2.5.2.5.

2.5.1.3.2 Transient Populations Outside the 50-mi. Region

Two facilities located beyond the 50-mi. radius attract transient populations: (1) the Lowe's Motor Speedway and (2) Concord Mills Mall. The Lowe's Motor Speedway is located approximately 51 mi. northeast of Lee Nuclear Station and attracts approximately 1.2 million people a year for events, tours, and driving schools. The peak months are May and October when the NASCAR NEXTEL Cup races occur. Concord Mills Mall is located approximately 51 mi. northeast of Lee Nuclear Station and reports over 17.6 million visitors a year. Peak visitor months are June and December.

2.5.1.4 Total Permanent and Transient Populations

For an average day, the peak transient population (Table 2.5-4) within the region of the Lee Nuclear Site, as discussed in Subsection 2.5.1.3, in 2007 has been estimated to be approximately 71,869 (References 11, 108, and 109). The permanent population within 50 mi. of the Lee Nuclear Site in 2007 (Table 2.5-1 and Table 2.5-2) has been estimated to be approximately 2,382,474 people (Reference 5). The total peak population within the Lee Nuclear Site region is calculated as the sum of the total permanent and total transient population as approximately 2,454,348.

2.5.2 COMMUNITY CHARACTERISTICS

This subsection addresses the following community characteristics for the Lee Nuclear Site region, where applicable: (1) economy, (2) transportation, (3) taxation and political structure, (4) land use and zoning, (5) aesthetics and recreation, (6) housing, (7) community infrastructure (e.g., social services and public facilities, water and sewer facilities, public safety, and health), and (8) education. Distinctive communities (based on state characteristics, Native American tribes, or regional characteristics) are discussed in detail in Subsections 2.5.3 and 2.5.4. Historic districts and cultural resources are discussed in Subsection 2.5.3. Information about tourist attractions is provided in Subsection 2.5.1.

2.5.2.1 Economy

The principal economic centers nearest to Lee Nuclear Site are (1) Gaffney, South Carolina (Cherokee County); (2) East Gaffney, South Carolina (Cherokee County); (3) Blacksburg, South Carolina (Cherokee County); (4) Smyrna, South Carolina (York County); and (5) Hickory Grove, South Carolina (York County). The largest economic center within the Lee Nuclear Site region is Charlotte, North Carolina (Mecklenburg County). In 2004, the manufacturing industry employed the greatest number of workers (26.2 percent of employment) in Cherokee County, South Carolina. Other important sectors of employment in Cherokee County, South Carolina, are government and government enterprises (10.9 percent of employment) and retail trade (10.6 percent of employment). From 1994 to 2004, finance, insurance, and real estate (70.6 percent combined) and construction (44 percent) saw the largest employment increases within the three-county area. Manufacturing (-28.3 percent), retail trade (-17 percent), and wholesale trade (-2.5 percent) had the largest employment decreases. Table 2.5-9 details employment by industry in the three counties (References 18, 19, 20, 21, 22, and 23).

In Cherokee County, South Carolina, the industrial base is varied. The top employers include food production, construction, machining, large-vehicle chassis assembly, and textile manufacturing. Between 1994 and 2004, wholesale trade increased by 72.9 percent. Employment in finance, insurance, and real estate; and transportation and utilities also made significant gains. Manufacturing employment dropped by 29.5 percent and retail trade dropped by 21 percent (References 18 and 21).

The largest employers in Cherokee County, South Carolina, are Nestle USA, Sanders Brothers Inc. and The Timken Company Inc. each with more than 1000 employees (Table 2.5-10). As of 2005 in the Charlotte/Mecklenburg County area, the largest employers were banking, healthcare, and education. The largest employer is Wachovia Corporation with more than 18,967 employees (References 24 and 25).

In October 2006, a total of 24,060 people were employed in Cherokee County, South Carolina. From October 2005 to October 2006, the number of employed people in Cherokee County, South Carolina, increased 1.4 percent. Over the same time period, employment in the state of South Carolina increased 1.9 percent (Reference 26). For the three counties containing principal economic centers in October 2006, a total of 544,424 people were employed (Reference 27). As of October 2006, the total labor force within North Carolina and South Carolina was 4,487,305 (References 26 and 119). As of 2004, the total construction workforce in Cherokee County was 2382, and the total construction workforce in York County was 5392 people (References 18 and 19). As of 2005, the total labor force in construction within South Carolina and North Carolina was 532,960 (References 120 and 121).

The heavy construction workforce was examined for both North Carolina and South Carolina at the state levels, the finest resolution available. According to the U.S. Census Bureau 2002 Economic Census, a total of 27,670 people were employed in the heavy construction industry in South Carolina, and 42,977 people were employed in this industry in North Carolina. Between 1997 and 2002, South Carolina saw a 140.3 percent increase of employees in the heavy construction industry, and North Carolina saw a 36.9 percent increase (References 34 and 38).

In October 2006, a total of 1970 people in Cherokee County, South Carolina, were unemployed. From October 2005 to October 2006, the unemployment rate in Cherokee County, South Carolina, decreased from 8 percent to 7.6 percent. For the same period of time, the unemployment rate in the state of South Carolina decreased from 6.9 percent to 6.6 percent. For the three-county area (i.e., Cherokee, York, and Mecklenburg), the unemployment rate in October 2006 was 5.8 percent (Reference 26). Employment trends from 1994 to 2004 for Cherokee County, South Carolina; York County, South Carolina; and Mecklenburg County, North Carolina, are shown in Table 2.5-11 (References 18, 19, 20, 21, 22, and 23).

At the county level, in 2004 per capita personal income ranged from a high of $40,416 in Mecklenburg County, North Carolina, to a low of $22,562 in Cherokee County, South Carolina. Household income distribution for the communities closest to the Lee Nuclear Station is shown in Table 2.5-12. The North Carolina average was $29,322, and the South Carolina average was $27,185. From 1994 to 2004, per capita personal income in Cherokee County, South Carolina, had an average annual growth rate of 4.3 percent. Per capita income in York County, South Carolina, and Mecklenburg County, North Carolina, grew at average annual rates of 4.3 and 5 percent, respectively. South Carolina's per capita personal income grew at an average annual rate of 3.2 percent, while North Carolina's grew at a rate of 4.4 percent for the same period. Personal income trends for Cherokee County, South Carolina; York County, South Carolina; and Mecklenburg County, North Carolina, are shown in Table 2.5-13 (Reference 27).

Cherokee County, South Carolina, does not have a planning department and does not currently have any plans or projections for future housing. According to the 2025 York County Comprehensive Plan, by 2025 York County, South Carolina, is expected to create 60,000 new housing units throughout the county (Reference 57).

2.5.2.2 Transportation

The Lee Nuclear Site is served by a transportation network of federal and state highways, one primary freight rail service, and two primary commercial passenger airports. Because of downstream dams, the Lee Nuclear Site cannot be accessed by barge.

2.5.2.2.1 Roads

Within Cherokee and York counties, there are two interstate highways and four federal highways. Figure 2.5-4 illustrates the road and highway system of Cherokee and York counties, South Carolina. Interstate 85 (I-85) runs northeast through northern Cherokee County, entering the county north of Cowpens, South Carolina, passing on the northern boundaries of Gaffney and Blacksburg, South Carolina, then crossing into North Carolina east of Grover, North Carolina. Interstate 77 (I-77) runs north to south through eastern York County, entering the county south of Rock Hill, South Carolina, passing through eastern portions of Rock Hill, South Carolina, and western portions of Fort Mill, and then crossing into North Carolina on the south side of Charlotte, North Carolina. U.S. Highway 221 (U.S. 221) passes through the extreme northwest corner of Cherokee County, South Carolina. U.S. Highway 29 (U.S. 29) parallels I-85 through Cherokee County, passing through downtown Gaffney and Blacksburg, South Carolina. U.S. Highway 321 (U.S. 321) runs north to south through central York County, passing through McConnells, York, and Clover, South Carolina. U.S. Highway 21 (U.S. 21) runs north to south through eastern York County, passing through Lesslie, Rock Hill, and Fort Mill, South Carolina. Numerous state routes pass through the counties, providing rural areas access to the urban areas (Reference 28). Access to the site is only available on McKowns Mountain Road on the southern side of the site.

As discussed in Subsections 4.4.2.4 and 5.8.2.4, the majority of construction and operations workers for the Lee Nuclear Station are expected to reside in either Cherokee or York County, South Carolina. However, some workers may opt to live in other areas outside of Cherokee and York counties, South Carolina.

Workers who reside in and commute from York County may travel on one of four routes, South Carolina State Highways 5, 55, 97, and 211 (South Carolina 5, 55, 97, and 211). South Carolina 55 allows workers who reside in northern York County access to Cherokee County. South Carolina 5 allows workers who reside in central York County access to Cherokee County. South Carolina 97 allows workers who reside in central and southern York County access to Cherokee County. South Carolina 211 also allows workers who reside in central and southern York County access to Cherokee County. South Carolina 5, 55, and 97 enter Cherokee County north of the site, and South Carolina 211 enters Cherokee County south of the site. Once inside Cherokee County, local roads may be used to gain access to the site.

Workers who reside in and commute from Cherokee County may travel on one of three routes, South Carolina State Highways 5, 105, and 329 (South Carolina 5, 105, and 329). Workers are able to travel from all parts of the county via numerous local and state roadways to either I-85 or U.S. 29. From one of these two roadways, workers can travel to South Carolina 105 to the south, South Carolina 329 in the middle, or South Carolina 5 to the north. South Carolina 105 and 329 provide access to the southern side of the site, and South Carolina 5 provides access to U.S. 29 and South Carolina 329 from the northern side of the county.

For the workers who opt to live outside of Cherokee and York counties, South Carolina, an adequate road network exists to allow these workers to commute to Lee Nuclear Station. An example of this is I-85 which connects the site to Gastonia, North Carolina, and Spartanburg, South Carolina, allowing workers to commute from these highly populated areas to the site.

2.5.2.2.2 Road Conditions and Mileage

There are approximately 743 mi. of state-maintained roadways in Cherokee County, South Carolina. All state-maintained roads in Cherokee County are paved. There are an estimated 290 mi. of county-maintained roads, which includes approximately 72 mi. of unpaved roads, in Cherokee County.

There are approximately 2000 mi. of state-maintained roadways in York County, South Carolina. All state-maintained roads in York County are paved. There are approximately 620 mi. of county-maintained roads in York County. Of the 620 mi. of roadway, approximately 17 mi. are unpaved.

2.5.2.2.3 Traffic Conditions

Cherokee and York Counties consist of both urban and rural roadways. Vehicle volume on roads, obtained from estimated Annual Average Daily Traffic (AADT) from the South Carolina Department of Transportation, reflects the urban and rural character of the county. The Department of Transportation uses AADT counts, traffic volume data, speed of traffic, time of travel, and budget restraints to determine the need for roadway expansion (Reference 31).

AADT counts in 2006 indicate that approximately 7000 vehicles travel on U.S. 29 between South Carolina 329 and South Carolina 5, and a maximum of approximately 5600 vehicles travel on South Carolina 5 between U.S. 29 and South Carolina 55. Approximately 5000 vehicles also travel along South Carolina 105 between South Carolina 211 and South Carolina 18. Approximately 1600 vehicles travel on South Carolina 329 between South Carolina 105 and

U.S. 29, and approximately 425 vehicles travel on South Carolina 97 between South Carolina 5 and the York County line. Approximately 950 vehicles travel McKowns Mountain Road between South Carolina 105 and the end of the road (near the Broad River). McKowns Mountain Road is also known as Cherokee County Highway 13 (County Rd. 13) (Reference 31).

2.5.2.2.4 Road Modifications

According to the South Carolina Department of Transportation, no road modifications near the Lee Nuclear Site are planned; however, there are several planned road construction projects in Cherokee County between 2007 and 2012. South Carolina 5 is planned to be widened to five lanes east of I-85 to east of U.S. 29 (Phase I) and from east of U.S. 29 to the York County line (Phase II). Several I-85 interchange upgrades are planned west of the site. In York County, the plans are to upgrade South Carolina 5 from the Cherokee County line to the South Carolina 5 Bypass (Reference 36). South Carolina 329 and McKowns Mountain Road were upgraded in the 1970s to handle anticipated truck traffic for construction of the Cherokee Nuclear Station.

2.5.2.2.5 Rails

Figure 2.5-5 shows railways within the Lee Nuclear Site region. Norfolk Southern Railroad Company (NSRC) owns and operates a small spur that passes within the 5-mi. radius (Reference 37). At its closest point, the line is approximately 4.7 mi. northeast of the Lee Nuclear Site center point.

An average of two trains per day travel on these tracks. The speed limit is 25 miles per hour (mph) on the majority of this spur with a speed limit of 10 mph around many of the curves. This spur does not carry passenger trains (References 37 and 39).

A major rail line owned by NSRC runs at its closest point approximately 5.5 mi. from the site center point. This line runs from Atlanta, Georgia, to Charlotte, North Carolina, and eventually on to the New York City, New York, area on the north end and to the New Orleans, Louisiana, area on the southern end. This line is the main line, or core route, in the northern South Carolina area, running through downtown Gaffney and Blacksburg (Reference 37). This main line averages 22 trains per day and has a speed limit of 50 mph. This line is primarily used for freight service, although one passenger train, the Amtrak Crescent, uses the line (References 37 and 39). The speed limit for passenger trains along this stretch of track is 79 mph, although they are unlikely to reach more than approximately 60 mph between Gaffney, South Carolina, and Blacksburg, South Carolina, due to curves in the tracks.

The proposed Southeast High-Speed Rail Corridor runs through this area. The proposed route is projected to follow the existing tracks that run from Atlanta, Georgia, to Charlotte, North Carolina. Trains are expected to travel at a maximum speed of 110 mph along this corridor. The proposed date for implementation of service along this route is 2012 at the earliest, and it is projected to carry more than 1.6 million passengers annually by the year 2015 (Reference 40).

2.5.2.2.6 Waterways

The Lee Nuclear Station footprint is located approximately 4800 feet (ft.) west and approximately 2400 ft. south of the Broad River, approximately 1.1 mi. upstream (north) of the Ninety-Nine Islands Hydroelectric Dam. The Broad River upstream of the Lee Nuclear Site is a shallow, non-navigable river; however, from the Ninety-Nine Islands Hydroelectric Station to the confluence with the Pacolet River, the Broad River is considered navigable waters under Regulation 19-450 of the South Carolina Code of Laws 1976, as amended (Reference 125). In 1991, this entire section was designated a State Scenic River (Reference 41). Additional information about the Broad River Scenic Corridor can be found in Subsection 2.2.1.1. The Broad River is not classified as a National Wild and Scenic River by the federal government (Reference 70). There are no ports within 50 mi. of the Lee Nuclear Site (Reference 28).

2.5.2.2.7 Airports

Figure 2.5-5 shows airports within the Lee Nuclear Site region. There are no airports within 10 mi. of the Lee Nuclear Site, but there is one heliport (Reference 28). The Milliken & Co. heliport is located approximately 6 mi. to the north of the Lee Nuclear Site center point. The heliport has a 25-ft. square, concrete helipad. There are no aircraft based at this heliport (Reference 42).

York Airport is located 14 mi. to the east of the Lee Nuclear Site. It has one 2580-ft. turf runway. Federal Aviation Administration (FAA) information effective April 13, 2006, indicates that 12 single-engine aircraft are based at the field. York Airport averages 62 operations per week. Local general aviation accounts for 69 percent of operations and transient general aviation accounts for 31 percent (Reference 43).

The closest major commercial airport is Charlotte/Douglas International Airport (CLT) which is located approximately 34 mi. northeast of the Lee Nuclear Site center point. It has three runways; one 10,000-ft. concrete runway, one 8674-ft. asphalt/concrete runway, and one 7502-ft. asphalt/concrete runway. FAA information effective June 7, 2006, indicates that 146 aircraft are based on the field; 25 of these are single-engine aircraft, 22 are multi-engine aircraft, 87 are jet aircraft, two are helicopters, and 10 are military aircraft. The average number of operations is approximately 1372 per day. Air taxis account for 45 percent of operations, 47 percent are commercial, 7 percent are transient general aviation, and less than 1 percent is military (Reference 45).

The next closest commercial airport is Greenville-Spartanburg International Airport (GSP) located approximately 41.3 mi. west to southwest of the Lee Nuclear Site (Reference 28). GSP has one 11,000-ft. asphalt runway, and FAA information effective June 7, 2006, indicates that 23 aircraft are based on the field; five of these are single-engine aircraft, 10 are multi-engine aircraft, and eight are jets. GSP averages 182 aircraft operations per day. Transient general aviation accounts for 17 percent of operation, air taxi for 69 percent, commercial for 11 percent, military for 2 percent, and local general aviation for 1 percent (Reference 44).

2.5.2.3 Taxes and Political Structure

The tax structure for all of South Carolina, unless specifically noted at the city or county level, is found in Title 12 of the South Carolina Code of Laws 1976 and its revisions (Reference 126). Cherokee County is the tax district that is expected to be most directly affected by construction and operation of Lee Nuclear Station.

Several tax revenue categories are affected by the construction and operation of new nuclear units. These include (1) income taxes on wages, salaries, and corporate profits; (2) sales and use taxes on construction- and operations-related purchases and on the purchases made by project-related workers; (3) property taxes related to the construction and operation of new nuclear units; and (4) property taxes on owned real property. Table 2.5-14 shows Cherokee County, South Carolina, tax collections by category.

Personal and corporate taxes, sales and use taxes, and property taxes all contribute to the total funds for the state of South Carolina. The percentage of appropriation by category for all state funds for fiscal year 2006 is shown in Table 2.5-16 (Reference 102).

Personal income taxes are regulated by Section 12, Chapter 6, of the South Carolina Code of Laws 1976 (2005 revision). Personal income taxes in South Carolina are on a tiered system ranging from a rate of 2.5 percent on net income up to $2250 to 7 percent on net income above $11,250 (Reference 126). State taxable income is based on federal taxable income. Most exemptions allowed on federal returns are also allowed on state returns.

South Carolina has license taxes on utilities and electric cooperatives. Corporations are charged $1 for every $1000 of assessed fair market value of property used for the conduct of business within the state. They are also charged $3 per $1000 of gross receipts (Reference 33).

Tax credits are available to any company subject to a license tax under Section 12-20-100 of the South Carolina Code of Laws for amounts paid in cash to provide infrastructure for an eligible project. Infrastructure improvements include those made to both public and private electric services. The maximum aggregate tax credit that can be claimed by a business in any single tax year is $300,000 (Reference 33). A company is not allowed this tax credit on any actual expenses incurred by the construction or operation of infrastructure facilities that it owns (Reference 53).

Property tax for Cherokee County, South Carolina, is collected on all real and personal property. The county allows the following property tax exemptions (Reference 51):

- No inventory taxes.
- No intangibles taxes.
- Five-year moratorium on county ordinary property taxes for manufacturing, distribution, corporate headquarters, and office facilities.

Table 2.5-15 shows property tax categories as used in Cherokee County, South Carolina, and South Carolina as a whole (Reference 106). Based on ordinance 2005-20, passed by County Council of Cherokee County, South Carolina, Duke Energy is entitled to make payments in lieu of taxes provided that the overall investment in the project is at least $2.5 billion (Reference 61).

2.5.2.3.1 Political Structure

The Lee Nuclear Site is located in Cherokee County, South Carolina. The plant is located in South Carolina House District 29, near the border between South Carolina House Districts 29 and 30 in northern South Carolina (Reference 54).

Six congressional districts are located within the Lee Nuclear Site region. Three are located in South Carolina, and three are located in North Carolina (References 55 and 56). The Lee Nuclear Site is located in the 5th South Carolina Congressional District (Reference 55).

The city of Gaffney and towns located in the Lee Nuclear Station vicinity either provide and maintain their own community services and infrastructure or contract with one another to provide specific services to their individual populations. Cherokee County's role is to maintain and build county roads, county property records, district and circuit court actions, and the Sheriff's department. At the local and county government level, the roles are unique regarding the services provided, but the county and local governments do cooperate for emergency situations with resources such as fire, police, and sheriff's departments.

Emergency planning in Cherokee County, South Carolina, is handled by the Cherokee County Emergency Management Agency (EMA), as directed by the South Carolina Emergency Management Division. Their mission “is to develop, coordinate, and lead the state emergency management program, enabling effective preparation for, and efficient response to, emergencies and disasters in order to save lives, reduce human suffering and reduce property loss” (Reference 81).

Emergency planning in York County, South Carolina, which is partially included in the EPZ, is provided by York County Office of Emergency Management. Their mission is "to provide the residents of York County with a comprehensive, integrated, and coordinated public safety program through which Homeland Security is coordinated, risks are reduced, emergency services delivered, and consequences of events managed to make our community a safe place to live, work, and play" (Reference 118).

2.5.2.4 Land Use and Zoning

The counties with the greatest potential to be socio-economically affected by the construction and operation of Lee Nuclear Station are Cherokee and York counties, South Carolina. Cherokee County, with an area of approximately 397 sq. mi., is the fourth smallest county in South Carolina.

Lee Nuclear Station Units 1 and 2 are expected to be located approximately 1 mi. northwest of the Ninety-Nine Islands Hydroelectric Dam; approximately 6 mi. south of Blacksburg, South Carolina; and approximately 8 mi. southeast of Gaffney, South Carolina (Reference 3). The Lee Nuclear Station is expected to be located approximately 25 mi. east of Spartanburg, South Carolina; approximately 52 mi. east to northeast of Greenville, South Carolina; and approximately 40 mi. west to southwest of Charlotte, North Carolina (Reference 3).

No zoning laws are in place at either the state or county levels in unincorporated portions of Cherokee County. Both Cherokee and York County have comprehensive land use plans submitted to the South Carolina Association of Counties (York County's plan is undergoing revisions). Because the site is located in an unincorporated portion of Cherokee County, the site is not subject to any state, county, or city land management plans. However in Cherokee County, because there is little zoning or designated land use outside of the communities, code and regulation enforcement is administered through the appropriate town or city, county, state, or federal governmental agency with the appointed oversight powers.

Community and county economic development authorities administer economic development incentives. The Cherokee County Chamber of Commerce promotes economic programs designed to expand income potential for businesses and industries within the county, while the Cherokee County Development Board offers development incentives including tax credits.

Gaffney, Blacksburg, and other towns in the vicinity seek assistance from the Cherokee County Development Board to promote development opportunities.

Based on U.S. Geological Survey (USGS) land categories and the latest data from the National Land Cover Dataset, the land use designated within the site is shown in Figure 2.2-1 (Reference 58). According to these data, approximately 1153 ac. of the site have been identified as forest (Reference 58). The excavated area (from previous construction) has been classified as water. Duke Energy removed the water from the excavation in late 2005/early 2006 and maintains pumps to continually remove seepage water from the excavation. Other site features are classified as grassland, pasture, and developed land (Reference 58). Vegetation cover types are discussed in Subsection 2.4.1.

The Lee Nuclear Site is bounded by the Broad River to the north and east with adjacent lands consisting of woodland and Duke Energy-owned properties. To the south, there is a mixture of woodland and residential, or residential land immediately along McKowns Mountain Road, with field or farmland set further off the road to the south. Land to the west and northwest is primarily woodland (Reference 58).

2.5.2.4.1 Industrial Parks and Facilities

There are no industrial parks within 5 mi. of the Lee Nuclear Site center point (Reference 60). However, there are three industrial parks located elsewhere in Cherokee County, South Carolina, and they are described in Subsections 2.5.2.4.1.1, 2.5.2.4.1.2, and 2.5.2.4.1.3. There are two industrial companies within the 5-mi. radius. The Broad River Energy Center is a natural gas-fired peaking electric generation plant located approximately 4.7 mi. northwest of the site center point (References 3 and 59). There is also a major distribution center for Herbie Famous Fireworks (South Carolina Distributors), located approximately 2.7 mi. north to northwest of the Lee Nuclear Site center point (Reference 3). There is no planned industrial growth within the 5-mi. area (Reference 60).

2.5.2.4.1.1 Meadowcreek Industrial Park

The oldest of the three industrial parks, Meadowcreek Industrial Park, has its entire infrastructure developed and has only four sites available for development. It is located at the intersection of South Carolina 18 and I-85 (Reference 60).

2.5.2.4.1.2 Cherokee Corporate Park

This park is located 0.5 mi. east of I-85 on South Carolina 105. All necessary infrastructures have been built, and there are approximately six to eight building sites available (Reference 60).

2.5.2.4.1.3 Upstate Corporate Park

This is the newest industrial park in Cherokee County, South Carolina, and it is a joint venture between Cherokee and Spartanburg Counties. It is located 1 mi. off I-85, east of South Carolina 110. The park is 600 ac. in size, and all necessary infrastructures are being run to the park (Reference 60).

2.5.2.4.1.4 Herbie Famous Fireworks

Herbie Famous Fireworks (South Carolina Distributors) is a consumer fireworks wholesale distribution company. Herbie Famous Fireworks operates a warehouse facility located approximately 2.7 mi. north to northwest of the site.

2.5.2.4.1.5 Broad River Energy Center

The Broad River Energy Center is a natural gas-fired peaking electric generation plant located approximately 4.7 mi. northwest of the site. The facility consists of five combustion turbines with a baseload capacity with peaking of 847 megawatts (Reference 59).

2.5.2.4.2 York County

York County has historically not had controlled planning.

As of 2004, York County, South Carolina, was 80 percent either Agricultural/Residential or Agricultural/Vacant. No areas affected by the York County 2025 Planned Growth Scenario, as stated in the York County 2025 Comprehensive Plan, fall within 10 mi. of the Lee Nuclear Site center point (Reference 112).

2.5.2.5 Aesthetics and Recreation

The Lee Nuclear Station is located on a 1900-ac. site near the Broad River in rural Cherokee County, South Carolina (Reference 63). Situated near the town of Gaffney, South Carolina, the Lee Nuclear Site is accessible only by road (Reference 63). According to the 2006 National Transportation Atlas Databases from the U.S. Department of Transportation, an abandoned railroad spur connects the site to the main line running through Gaffney, South Carolina. Although this line is considered abandoned by the U.S Department of Transportation, the tracks have physically been removed and only the berm remains. Duke Energy plans to reactivate this spur prior to plant operations. I-85 is the main transportation route and provides a connection between Spartanburg, South Carolina, and Gastonia, North Carolina (Reference 28). U.S. Highway 29 and South Carolina 329 and 105 also service this area (Reference 28). Land use immediately adjacent to the Lee Nuclear Site is described in Subsection 2.2.1.2.

Cherokee County is located centrally along the northern border of South Carolina with North Carolina. It is bounded on the east by York County, South Carolina; on the south by Union County, South Carolina; on the west by Spartanburg County, South Carolina; and on the north by Rutherford and Cleveland counties, North Carolina. The county is entirely drained by the Broad River and its basin. Elevations at the site range from a low of 437 ft. to a high of 816 ft. above mean sea level (msl). The climate of Cherokee County, South Carolina, is Humid Subtropical (Reference 64).

Cherokee County is entirely contained within one physiographic region: Piedmont (PMT). It is characterized by rolling hills, numerous tributaries, and, especially in the southeast, iron-rich red clay once hidden by ample deposits of topsoil (References 65 and 80).

Hunting, fishing, and wildlife watching in the portions of North Carolina and South Carolina included in the region are an important recreational pastime. The combined wildlife-related activities attract approximately 704,901 outdoor enthusiasts per year (References 67 and 68).

Other recreational opportunities in the Lee Nuclear Site region include local, state, and national park visitation, outlet shopping, and special events. Visitor numbers for these recreational opportunities are discussed in Subsection 2.5.1.3. The nearest of the parks to the Lee Nuclear Site is Kings Mountain State Park, located approximately 8 mi. to the northeast of the site center point, and the largest shopping draw in the region, the Prime Outlets at Gaffney, is located within 10 mi. of the site center point.

Cherokee County, South Carolina, has two private golf courses; Cherokee National Golf Club and Gaffney Country Club, both located near Gaffney, South Carolina. York County, South Carolina, has three private golf courses; Carolina Crossings Golf Club and Spring Lake County Club, both located near York, South Carolina, and Tega Cay County Club, located near Tega Cay, South Carolina (Reference 79).

Information relating to the visual aesthetics of Lee Nuclear Station, especially with regard to cooling towers, is provided in Subsections 2.2.1.2, 4.4.1.4, and 5.8.1.4.

2.5.2.6 Housing

Many of the Lee Nuclear Site employees are projected to live in York County and Cherokee County, South Carolina. However, some employees may opt to live in some of the surrounding counties.

Within the 50-mi. radius, residential areas are found in cities, towns, smaller rural communities, and farms. Rental property is scarce in the rural areas, but it is widely available in the larger communities surrounding the area such as Gaffney, East Gaffney, and Blacksburg, South Carolina. Within the vicinity of the Lee Nuclear Site, the majority of the residents are clustered in residential neighborhoods within the cities of Gaffney, East Gaffney, and Blacksburg, South Carolina. Outside of these city limits, residents live in isolated, single-family homes or mobile homes.

According to the U.S. Census Bureau 2000 data, there were a total of 66,061 housing units in York County, South Carolina. Of that total 16,422 were renter-occupied (26.9 percent) and 5010 were vacant (7.6 percent). Of the vacant housing units, 1478 were for rent and 1104 were for sale (Reference 69). Based on U.S. Census Bureau 2000 data, the median age for owner-occupied homes in York County was 24 years, and the median age for renter-occupied homes was 27 years. The median number of rooms per owner-occupied house in York County was 5.9. For renter-occupied housing, it was 4.3 rooms (References 122 and 123).

According to the U.S. Census Bureau 2000 data, there were 22,400 housing units for Cherokee County, South Carolina. Of that total, 5349 were renter-occupied (26.1 percent) and 1905 were vacant (8.5 percent). Of the vacant housing units, 581 were for rent and 272 were for sale (Reference 71). Based on U.S Census Bureau 2000 data, the median age for owner-occupied homes in Cherokee County was 29 years, and the median age for renter-occupied homes was 34 years. The median number of rooms per owner-occupied house in Cherokee County was 5.4. For renter-occupied housing, it was 4.3 rooms (References 113 and 124).

Table 2.5-17 presents detailed 2000 Census data on vacant housing in communities closest to the Lee Nuclear Site: Gaffney, East Gaffney, Blacksburg, Smyrna, and Hickory Grove, South Carolina (References 71, 72, 73, 74, 75, and 76). Total housing units, occupation status, vacant housing units, and housing units for rent for each of the communities closest to the Lee Nuclear

Site are presented in Table 2.5-17 (References 71, 72, 73, 74, 75, and 76). The age of housing in the communities is shown in Table 2.5-18.

2.5.2.7 Community Infrastructure and Public Services

Public services and community infrastructure consist of (1) public water and wastewater treatment systems, (2) police and fire departments, (3) medical facilities, (4) social services, and (5) schools. They are typically located within municipalities or near population centers. Schools are described in Subsection 2.5.2.8. The other services are described below.

2.5.2.7.1 Public Water Supplies and Wastewater Treatment Systems

All of the potable water Lee Nuclear Station is expected to use per day for human consumption is expected to be obtained from the Draytonville Water System, which purchases its water from the city of Gaffney, South Carolina. The city of Gaffney, South Carolina, draws its water from Lake Whelchel and the Broad River (Reference 82). No groundwater is expected to be used in this facility.

There are two drinking water treatment plants in Cherokee County, South Carolina, the Victor Gaffney Plant and the Cherokee Plant, both operated by the city of Gaffney, South Carolina. Victor Gaffney is the largest water plant in the county with a maximum capacity of 12 million gallons per day (mgd). The Cherokee Plant, which completed upgrades in May 2007, has a capacity of 6 mgd. The county currently draws approximately 8 mgd. This water is used for local consumption and is sold to municipalities like Blacksburg, South Carolina, for resale and water districts like Draytonville Water District. According to officials, there are no concerns with water supplies as water systems in the county are generally not operating at or near capacity.

Based on information received from the USGS, SCDHEC, and local agencies, as well as a detailed field reconnaissance effort, local groundwater use in the vicinity appears limited to mainly individual residences. The Lee Nuclear Station is not anticipating using groundwater as a safety-related source of water, and it does not plan to use groundwater as its primary water supply resource for any purpose.

Wastewater treatment is provided by the city of Gaffney, South Carolina. Currently, there are two wastewater treatment facilities in the county. The largest is the Clary Plant with a maximum capacity of 5 mgd. The second plant is the Broad River Plant with a maximum capacity of 4 mgd. Currently, the Clary Plant is operating at approximately 60 percent of capacity, and the Broad River Plant is operating at 40 percent of capacity. Table 2.5-19 summarizes the public wastewater treatment systems, their capacities, and their average daily utilization. The rural areas of Cherokee County are on septic systems.

2.5.2.7.2 Police, Fire, and Medical Services

The Cherokee County Sheriff’s Department has jurisdiction everywhere in Cherokee County and is the only such authority in the county. The Cherokee County Sheriff’s Department employs 45 sworn officers. There are two other police departments in Cherokee County, belonging to the city of Gaffney, South Carolina, and the town of Blacksburg, South Carolina. The city of Gaffney, South Carolina, has approximately 40 officers and the town of Blacksburg, South Carolina, has 14 sworn full-time officers and six certified reserve officers. Local officials consider police and fire protection adequate, but expansion and facility upgrades may be needed to accommodate future population growth (Reference 116).

There are 15 fire departments with over 350 volunteer and paid firefighters in the county. The Gaffney Fire Department is the only fully paid department in the county. They are staffed 24 hours a day. Grassy Pond and Cherokee Creek are part paid, part volunteer, and only staffed Monday through Friday, 8:00 a.m. to 5:00 p.m. (Reference 117).

York County has 18 fire departments with more than 590 volunteer firefighters and 105 pieces of firefighting equipment. The fire departments of Rock Hill and Tega Cay operate independently of York County, but they are not likely to be affected by the construction and operation of Lee Nuclear Station (Reference 115). The Rock Hill Fire Department is the only paid fire department in York County and employs a total of 98 firefighters at five different stations.

Cherokee County, South Carolina, is home to only one hospital, Upstate Carolina Medical Center. Upstate Carolina Medical Center, located in Gaffney, South Carolina, contains 125 beds with nearly 100 medical staff members (Reference 103). There are also two nursing home facilities in the area: Brookview Healthcare Center in Gaffney, South Carolina, and Peachtree Healthcare Center, also in Gaffney, South Carolina. Brookview Healthcare Center has 132 beds and 150 employees at the facility. Peachtree Healthcare Center has 145 beds and 165 employees at the facility.

Cherokee County also has a county health department, located in Gaffney, South Carolina, that is overseen by SCDHEC. They provide general medical services and service between approximately 17,000 and 20,000 individuals per year (Reference 111).

There are no medical facilities within 10 mi. of Lee Nuclear Site in York County; however, Piedmont Medical Center, which is just outside the 10-mi. radius, has an existing agreement with Duke Energy to provide emergency medical care for radiologically contaminated employees at the Catawba Nuclear Station. Piedmont Medical Center will also be used by Lee Nuclear Station as part of this agreement.

2.5.2.7.3 Social Services

Social services such as adoptions, child protective services, family nutrition programs, foster care services, foster home and group home licensing, and food stamps are overseen by the South Carolina Department of Social Services (SCDSS). The SCDSS employs more than 3600 people. For the fiscal year 2005-2006, SCDSS had operating funds totaling $1,078,481,283 with more than 80 percent of the funds going towards case services (References 100 and 114).

2.5.2.8 Education

2.5.2.8.1 Public Schools – Pre-Kindergarten through Grade 12

There are 57 school districts associated with the counties and cities that are either wholly or partially contained within the 50-mi. radius of the Lee Nuclear Site center point. According to the National Center for Education Statistics, these school districts had more than 526,675 students enrolled for the 2004-2005 school year in 799 schools (References 83 and 84).

For the 2001-2002 school year, the national student/teacher ratios for primary, middle, and high schools are 16, 15.7, and 15.1 students per teacher, respectively. When compared to the rest of the nation, South Carolina's ratios are below the national average for primary education (14.5) and middle school levels (15.1). South Carolina is above the national average for high school levels at 15.5 (Reference 85).

2.5.2.8.2 Cherokee County and York County

There is one school district within Cherokee County (Cherokee County Schools) and there are four school districts within York County: York County District 1, Clover School District, York County District 3, and Fort Mill School District. For the 2004-2005 school year, Cherokee County Schools had 9322 enrolled students in 19 schools with a student/teacher ratio of 14:1. The four York County school districts had 34,661 enrolled students in 49 schools with an average student/teacher ratio of 15.2:1 (References 84, 85, 86, 87, 88, 89, and 90).

Cherokee County Schools falls under the auspices of the South Carolina Department of Education (Reference 91). As of 2006, a new primary school has been completed in Blacksburg, South Carolina, and additions and renovations have been completed at two other schools. Cherokee County has passed a $45 million bond issue to fund stadium upgrades at two high schools and classroom additions and renovations at other schools (References 84 and 86).

York County District 1 serves the central and western parts of York County, including the portion that borders with Cherokee County, South Carolina, and is the school district in York County most likely to be affected by construction and operation of the Lee Nuclear Station. This district has 5209 students, eight schools, and a student/teacher ratio of 15:1. As of 2007, York County District 1 has approved a capital improvement plan that includes the construction of a new comprehensive high school with technology center, the conversion of the existing high school to a junior high, and the renovation of several elementary schools. Construction is set to begin during the fall of 2007 (Reference 84).

2.5.2.8.3 Colleges and Universities

There are 33 two-year and four-year colleges and universities within the region of the Lee Nuclear Site. Total enrollment for these schools is more than 98,145 students (References 93 and 94). The two-year and four-year colleges and universities in the region are typically near peak daily capacity for the majority of the year, excluding the summer months (mid-May through mid-August). The nearest college or university to the Lee Nuclear Station site is Limestone College, located in Gaffney, South Carolina. Limestone College is a private not-for-profit institution with a full-time main campus enrollment of approximately 700 students (Reference 66).

2.5.3 HISTORIC PROPERTIES

Section 106 of the National Historic Preservation Act (NHPA) requires federal agencies, such as the U.S. Nuclear Regulatory Commission (NRC), to take into account the effects of their undertakings on historic properties. Historic properties are defined as those properties that are eligible for listing on the National Register of Historic Places (NRHP) or that are already listed on the NRHP (Title 36 Code of Federal Regulations CFR 800.16 [I][1]) (Reference 29). Issuance of a combined construction and operating license for the Lee Nuclear Station is a federal undertaking. The historic preservation review process mandated by Section 106 is outlined in regulations issued by the Advisory Council on Historic Preservation. These regulations, entitled

Protection of Historic Properties, are codified at 36 CFR 800. In the Section 106 process, a responsible federal agency first determines whether it has an undertaking that could affect historic properties. If so, it must identify the appropriate State Historic Preservation Office/Tribal Historic Preservation Office (SHPO/THPO) to consult with during the process, identify historic properties within the area of potential affect (APE) of the undertaking, and assess the potential effects of the undertaking on these properties. If a federal agency determines that it has no undertaking or that its undertaking has no potential to affect historic properties, the agency has no further obligations under Section 106.

This subsection focuses on the existing historic properties on the Lee Nuclear Site and within a 10-mi. radius of its boundaries. This includes portions of both Cherokee and York counties in South Carolina.

In Cherokee and York counties, 69 aboveground historic properties are located within a 10-mi. radius of the Lee Nuclear Site boundary (Table 2.5-20). Six NRHP-listed historic districts and one listed national military park contain another 184 aboveground historic sites that contribute directly to their historical significance and integrity.

An “archaeological site” is defined as an area of land that yields three or more prehistoric or Historic Period artifacts within a radius of approximately 100 ft. and/or area with visible or historically recorded cultural features (e.g., earthen mounds, military earthworks, chimney falls, etc.) (Reference 52). Many archaeological sites were occupied by culturally different groups of people at different periods in prehistory and history. In American archaeology, each of these separate occupations (and the artifacts/features homogeneously associated with them on an archaeological site) is referred to as a “component” of the site. On the Lee Nuclear Site and within 10 mi. of its boundary in Cherokee and York counties, 118 archaeological sites have been identified. Many of these sites are solely prehistoric archaeological sites, and many are solely Historic Period archaeological sites. Some sites have components dating to both prehistoric time periods and the Historic Period.

2.5.3.1 Cultural Resource Surveys

A Phase I survey is a field investigation designed to identify historic properties within the boundaries of a specific area of land. This term includes a simple nonsystematic or systematic reconnaissance on a tract of land. It can also include a much more intensive on-the-ground investigation involving a combination of reconnaissance activities and systematic shovel testing of the soil for artifacts and evidence of subsurface features, referred to as a Phase I intensive survey. Phase I surveys are supported by background archival research, and they usually include an architectural inventory of the study area.

A number of Phase I surveys have been performed on the Lee Nuclear Site. This subsection provides basic information on these surveys and describes their physical extent, the applied survey techniques, and the professional qualifications of the surveyors. The findings of the surveys are discussed in Subsection 2.5.3.3 through 2.5.3.6 and Subsection 2.5.3.8.

The South Carolina Institute of Archaeology and Anthropology (SCIAA) performed the first survey in February 1974. This survey was conducted on Site B for Duke Power Company’s (DPC) proposed X-81 Plant (later designated as and hereinafter referred to as the Cherokee Nuclear Station). This nuclear station was partially constructed on the Cherokee site (now the

Lee Nuclear Site) from 1977 to 1982. The Cherokee site was about the same size as the current Lee Nuclear Site, which encompasses 1900 ac. of land.

The 1974 survey was focused on an approximately 750-ac. portion of the Cherokee site that was slated for construction and operation of the Cherokee Nuclear Station. The survey area was bounded by McKowns Mountain to the west, Ninety-Nine Islands Reservoir to the north, a short portion of the Broad River to the east immediately below Ninety-Nine Islands Dam, and McKowns Mountain Road to the south. McKowns Mountain and the rest of the site to the north and west of this area were not surveyed. The historic properties assessment began with a program of archival research to lay the groundwork for a walkover reconnaissance survey focused on the identification of Historic Period structural remains on the ground surface and artifacts lying on the ground in areas with little or no vegetation. Although shovels were used to scrape away surface vegetation in certain locations, a modern program of systematic shovel testing was not conducted as part of this early survey effort (Reference 30). A simple site walkover such as this was the most commonly used survey technique at that time.

This survey was conducted before the Secretary of the Interior's Historic Preservation Professional Qualification Standards, which were first issued on September 29, 1983 (48 Federal Register (FR) 44716) (Reference 17). The SCIAA was the principal state cultural resource management agency in South Carolina in 1974, and the SCIAA crews were professionally well qualified to perform the surveys according to the techniques of their time.

In February 1980 and September 1981, the SCIAA performed a survey and field inspection within a proposed transmission line corridor for the Cherokee Nuclear Station. This was a systematic reconnaissance survey involving two transects and 10 field check points along road rights-of-way within the transmission line corridor, which measured 13.27-mi. long and from 270- to 319-ft. wide. In addition, shovel testing was performed at 20-meter intervals. Survey and field inspection activities were focused primarily on land outside the boundaries of the Cherokee site, including a portion of the corridor that intercepted the Cherokee Ford Ironworks, which is listed on the NRHP. However, a small portion of this transmission line corridor overlapped an area of the Cherokee site that was not surveyed in 1974. As a result, this additional area of the Lee Nuclear Site was surveyed (Reference 35). This archaeological work was conducted before the Secretary of the Interior's Historic Preservation Professional Qualification Standards were issued. However, the SCIAA was the principal state cultural resource management agency in South Carolina in 1980, and the SCIAA crews were professionally well qualified to perform the survey according to the techniques of the time. Because this survey included systematic shovel testing, it was methodologically more rigorous than the previous survey.

In the spring of 2007, a Phase I intensive survey of historic properties was conducted to support preparation of the combined license application for the Lee Nuclear Station. The information contained in the 2007 Phase I report is considered by the SHPO to be sensitive and detailed maps and photos are not included in this ER. A copy of this report is available to the NRC at their request. Background information for this survey was collected through a program of archival research at the South Carolina Department of Archives and History (SCDAH) and SCIAA. This research focused on reviewing records of past historic properties investigations on the Lee Nuclear Site and in the surrounding area. In addition, early USGS topographic maps and other appropriate documents were used to support the location, identification, and investigation of previously unrecorded historic properties for the Phase I intensive survey. This background research was supplemented by additional archival research conducted at SCDAH and SCIAA facilities in late April 2006. This earlier research was focused on identifying and locating all previously recorded historic properties within 10 mi. of the Lee Nuclear Site in Cherokee and York counties. Although a very small portion of this 10-mi. buffer overlapped into Cleveland County, North Carolina, previously recorded historic properties in this area were not identified because they were deemed too distant to be affected by the proposed construction and operations on the Lee Nuclear Site.

The Phase I survey was conducted in accordance with the most recent edition of the “South Carolina Standards and Guidelines for Archaeological Investigations” (Reference 16). The 2007 survey was limited to the area of potential effect (APE) to historic properties from the proposed construction and operation of the Lee Nuclear Station. The largest portion of the on-site APE is a 750-ac. area that was disturbed to a depth of up to 30 ft. by grading and construction for the previous Cherokee Nuclear Station. This area was not included in the 2007 Phase I survey because of the extensive past soil disturbance. The rest of the on-site APE consists of five discrete areas outside of this zone. One is a 5-ac. area at the northeast edge of the Lee Nuclear Site. This area is on a bluff overlooking the Ninety-Nine Islands Reservoir, and it is slated for construction of the Broad River intake structure for the Lee Nuclear Station. The second portion of the on-site APE consists of two 50-ft.-wide strips of land, one along each side of the existing road to the station overlook for its entire length. The road to the overlook, which is approximately 1-mi. long, begins just inside the main entrance to the Lee Nuclear Site, extends to the west as it ascends McKowns Mountain, and then gradually turns north to run across the full spine of the mountain. Duke Energy plans to improve this road during construction of the station. The APE for the road contains approximately 12 ac. The third portion of the on-site APE is the planned location for a new meteorological tower (MET Tower 3) and its associated access road. This small area, approximately 10 ac., is located just north of Make-Up Pond B. The 2007 Phase I survey was confined to the Broad River intake, existing road to the overlook, and MET Tower 3 portions of the on-site APE. The fourth portion of the on-site APE is the planned location of the cooling water discharge system for the Lee Nuclear Station. The fifth portion is an alternative road ROW to the overlook.

The off-site APE for noise and aesthetic/visual effects on aboveground historic properties was determined to be the area within a 1-mi. radius of the proposed footprints for the circulating water system (CWS) cooling tower pads and MET Tower 3. This determination was based on the rolling Piedmont topography in the vicinity of the Lee Nuclear Site, and it was made in consultation with the SHPO. The SHPO deemed the 1-mi. radius sufficient to assess noise and aesthetic/visual effects from these high structures on the site. Throughout South Carolina, the 1-mi. radius is commonly used to assess effects from proposed cell phone towers that are similar in height. The APEs for transmission corridors and other off-site areas are delineated in Subsection 2.5.3.8.

Similar survey techniques were applied in all portions of the APE. The water intake portion of the APE was investigated by excavating five 1-ft.-diameter shovel tests in areas that had the least slope and the least disturbance from prior road construction. Each shovel test was excavated to sterile subsoil, and the fill was sifted through 0.25-in. mesh hardware cloth. Information about each shovel test was recorded in field notebooks. The recorded information included the presence or absence of artifacts, soil color, soil texture, and stratification. In the overlook road portion of the on-site APE, two 1-mi.-long survey transects were established, one on each side of the road and about 10 ft. from its edge. Shovel tests were excavated wherever possible along each transect, accounting for the steep topographic relief on McKowns Mountain. The shovel testing and field recording techniques used in these areas were essentially the same as those used in the MET Tower 3 area.

The 2007 Phase I survey included an architectural inventory of the area within a 1-mi. radius of the on-site locations for the proposed CWS cooling towers and MET Tower 3. The purpose of this inventory was to identify aboveground historic properties that could be affected aesthetically by visibility of the towers. The architectural survey involved a review of historic maps to identify past building locations, and this was supplemented by a windshield survey of the 1-mi. radius to identify potentially affected architectural resources and landscapes that could be eligible for listing on the NRHP. The survey included a field review of structures more than 50 years of age. Information on these structures was recorded on standard field forms and survey cards required by the SHPO. Photographs of the structures were also taken.

The Phase I survey was directed by Mr. Ralph Bailey, Jr. (Principal Investigator [PI]). Mr. Bailey has an M.A. in history from The Citadel/University of Charleston and a B.A. in anthropology from George Washington University. In addition, he is a registered professional archaeologist who meets the Secretary of the Interior's Historic Preservation Professional Qualification Standards. Mr. Bailey has been the PI for a number of archaeological survey, testing, and data recovery projects in South Carolina, Virginia, Mississippi, and Alabama (Reference 13).

2.5.3.2 Consultations With the SHPO and American Indian Tribes

Under Section 106 of the NHPA (Reference 46) and the federal regulations in 36 CFR 800 (Reference 29), Duke Energy is required to consult with the South Carolina SHPO as part of an effort to determine whether historic properties are located within the area of potential effect of the proposed Lee Nuclear Station. On April 3, 2006, Duke Energy initiated Section 106 compliance by sending a consultation letter to the SHPO (Appendix B). This letter emphasized past intensive development within 750 ac. of the current 1900-ac. site, basically the same 750 ac. slated for most of the proposed construction for the Lee Nuclear Station. In addition, based on the results of a 1975 environmental impact statement (Reference 127), this letter emphasized the absence of any on-site properties eligible for listing or already listed on the NRHP. On April 28, 2006, the SHPO sent a response to this letter in which they recommended a Phase I intensive survey of the APE to identify and evaluate all historic properties more than 50 years old. Plans and methods for the requested survey were discussed in a meeting with the SHPO on December 7, 2006. Based on the results of this meeting, Duke Energy submitted a written scope of work to the SHPO for approval. The SHPO approved this scope of work in a letter dated February 26, 2007, and the 2007 Phase I intensive survey was initiated shortly thereafter in March. Further SHPO consultations concerning a survey of the MET Tower 3 site were undertaken in the late spring of 2007. In a letter dated June 8, 2007, the SHPO approved the written report on the March 2007 Phase I Intensive survey and an addendum report on the MET Tower 3 survey. No prehistoric archaeological sites, Historic Period archaeological sites, historic sites, or traditional cultural properties were identified in the on-site APE for the Broad River intake, the existing road to the overlook, and the MET Tower 3 area. The only historic sites identified within a 1-mi. radius of the proposed cooling towers and MET Tower 3 were the Ninety-Nine Islands Dam and its associated hydroelectric plant, which are both eligible for listing on the NRHP (see Subsection 2.5.3.5). Consultation letters to the SHPO and the responses are provided in Appendix B.

Consultation letters were sent to the Native American Tribal Historic Preservation Officers (THPO) of the federally recognized tribes that have a historical, cultural, and traditional interest in the lands of Cherokee and York counties. Letters were also sent to four Native American organizations with similar stakeholder interests. These tribes and organizations are as follows: (1) Catawba Indian Nation, (2) Eastern Band of Cherokee Indians, (3) Eastern Shawnee Tribe of

Oklahoma, (4) Piedmont American Indian Association, (5) United South and Eastern Federation of Tribes, (6) Carolina Indian Heritage Association, and (7) Pine Hill Indian Community. Responses were received from the Catawba Indian Nation, Eastern Shawnee Tribe of Oklahoma, and Eastern Band of Cherokee Indians. The THPO for the Eastern Band of Cherokee Indians requested a Phase I survey of the APE and requested an opportunity to review the Phase I survey report and related cultural resource data and documentation. The Catawba Indian Nation requested appropriate shovel testing in previously undisturbed areas of the APE and notification if Native American artifacts or human remains are encountered during construction. The Eastern Shawnee Tribe of Oklahoma indicated that it did not wish to participate as a consulting party, but it did request a work stoppage and notification if human skeletal remains or objects under the jurisdiction of the Native American Graves Protection and Repatriation Act are encountered during construction. No responses were received from the other Native American groups. Additional THPO consultations have occurred in parallel with the SHPO consultations. The THPO consultation letters and responses are provided in Appendix B.

2.5.3.3 Prehistoric Archaeological Sites

Five prehistoric archaeological sites and three more sites with prehistoric components (see Subsection 2.5.3) were identified on the Lee Nuclear Site during the 1974 survey (Table 2.5-21) (Reference 30). The SHPO deemed all five of these archaeological sites as ineligible for listing on the NRHP (Reference 47). Subsequent to the SHPO determination, a number of these prehistoric sites and one multi-component site's prehistoric component were heavily disturbed or completely destroyed by the extensive excavations associated with construction of the Cherokee Nuclear Station. The affected sites are numbers 38CK10, 38CK11, and 38CK13, and the affected component is at 38CK12 (Reference 30). All of these site locations are within the on-site APE of the Lee Nuclear Station.

The remaining four prehistoric sites and components (38CK8, 38CK9, 38CK14, and 38CK15) are located in areas that were not disturbed by early construction activities on the site. The 1974 survey recommended further archaeological survey work and stratigraphic testing at 38CK8. No further work was recommended for the other three sites (Reference 30). Prior to the construction, the SHPO determined that all of these sites were ineligible for listing on the NRHP (Reference 47). However, the report on the 2007 Phase I survey designates all four as "unassessed" sites, which means that their NRHP eligibility is now considered uncertain by the SHPO because they have not been assessed using current methods. These four prehistoric sites and components are not within the on-site APE for the Lee Nuclear Station.

The Broad River intake, existing road to the overlook, and MET Tower 3 portions of the on-site APE were surveyed intensively for prehistoric archaeological sites in 2007. No prehistoric archaeological sites are located in these areas.

The closest prehistoric sites outside the current boundary of the Lee Nuclear Site are 38CK52 and 38CK58, and the closest prehistoric components are at 38CK5 and 38CK6. After the 1974 survey, 38CK5 and 38CK6 were recommended for further investigation (Reference 30). However, one year after completion of the survey, the SHPO deemed the two sites as ineligible for listing on the NRHP (Reference 47). However, the 2007 Phase I survey report designates all four as "unassessed" sites. These four sites are less than 0.3 mi. from the boundary of the Lee Nuclear Site. The other identified prehistoric sites and components within 10 mi. of the Lee Nuclear Site are located more than 1.5 mi. from the boundary of the site (Reference 35).

2.5.3.4 Historic Period Archaeological Sites

In the 1974 survey, four Historic Period archaeological sites (38CK16, 38CK17, 38CK18, and 38CK19) and three archaeological sites with Historic Period components (38CK12, 38CK14, and 38CK15) were identified on the Lee Nuclear Site (Table 2.5-21) (see Subsection 2.5.3) (Reference 30). The SHPO deemed all seven sites and components ineligible for listing on the NRHP (Reference 47). Subsequent to the SHPO determination two Historic Period archaeological sites (38CK17 and 38CK18) and one Historic Period component (38CK12) were heavily disturbed or completely destroyed by the extensive excavations associated with construction of the Cherokee Nuclear Station. All three of these site and component locations are within the on-site APE for the Lee Nuclear Station.

The remaining four Historic Period archaeological sites and components (38CK14, 38CK15, 38CK16, and 38CK19) are located in areas that were not disturbed by the early construction activities. The 1974 survey recommended further documentary research at 38CK16. Documentation and preservation of 38CK19 was also recommended. No further work was recommended for 38CK14 and 38CK15 (Reference 30). In 1975, the SHPO deemed all of these sites to be ineligible for listing on the NRHP (Reference 47). However, the 2007 Phase I survey report designates 38CK14, 38CK15, and 38CK16 as “unassessed” sites. All four of these Historic Period archaeological sites are located outside of the on-site APE.

The Broad River intake, overlook road, and MET Tower 3 portions of the on-site APE were surveyed intensively for Historic Period archaeological sites in 2007. No Historic Period archaeological sites are located in these areas.

The closest Historic Period archaeological site outside the current boundary of the Lee Nuclear Site is 38CK7, and the closest Historic Period archaeological components are at 38CK5 and 38CK6. All three sites are less than 0.3 mi. from the boundary of the Lee Nuclear Site. Another nearby Historic Period archaeological site is the old Jackson Furnace, which was a key element of the local iron industry in the vicinity of the Lee Nuclear Site from the middle 1700s to about 1900 (References 62 and 77). Jackson Furnace is listed on the NRHP. When the 1974 survey was completed, 38CK5 and 38CK6 were recommended for further investigation, but the SHPO determined that they were ineligible for listing on the NRHP (References 30 and 47). The 2007 Phase I survey report designates 38CK5, 38CK6, and 38CK7 as “unassessed” sites. The other previously identified Historic Period archaeological sites and components within 10 mi. of the Lee Nuclear Site are located more than 1.5 mi. from the boundary of the Lee Nuclear Site.

2.5.3.5 Historic Sites

Historic sites are herein defined as those discrete areas of land that have fully intact aboveground structures, architectural resources, and features (e.g., houses, churches, stores, dams, grist mills, military earthworks) that date to the Historic Period. If one of these sites has a formal state archaeological site number, it is considered to be a historic archaeological site for the purposes of this environmental description (see Subsection 2.5.3.4).

No aboveground historic sites with complete standing structures and other intact surface features were identified on the Lee Nuclear Site during the 1974, 1981, and 2007 surveys (References 30 and 35). Furthermore, a recent records search at the SCDAH indicated that no such sites have been previously identified and recorded at any location within the boundary of the Lee Nuclear

Site. Therefore, the Lee Nuclear Site has no aboveground historic sites that are eligible for listing or listed on the NRHP.

The 2007 architectural survey identified 14 historic architectural resources outside of the Lee Nuclear Site boundary but within a 1-mi. radius of the proposed CWS cooling tower pads and MET Tower 3 on the site. The Ninety-Nine Islands Dam and its associated hydroelectric plant are the most significant architectural resources within this area. The dam sits adjacent to the east boundary of the Lee Nuclear Site, and its hydroelectric plant is on the east bank of the Broad River approximately 650 ft. northeast of the site. The SHPO has designated both as eligible for listing on the NRHP because of their significance. The dam and power plant are significant because of their association with the development of hydroelectric power in the state (NRHP Criterion A) and because the plant is an excellent example of an early hydroelectric plant (NRHP Criterion C). In addition to significance, an eligible property must have integrity, which is the ability to convey its significance. The crucial elements of integrity for the dam and power plant are their design, workmanship, and materials. The remaining 12 architectural resources within the 1-mi. radius are small houses, McKowns Mountain Baptist Church, the associated church cemetery, and a few outbuildings. These buildings and features are located south of the Lee Nuclear Site on McKowns Mountain Road and in its immediate vicinity. The 2007 survey recommended these architectural resources as not eligible for listing on the NRHP.

Seven NRHP-listed historic sites, six national historic districts, and Kings Mountain National Military Park are located within 10 mi. of the Lee Nuclear Site. The Limestone Springs Historic District, located 6 mi. northwest of the site boundary, is the NRHP-listed historic site that is nearest to the Lee Nuclear Site. Apart from the Ninety-Nine Islands Dam and its hydroelectric plant, the other 53 historic sites (Table 2.5-20) eligible for listing on the NRHP are more than 2 mi. from the boundary of the Lee Nuclear Site. These historic sites and their NRHP status are presented on Table 2.5-22.

2.5.3.6 Historic Cemeteries

Four small Euroamerican family cemeteries have been identified within the Lee Nuclear Site. They are located in peripheral areas near the site boundary lines and all are outside of the on-site APE (References 30 and 78). The J.H. Stroup Cemetery and Moss Cemetery are located near the site boundary on the east side of the site. The McKown Family Cemetery and an unnamed family cemetery are located near the site boundary northwest of the Make-Up Pond B. The eligibility of these cemeteries for listing on the NRHP has not been determined, and none are listed on the NRHP. Numerous municipal, church, and small family cemeteries are located within 10 mi. of the Lee Nuclear Site in Cherokee and York counties (Reference 78).

2.5.3.7 Traditional Cultural Properties

The Native American tribes and organizations that maintain a historical, cultural, and traditional interest in the lands of Cherokee and York counties were consulted to identify any traditional cultural properties that might exist on or in the immediate vicinity of the Lee Nuclear Site. No specific traditional cultural properties of special sensitivity or concern to these groups are known to exist on the Lee Nuclear Site or anywhere in its vicinity (Appendix B). No traditional cultural properties important to Euroamerican communities have been identified on the Lee Nuclear Site or at nearby locations outside the site boundary.

2.5.3.8 Historic Properties in Transmission Corridors and Off-Site Areas

This subsection describes the existing historic properties environment in the proposed transmission line corridors and railroad spur right-of-way (ROW) for the Lee Nuclear Station.

2.5.3.8.1 Transmission Corridors

Two transmission line corridors are proposed for the Lee Nuclear Station, but the precise route of each corridor has not been selected. However, Duke Energy has established a number of broadly-defined alternative corridors for study and evaluation. The two eventually selected corridors and the historic properties APE for each is expected to lie within these larger study corridors.

Subsection 9.4.3 identifies the broad alternative corridors that have been established, and it describes the existing historic properties environment within each of these corridors. These descriptions are based on the results of previous historic properties surveys that have been conducted over the years within these large corridors. To the extent possible, the survey results are expected to be used to reduce the size of or eliminate known historic properties within the final two corridors to be selected. After the two corridors are selected, Duke Energy plans to conduct a Phase I survey to identify any additional historic properties that may be located within the transmission corridor APE.

2.5.3.8.2 Railroad Spur

In the 1970s, Duke Power Company laid its own railroad spur to support construction of the Cherokee Nuclear Station. This spur was approximately 6.8-mi. long, and 100-ft wide, and it ran from East Gaffney, South Carolina, to the construction site for the station. A short segment of the railroad ROW is on the Lee Nuclear Site.

When station construction activities were terminated in 1982, the railroad spur was abandoned and the rails were removed, leaving behind only the railroad bed. The ROW was soon turned over to private ownership. In the ensuing 25 years, an ice manufacturing and distribution plant was established near ROW in East Gaffney, and a portion of the ROW now crosses the driveway for the ice plant. The plant is now known as Reddy Ice, and it is owned by the Reddy Ice Corporation. With the exception of a brief detour at the ice plant, Duke Energy plans to rebuild this spur on its original bed to support construction and operation of Lee Nuclear Station. The detour, agreed to by Duke Energy and the owner of the ice plant, extends to a maximum of 125 ft. north of the current railroad bed, and it involves approximately 1300 ft. of track.

The off-site APE for the proposed rail spur is primarily the existing railroad bed and the parallel areas along each side that were disturbed during the earlier railroad construction. The only exception is the ROW section for the proposed detour at the ice plant. The section of the spur that crosses a portion of the Lee Nuclear Site is considered to be part of the previously developed on-site APE.

The Ellen Furnace Site (38CK68) is a very large Historic Period archaeological site representative of the local iron industry that thrived in Cherokee County, South Carolina, prior to about 1900 (Reference 77). This site is located just east of East Gaffney, South Carolina, and is listed on the NRHP. The railroad spur goes through the middle of 38CK68. The portions of 38CK68 within the original ROW were disturbed during the earlier railroad construction.

During a past survey, another archaeological site (38CK38) was identified about 150 ft. north of the railroad ROW along a straight length of rail bed near the center of the spur route. However, the SCIAA officially considers the location of this site and the locations of several other archaeological sites in the surrounding area to be very inaccurate as a result of highly inadequate and unreliable survey documentation. Because of these problems, the existing site file information and data on these sites are excluded from consideration to maintain accuracy in reporting.

2.5.4 ENVIRONMENTAL JUSTICE

This subsection identifies, describes, and locates low-income and minority populations.

2.5.4.1 Methodology

Environmental Justice refers to a federal policy under which each federal agency identifies and addresses, as appropriate, disproportionately high and adverse human health or environmental effects of its program, policies, and activities on minority or low-income populations. On August 24, 2004, the NRC issued its policy statement on the treatment of environmental justice matters in licensing actions (69 Federal Register 52040).

Concern that minority and/or low-income populations might be bearing a disproportionate share of adverse health and environmental effects led President Clinton to issue Executive Order - 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,” in 1994 to address these issues (Reference 128). The Order directs federal agencies to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations. Guidance from the NRC Office of Nuclear Reactor Regulation was used in this analysis (Reference 49).

The NRC guidance concluded that an 80-km (50-mi.) radius, such as the Lee Nuclear Site region, could reasonably be expected to contain potentially affected areas and that the state was an appropriate geographic area for comparative analysis. The guidance discusses the recommended methodology to identify the locations of minority and low-income populations within the region (Reference 49). Potential adverse effects are identified and discussed in Subsections 4.4.3 and 5.8.3.

2.5.4.2 Minority Populations

The NRC guidance and the U.S. Census Bureau define a “minority” population as (1) American Indian or Alaskan Native, (2) Asian, (3) Native Hawaiian or other Pacific Islander, (4) Black races, (5) Multiracial, and (6) Hispanic ethnicity. Additionally, the NRC guidance requires that all other single minorities are to be treated as one population and analyzed (Other), and that the aggregate of all minority populations (Aggregate) is to be treated as one population and analyzed. The guidance indicates that a minority population exists if either of the following two conditions is met:

- The minority populations of the census block or the environmental impact site exceed 50 percent.

- The minority population percentage of the environmental impact area is significantly greater (typically at least 20 percentage points) than the minority population percentage in the geographic area chosen for the comparative analysis (i.e., individual state and two-state combined average).

The area within the Lee Nuclear Site region is used in this analysis to define the potential environmental impact area. Census blocks that are located within or are intersected by the boundary of the region are included in this area.

Two geographic area types are used to define the criteria: (1) individual states and (2) a combination of North Carolina and South Carolina. For the first geographic area type, the percentage of minorities, as defined above, for each of the two states (North Carolina and South Carolina) are obtained from the U.S. Census 2000 data to derive a criteria set for each state individually. For the second geographic area type, the census data are averaged for both states in each minority category to derive a criteria set. The calculated percentages derived from census block data within the region are compared to the criteria sets of each geographic area type to locate census blocks that contain a minority population.

In addition to the minority definitions stated above, Hispanic ethnicity is also considered. According to the U.S. Census Bureau, Hispanic ethnicity is not a race. Therefore, a Hispanic individual can be counted in any of the race categories as well as the Hispanic ethnicity category. Because both Hispanic ethnicity and minority races are included in the Aggregate Minority Plus Hispanic category, individuals who reported both a Hispanic ethnicity and a minority race are counted twice (Reference 48). Because NRC guidance suggests that both minority races and Hispanic ethnicity can be considered minority populations, the Aggregate Minority Plus Hispanic category is presented here. The double-counting is a conservative approach to map all potential minority areas, thus reducing the possibility of missing one.

Using the NRC minority guidance conditions and the U.S. Census data for North Carolina and South Carolina, the 50,627 census blocks in the region are analyzed for minority populations. The results of the analysis are listed in Table 2.5-23 and shown in Figures 2.5-6, 2.5-7, 2.5-8, 2.5-9, 2.5-10, 2.5-11, 2.5-12, 2.5-13, 2.5-14, 2.5-15, 2.5-16, 2.5-17, 2.5-18, 2.5-19, 2.5-20, 2.5-21, 2.5-22, 2.5-23, 2.5-24, and 2.5-25. The minority population percentage is also calculated for the region and is presented in Table 2.5-24. Analysis of the data in Table 2.5-24 shows that the minority population is dominated by individuals identifying themselves as Black or African Americans. Figures 2.5-6, 2.5-7, 2.5-8, 2.5-9, 2.5-10, 2.5-11, 2.5-12, 2.5-13, 2.5-14, 2.5-15, 2.5-16, 2.5-17, 2.5-18, 2.5-19, 2.5-20, 2.5-21, 2.5-22, 2.5-23, 2.5-24, and 2.5-25 reveal a trend of increasing minority percentages as one moves in a south-southeast direction through the region.

2.5.4.3 Low-Income Populations

NRC guidance defines low-income households based upon statistical poverty thresholds (Reference 49). A block group is considered low-income if either of the following two conditions is met:

- The low-income population in the census block groups or the environmental impact site exceeds 50 percent.

- The percentage of households below the poverty level in an environmental impact site is significantly greater (typically at least 20 percentage points) than the low-income population percentage in the geographic area chosen for comparative analysis (i.e., individual state and two-state combined average).

The same geographic area types used in Subsection 2.5.4.2 are used for this analysis. The census data for poverty status are used for this analysis. The U.S. Census Bureau determines poverty status by comparing a person’s total family income, family size, and composition to a poverty threshold matrix. The poverty matrix contains 48 thresholds arranged by family size and number of children. Anyone meeting the matrix criteria for poverty is counted as an individual in poverty. To calculate household poverty data only the householder and related individuals are considered. Anyone who is not related by marriage or birth to the householder is not included. To achieve a more conservative estimate, the census-defined “individuals below poverty level” data are used rather than the “households below poverty level” data (Reference 50).

Using the individual state criteria, 64 census block groups (approximately 4.4 percent) of the 1464 census block groups within the region have low-income populations that meet the conditions described above. Within the vicinity there are no block groups that meet the conditions. Using the two-state average, 62 census block groups (approximately 4.2 percent) within the region have low-income individuals. Within the vicinity there are no block groups that meet the conditions. The low-income population percentage is also calculated for the region and is presented in Table 2.5-24.

2.5.4.4 Subsistence Populations

NRC guidance (NUREG-1555) recommends the identification of any unique economic, social, or human health circumstances and lifestyle practices of minority and low-income populations that could result in disproportionately high and adverse impacts to these populations from plant construction and operation. Such circumstances and practices may include, for example, exceptional dependence on subsistence resources, unusual concentrations of minority or low-income population within a compact area (e.g., Native American settlement), or pre-existing health conditions within a community that might make it more susceptible to potential plant-related impacts.

Based upon the demographic (local and regional) and environmental justice analyses set forth above, Duke Energy is not aware of any unusual resource dependencies or practices, or other circumstances, that could result in disproportionate impacts to minority or low-income populations. Indeed, the foregoing analysis suggest that such disproportionate impacts are unlikely give the observed distribution of low-income and minority populations within the site, vicinity and region.

Specifically, based on the U.S. Census data, Duke Energy identified no low-income populations within the site vicinity (Figure 2.5-24), where potential plant-related impacts (which have been found to be generally SMALL) would be expected to be most significant. Moreover, as reflected in Figures 2.5-23 and 2.5-25, minority and low-income populations identified within the region and located principally within urban areas, where subsistence type dependence on natural resources (e.g., fish, game, agricultural products, and natural water sources) is less likely. To the extent that fishing, hunting, and agriculture occur in the vicinity of the Lee Nuclear Station, they appear to be recreational in nature.

2.5.4.5 Migrant Populations

Information on migrants is difficult to collect and evaluate. The most recent data source for this information is the 2002 Census of Agriculture. As part of this census, farm operators were asked whether any hired or contract workers were migrant workers. A migrant worker is defined as a farm worker whose employment requires travel that prevents the worker from returning to a permanent place of residence the same day. Migrants tend to work short-duration (assumed less than 150 days), labor-intensive jobs such as harvesting fruits and vegetables. Table 2.5-25 provides information on farms in the region that employ migrant labor (References 96, 97, 98, and 99). Cherokee County, where the Lee Nuclear Station is located, is reported to have two farms employing migrant workers out of 430 total farms, while York County is reported to have 12 farms employing migrant workers out of 858 total farms. Table 2.5-25 also provides the number of individuals per county who work less than 150 days per year. It is assumed that the migrant workers are included in the values reported. Impacts to migrant workers are discussed in Sections 4.4 and 5.8.

2.5.5 NOISE

The Lee Nuclear Site is a formerly characterized site that was previously granted a construction permit by the NRC to build a nuclear power plant. The site has partially completed structures that have never been operational over the past 30 years. The facility is unoccupied except for a 24-hour security crew and an occasional maintenance contractor who performs routine maintenance and support activities. Noise generated from these activities is limited to traffic entering and exiting the facility and the occasional use of equipment such as fork lifts, trucks, tractors, mowers, and other maintenance vehicles. Other noise generated on-site is from natural sources such as wind through foliage, wildlife, and insects. Nearby off-site sources of noise include a hydroelectric plant (location 14), traffic along the southern and eastern perimeters of the site, and aquatic vehicles (boats, personal water craft, etc.) along the Broad River (Figure 2.5-26).

Nearby locations with potential sensitivity to noise are identified from the site reconnaissance conducted in 2006. Sensitive receptors near the site include:

- Historic family cemeteries (locations 1-4) and a church cemetery (location 10).
- Nearest residences (location 15).
- Nearest business (a hydroelectric power plant, location 14).
- Nearest churches (McKowns Mountain Baptist Church – location 10, Nazareth Baptist Church – location 11, Mt. Ararat Baptist Church – located out of range of Figure 2.5-26 approximately 12,548 ft. to the west-northwest of potential noise sources, Church of God - located out of range of Figure 2.5-26 approximately 10,529 ft. to the north-northwest of potential noise source, and Sardis Church -Location 17).
- An elementary school (located out of range of Figure 2.5-26 approximately 20,200 ft. to the west of potential noise sources).

Recreation locations such as a small boat ramp and fishing area (location 7) were also selected for monitoring. Sensitive receptors located within the property line of the facility included family cemeteries, wildlife, and migratory birds. The nearby residences are south and east of the site boundary.

An ambient noise survey was conducted in June 2006. The results of the survey indicate that noise levels along the approximate fence line (locations 5, 6, 8, and 9 as illustrated in Figure 2.5-26) and off-site noise levels were in the range of values expected for ambient noise in a low-density residential and rural location. Area noise levels ranged between 28 and 69 A-weighted decibels (dBA) (daytime) and between 36 and 53 dBA (nighttime). Average equivalent sound levels (Leq) measured between 42 and 52 dBA (daytime) and 40 to 46 dBA (nighttime). Noise sources included traffic entering and exiting the facility, occasional use of maintenance equipment, wind through foliage, and wildlife. Ambient noise sources are similar to those stated in the Cherokee Nuclear Station environmental report (Reference 92). The survey did not include ambient noise measurements for transmission lines because there are none. Transmission line noise for new transmission lines is discussed in the operational impacts section in Subsection 5.8.1.5.

Ambient noise levels may fluctuate during the winter, spring, summer, and fall seasons. The loudest potential for background noise is during the spring and summer months when the wind through foliage and a full array of wildlife (birds, insects, amphibians, etc.) would be predominant noise sources. Monitoring locations were established at measured distances from the most likely (predominant) noise sources during power plant operation, specifically the two CWS cooling tower pad locations. Impacts from noise during construction and operation of Lee Nuclear Station were evaluated in Subsection 4.4.1.5 and Subsection 5.8.1.5, respectively.

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TABLE 2.5-1 (Sheet 1 of 6)
THE PROJECTED PERMANENT POPULATION FOR EACH SECTOR 0 – 16 KM (10 MI.) FOR 2007, 2016, 2026, 2036, 2046, AND 2056

Direction/Year	Sector 0–2 (km)	2–4 (km)	4–6 (km)	6–8 (km)	8–10 (km)	10–16 (km)	0–16 (km)
North							
2007	18	82	183	473	1976	1445	4177
2016	20	90	201	517	2160	1569	4557
2026	22	98	220	566	2365	1706	4977
2036	24	107	239	616	2570	1844	5400
2046	26	115	258	665	2775	1981	5820
2056	28	124	277	714	2980	2119	6242
NNE							
2007	16	67	131	162	247	1500	2123
2016	17	74	143	178	270	1635	2317
2026	19	81	157	194	295	1786	2532
2036	20	88	170	211	321	1937	2747
2046	22	95	184	228	346	2089	2964
2056	24	102	197	245	372	2240	3180
NE							
2007	15	50	67	99	335	466	1032
2016	17	55	73	108	366	518	1137
2026	18	60	80	118	401	576	1253
2036	20	65	87	129	436	635	1372
2046	21	71	94	139	471	693	1489
2056	23	76	101	149	505	751	1605

TABLE 2.5-1 (Sheet 2 of 6)
THE PROJECTED PERMANENT POPULATION FOR EACH SECTOR 0 – 16 KM (10 MI.) FOR 2007, 2016, 2026, 2036, 2046, AND 2056

Direction/Year	Sector 0–2 (km)	2–4 (km)	4–6 (km)	6–8 (km)	8–10 (km)	10–16 (km)	0–16 (km)
ENE							
2007	12	21	24	163	299	854	1373
2016	13	23	26	179	327	979	1547
2026	14	25	29	196	359	1119	1742
2036	15	27	31	213	391	1259	1936
2046	17	29	34	230	423	1399	2132
2056	18	32	37	247	454	1539	2327
EAST							
2007	11	22	16	41	122	583	795
2016	12	25	18	47	140	671	913
2026	13	29	21	54	159	769	1045
2036	15	32	23	61	179	867	1177
2046	16	36	26	68	198	965	1309
2056	17	39	29	74	218	1063	1440
ESE							
2007	4	21	37	80	70	464	676
2016	4	24	42	92	81	535	778
2026	4	28	48	105	93	613	891
2036	5	31	54	119	105	691	1005
2046	5	34	61	132	116	769	1117
2056	5	38	67	146	128	847	1231

TABLE 2.5-1 (Sheet 3 of 6)
THE PROJECTED PERMANENT POPULATION FOR EACH SECTOR 0 – 16 KM (10 MI.) FOR 2007, 2016, 2026, 2036, 2046, AND 2056

Direction/Year	Sector 0–2 (km)	2–4 (km)	4–6 (km)	6–8 (km)	8–10 (km)	10–16 (km)	0–16 (km)
SE							
2007	1	23	20	38	141	876	1099
2016	1	26	23	44	163	1009	1266
2026	2	29	27	50	187	1157	1452
2036	2	32	30	57	210	1304	1635
2046	2	35	33	63	234	1451	1818
2056	2	37	37	70	258	1599	2003
SSE							
2007	7	44	13	18	31	177	290
2016	8	49	14	20	35	202	328
2026	9	53	16	23	40	231	372
2036	9	58	17	25	45	260	414
2046	10	62	18	27	50	288	455
2056	11	67	20	29	55	317	499
SOUTH							
2007	10	57	30	84	44	132	357
2016	11	62	32	91	48	144	388
2026	12	68	35	100	53	158	426
2036	13	74	39	109	58	172	465
2046	14	80	42	117	62	186	501
2056	15	86	45	126	67	200	539

TABLE 2.5-1 (Sheet 4 of 6)
THE PROJECTED PERMANENT POPULATION FOR EACH SECTOR 0 – 16 KM (10 MI.) FOR 2007, 2016, 2026, 2036, 2046, AND 2056

Direction/Year	Sector 0–2 (km)	2–4 (km)	4–6 (km)	6–8 (km)	8–10 (km)	10–16 (km)	0–16 (km)
SSW							
2007	7	41	43	47	47	207	392
2016	8	44	47	52	51	226	428
2026	9	49	52	57	56	247	470
2036	10	53	56	62	61	269	511
2046	10	57	61	67	66	290	551
2056	11	61	65	72	71	312	592
SW							
2007	3	57	72	41	102	323	598
2016	3	62	79	44	111	353	652
2026	4	68	87	49	122	386	716
2036	4	74	94	53	132	420	777
2046	4	80	102	57	143	453	839
2056	5	86	109	61	153	487	901
WSW							
2007	0	65	74	89	173	1583	1984
2016	0	71	81	97	189	1731	2169
2026	0	78	88	107	207	1895	2375
2036	0	84	96	116	225	2059	2580
2046	0	91	104	125	242	2224	2786
2056	0	98	111	134	260	2388	2991

TABLE 2.5-1 (Sheet 5 of 6)
THE PROJECTED PERMANENT POPULATION FOR EACH SECTOR 0 – 16 KM
(10 MI.) FOR 2007, 2016, 2026, 2036, 2046, AND 2056

Direction/Year	Sector 0–2 (km)	2–4 (km)	4–6 (km)	6–8 (km)	8–10 (km)	10–16 (km)	0–16 (km)
WEST							
2007	1	67	169	445	365	4596	5643
2016	1	73	185	487	399	5025	6170
2026	1	80	202	533	437	5501	6754
2036	1	87	220	579	475	5978	7340
2046	1	94	237	625	513	6455	7925
2056	1	101	255	671	551	6932	8511
WNW							
2007	4	64	275	360	664	16,266	17,633
2016	4	70	301	394	726	17,785	19,280
2026	4	76	329	431	795	19,472	21,107
2036	5	83	358	469	864	21,160	22,939
2046	5	89	386	506	933	22,847	24,766
2056	5	96	415	544	1002	24,535	26,597
NW							
2007	4	43	142	216	293	1784	2482
2016	4	47	155	236	321	1951	2714
2026	5	52	170	259	351	2136	2973
2036	5	56	185	281	381	2321	3229
2046	5	61	200	304	412	2506	3488
2056	6	65	214	326	442	2691	3744

TABLE 2.5-1 (Sheet 6 of 6)
THE PROJECTED PERMANENT POPULATION FOR EACH SECTOR 0 – 16 KM (10 MI.) FOR 2007, 2016, 2026, 2036, 2046, AND 2056

Direction/Year	Sector 0–2 (km)	2–4 (km)	4–6 (km)	6–8 (km)	8–10 (km)	10–16 (km)	0–16 (km)
NNW							
2007	8	124	230	372	308	1436	2478
2016	9	135	251	407	336	1568	2706
2026	10	148	275	446	368	1715	2962
2036	11	161	299	484	400	1863	3218
2046	12	174	322	523	432	2010	3473
2056	13	187	346	561	464	2157	3728
Totals							
2007	121	848	1526	2728	5217	32,692	43,132
2016	132	930	1671	2993	5723	35,901	47,350
2026	146	1022	1836	3288	6288	39,467	52,047
2036	159	1112	1998	3584	6853	43,039	56,745
2046	170	1203	2162	3876	7416	46,606	61,433
2056	184	1295	2325	4169	7980	50,177	66,130

Cumulative Totals	0-2 (km)	0-4 (km)	0-6 (km)	0-8 (km)	0-10 (km)	0-16 (km)
2007	121	969	2495	5223	10,440	43,132
2016	132	1062	2733	5726	11,449	47,350
2026	146	1168	3004	6292	12,580	52,047
2036	159	1271	3269	6853	13,706	56,745
2046	170	1373	3535	7411	14,827	61,433
2056	184	1479	3804	7973	15,953	66,130

Source: Based on data provided in Reference 5.

TABLE 2.5-2 (Sheet 1 of 6)
THE PROJECTED PERMANENT POPULATION FOR EACH SECTOR 16 KM (10 MI.) – 80 KM (50 MI.) FOR 2007, 2016, 2026, 2036, 2046, AND 2056

Direction/Years	Sector 16–40 (km)	40–60 (km)	60–80 (km)	16–80 (km)
North				
2007	38,714	16,194	57,871	112,779
2016	40,905	17,691	62,189	120,785
2026	43,339	19,354	66,986	129,679
2036	45,773	21,017	71,784	138,574
2046	48,207	22,680	76,581	147,468
2056	50,641	24,342	81,379	156,362
NNE				
2007	30,164	43,594	71,754	145,512
2016	31,669	49,078	80,489	161,236
2026	33,340	55,171	90,195	178,706
2036	35,011	61,264	99,901	196,176
2046	36,683	67,357	109,606	213,646
2056	38,354	73,450	119,312	231,116
NE				
2007	64,806	63,972	81,956	210,734
2016	68,160	67,825	96,044	232,029
2026	71,887	72,106	111,696	255,689
2036	75,614	76,387	127,349	279,350
2046	79,341	80,668	143,002	303,011
2056	83,068	84,949	158,654	326,671

TABLE 2.5-2 (Sheet 2 of 6)
THE PROJECTED PERMANENT POPULATION FOR EACH SECTOR 16 KM (10 MI.) – 80 KM (50 MI.) FOR 2007, 2016, 2026, 2036, 2046, AND 2056

Direction/Years	Sector 16–40 (km)	40–60 (km)	60–80 (km)	16–80 (km)
ENE				
2007	33,928	123,495	444,073	601,496
2016	37,928	141,988	541,141	721,057
2026	42,374	162,536	648,994	853,904
2036	46,819	183,084	756,848	986,751
2046	51,264	203,632	864,701	1,119,597
2056	55,709	224,180	972,554	1,252,443
EAST				
2007	23,554	111,434	237,822	372,810
2016	27,121	129,708	301,029	457,858
2026	31,084	150,012	371,259	552,355
2036	35,047	170,316	441,489	646,852
2046	39,010	190,619	511,719	741,348
2056	42,973	210,923	581,949	835,845
ESE				
2007	17,869	66,163	39,213	123,245
2016	20,575	74,624	44,076	139,275
2026	23,582	84,025	49,480	157,087
2036	26,589	93,426	54,883	174,898
2046	29,595	102,827	60,287	192,709
2056	32,602	112,228	65,690	210,520
SE				

TABLE 2.5-2 (Sheet 3 of 6)
THE PROJECTED PERMANENT POPULATION FOR EACH SECTOR 16 KM (10 MI.) – 80 KM (50 MI.) FOR 2007, 2016, 2026, 2036, 2046, AND 2056

Direction/Years	Sector 16–40 (km)	40–60 (km)	60–80 (km)	16–80 (km)
2007	3922	18,411	9178	31,511
2016	4393	19,143	9594	33,130
2026	4917	19,956	10,057	34,930
2036	5440	20,768	10,520	36,728
2046	5964	21,581	10,983	38,528
2056	6487	22,394	11,446	40,327
SSE				
2007	2172	2690	3603	8465
2016	2338	2802	3799	8939
2026	2523	2926	4017	9466
2036	2708	3050	4235	9993
2046	2892	3174	4453	10,519
2056	3077	3298	4671	11,046
SOUTH				
2007	3691	3433	6144	13,268
2016	3739	3455	6487	13,681
2026	3792	3480	6868	14,140
2036	3844	3505	7249	14,598
2046	3897	3529	7630	15,056
2056	3949	3554	8012	15,515
SSW				
2007	17,533	3002	20,073	40,608

TABLE 2.5-2 (Sheet 4 of 6)
THE PROJECTED PERMANENT POPULATION FOR EACH SECTOR 16 KM (10 MI.) – 80 KM (50 MI.) FOR 2007, 2016, 2026, 2036, 2046, AND 2056

Direction/Years	Sector 16–40 (km)	40–60 (km)	60–80 (km)	16–80 (km)
2016	17,675	3057	21,828	42,560
2026	17,832	3118	23,778	44,728
2036	17,989	3179	25,728	46,896
2046	18,147	3240	27,678	49,065
2056	18,304	3302	29,628	51,234
SW				
2007	6257	14,072	31,423	51,752
2016	6510	15,173	34,451	56,134
2026	6792	16,396	37,815	61,003
2036	7074	17,619	41,180	65,873
2046	7355	18,842	44,544	70,741
2056	7637	20,065	47,909	75,611
WSW				
2007	44,615	69,520	156,415	270,550
2016	48,564	75,559	171,892	296,015
2026	52,951	82,270	189,088	324,309
2036	57,338	88,981	206,285	352,604
2046	61,725	95,691	223,482	380,898
2056	66,113	102,402	240,679	409,194
WEST				
2007	33,913	68,076	86,269	188,258
2016	36,930	73,990	94,905	205,825

TABLE 2.5-2 (Sheet 5 of 6)
THE PROJECTED PERMANENT POPULATION FOR EACH SECTOR 16 KM (10 MI.) – 80 KM (50 MI.) FOR 2007, 2016, 2026, 2036, 2046, AND 2056

Direction/Years	Sector 16–40 (km)	40–60 (km)	60–80 (km)	16–80 (km)
2026	40,282	80,561	104,500	225,343
2036	43,634	87,132	114,095	244,861
2046	46,986	93,703	123,691	264,380
2056	50,338	100,275	133,286	283,899
WNW				
2007	17,054	12,829	21,303	51,186
2016	18,498	14,027	23,784	56,309
2026	20,103	15,358	26,541	62,002
2036	21,707	16,690	29,298	67,695
2046	23,312	18,022	32,055	73,389
2056	24,917	19,353	34,812	79,082
NW				
2007	14,322	38,107	11,067	63,496
2016	15,131	39,630	11,664	66,425
2026	16,029	41,322	12,327	69,678
2036	16,928	43,013	12,991	72,932
2046	17,827	44,705	13,654	76,186
2056	18,725	46,397	14,318	79,440
N-NW				
2007	18,177	7787	27,708	53,672
2016	19,200	8145	29,491	56,836
2026	20,337	8542	31,473	60,352

TABLE 2.5-2 (Sheet 6 of 6)
THE PROJECTED PERMANENT POPULATION FOR EACH SECTOR 16 KM (10 MI.) – 80 KM (50 MI.) FOR 2007, 2016, 2026, 2036, 2046, AND 2056

Direction/Years	Sector 16–40 (km)	40–60 (km)	60–80 (km)	16–80 (km)
2036	21,474	8940	33,455	63,869
2046	22,611	9338	35,437	67,386
2056	23,747	9735	37,418	70,900
Totals				
2007	370,691	662,779	1,305,872	2,339,342
2016	399,336	735,895	1,532,863	2,668,094
2026	431,164	817,133	1,785,074	3,033,371
2036	462,989	898,371	2,037,290	3,398,650
2046	494,816	979,608	2,289,503	3,763,927
2056	526,641	1,060,847	2,541,717	4,129,205
Cumulative Totals	**16-40 (km)**	**16-60 (km)**	**16-80 (km)**	
2007	370,691	1,033,470	2,339,342	
2016	399,336	1,135,231	2,668,094	
2026	431,164	1,248,297	3,033,371	
2036	462,989	1,361,360	3,398,650	
2046	494,816	1,474,424	3,763,927	
2056	526,641	1,587,488	4,129,205	

Source: Based on data provided in Reference 5.

TABLE 2.5-3
THE CURRENT RESIDENTIAL AND TRANSIENT POPULATION FOR EACH SECTOR 0 – 16 KM (10 MI.)

Direction	Sector 0–2 (km)	2–4 (km)	4–6 (km)	6–8 (km)	8–10 (km)	10–16 (km)	0–16 (km)
NORTH	18	82	183	473	1976	1445	5169
NNE	16	67	131	162	247	1500	2123
NE	15	50	67	99	335	466	1967
ENE	12	21	24	163	299	854	1411
EAST	11	22	16	41	122	583	795
ESE	4	21	37	80	70	464	676
SE	1	23	20	38	141	876	1099
SSE	7	44	13	18	31	177	290
SOUTH	10	57	30	84	44	132	357
SSW	7	41	43	47	47	207	392
SW	3	57	72	41	102	323	598
WSW	0	65	74	89	173	1583	1984
WEST	1	67	169	445	365	4596	5643
WNW	4	64	275	360	664	16,266	22,471
NW	4	43	142	216	293	1784	2482
NNW	8	124	230	372	308	1436	2478
Totals	121	848	1526	2728	5217	38,503	49,935

Cumulative Totals	0-2 (km)	0-4 (km)	0-6 (km)	0-8 (km)	0-10 (km)	0-16 (km)
2007	121	969	2495	6215	11,432	49,935

Source: Based on data provided in Reference 5.

TABLE 2.5-4
THE PROJECTED TRANSIENT POPULATION FOR EACH SECTOR 0 – 80 KM (50-MI.) FOR 2007, 2016, 2026, 2036, 2046, AND 2056

Distance	Direction	2007	2016	2026	2036	2046	2056
8	N	992	1084	1187	1291	1394	1497
16	ENE	38	43	49	55	62	68
16	NE	935	1040	1156	1274	1391	507
16	WNW	4838	5290	5792	6294	6795	7297
40	ENE	200	224	250	277	303	329
40	NE	1487	1563	1649	1734	1820	1905
40	S	146	148	150	152	154	156
40	SSE	77	83	90	96	103	109
40	SW	74	77	81	84	87	91
40	WNW	10,809	11,724	12,741	13,758	14,775	15,792
40	WSW	1379	1501	1637	1772	1908	2044
60	E	11,483	13,366	15,458	17,550	19,642	21,734
60	ENE	32,650	37,539	42,972	48,404	53,837	59,269
60	N	17	19	20	22	24	26
60	NNW	5	5	6	6	6	6
60	S	730	735	740	746	751	756
60	SSE	140	146	153	159	165	172
60	SSW	485	494	503	513	523	533
60	W	441	479	521	564	606	649
60	WSW	327	355	387	418	450	482
80	E	52	65	81	96	111	126
80	ENE	1026	1251	1500	1749	1998	2248
80	ESE	91	102	114	127	139	152
80	N	335	360	387	415	443	471
80	NNW	191	203	217	230	244	258
80	NW	708	746	788	831	873	915
80	S	911	962	1018	1075	1131	1188
80	SSE	151	159	169	178	187	196
80	SSW	539	587	639	691	744	796
80	W	56	62	68	75	81	87
80	WSW	556	611	672	734	795	856

Source: References 1, 2, 11, 108, and 109.

TABLE 2.5-5
COUNTIES ENTIRELY OR PARTIALLY LOCATED WITHIN THE LEE NUCLEAR SITE REGION

North Carolina Counties		South Carolina Counties	
Burke	Lincoln	Cherokee	Laurens
Cabarrus	McDowell	Chester	Newberry
Catawba	Mecklenburg	Fairfield	Spartanburg
Cleveland	Polk	Greenville	Union
Gaston	Rutherford	Lancaster	York
Henderson	Union		
Iredell			

Source: Reference 110.

TABLE 2.5-6
MUNICIPALITIES IN THE LEE NUCLEAR SITE REGION WITH POPULATIONS IN EXCESS OF 25,000

POPULATED PLACES	2000 POPULATION	DISTANCE FROM SITE (Mi.)
Charlotte	540,828	40.1
Gastonia	66,277	24.0
Greenville	56,002	51.6
Concord	55,977	25.7
Rock Hill	49,765	28.7
Spartanburg	39,673	24.6
Hickory	37,222	48.9
Monroe	26,228	54.7

Source: Reference 110.

TABLE 2.5-7
DISTRIBUTION OF POPULATION IN THE LEE NUCLEAR STATION VICINITY, REGION, AND THE STATE OF SOUTH CAROLINA BY AGE AND SEX

	Vicinity		Region		State of South Carolina	
Age	Males (%)	Females(%)	Males (%)	Females(%)	Males (%)	Females(%)
Under 5 Years	3.6	3.6	3.5	3.3	3.4	3.2
5 to 9 Years	4.0	3.7	3.7	3.5	3.6	3.5
10 to 14 Years	3.5	3.6	3.6	3.4	3.7	3.5
15 to 17 Years	2.2	1.8	2.0	1.9	2.2	2.1
18 and 19 Years	1.5	1.3	1.3	1.3	1.6	1.5
20 Years	0.6	0.7	0.7	0.6	0.8	0.8
21 Years	0.7	0.7	0.6	0.6	0.7	0.7
22 to 24 Years	1.9	2.0	1.9	1.9	2.0	2.0
25 to 29 Years	3.6	3.8	3.9	3.9	3.4	3.5
30 to 34 Years	3.8	3.6	4.1	4.0	3.5	3.6
35 to 39 Years	3.8	3.7	4.2	4.2	3.9	4.0
40 to 44 Years	3.7	3.8	4.0	4.0	3.8	4.0
45 to 49 Years	3.4	3.7	3.5	3.7	3.5	3.7
50 to 54 Years	3.3	3.3	3.2	3.3	3.2	3.4
55 to 59 Years	2.6	2.8	2.4	2.6	2.5	2.7
60 and 61 Years	0.8	0.9	0.8	0.8	0.8	0.9
62 to 64 Years	1.1	1.2	1.0	1.2	1.1	1.3
65 and 66 Years	0.7	0.8	0.6	0.7	0.7	0.8
67 to 69 Years	0.9	1.2	0.8	1.0	1.0	1.1
70 to 74 Years	1.3	1.8	1.2	1.6	1.3	1.8
75 to 79 Years	0.9	1.4	0.9	1.4	1.0	1.5
80 to 84 Years	0.5	0.9	0.5	1.0	0.6	1.0
85 Years and Over	0.3	0.7	0.3	0.9	0.3	0.9
Total	48.9	51.1	48.8	51.2	48.6	51.4

This table is based on Census 2000 Sf1, 100-percent data

(Reference 5)

TABLE 2.5-8
MAJOR CONTRIBUTORS TO TRANSIENT POPULATION WITHIN LEE NUCLEAR SITE REGION

Name	Average Daily Transients[(a)]	Peak Daily Transients
Christmastown USA	23,077	
Charlotte Knights Baseball Club		10,000
Prime Outlets at Gaffney	7671	
Sumter National Forest	7268	
Daniel Stowe Botanical Garden	6000	
South Carolina Peach Festival		2500
Christmas on Limestone		2000
Kings Mountain National Military Park	1452	
Spartanburg Museum of Art	1000	
Crowders Mountain State Park	930	
Mint Museum of Art	750	
Chimney Rock Park	684	
Cowpens National Battlefield	573	
Kings Mountain State Park	548	
South Mountain State Park	527	
Roper Mountain Science Center	515	
Schiele Museum of Natural History	500	
Hollywild Animal Park	411	
Croft State Natural Area	345	
Hatcher Garden and Woodland Preserve	305	
Charlotte Museum of History	113	
Lansford Canal State Park	82	
Chester State Park	64	
Paris Mountain State Park	52	
Charlotte Steeplechase	41	
Gaffney Visitor’s Center	35	
Musgrove Mill State Historic Site	28	
Spartanburg County Historical Museum	15	
Rose Hill Plantation State Historic Site	15	

a) Daily transients are peak numbers, when available. Otherwise a daily average derived from the yearly total is used.

Source: References 11, 108, and 109.

TABLE 2.5-9
EMPLOYMENT BY INDUSTRY (1994 – 2004)

	Cherokee		York		Mecklenburg		Total		Avg. Annual Growth Percent
Year	1994	2004	1994	2004	1994	2004	1994	2004	1994–2004
Total Employment	22,558	24,451	65,901	87,064	476,524	622,928	564,983	734,443	3.0%
Wage and Salary Employment	20,270	21,205	56,142	73,382	427,439	540,475	503,851	635,062	2.6%
Proprietors Employment	2288	3246	9759	13,682	49,085	82,453	61,132	99,381	6.3%
Farm	613	600	884	1153	829	692	2326	2445	0.5%
Agricultural Services, Forestry, Fishing and Other	120	(D)	(D)	201	3555	(D)	N/A	N/A	N/A
Mining	22	(D)	(D)	70	340	(D)	N/A	N/A	N/A
Construction	1711	2382	3731	5392	26,921	38,832	32,363	46,606	4.4%
Manufacturing	9107	6416	14,248	10,218	53,426	38,443	76,781	55,077	-2.8%
Transportation and Utilities	1024	1439	3767	(D)	43,389	30,208	48,180	N/A	N/A
Wholesale Trade	376	650	2365	5873	45,639	40,624	48,380	47,147	-0.3%
Retail Trade	3277	2590	11,654	9792	73,774	61,219	88,705	73,601	-1.7%
Finance, Insurance, and Real Estate	526	834	2915	5862	50,422	85,205	53,863	91,901	7.1%
Services	3513	4457	16,447	22,710	134,153	173,878	154,113	201,045	3.0%
Government	2269	2656	9010	11,098	44,076	59,793	55,355	73,547	3.3%

Source: References 18, 19, 20, 21, 22, and 23.

(D): Did not disclose.

TABLE 2.5-10
TOP EMPLOYERS LOCATED IN CHEROKEE COUNTY, SOUTH CAROLINA

Company	City	Product	Employees
Nestle USA - Food Division	Gaffney	Frozen Prepared Foods	1620
Sanders Brothers. Inc	Gaffney	Turnkey Construction	1200
The Timken Company, Inc	Gaffney	Tapered Roller Bearings	1000
Freightliner Custom Chassis Corp	Gaffney	Motorhome, Truck, and Bus Chassis	650
Hamrick Mills	Gaffney	Print Cloth, Shade Cloth, and Sheeting	394
Brown Packing Company	Gaffney	Print Cloth, Shade Cloth, and Sheeting	250

Source: Reference 24.

TABLE 2.5-11
EMPLOYMENT TRENDS 1994 – 2004

	Cherokee, South Carolina			York, South Carolina			Mecklenburg, North Carolina			Total		
	1994	2004	Avg. Annual Change (percent)	1994	2004	Avg. Annual Change (percent)	1994	2004	Avg. Annual Change (percent)	1994	2004	Avg. Annual Change (percent)
Labor Force	24,040	25,199	0.5%	78,451	94,628	2.1%	324,602	418,950	2.9%	427,093	538,777	2.6%
Employed	22,937	22,946	0.0%	75,117	87,893	1.7%	313,303	397,873	2.7%	411,357	508,712	2.4%
Unemployed	1103	2253	10.4%	3334	6735	10.2%	11,299	21,077	8.7%	15,736	30,065	9.1%
Unemployment Rate (Percent)	4.6%	8.9%		4.2%	7.1%		3.5%	5.0%		3.7%	5.6%	

Source: References 18, 19, 20, 21, 22, and 23.

TABLE 2.5-12
HOUSEHOLD INCOME DISTRIBUTION FOR COMMUNITIES CLOSEST TO LEE NUCLEAR STATION

	Gaffney		East Gaffney		Blacksburg		Hickory Grove		Smyrna	
Income by Household	Number	Percent (%)	Number	Percent (%)	Number	Percent (%)	Number	Percent (%)	Number	Percent (%)
Less than $10,000	904	16.9	269	19.2	179	22.8	9	7.8	0	0.0
$10,000 to $14,999	457	8.6	102	7.3	70	8.9	3	2.6	1	3.6
$15,000 to $19,999	436	8.2	183	13.1	55	7.0	16	13.8	1	3.6
$20,000 to $24,999	546	10.2	158	11.3	67	8.5	4	3.4	5	17.9
$25,000 to $29,999	351	6.6	103	7.4	69	8.8	6	5.2	7	25.0
$30,000 to $34,999	321	6.0	96	6.9	58	7.4	5	4.3	0	0.0
$35,000 to $39,999	344	6.4	128	9.1	33	4.2	7	6.0	3	10.7
$40,000 to $44,999	246	4.6	64	4.6	48	6.1	10	8.6	0	0.0
$45,000 to $49,999	261	4.9	31	2.2	24	3.1	8	6.9	0	0.0
$50,000 to $59,999	485	9.1	92	6.6	48	6.1	23	19.8	2	7.1
$60,000 to $74,999	307	5.7	137	9.8	51	6.5	6	5.2	2	7.1
$75,000 to $99,999	325	6.1	26	1.9	46	5.9	6	5.2	0	0.0
$100,000 to $124,999	137	2.6	0	0.0	20	2.5	9	7.8	6	21.4
$125,000 to $149,999	83	1.6	0	0.0	5	0.6	0	0.0	1	3.6
$150,000 to $199,999	56	1.0	0	0.0	5	0.6	1	0.9	0	0.0
$200,000 or more	82	1.5	10	0.7	7	0.9	3	2.6	0	0.0

TABLE 2.5-13
PERSONAL INCOME – 1994, 1999, AND 2004

	1994	1999	2004	Average Annual Growth Percent (1994-2004)
Cherokee County, SC	$15,744	$19,194	$22,562	4.3%
York County, SC	$20,084	$24,449	$28,714	4.3%
Mecklenburg County,NC	$27,013	$35,285	$40,416	5.0%

(Reference 27)

TABLE 2.5-14
CHEROKEE COUNTY TAX COLLECTIONS BY CATEGORY

Fiscal Year Ended June 30,		Fee Transfers from other Counties - 1% money (dollars)	Fee-in-Lieu of Tax Collected (dollars)	Penalties, Interest, and Costs on Collected Property Taxes (dollars)	Delinquent Collections - without penalties or interest (dollars)	Motor Vehicle Collections (dollars)	Current Collections - without penalties or reimbursements (dollars)
2002	County	0	1231128.52	169738.65	664143.04	1995220.67	7083993.16
	School	0	2607388.24	183883.25	1311420.37	3931516.77	13672756.77
	Special	0	207768.94	9524.74	55571.29	142851.41	498875.48
	Total	0	4046285.70	363146.64	2031134.70	6069588.85	21255625.41
2003	County	4243.33	1417908.25	240205.44	929926.36	1785532.02	7780398.55
	School	0	3235888.12	328257.17	1888421.47	3893978.85	16854809.33
	Special	0	254056.93	12918.13	68364.02	141620.58	567064.33
	Total	4243.33	4907853.30	581380.74	2886711.85	5821131.45	25202272.21
2004	County	19166.01	1376188.06	216813.68	867955.81	1661358.30	7544611.08
	School	40377.37	3111527.02	206252.97	1705804.32	3739884.99	15736809.56
	Special	0	259953.57	8193.25	65020.01	136704.07	602590.14
	Total	59543.38	4747668.65	431259.90	2638780.14	5537947.36	23884010.78
2005	County	10193.98	1427082.79	196324.28	547498.98	1632465.75	7579880.76
	School	20633.50	3227452.40	195265.89	1071827.43	3687255.20	15808717.33
	Special	0	257221.12	7487.12	37348.59	137299.68	622320.12
	Total	30827.48	4911756.31	399077.29	1656675.00	5457020.63	24010918.21
2006	County	12591.67	1379273.00	182978.03	731775.07	1652862.01	7946774.90
	School	24881.52	2924662.06	170362.44	1546035.73	3618979.73	15094772.93
	Special	0	253820.21	7058.43	57968.47	140397.01	610775.90
	Total	37473.19	4557755.27	360398.90	2335779.27	5412238.75	23652323.73

TABLE 2.5-15
SOUTH CAROLINA PROPERTY TAX CLASSES

Type of Property	Assessment Rate
Manufacturing Property	10.5% of fair market value
Utility Property	10.5% of fair market value
Railroads, Private Carlines, Airlines and Pipelines	9.5% of fair market value
Primary Residences	4.0% of fair market value
Agricultural Property (privately owned)	4.0% of use value
Agricultural Property (corporate owned)	6.0% of the value
Other real estate	6.0% of fair market value
Personal property	10.5% of income

Source: Reference 106.

TABLE 2.5-16
APPROPRIATION OF STATE FUNDS FOR 2006

Tax Appropriation Category	Percentage
Education	53
Health	22
Corrections and Public Safety	9
Aid to Subdivisions	4
Debt Service	4
Administration of Government	4
Other Expenditures	4
Total	100.00

TABLE 2.5-17
HOUSING IN COMMUNITIES CLOSEST TO THE LEE NUCLEAR SITE

	Gaffney	East Gaffney	Blacksburg	Hickory Grove	Smyrna	Total
Year			2000			
Total Housing Units	5,765	1,563	911	129	26	8,707
Total Occupied	5,304	1,380	785	115	22	7,886
Owner-Occupied	3,222	879	471	96	19	4,874
Renter-Occupied	2,082	501	314	19	3	3,012
Vacant Units	461	183	126	14	4	821
For Rent	161	73	31	0	0	265

Source: References 71, 72, 73, 74, 75, and 76.

TABLE 2.5-18
PERCENT OF HOUSES CONSTRUCTED BY DECADE FOR COMMUNITIES CLOSEST TO THE LEE NUCLEAR STATION

	Date of Construction						
	Before 1940	1940 - 1949	1950 - 1959	1960 - 1969	1970 - 1979	1980 - 1989	1990 - 2000
Gaffney							
Owner-Occupied	12.8	6.5	17.3	24.1	22.8	11.0	5.5
Renter-Occupied	12.1	11.2	15.4	17.6	21.4	17.8	4.6
East Gaffney							
Owner-Occupied	10.3	15.8	14.5	14.6	15.6	18.1	11.0
Renter-Occupied	21.7	24.4	3.8	11.9	10.2	14.4	13.6
Blacksburg							
Owner-Occupied	21.5	6.1	8.0	19.7	19.7	10.6	14.3
Renter-Occupied	11.6	8.2	17.7	18.0	18.6	11.3	14.6
Hickory Grove							
Owner-Occupied	15.5	6.8	25.2	17.5	13.6	11.7	9.7
Renter-Occupied	27.8	22.2	0.0	0.0	11.1	11.1	27.8
Smyrna							
Owner-Occupied	60	15.0	5.0	0.0	0.0	0.0	20.0
Renter-Occupied	40	0.0	60.0	0.0	0.0	0.0	0.0

TABLE 2.5-19
PUBLIC WASTEWATER TREATMENT FACILITIES WITHIN CHEROKEE COUNTY, SOUTH CAROLINA

Facility	Max Capacity (gallons per day)	Utilization (gallons per day)
Clary Plant	5,000,000	3,000,000
Broad River	4,000,000	1,600,000

TABLE 2.5-20
NUMERICAL SUMMARY OF ABOVEGROUND HISTORIC PROPERTIES WITHIN A 10-MI. RADIUS OF THE LEE NUCLEAR SITE, CHEROKEE AND YORK COUNTIES, SOUTH CAROLINA

Historic Property	NRHP Status		
	Eligible	Listed	Total
Individual Sites	55	7	62
Historic Districts	0	6	6
National Military Parks	0	1	1
Total	55	14	69

TABLE 2.5-21 (Sheet 1 of 2)
PREHISTORIC AND HISTORIC ARCHAEOLOGICAL SITES ON THE LEE NUCLEAR SITE

Site Number	Location	Type of Site/Component	Time Range of Site Occupation and Time Period	1974 Survey Recommendation	NRHP Determination	Disturbed by 1977–1982 Construction
38CK8	Restricted	Prehistoric	5000 B.C. to 1000 A.D. (Middle Archaic – Woodland Period)	Further survey and testing	Not eligible[(a)]	No
38CK9	Restricted	Prehistoric	5000 B.C. to 1000 B.C. (Middle Archaic – Late Archaic Period)	No further investigation	Not eligible[(a)]	No
38CK10	Restricted	Prehistoric	5000 B.C. to 1000 B.C. (Middle Archaic – Late Archaic Period)	No further investigation	Not eligible	Yes
38CK11	Restricted	Prehistoric	4000 B.C. to 2000 B.C. (Middle Archaic – Late Archaic Period)	No further investigation	Not eligible	Yes
38CK12	Restricted	Prehistoric	Prehistoric range unknown (Period unknown)	No further investigation	Not eligible	Yes
		Historic (former house)	1800s (Historic Period)	No further investigation	Not eligible	Yes
38CK13	Restricted	Prehistoric	5000 B.C. to 1000 B.C. (Middle Archaic – Late Archaic Period)	No further investigation	Not eligible	Yes

TABLE 2.5-21 (Sheet 2 of 2)
PREHISTORIC AND HISTORIC ARCHAEOLOGICAL SITES ON THE LEE NUCLEAR SITE

Site Number	Location	Type of Site/Component	Time Range of Site Occupation and Time Period	1974 Survey Recommendation	NRHP Determination	Disturbed by 1977–1982 Construction
38CK14	Restricted	Prehistoric	5000 B.C. to 1000 B.C. (Middle Archaic – Late Archaic Period)	No further investigation	Not eligible[a]	No
		Historic (three former houses)	1800s A.D. to 1974 A.D. (Historic Period)	No further investigation	Not eligible[a]	No
38CK15	Restricted	Prehistoric	5000 B.C. to 1000 B.C. (Middle Archaic – Late Archaic Period)	No further investigation	Not eligible[a]	No
		Historic (unknown)	1800s (Historic Period)	No further investigation	Not eligible[a]	No
38CK16	Restricted	Historic (Ferry)	Time range unknown (Historic Period)	Further documentary research	Not eligible	No
38CK17	Restricted	Historic (former house)	1800s (Historic Period)	No further investigation	Not eligible	Yes
38CK18	Restricted	Historic (former house)	1800s (Historic Period)	No further investigation	Not eligible	Yes
38CK19	Restricted	Historic (Cemetery)	1800s (Historic Period)	Documentation and preservation	Not eligible	No

a) The 2007 Phase I survey designated this site as “unassessed;” therefore, this NRHP determination is now considered uncertain.

Source: References 30 and 47.

TABLE 2.5-22 (Sheet 1 of 5)
ABOVEGROUND HISTORIC PROPERTIES WITHIN A 10-MI. RADIUS OF THE LEE NUCLEAR SITE BOUNDARIES, CHEROKEE AND YORK COUNTIES, SOUTH CAROLINA

Property Name	Site Number	Location	Property Association	NRHP Status
Winnie Davis Hall	No Number Assigned	Gaffney (Cherokee County)	Limestone Springs Historic District	Listed
Irene Mill Finishing Plant	No Number Assigned	Gaffney (Cherokee County)	Individual	Listed
Jefferies House	No Number Assigned	Gaffney (Cherokee County)	Individual	Listed
Settlemyer House	No Number Assigned	Gaffney (Cherokee County)	Individual	Listed
Carnegie Free Library	No Number Assigned	Gaffney (Cherokee County)	Individual	Listed
Magness-Humphries House	No Number Assigned	Cherokee County	Individual	Listed
Allison Plantation	No Number Assigned	York County	Individual	Listed
Gaffney Commercial Historic District	No Number Assigned	Gaffney (Cherokee County)	Contributing and noncontributing properties	Listed
Gaffney Residential Historic District	No Number Assigned	Gaffney (Cherokee County)	Contributing and noncontributing properties	Listed
Limestone Springs Historic District	No Number Assigned	Gaffney (Cherokee County)	Contributing and noncontributing properties	Listed
Sharon Downtown Historic District	No Number Assigned	Sharon (York County)	Contributing and noncontributing properties	Listed
Hill Complex Historic District	No Number Assigned	Sharon (York County)	Contributing and noncontributing properties	Listed
Kings Mountain National Military Park	No Number Assigned	Cherokee and York Counties	Contributing and noncontributing properties	Listed

TABLE 2.5-22 (Sheet 2 of 5)
ABOVEGROUND HISTORIC PROPERTIES WITHIN A 10-MI. RADIUS OF THE LEE NUCLEAR SITE BOUNDARIES, CHEROKEE AND YORK COUNTIES, SOUTH CAROLINA

Property Name	Site Number	Location	Property Association	NRHP Status
W.L. Hill Store	No Number Assigned	Sharon (York County)	Hill Complex Historic District	Listed
Nucholls or Nuckolls House	No Number Assigned	Cherokee County	Individual	Eligible
Gaston Shoals Hydro Plant-Spillway	039-0041.03	Cherokee County	Individual	Eligible
Gaston Shoals Hydro Plant-Spillway	039-0041.02	Cherokee County	Individual	Eligible
Gaston Shoals Hydro Plant-Dam	039-0041.01	Cherokee County	Individual	Eligible
Ninety-Nine Islands Hydroelectric Plant Dam	269-0042.01	Cherokee County	Individual	Eligible
Ninety-Nine Islands Hydroelectric Plant	269-0042.00	Cherokee County	Individual	Eligible
Mulberry Chapel	No Number Assigned	Cherokee County	Individual	Eligible
Hopewell Presbyterian Church	269-0037	Cherokee County	Individual	Eligible
U.S. 29/Big Thicketty Creek Bridge	186-0051	Cherokee County	Individual	Eligible
Vassy Homeplace	No Number Assigned	Cherokee County	Individual	Eligible
House-Unidentified	160-1148	York County	Individual	Eligible
House-Unidentified	160-1153	York County	Individual	Eligible
Johnathan Buice Home	229-1010	York County	Individual	Eligible
Buice Tenant House	229-1011	York County	Individual	Eligible
Smith’s Ford Farm	229-1018	York County	Individual	Eligible

TABLE 2.5-22 (Sheet 3 of 5)
ABOVEGROUND HISTORIC PROPERTIES WITHIN A 10-MI. RADIUS OF THE LEE NUCLEAR SITE BOUNDARIES,
CHEROKEE AND YORK COUNTIES, SOUTH CAROLINA

Property Name	Site Number	Location	Property Association	NRHP Status
Tom Kell House	229-1079	Hickory Grove (York County)	Individual	Eligible
Wilkerson Warehouse	229-1083	Hickory Grove (York County)	Individual	Eligible
John Wilkerson House	229-1085	Hickory Grove (York County)	Individual	Eligible
Hickory Grove School	229-1097	Hickory Grove (York County)	Individual	Eligible
The Teachery	229-1098	Hickory Grove (York County)	Individual	Eligible
School Building	229-1099	Hickory Grove (York County)	Individual	Eligible
ARP Orphanage	229-1102	Hickory Grove (York County)	Individual	Eligible
Wilkerson Supply Company	229-1108	Hickory Grove (York County)	Individual	Eligible
Store-Unidentified	229-1109	Hickory Grove (York County)	Individual	Eligible
Hood's Drug Store	229-1110	Hickory Grove (York County)	Individual	Eligible
Store-Unidentified	229-1111	Hickory Grove (York County)	Individual	Eligible
McGill Boarding House	229-1080	Hickory Grove (York County)	Individual	Eligible
Woodlawn Presbyterian Church	469-0932.00	Sharon (York County)	Individual	Eligible
Presbyterian Manse	469-0932.01	Sharon (York County)	Individual	Eligible
Woodlawn Presbyterian Cemetery	469-0932.02	Sharon (York County)	Individual	Eligible
Hill House	469-0951	Sharon (York County)	Individual	Eligible
Sharon School	469-0954	Sharon (York County)	Individual	Eligible

TABLE 2.5-22 (Sheet 4 of 5)
ABOVEGROUND HISTORIC PROPERTIES WITHIN A 10-MI. RADIUS OF THE LEE NUCLEAR SITE BOUNDARIES, CHEROKEE AND YORK COUNTIES, SOUTH CAROLINA

Property Name	Site Number	Location	Property Association	NRHP Status
Store, Now Town Hall	469.0974	Sharon (York County)	Sharon Downtown Historic District	Eligible
Store-Unidentified	469.0975	Sharon (York County)	Sharon Downtown Historic District	Eligible
Luther Whiteside’s Store	469-0973	Sharon (York County)	Sharon Downtown Historic District	Eligible
Bank of Sharon	469.0971	Sharon (York County)	Sharon Downtown Historic District	Eligible
Norma’s Store	469-0972	Sharon (York County)	Sharon Downtown Historic District	Eligible
Hood-Sims Drugstore	469-0976	Sharon (York County)	Sharon Downtown Historic District	Eligible
Rainey Gin	469-0980	Sharon (York County)	Sharon Downtown Historic District	Eligible
Rainey Gin Warehouse	469-0981	Sharon (York County)	Sharon Downtown Historic District	Eligible
House-Unidentified	469-0982	Sharon (York County)	Individual	Eligible
Dr. J.H. Saye Home	469-0986	Sharon (York County)	Individual	Eligible
Sharon ARP Church	469-0988.00	Sharon (York County)	Individual	Eligible
Old Sharon Cemetery	469.0988.01	Sharon (York County)	Individual	Eligible
Whiteside Farm	469-1123	York County	Individual	Eligible
Mary Morris (Norman) House	No Number Assigned	Cherokee County	Kings Mountain National Military Park	Eligible
Henry Howser House	No Number Assigned	Cherokee County	Kings Mountain National Military Park	Eligible
Howser Cemetery	No Number Assigned	Cherokee County	Kings Mountain National Military Park	Eligible
Gordon Cemetery	No Number Assigned	York County	Kings Mountain National Military Park	Eligible

TABLE 2.5-22 (Sheet 5 of 5)
ABOVEGROUND HISTORIC PROPERTIES WITHIN A 10-MI. RADIUS OF THE LEE NUCLEAR SITE BOUNDARIES, CHEROKEE AND YORK COUNTIES, SOUTH CAROLINA

Property Name	Site Number	Location	Property Association	NRHP Status
Superintendents Residence	No Number Assigned	York County	Kings Mountain National Military Park	Eligible
Old Chronicle Monument	No Number Assigned	York County	Kings Mountain National Military Park	Eligible
Centennial Monument	No Number Assigned	York County	Kings Mountain National Military Park	Eligible
United States Monument	No Number Assigned	York County	Kings Mountain National Military Park	Eligible
Old Ferguson Grave Marker and Cairn	No Number Assigned	York County	Kings Mountain National Military Park	Eligible
Yorkville-Shelbyville Road	No Number Assigned	York County	Kings Mountain National Military Park	Eligible

TABLE 2.5-23
MINORITY AND LOW-INCOME POPULATION DATA IN SOUTH CAROLINA AND NORTH CAROLINA AND IN NORTH AND SOUTH CAROLINA COMBINED

	Individual States			Combined States		
Race Category	Blocks	Percent	Figure	Blocks	Percent	Figure
Black or African American	5966	11.78	2.5-6	6036	11.92	2.5-15
Aggregate Minority	6800	13.43	2.5-7	6740	13.31	2.5-16
Hispanic	1032	2.04	2.5-8	1028	2.03	2.5-17
American Indian or Alaskan Native	78	0.15	2.5-9	78	0.15	2.5-18
Asian	502	0.99	2.5-10	502	0.99	2.5-19
Native Hawaiian or Other Pacific Islander	21	0.04	2.5-11	21	0.04	2.5-20
Persons Reporting Two or More Races	407	0.8	2.5-12	405	0.8	2.5-21
Persons Reporting Some Other Race	490	0.97	2.5-13	492	0.97	2.5-22
Aggregate Minority Plus Hispanic	7498	14.81	2.5-14	7498	14.81	2.5-23
Low-Income Population[a]	64	4.37	2.5-24	62	4.23	2.5-25

a) U.S. Census 2000 SF3 Block Group Data.

Source: Reference 5 and 95.

TABLE 2.5-24
MINORITY AND LOW-INCOME PERCENTAGES BY REGION FOR THE LEE NUCLEAR SITE

Description	Percent in the Lee Nuclear Site Region
Black or African American Persons	20.2
American Indian and Alaska Native Persons	0.3
Asian Persons	1.8
Persons Reporting Some Other Race	1.7
Persons Reporting Two or More Races	1.1
Native Hawaiian and Other Pacific Islander	0.04
Aggregate Minority Percentage	25.2
Hispanic Persons	3.9
Aggregate Minority Plus Hispanic Percentage	29.2
Low-Income Percentage	10.4

Source: Reference 5 and 95.

TABLE 2.5-25
FARMS THAT EMPLOY MIGRANT LABOR IN THE LEE NUCLEAR SITE REGION, 2002

County	Total Farms	Farms with Migrant Workers	Percent of Total Farms	Workers Working less than 150 days
		North Carolina		
Burke	439	22	5.0%	405
Cabarrus	658	3	0.5%	126
Catawba	715	5	0.7%	422
Cleveland	1131	1	0.1%	510
Gaston	450	0	0.0%	115
Henderson	525	69	13.1%	1901
Iredell	1262	8	0.6%	1025
Lincoln	618	4	0.6%	79
McDowell	282	11	3.9%	290
Mecklenburg	300	10	3.3%	329
Polk	260	7	2.7%	143
Rutherford	653	0	0.0%	267
Union	1224	13	1.1%	678
		South Carolina		
Cherokee	430	2	0.5%	342
Chester	430	1	0.2%	60
Fairfield	237	0	0.0%	65
Greenville	909	12	1.3%	437
Lancaster	637	3	0.5%	161
Laurens	931	1	0.1%	282
Newberry	633	1	0.2%	188
Spartanburg	1412	31	2.2%	861
Union	299	0	0.0%	Did Not Disclose
York	858	12	1.4%	840

Source: References 96, 97, 98, and 99.

2.6 GEOLOGY

This Environmental Report section provides a brief summary of the physiographic setting and the regional and local geology of the Lee Nuclear Site. A detailed description of regional and site geology is provided in Section 2.5 of the combined construction and operating license Final Safety Analysis Report. A discussion of geology as it pertains to the hydrogeological conditions at the Lee Nuclear Site is presented in ER Subsection 2.3.1.5.

2.6.1 PHYSIOGRAPHIC SETTING

The Lee Nuclear Site is located within the Piedmont physiographic province, a southwest-northeast-oriented province of the Appalachian Mountain system (Figure 2.3-7). The Piedmont province is 80 – 120 miles (mi.) wide and situated between the Blue Ridge province, a mountainous region to the northwest and the Atlantic Coastal Plain province to the southeast. The Piedmont province is the nonmountainous portion of the older Appalachians. Its surface is the result of degradation because the underlying rocks are deformed. Rarely is the surface parallel to the beds of rocks, and nowhere is the original surface preserved.

So far as this extensive region has unity, it is found in the results of repeated uplifts, involving for the most part greater altitude and stronger relief than that of adjacent regions. The most pronounced differences in present topography are due to differences in rocks, either in their material constitution or in structural features made during older uplifts. Most of the province boundaries may be defined in terms of rocks and structure as well as those of topography.

Figure 2.6-1 shows the Lee Nuclear Site within an array of USGS 7.5 minute topographic maps. The Piedmont surface in the subregion ranges from 400 to 1000 feet (ft.) above mean sea level. The typical landscape of the Piedmont province is a rolling surface of gentle slopes with minimal relief (averaging about 50 ft.) cut by or bounded by valleys of steeper slope and greater depth (often several hundred feet). Near the larger streams, tributaries cut through deep and steep valleys, which, traced headward, become wide, shallow, and of gentle gradient. The deeper valleys are those of rejuvenated streams. The principal stream in the Kings Mountain belt is the Broad River. The regional southeastward drainage of the Upper Broad River basin is reflected in the trend of the Broad River. The Broad River is incised 200 – 250 ft. below the summit levels of the Piedmont province. The Broad River valley is narrow with little or no floodplain development, and its tributary streams cut downward to the level of the Broad River and have caused locally rugged topography (Reference 1).

2.6.2 REGIONAL AND LOCAL GEOLOGY

A complex mosaic of igneous and metamorphic rocks underlies the vast majority of the Broad River basin. The majority of rocks in the Piedmont province are medium- to high-grade metamorphic rocks such as schist, gneiss, and amphibolites. These rocks are generally stratified and compositionally layered with distinct foliation. In addition, lineaments and fault systems are common in the region, and several major thrust sheets are present in the basin. Numerous granitic plutons and stocks have intruded older metamorphic rocks and are often marked by areas of higher topography, a result of the massive, resistant nature of these intrusive rocks. The Lee Nuclear Site is located within the Kings Mountain belt of the Piedmont province, which contains a complex series of deformed rocks consisting of felsic and mafic schists and gneisses, quartzites, conglomerates, and marble, generally considered to be of Precambrian and early Paleozoic age (References 1 and 2).

According to the U.S. Geological Survey (USGS), the Lee Nuclear Site overlies metatonalite (a metamorphosed quartz diorite or felsic gneiss) and mafic metavolcanic rocks of the Battleground and Blacksburg formations (Figures 2.3-8 and 2.3-9). The metatonalite is described as a metamorphosed biotitic tonalite and lesser amounts of hornblende tonalite, trondjemite, and granodiorite of Neoproterozoic age. The mafic (to intermediate) metavolcanic rocks are grouped with other Battleground and Blacksburg formation rocks of Neoproterozoic age. Geologic maps show the distribution of rock types, which tend to have locally erratic outcrop and subsurface distribution patterns, but regionally trend northeast-southwest (Reference 3).

Based on recent and past subsurface investigations at the Lee Nuclear Site, no active faults exist in the general location of the site. According to published documents from the USGS, several inactive faults are within the vicinity of the site, with the closest being approximately 2 mi. west-southwest of the Lee Nuclear Site (Reference 2).

A variation of approximately 100 ft. in the top of continuous rock elevations is due to differential weathering patterns created by the joint characteristics found in the rock. This weathering action has created a soil overburden, which is classified as being of silt and silty sand composition (Reference 2).

2.6.3 REFERENCES

1. Duke Power Company, *Preliminary Safety Analysis Report, Project 81 - Cherokee Nuclear Station,* revised 1974.

2. Duke Power Company (DPC), *Cherokee Nuclear Station - Environmental Report*, Amendment No. 4, revised 1975.

3. Horton, J.W. Jr., and C. Dicken, “Preliminary Digital Geologic Map of the Appalachian Piedmont and Blue Ridge, South Carolina Segment,” U.S. Geological Survey Open-File Report 01-298, revised 2004.

2.7 METEOROLOGY

This section discusses regional and local meteorological conditions, the onsite meteorological measurement program, and short-term and long-term diffusion estimates.

2.7.1 REGIONAL CLIMATOLOGY

The description of the general climate of the region is based primarily on climatological records for Greenville/Spartanburg International Airport (GSP), located between Greenville and Spartanburg, South Carolina. This first order station was selected because the terrain and land-use in the surrounding area is similar to the area around the Lee Nuclear Site (i.e. rural). This description uses data from those records, as appropriate, and is augmented by recent data from the Lee Nuclear Station site meteorological tower (Tower #2). Current meteorological data for the Lee Nuclear Station site are available for 12/1/2005 – 11/31/2006.

Topographical considerations and examination of the records indicate that meteorological conditions at the Greenville/Spartanburg International Airport are representative of the general climate of the region that encompasses the site. Because the Ninety-Nine Islands cooperative observer station (Station No. 386293) in Blacksburg, South Carolina, is the closest National Weather Service (NWS) station (two miles southeast), the tables and figures included are based primarily on data from this location when the period of record and observational procedures are considered adequate. Otherwise, data from the National Oceanic and Atmospheric Administration (NOAA) first order weather station at the Greenville/Spartanburg International Airport (GSP) approximately 42 miles west are presented. Data from the National Oceanic and Atmospheric Administration (NOAA) first order weather station in Charlotte, NC (CLT) approximately 35 miles ENE of the site is also used in the cooling tower analysis. In cases such as the reoccurrence rate of rare events which are based on decades of observation (e.g. climatology), the National Weather Service off-site data is preferable, due to the shorter period of meteorological data currently available on site.

2.7.1.1 General Climate

The most important factors controlling the local climate are the state's location in the northern mid-latitudes, its proximity to both the Atlantic Ocean and the Appalachian Mountains, and local elevation. South Carolina’s geographic regions are shown on Figure 2.7-71. The Lee Nuclear Station site is located in the piedmont region of South Carolina. South Carolina's mid-latitude location allows for solar radiation to vary throughout the year, producing four distinct seasons. At the summer solstice, the sun is nearly overhead at solar noon with a maximum zenith angle of approximately 79½º; at winter solstice, the sun is low in the southern horizon at solar noon with a maximum zenith angle of approximately 23½º. This allows for a variance in length of day sufficient to produce ample daytime heating during summer and nighttime cooling during winter (Reference 1).

The state's position on the eastern coast of a continent is important because land and water heat and cool at different rates. This provides for cooling sea breezes during the summer and warms the immediate coast during the winter. Also, it influences the way pressure and wind systems affect the state. During the summer, South Carolina's weather is dominated by a maritime tropical air mass known as the Bermuda High. Airflow passing over the Gulf Stream, as it circulates around the Bermuda High brings warm, moist air inland from the ocean. As the air comes inland, it rises and forms localized thunderstorms, resulting in precipitation maxima (Reference 1).

The Appalachian Mountains also exert a major influence on the state's climate in three ways. First, they tend to block many of the cold air masses arriving from the northwest, thus making the winters somewhat milder. Second, the occurrence of downslope winds, which warm the air by compression, causes the areas leeward of the mountains to experience slightly higher temperatures than the surrounding areas. Hence, the proximity of the mountains to the state results in a more temperate climate than otherwise would be experienced. Lastly, the mountains cause a leeside rain shadow, an area of decreased precipitation across the Midlands and roughly parallel to the fall line where the upland region meets the coastal plain (Reference 1).

The climate of South Carolina is humid and subtropical with a short cold season and a relatively long warm season. Synoptic features during winter cause rather frequent alternation between mild and cool periods with occasional outbreaks of cold air. Such intrusions of cold air, however, are modified in the crossing and descent of the Appalachian Mountains. Summers, noted for their greater persistence in flow pattern, experience fairly constant trajectories from the south and southwest with advection of maritime tropical air. In this area of the Southeast, significant local circulation often results during periods of weak synoptic circulation. These effects, usually induced by the local terrain, are responsible for a redistribution of wind directions and speeds from those expected in the absence of the local terrain (Reference 2). Generic climatic assessments at the time of Reference 2 remain valid.

The state's annual average temperature, in Fahrenheit, varies from the mid-50's in the Mountains to low 60's along the coast. During the winter, average temperatures range from the mid-30's in the Mountains to low 50's in the Low Country. During summer, average temperatures range from the upper 60's in the Mountains to the mid-70's in the Low Country (Reference 1). Temperatures in the region indicate warm summers and mild winters. In the piedment region around the Lee Nuclear Station site the annual average temperature is 59°F with a winter average of 41°F and a summer average of 76°F.

Precipitation in South Carolina is ample and distributed with two maxima and two minima throughout the year. The maxima occur during March and August; the minima occur during April and November. There is no wet or dry season; only relatively heavy precipitation periods or light precipitation periods. No month averages less than two inches of precipitation anywhere in South Carolina. In northwestern South Carolina, winter precipitation is greater than summer precipitation; the reverse is true for the remainder of the state. During summer and early fall of most years, the state is affected by one or more tropical storms or hurricanes (Reference 1). Average annual precipitation is heaviest in northwestern South Carolina, and annual totals vary directly with elevation, soil type, and vegetation. In the Mountains, 70 to 80 inches of rainfall occur at the highest elevations with the highest annual total at Caesars Head, South Carolina (79.29 inches). Across the Foothills, average annual precipitation ranges from 60 to more than 70 inches. In the eastern and southern portions of the Piedmont, the average annual rainfall ranges from 45 to 50 inches. The driest portion of the state, on average, is the Midlands where annual totals are mostly between 42 and 47 inches.

The annual number of days of precipitation greater than or equal to one inch varies with elevation, with amounts of more than 24 inches in the Upstate to less than 12 inches in the Midlands. The annual number of days of precipitation greater than or equal to 0.1 inches varies from 95 in the Upstate to less than 70 in a portion of the Midlands. The annual number of days of precipitation greater than or equal to 0.5 inches varies from 48 in the Upstate to less than 30 in a portion of the Midlands (Reference 1). Yearly average precipitation at Greenville/Spartanburg International Airport for the period of 1997 through 2005 was about 46 inches (Table 2.7-1).

Snow and sleet may occur separately, together, or mixed with rain during the winter months from November to March, although snow has occurred as late as May in the mountains. Measurable snowfall may occur from one to three times in a winter in all areas except the Low Country where snowfall occurs on average once every three years. Accumulations seldom remain very long on the ground except in the mountains (Reference 1). Typically, snowfall occurs when a mid-latitude cyclone moves northeastward along or just off the coast. Snow usually occurs about 150 to 200 miles inland from the center of the cyclone. The greatest snowfall in a 24-hour period was 24 inches at Rimini, South Carolina, in February 1973. During December 1989, Charleston, South Carolina, experienced its first white Christmas on record, and other coastal locations had more than six inches of snow on the ground for several days following it. The greatest snowfall for Ninety-Nine Islands was 13 inches on January 7, 1988. Figure 2.7-1 shows the annual distribution of snow across the state (Reference 1).

Sleet and freezing rain vary from 3.75 events per year in Chesterfield County to less than 0.75 events per year in the Low Country. The highest frequency by month occurs in January with more than 1.5 events per year in the Charlotte area and Chesterfield County to less than 0.25 events per year in the Low Country. One of the most severe cases of ice accumulation from freezing rain took place February 1969 in several Piedmont and Midlands counties. Timber losses were tremendous and power and telephone services were seriously disrupted over a large area (Reference 1). Another significant storm was the ice storm of December 2005. This was a damaging winter storm that produced extensive ice damage in a large portion of the Southern United States on December 14 - 16, 2005. It led to enormous and widespread power outages and at least 7 deaths. The ice storm left more than 700,000 people without power in and near the Appalachians, including 30,000 customers in Georgia, 358,000 in South Carolina, 328,000 in North Carolina and 13,000 in Virginia. An ice storm (also called glaze ice) is the accretion of generally clear and smooth ice formed on exposed objects by the freezing of a film of super-cooled water deposited by rain, drizzle, or possibly condensed from super-cooled water vapor. The weight of this ice is often sufficient to greatly damage telephone and electric power lines and poles. Most glaze is the result of freezing rain or drizzle falling on surfaces with temperatures between 25°F and 32°F (Reference 4). The glaze ice belt of the United States includes all of the area east of the Rocky Mountains. However, in the Southeast and Gulf Coast sections of the country, below freezing temperatures seldom last more than a few hours after glaze storms.

Hail occurs infrequently, falling most often during spring thunderstorms from March through May. The incidence of hail varies from 1 to 1.5 hail days per year in the Midlands, Piedmont, and Foothills to 0.5 day per year in the Low Country. Although hail can occur in every month during the year, May has the highest incidence with an average of more than five events per year. Typically, it occurs during the late afternoon and early evening between the hours of 3:00 p.m. and 8:00 p.m. (Reference 1). Severe weather occurs in South Carolina occasionally in the form of violent thunderstorms and tornadoes. Although less frequent than surrounding states, thunderstorms are common in the summer months. The more violent storms generally accompany squall lines and active cold fronts of late-winter or spring. Strong thunderstorms usually bring high winds, hail, considerable lightning, and rarely spawn a tornado (Reference 1).

In the 40-year period from 1950 through 1989, an average of 11 tornadoes occurred per year in South Carolina. Since a tornado is very small and affects a localized area, the probability of a tornado striking a specific point in a given year is low. The majority of tornadoes, 88 percent, occur from February through September. May and August are peak months. The May peak is primarily due to squall lines and cold fronts; the August peak is due to tropical cyclone activity. A secondary maxima, nine percent of all occurrences, happens in November and December

(Reference 1). During spring, tornadoes result from active cold fronts, whereas during summer and early fall many are associated with the passage of tropical cyclones. During November and December, it is not uncommon to have active cold fronts and tornadic activity. Tornado frequency is at a minimum in October and January; only three percent of the total are experienced during these two months (Reference 1).

Tropical cyclones affect the South Carolina coast on an infrequent basis, but do provide significant influence annually through enhanced rainfall inland during the summer and fall months. Depending on the storm's intensity and proximity to the coast, tropical systems can be disastrous. The major coastal impacts from tropical cyclones are storm surge, winds, precipitation, and tornadoes. Hurricanes are the most intense warm season coastal storms and are characterized by wind speeds exceeding 64 knots (74 miles per hour) and central pressure usually less than 980 millibars (mb) (28.94 inches of mercury). Less intense, but more frequent, are tropical storms (winds over 34 knots and under 64 knots, greater than 980 mb central pressure) and tropical depressions (winds under 34 knots). (Reference 1) Tracks of tropical cyclones within 75 miles of Greer, South Carolina between 1851 and 2006 are shown on Figure 2.7-72.

Winds are usually the most destructive force associated with tropical cyclones, particularly inland. Strong winds, resulting from the low central pressure and forward movement, also combine to result in significant ocean rise and wave action. This resulting water rise, known as the storm surge, plagues coastal inlands and low-lying inland areas as these storms make landfall. Because of the low central pressure in a hurricane, a 100 mb drop in ocean surface pressure results in about a one meter increase of ocean elevation. (Reference 1).

The Mountains have a strong influence on the prevailing surface wind direction. On a monthly basis, prevailing winds across South Carolina tend to be either from the northeast or southwest. Winds from all directions occur throughout the state during the year, but the prevailing statewide directions by season are as follows: (Reference 1)

Season	Direction	Degrees
Spring	Southwest	210 to 240
Summer	South and Southwest	170 to 250
Autumn	Northeast	20 to 60
Winter	Northeast and Southwest	20 to 60 and 210 to 240

Average surface wind speeds across the state for all months range between six and 10 miles per hour. Winds at more than 1500 meters above msl are usually southwest to northwest in winter and spring, south to southwest in summer, and southwest to west in autumn. The mountains control wind direction during all seasons, but have a more pronounced effect in the winter, summer, and autumn (Reference 1). During winter, most cyclones that affect the state pass to the south of the Mountains. As these systems move around the Mountains, the winds are generally southwest. As the cyclone moves over the Atlantic Ocean, the winds shift to the northeast. During summer, air flows north from the Gulf of Mexico along the western edge of the Bermuda High. Quite often the Mountains form the western extent of the Bermuda High. During autumn, winds are northeast because the mountains form a western barrier to the northeast surface winds wrapping around the predominant continental high pressure centered over New England. This northeast flow wedges in cool air at the surface and moves southward along the eastern seaboard (Reference 1).

The Bermuda High also contributes to air stagnation, especially during the summer. During the period 1936-75, it was shown that the state experienced 20 stagnation days per year in the Coastal Plain, and more than 28 stagnation days per year occurred in the Central Savannah River area. The winds in stagnant air are very light and tend to be rather disorganized in direction (Reference 1).

Relative potential for air pollution can be demonstrated by the seasonal distribution of atmospheric stagnation cases that persist for at least four days. Data for the 50-year period (1948 to 1998), analyzed by Julian X. L. Wang and James K. Angell (Reference 5), show that, in South Carolina, air stagnation conditions exist between 10 and 20 days per year. The meteorological condition which is favorable to an air pollution episode is an air stagnation event. The air stagnation event identifies areas where air may be trapped by pool ventilation due to persistent light or calm winds, and by the presence of inversions. Most air stagnation events happen in an extended summer season from May to October. This is the result of the weaker pressure and temperature gradients, and therefore weaker wind circulation during this period. In the eastern U.S., there is a relative minimum of stagnation in July accompanied by relative maxima in May-June and August-October. This mid-summer decrease of air stagnation is due to the impact of the Bermuda High on the eastern United States. The Bermuda High is strongest in July; and hence, the meridianal wind in the Gulf States is a maximum then due to the increased pressure gradient, resulting in a relative minimum of air stagnation. Therefore, the Bermuda High is an additional and unique controlling factor for air stagnation conditions over the eastern United States, besides the seasonal cycle of minimum wind in summer and maximum wind in winter.

Another unique feature of air stagnation in the eastern U.S. is its early onset in May, compared to the onset in June in the west and central U.S. This results in a prolonged but weaker air stagnation season in the eastern U.S (Reference 5). For the eastern United States, the evaluation presented in Reference 5 show a regionally averaged mean annual cycle of six cases in the spring, 14 cases in the summer, and 11 cases in the fall for the region.

Just to the North of the Lee Nuclear Station site, is the border of North Carolina. The climate in this area is typical of the Piedmont area of North Carolina. The three principal physiographic divisions of the eastern United States are particularly well developed in North Carolina. From east to west, they are the Coastal Plain, the Piedmont, and the Mountains. The fall line is the dividing line between the Coastal Plain and the Piedmont. The Piedmont area, comprising about one-third of the State, rises gently from about 200 feet at the fall line to near 1,500 feet at the base of the Mountains (Reference 34).

The westernmost, or Mountain Division of North Carolina is the smallest of the three, comprising a little more than one-fifth of the total area of the State. Its range of elevation, however, is by far the greatest; it stretches upward from around 1,500 feet along the eastern boundary to 6,684 feet at the summit of Mount Mitchell. Some of the valleys drop to 1,000 feet above sea level while some 125 peaks exceed 5,000 feet and 43 tower above 6,000 feet.

Latitude accounts for some climatic variations, as do soils, plant cover, and inland bodies of water. The Gulf Stream has some direct effect on North Carolina temperatures, especially on the immediate coast. Though the Gulf Stream lies some 50 miles offshore, warm water eddies spin off from it and moderate the winter air temperatures along the Outer Banks. Coastal fronts are common during the winter months, and can push inland, bringing warmer than expected temperatures to coastal areas (Reference 34).

The most important single influence contributing to the variability of North Carolina climate is altitude. In all seasons of the year, the average temperature varies more than 20° Fahrenheit from the lower coast to the highest elevations. The average annual temperature at Southport on the lower coast is nearly as high as that of interior northern Florida, while the average on the summit of Mount Mitchell is lower than that of Buffalo, NY (Reference 34).

In winter, the greater part of North Carolina is partially protected by the mountain ranges from the frequent outbreaks of cold air which move southeastward across the central States. Such outbreaks often move southward all the way to the Gulf of Mexico without attaining sufficient strength and depth to traverse the heights of the Appalachian Range. When cold waves do break across, they are usually modified by the crossing and the descent on the eastern slopes. The temperature drops to 10° or 12° F about once during an average winter over central North Carolina, ranging some 10° F warmer the coast and 10° F colder in the upper mountains. Temperatures as low as 0° F are rare outside the mountains, but have occurred throughout the western part of the State. The lowest temperature of record is minus 34° F recorded January 21, 1985, at Mount Mitchell. Winter temperatures in the eastern sections are modified by the Atlantic Ocean, which raises the average winter temperature and decreases the average day-to-night range. In spring, the storm systems that bring cold weather southward reach North Carolina less often and less forcefully, and temperatures begin to modify. The rise in average temperatures is greater in May than in any other month. Occasional invasions of cool dry air from the north continue during the summer, but their effect on temperatures is slight and of short duration (Reference 34).

The increase in sunshine in the spring usually brings temperatures back up quickly. When the dryness of the air is sufficient to keep cloudiness at a minimum for several days, temperatures may occasionally reach 100° F or higher in the interior at elevations below 1,500 feet. Ordinarily, however, summer cloudiness develops to limit the sun's heating while temperatures are still in the 90-degree range. An entire summer sometimes passes without a high of 100° F being recorded in North Carolina. The average daily maximum reading in midsummer is below 90° F for most localities (Reference 34).

Autumn is the season of most rapidly changing temperature, the daily downward trend being greater than the corresponding rise in spring. The drop-off is greatest during October, and continues at a rapid pace in November, so that average daily temperatures by the end of that month are within about five degrees of the lowest point of the year (Reference 34).

While there are no distinct wet and dry seasons in North Carolina, average rainfall does vary around the year. Summer precipitation is normally the greatest, and July is the wettest month. Summer rainfall is also the most variable, occurring mostly in connection with showers and thunderstorms. Daily showers are not uncommon, nor are periods of one to two weeks without rain. Autumn is the driest season, and November the driest month. Precipitation during winter and spring occurs mostly in connection with migratory low pressure storms, which appear with greater regularity and in a more even distribution than summer showers. In southwestern North Carolina, where moist southerly winds are forced upward in passing over the mountain barrier, the annual average is more than 90 inches. This region is the rainiest in the eastern United

States. Less than 50 miles to the north, in the valley of the French Broad River, sheltered by mountain ranges on all sides, is the driest point south of Virginia and east of the Mississippi River. Here the average annual precipitation is only 37 inches. East of the Mountains, average annual rainfall ranges mostly between 40 and 55 inches (Reference 34).

Winter-type precipitation usually occurs with southerly through easterly winds, and is seldom associated with very cold weather. Snow and sleet occur on an average once or twice a year near the coast, and not much more often over the southeastern half of North Carolina. Such occurrences are nearly always connected with northeasterly winds, generated when a high pressure system over the interior, or northeastern United States, causes a southward flow of cold dry air down the coastline, while offshore a low pressure system brings in warmer, moist air from the North Atlantic. Farther inland, over the Mountains and western Piedmont, frozen precipitation sometimes occurs in connection with low pressure storms, and in the extreme west with cold front passages from the northwest. Average winter snowfall over North Carolina ranges from about inch per year on the outer banks and along the lower coast to about 10 inches in the northern Piedmont and 16 inches in the southern Mountains. Some of the higher mountain peaks and upper slopes receive an average of nearly 50 inches a year (Reference 34).

The average relative humidity does not vary greatly from season to season but is generally the highest in winter and lowest in spring. The lowest relative humidity is found over the southern Piedmont, where the year around average is about 65 percent (Reference 34).

2.7.1.2 Regional Meteorological Conditions

This section describes severe weather phenomena. Most recent data is taken from the NCDC storm event database that covers the period from 1950 through 2005 (Reference 7), but even longer data periods are used for some phenomena to try to capture the occurrence of rare events.

Severe synoptic-scale storms are relatively infrequent in the Lee Nuclear Station site area. The effects of such storms are generally restricted to local flooding from heavy rains. Damage from snow, freezing rain, or ice storms in mid-winter is uncommon.

2.7.1.2.1 Hurricanes

During the period 1899 to 2005 there were 44 documented tropical cyclones that affected either North Carolina (30 cyclones) or South Carolina (17 cyclones), with three cyclones affecting both states (Reference 9 and Reference 10). See Table 2.7-2. Of these 44 cyclones, 20 (45 percent) were Category 1, 10 (23 percent) were Category 2, and 12 (27 percent) were Category 3, 2 (5 percent) were Category 4 hurricanes. The storm category cited is the category observed at landfall in North Carolina and South Carolina. Table 2.7-3 presents a monthly breakdown of the 44 cyclones and provides a definition of the storm categories. Tropical cyclones, including hurricanes, lose strength as they move inland from the coast and the greatest concern for an inland site is possible flooding due to excessive rainfall. The maximum one day rainfall at Ninety-Nine Islands for the years 1949-2005 was 7.16 inches on 8/17/1985 resulting from hurricane Danny which was a tropical depression when it passed through this part of South Carolina (Reference 3).

2.7.1.2.2 Tornadoes

The probability that a tornado will occur at the Lee Nuclear Station site is low. Records show that in a 56-year period (1950-2005) there were 15 tornadoes reported in Cherokee County, the location of the site. The data reported by NOAA's National Environmental Satellite, Data, and Information Service (NESDIS) (Reference 7) is given in Table 2.7-4. From this data, the total tornado area in Cherokee County, ignoring events with a zero path length (i.e., no path length or no path length reported), is approximately 3.6 square miles. Using the principle of geometric probability described by H. C. S. Thom (Reference 11), a mean tornado path area of 0.24 square miles and an average tornado frequency of 0.27 per year was calculated for the area of Cherokee County (392.7 mi^2), the point probability of a tornado striking the Lee Nuclear Station is $1.64x10^{-4}$/year [((total tornado area in Cherokee County)/(area of Cherokee County))x(number of tornadoes per year)]. This corresponds to an estimated recurrence interval of 6108 years.

The tornadoes reported during the years 1950-2005 in the vicinity of Cherokee, Spartanburg, Union, Chester, and York Counties in South Carolina and Cleveland, Gaston, and Mecklenburg Counties in North Carolina are shown in Table 2.7-4.

During the period 1950 to 2005, a total of 118 tornadoes touched down in these counties, which have a combined total land area of 5,131.2 square miles (Reference 12). These local tornadoes have a mean path area of 0.46 square miles, excluding tornadoes without a length specified. The site recurrence frequency of tornadoes can be calculated using the point probability method as follows:

Total area of tornado sightings = 5,131.2 sq mi

Average annual frequency = 118 tornadoes/56 years = 2.11 tornadoes/year

Annual frequency of a tornado striking a particular point P = [(0.46 mi^2/tornado) (2.11 tornadoes/year)] / 5,131.2 sq. mi = 0.0002 yr^{-1}

Mean recurrence interval = 1/P = 5000 years.

This result shows that the frequency of a tornado in the immediate vicinity of the site is slightly lower than the frequency in the surrounding counties. Another methodology for determining the tornado strike probability at the Lee Nuclear Station is given in NUREG/CR-4461 (Reference 13). Based on a 2° longitude and latitude box centered on the Lee Nuclear Station site, the number of tornadoes is 221 from data collected from 1950 through August 2003. The corresponding expected maximum tornado wind speed and upper limit (95th percentile) of the expected wind speed is given below with the associated probabilities.

Probability	Expected maximum tornado wind speed mph	Upper limit (95 percent) of the expected tornado wind speed mph
10^{-5}	168	184
10^{-6}	223	236
10^{-7}	271	283

The design basis tornado characteristics are specific to the site location and region of the country in which the site is located. However, rather than conducting site research on tornado characteristics, most sites in past licensing proceedings have relied on NRC-endorsed studies that set conservative values for key design basis tornado characteristics. These characteristics were then used in the design of the subject facility.

Regulatory Guide 1.76, Revision 1, provides tornado characteristics, depending on the proposed site location in the country. Based on these criteria, the best estimated exceedance frequency is 10^{-7} per year. The tornado characteristics defined for Lee Nuclear Station are based on the guidance in Regulatory Guide 1.76 for Region 1. The below listed characteristics are associated with a Region I site.

	Region I
Maximum wind speed, mph	230
Rotational speed, mph	184
Maximum Translational speed, mph	46
Radius of maximum rotational speed, ft	150
Pressure drop, psi	1.2
Rate of pressure drop, psi/sec	0.5

Waterspouts are common along the southeast U.S. coast, especially off southern Florida and the Keys and can happen over seas, bays, and lakes worldwide. However, they are not expected to occur at the Lee Nuclear Station site since the only nearby bodies of water are the Broad River and the Make-Up Pond B.

2.7.1.2.3 Thunderstorms

Thunderstorms occur an average of 40 to 60 days a year at locations in north-central South Carolina and south-central North Carolina. Regionally, storms with wind speeds reaching 35 to 50 mph may occur several times a year. During the period 1950-2005, there were 134 thunderstorm or high wind events in Cherokee County (see Table 2.7-5). Of these, 75 events had a wind speed of greater than or equal to 50 knots (> 57 mph). The number of high wind speed (≥ 50 knots) events is 1.3 per year in Cherokee County. Table 2.7-5 presents the thunderstorm data for Cherokee County from 1950 through 2005. Approximately 57 percent of the thunderstorms in this area occur during the warm months (June-August), indicating that the majority are warm-air-mass thunderstorms. As shown in Table 2.7-5, from 1950 - 2005, 1219 thunderstorms are listed for this region, with Cherokee County receiving 11.0 percent, Spartanburg County receiving 24.5 percent, Union County receiving 8.4 percent, Chester County receiving 7.0 percent, and York County, South Carolina, receiving 13.3 percent of the thunderstorms. In the adjacent North Carolina counties, Cleveland County received 9.1 percent, Gaston County received 10.5 percent, and Mecklenburg County received 16.2 percent of the thunderstorms. (Reference 7)

2.7.1.2.4 Lightning

Data on lightning strike density is becoming more readily available due to the National Lightning Detection Network (NLDN), which has measured cloud-to-ground (CG) lightning for the contiguous United States since 1989. Prior to the availability of this data, isokeraunic maps of thunderstorm days were used to predict the relative incidence of lightning in a particular region. A general rule, based on a large amount of data from around the world, estimates the earth flash mean density to be 1-2 cloud to ground flashes per 10 thunderstorm days per square kilometer. (Reference 14). The annual mean number of thunderstorm days in the site area is estimated to be 50 based on interpolation from the isokeraunic map (Reference 15); therefore, it is estimated that the annual lightning strike density in the Lee Nuclear Station site area is 26 strikes per square mile per year. Other studies gave a ground flash density (GFD) in strikes/km^2/yr, based on thunderstorm days per year (TSD) as GFD = 0.04 (TSD)$^{1.25}$ = 0.04 (50)$^{1.25}$ = 5.3 strikes/km^2/yr or 14 strikes/mi^2/yr. (Reference 16). Recent studies based on data from the NLDN (Reference 17) indicate that the above strike densities are upper bounds for the Lee Nuclear Station site. Mean annual flash density for 1989-96 is 5 strikes/km^2/yr or 13 strikes/mi^2-yr in northern South Carolina.

2.7.1.2.5 Hail

From 1950 - 2005, 670 hailstorms occurred in the region annually with Cherokee County receiving approximately nine percent, as shown in Table 2.7-6. For this table, each occurrence of hail was counted as an individual event, even if two counties recorded hail simultaneously. The most probable months of hail occurrence are May and June in Cherokee County. The average number of hailstorms in Cherokee County is slightly more than one per year. The maximum hail size reported was 2.8 inch diameter and the average size was slightly more than 1 inch diameter. Property damage occurs infrequently, with three recorded events in Cherokee County, South Carolina in this 56-year period. (Reference 7)

2.7.1.2.6 Regional Air Quality

The Clean Air Act, which was last amended in 1990, requires the U.S. Environmental Protection Agency (EPA) to set National Air Quality Standards for pollutants considered harmful to the public health and the environment. The EPA Office of Air Quality Planning and Standards has set National Ambient Air Quality Standards for six principle pollutants, which are called "Criteria" pollutants. Units of measure for the standards are parts per million (ppm), milligrams per cubic meter (mg/m^3), and micrograms per cubic meter of air (μgm/m^3). Areas are either in attainmet of the air quality standards or in non-attainment. Attainment means that the air quality is better than the standard.

The U.S. Environmental Protection Agency (EPA) 8-hour ozone standard (62 FR 36, July 18, 1997) is 0.08 ppm in accordance with 40 CFR 50.10. Cherokee County is in the Greenville-Spartanburg Intrastate Air Quality Control Region (South Carolina). Cherokee County is in attainment for all criteria pollutants (carbon monoxide, lead, nitrogen dioxide, particulate matter (PM_{10}, particulate matter less than 10 micron), particulate matter ($PM_{2.5}$, particulate matter less than 2.5 micron), ozone, and sulfur oxides. There are six areas in South Carolina that are in non-attainment with the 8-hour ozone standard (Reference 18). Currently designated (as of March 02, 2006) non-attainment areas in South Carolina for the criteria pollutants are as follows:

County	Pollutant	Area Name
Anderson Co	8-Hr Ozone	Greenville-Spartanburg-Anderson, SC
Greenville Co	8-Hr Ozone	Greenville-Spartanburg-Anderson, SC
Lexington Co	8-Hr Ozone	Columbia, SC
Richland Co	8-Hr Ozone	Columbia, SC
Spartanburg Co	8-Hr Ozone	Greenville-Spartanburg-Anderson, SC
York Co	8-Hr Ozone	Charlotte-Gastonia-Rock Hill, NC-SC

The bordering North Carolina counties are Cleveland, Gaston, and Mecklenburg. Both Gaston County and Mecklenburg County are in non-attainment for 8-hr ozone. Cleveland County is in attainment for all criteria pollutants.

The ventilation rate is a significant consideration in the dispersion of pollutants. Higher ventilation rates are better for dispersing pollution than lower ventilation rates. The atmospheric ventilation rate is numerically equal to the product of the mixing height and the wind speed within the mixing layer. A tabulation of daily mixing heights and mixing layer wind speeds for both morning and afternoon was obtained from the EPA's SCRAM Website for 1984-1987 and 1989-1991 at the Greensboro-High Point, North Carolina station (Reference 19). This data was used to generate the morning and afternoon ventilation rates in Table 2.7-7. Morning ventilation is less than 4000 m^2/s throughout the year and is less than 2400 m^2/s from June through October. Afternoon ventilation is higher than 9200 m^2/s from March through June, but lower than 6500 m^2/s from August through January. The highest daily air pollution potentials exist in the morning from June through October when ventilation rates are lower. Lowest air pollution potentials occur from December through March due to the relatively high morning mean ventilation rates.

Other data sources provide independent checks of the regional air pollution potential. According to Wang and Angell (Reference 5), the annual average air stagnation cases for South Carolina over a fifty-one year period (1948-1998) was four cases per year with a mean duration of five days. The annual mean days of air stagnation was given as 20 for South Carolina. This report also concluded that the highest number of air stagnation days occurred from July through October with the lowest air stagnation days from November through March. The number of air stagnation days in the South Carolina region exhibited a slightly increasing trend over the 50 years evaluated (see Figure 2.7-2). This almost imperceptible positive trend in the number of air stagnation days has no impact on the Lee Nuclear Station Site.

2.7.1.2.7 Severe Winter Storm Events

The occurrences and durations of recorded ice storms and heavy snowstorms in the vicinity of the Lee Nuclear Station site for the thirteen-year period 1993-2005 is shown in Table 2.7-8. From these data, the frequency of winter storms is estimated to be 22 events per year in this regional area. For the region, each occurrence of a severe winter storm was counted as an individual event, even if two counties recorded a severe winter event simultaneously. For Cherokee County, the frequency is 3.6 events per year.

The equivalent ice thickness due to freezing rain with concurrent 3-second gust speeds for a 100-year mean recurrence interval is given in "Extreme Ice Thicknesses from Freezing Rain" (Reference 8) as 0.75 inch for the north central South Carolina area.

The 48-hour probable maximum winter precipitation at the Lee Nuclear Station site is based on the data for the Greenville-Spartanburg NWS (GSP) at Greer, SC. Based on this data, covering the time period of 1997-2005, the maximum 48-hour probable maximum winter precipitation is 3.54 inches. The maximum one day rainfall in Ninety-Nine Islands for the years 1949-2005 was 7.16 inches (Reference 3).

In the Ninety-Nine Islands/Lee Nuclear Station site area, snow melts and/or evaporates quickly, usually within 48 hours and before additional snow is added. Because the plant site is subjected to a subtropical climate with mild winters, prolonged snowfalls or large accumulations of snow or ice on the ground and structures are not anticipated.

2.7.1.2.8 100-Year Return Period Fastest Mile of Wind

The fastest mile of wind speed recorded in 56 years (1950-2006) in NWS storm events database for Cherokee County is 80.6 mph. A Gumbel-Lieblein extreme value analysis of this data gives an estimated value of 88 mph for the 100-year return period fastest mile of wind in Cherokee County. From Figure 6-1 of ASCE 7-95 (Reference 22), the 50-year return 3-second gust wind speed at 33 feet above ground for the Lee Nuclear Station site is 90 mph. This gives a 100-year return wind speed of 96 mph, based on Table C6-5 of ASCE 7-95.

2.7.1.2.9 Probable Maximum Annual Frequency and Duration of Dust Storms

The occurrence of dust storms (i.e., blowing dust or blowing sand) is a rare phenomenon in the Lee Nuclear Station site area. Although there are categories for dust and sand in the NCDC meteorological database, no hours are identified under this category for Cherokee County in the period from 01/01/1950 to 05/31/2006.

2.7.2 LOCAL METEOROLOGY

This section discusses the local meteorological conditions at the Lee Nuclear Station site. Onsite meteorological data was collected in 2006 and 2007. Local site meteorological conditions reflect the synoptic-scale atmospheric processes and are consistent with the regional meteorology. There are two exceptions caused by local effects from the Broad River. First, there is higher humidity directly adjacent to the river, so the site humidity data is more appropriate for site estimates than the Greenville/Spartanburg data. Second, there is a possibility of channeling of low-level winds along the river valley. Channeling of flow from the NW is indicated in the sites wind rose in Figure 2.7-3. This figure shows that the predominant wind direction is from the Northwest which aligns with the river valley.

The Lee Nuclear Station site is located in a temperate latitude in northern South Carolina about 250 miles northwest of the Atlantic coast and is in a region strongly influenced for much of the year by the Azores-Bermuda anticyclonic circulation (Reference 23). This behavior is shown in Figure 2.7-4 which gives the Atlantic subtropical anticyclone seasonality. In late summer and fall, the position of the subtropical high is such that the region experiences extended periods of fair weather and light wind conditions. In winter and early spring, the frequency of eastward moving migratory highs or low-pressure systems increases, alternately bringing cold and warm air masses into the Lee Nuclear Station site area. Frequent and prolonged incursions of warm moist air from the Atlantic Ocean and the Gulf of Mexico are experienced from late spring through summer.

The general direction of airflow across the region is from the northerly sectors during much of the year, although the prevailing direction may be from one of the southerly sectors during some months.

The net regional air movement can be deduced from the monthly wind joint frequency distributions for the Greenville/Spartanburg International Airport shown in Tables 2.7-9, 2.7-10, 2.7-11, 2.7-12, 2.7-13, 2.7-14, 2.7-15, 2.7-16, 2.7-17, 2.7-18, 2.7-19, 2.7-20, and Table 2.7-21. Long-term temperature and precipitation records from Ninety-Nine Islands were compared to records from Greenville/Spartanburg. This comparison indicates that, for these parameters, data from Greenville/Spartanburg reasonably represent meteorological conditions in the vicinity of the site. Presumably, this is indicative of the similarity in controlling synoptic influences throughout the region. Other meteorological parameters are assumed to be subject to the same synoptic controls.

2.7.2.1 Winds

2.7.2.1.1 Greenville/Spartanburg Wind Distribution

Tables 2.7-9, 2.7-10, 2.7-11, 2.7-12, 2.7-13, 2.7-14, 2.7-15, 2.7-16, 2.7-17, 2.7-18, 2.7-19, and 2.7-20 provide monthly percent joint frequency distributions for wind directions and speeds, based on a 9-year period of record from 1997 through 2005 for Greenville/Spartanburg. Table 2.7-21 provides an annual summary of the data. On an annual basis, Greenville/Spartanburg wind data collected in the 9 years from 1997 through 2005 show that northeastern wind direction is the most frequent (11 percent). Wind from the ESE was the least likely with a frequency of approximately one percent. At the Greenville/Spartanburg NWS station, winds average 7.1 mph from January through June, and 5.6 mph from July through December. Mean annual wind speed is 6.4 mph (Tables 2.7-9, 2.7-10, 2.7-11, 2.7-12, 2.7-13, 2.7-14, 2.7-15, 2.7-16, 2.7-17, 2.7-18, 2.7-19, 2.7-20 and 2.7-21).

The Greenville/Spartanburg meteorological station winds are presented graphically in Figures 2.7-5, 2.7-6, 2.7-7, 2.7-8, 2.7-9, 2.7-10, 2.7-11, 2.7-12, 2.7-13, 2.7-14, 2.7-15, 2.7-16, and 2.7-17. These wind roses cover the period from 1997 through 2005 and represent the frequency of winds from a particular direction by the length of the line in that direction. Greenville/Spartanburg data shows a usual pattern of winds coming from the northeast or southwest. During the fall, winds from the northeast are more common. At Greenville/Spartanburg, winds from the northwest or southeast occur infrequently. Monthly wind rose for the Lee Nuclear Station site are given in Figures 2.7-18, 2.7-19, 2.7-20, 2.7-21, 2.7-22, 2.7-23, 2.7-24, 2.7-25, 2.7-26, 2.7-27, 2.7-28, and 2.7-29 and seasonal wind rose are given in Figures 2.7-30, 2.7-31, 2.7-32, and 2.7-33. On a seasonal basis, the prevailing wind direction is from the northwest. This is also shown on the annual wind rose given in Figure 2.7-3. Joint frequency distributions of wind speed and direction by atmospheric stability class are provided in Tables 2.7-35, 2.7-36, 2.7-37, 2.7-38, 2.7-39, 2.7-40, and 2.7-41.

2.7.2.1.2 Lee Nuclear Site Wind Distribution

For the Lee Nuclear site, the annual wind direction frequency is fairly uniform with the NW direction slightly more frequent at approximately 15 percent. Wind from the West was the least frequent at about 3 percent. At the Lee Nuclear site, winds average 5.3 mph from January through June, and 4.5 mph from July through December. Mean annual wind speed is 5.0 mph (Tables 2.7-22, 2.7-23, 2.7-24, 2.7-25, 2.7-26, 2.7-27, 2.7-28, 2.7-29, 2.7-30, 2.7-31, 2.7-32, 2.7-33, and 2.7-34).

Monthly wind roses for the Lee Nuclear site are given inFigures 2.7-18, 2.7-19, 2.7-20, 2.7-21, 2.7-22, 2.7-23, 2.7-24, 2.7-25, 2.7-26, 2.7-27, 2.7-28, and 2.7-29 and seasonal wind roses are given in Figures 2.7-30, 2.7-31, 2.7-32, and 2.7-33. On a seasonal basis, the prevailing wind direction is from the northwest. This is also shown on the annual wind rose given in Figure 2.7-3. Joint frequency distributions of wind speed and direction by atmospheric stability class are provided in Tables 2.7-35, 2.7-36, 2.7-37, 2.7-38, 2.7-39, 2.7-40, and 2.7-41.

2.7.2.1.3 Wind Direction Persistence

Hourly weather observation records from the NWS at Greenville/Spartanburg, South Carolina, for the years 1997 through 2005 were examined for wind direction persistence. The longest persistence periods from a single sector (22.5 degrees), three adjoining sectors (67.5 degrees), and five adjoining sectors (112.5 degrees) were determined from each sector during each year. The results are shown in Tables 2.7-42, 2.7-43 , and 2.7-44. During the period, the single sector maximum persistence was greatest (23 hours) for the NE direction. The average maximum persistence (14.0 hours) was greatest for the NE direction. For the persistence in three adjoining sectors, the NE sector had the longest period of persistence (82 hours). The largest average maximum persistence (57.8 hours) was also for the NE sector, as shown in Table 2.7-43. The longest persistence period (150 hours) from five adjoining sectors occurred in the NE sector (Table 2.7-44). The NE sector also showed the greatest average maximum persistence (91.0 hours).

For the Lee Nuclear Station site, the single sector maximum persistence was greatest (15 hours) for the NW direction. For the persistence in three adjoining sectors, the NW sector had the longest period of persistence (45 hours). The longest persistence period (71 hours) from five adjoining sectors occurred in the NNE sector (Table 2.7-45).

2.7.2.2 Air Temperature

In the Lee Nuclear site area, January average maximum temperatures are between 50 and 55°F with average minimums between 25 and 30°F (see Figure 2.7-34 and Figure 2.7-35). In July, average minimum temperatures are in the vicinity of 65 to 70°F , while the average maximum is between 85 and 90°F, (see Figure 2.7-36 and Figure 2.7-37). The maximum and minimum mean temperatures at the Ninety-Nine Islands weather station in Blacksburg, South Carolina are given in the monthly climate summary, Table 2.7-46. The daily maximum, minimum, and average temperatures from the Ninety-Nine Islands weather station, spanning the years 1971 - 2000, are given in Figure 2.7-38.

The annual average maximum monthly temperature at the Ninety-Nine Islands weather station from 8/1/1948 to 12/31/2005 was 71.5°F, and the annual average minimum monthly temperature was 45.6°F. The average maximum monthly temperature was 89.0°F in July, and the average minimum monthly temperature was 26.7°F in January.

Data from the Southeast Regional Climate Center indicates that temperature extremes for Ninety-Nine Islands, South Carolina, for the years 1971 through 2000 have ranged from the highest mean temperature of 94.4°F (July 1993) to the lowest mean minimum temperature of 17.2°F (January 1977) (Reference 3). Table 2.7-46 presents the temperature means and extremes for Ninety-Nine Islands collected over a 30-year period.

The maximum temperature at the Lee Nuclear Station site during the 2005-2006 data collection period was 96°F and the minimum was 20°F which is within the bounds of the historic record for Ninety-Nine Islands, South Carolina (see Figure 2.7-38). The temperature range at the Lee Nuclear Station site is consistent with the temperature ranges for Ninety-Nine Islands and the Greenville/Spartanburg areas. The controlling meteorological parameters required for the analysis of cooling tower performance are the wet bulb temperature and the coincident dry bulb temperature. Tables 2.7-47, 2.7-48, and 2.7-49 present data on the worst 1-day (worst 1-day is defined as the calendar day with the highest average wet bulb temperature), worst five day, and worst 30-day period for Greenville/Spartanburg, South Carolina. Tables 2.7-50, 2.7-51, and 2.7-52 provide the same information based on Lee Nuclear Station site data.

2.7.2.3 Atmospheric Moisture

All of South Carolina experiences moderately high humidity during much of the year. At Greenville/Spartanburg, during the years 1997-2005, humidities of 50 percent or higher have occurred at any hour of the day. Mean relative humidities for four time periods per day at Greenville/Spartanburg are shown in Table 2.7-53. The highest humidity is most frequent in the early morning hours with an annual average of 81 percent. At times in the summer, a combination of high temperatures and high humidities develops; this usually builds up progressively for several days and becomes oppressive for one or more days. Lower humidities on the order of 50 percent occur on some days each month, usually in the early afternoon hours. (Reference 24).

Relative humidity in Blacksburg, South Carolina, averages near 70 percent for the year (Figure 2.7-39). Climatic records of humidity in Greenville/Spartanburg are shown in Table 2.7-53.

These data show that relative humidity in the region is high throughout the year. Nighttime relative humidities are highest in summer and lowest in the winter. Daytime humidities are highest in the summer. Seasonal variations are in the vicinity of 5 to 15 percent. Highest relative humidities occur in the early morning hours (00:00 - 6:00 a.m.), averaging greater than 72 percent during all months. Lowest relative humidities occur during the afternoon with averages below 58 percent for all months. The temperature regime of the region can be described by the data shown in Table 2.7-54.

Similar relative humidity data for the Lee Nuclear Station site is presented in Table 2.7-55. As shown, the site humidity follows the same pattern as the Greenville/Spartanburg data with the highest humidity in the early morning hours with an annual average of 86 percent. The afternoon average relative humidity is 50 percent at the Lee Nuclear Station site.

2.7.2.3.1 Precipitation

Precipitation averages 48.37 inches annually at the Ninety-Nine Islands meteorological station and is generally well distributed throughout the year (Table 2.7-46). The annual precipitation during the fall months (September - November) is slightly less than 12 inches (11.6 inches), and the other seasons have an annual precipitation of more than 12 inches. April is the driest month with an average precipitation of approximately three inches (see Table 2.7-46). Precipitation data from the 2005-2006 data period at the Lee Nuclear site is in general agreement with the longer-term data record from Ninety-Nine Islands with a total rainfall of 39.72 inches. This total is below the long-term mean of 47.34 inches for Ninety-Nine Islands but is above the long-term low of 32.27 inches.

For Greenville/Spartanburg, the maximum mean monthly precipitation is in July (5.3 inches), and the minimum monthly mean (3.2 inches) occurs in May, August, and October. The maximum monthly precipitation in Greenville/Spartanburg is 11.4 inches (Table 2.7-56). Table 2.7-56 provides the monthly frequency distribution of rainfall rates at the Greenville/Spartanburg meteorological station.

The maximum short period precipitation frequency for this region is given in Table 2.7-57 (Reference 25). Figure 2.7-40 shows the annual precipitation wind rose for Greenville/Spartanburg, South Carolina, based on data from the years 1997 through 2005 and Figure 2.7-41 gives the annual precipitation wind rose for the Lee Nuclear Station site. Table 2.7-58 provides the monthly precipitation by direction at Greenville/Spartanburg. This data shows that the highest rainfall frequency at Greenville/Spartanburg occurs most often in the months of November through April, and the most common directions are N through ENE. Winds speeds during precipitation average 7.1 mph annually.

Figure 2.7-42 gives the average total monthly precipitation for Ninety-Nine Islands, South Carolina for the period of 1948 through 2005. The daily precipitation average and extreme is given in Figure 2.7-43 for the same time period. Similar data for the Lee Nuclear Station site is provided in Table 2.7-59. This data shows that the highest rainfall frequency is during the months of October through January and the highest frequency directions are N through NE. The Lee Nuclear Station site monthly rainfall frequency distribution is given in Table 2.7-60 and the maximum 24-hour rainfall is given in Table 2.7-61. Monthly precipitation wind roses for Greenville/Spartanburg are given in Figures 2.7-47, 2.7-48, 2.7-49, 2.7-50, 2.7-51, 2.7-52, 2.7-53, 2.7-54, 2.7-55, 2.7-56, 2.7-57, and 2.7-58. Similar figures for the Lee Nuclear Site are given in Figures 2.7-59, 2.7-60, 2.7-61, 2.7-62, 2.7-63, 2.7-64, 2.7-65, 2.7-66, 2.7-67, 2.7-68, 2.7-69 and 2.7-70.

2.7.2.3.2 Snow

Snowfall is not a rare event in north central South Carolina. During the 59 years from 1947-48 through 2005-06, measurable snow fell on Ninety-Nine Islands in 24 years. As Table 2.7-62 shows, during these 59 years, snow or sleet fell in January in 11 years and February in 12 years (Reference 3). Average winter snowfall at the Ninety-Nine Islands meteorological station is three inches (Table 2.7-46 and Table 2.7-62).

Annual average snowfall in the area of the Lee Nuclear Station site is estimated to be approximately 3.0 inches. This estimate is based on 59 years of record (1948-2005) at Ninety-Nine Islands (Reference 3). The monthly and annual snowfall at Ninety-Nine Islands is given in Table 2.7-46. Figure 2.7-44 provides the daily snowfall average and extreme for Ninety-Nine Islands between 1948 and 2005. The maximum monthly snowfall at Ninety-Nine Islands was 14 inches in February 1978-79 (Reference 3). The Southeast Regional Climate Center snowfall records for Ninety-Nine Islands (8/1/1948 through 12/31/2005) give a maximum 24-hour snowfall of 13.0 inches (Reference 3).

2.7.2.3.3 Fog

Fog is an aggregate of minute water droplets suspended in the atmosphere near the surface of the earth. According to international definition, fog reduces visibility to less than 0.62 miles. Table 2.7-63 indicates that, over the period 1997 to 2005, Greenville/Spartanburg has averaged approximately 38 hours/year of fog with November, December, and January having the greatest frequency of fog.

2.7.2.4 Atmospheric Stability

The frequency and strength of inversion layers are evaluated using five years of weather balloon data collected at the Greensboro radiosonde station (Reference 26). Weather balloons are released twice daily at 0:00 GMT (7:00 p.m. EST) and 12:00 GMT (7:00 a.m. EST) to vertically profile temperatures, dewpoints, and winds. The monthly data are provided in Tables 2.7-64, 2.7-65, 2.7-66, 2.7-67, 2.7-68, 2.7-69, 2.7-70, 2.7-71, 2.7-72, 2.7-73, 2.7-74, and 2.7-75 in terms of number of mornings and afternoons containing inversions, average inversion layer elevation, and the average strength of the inversions. Table 2.7-76 provides annual average data for the period. An inversion is defined as any three readings on a sounding that show temperatures increasing with elevation (below 3000 feet). The inversion layer height is the point (found by interpolation between readings) at which temperature again starts to decrease with elevation. The maximum inversion strength is the maximum temperature rise divided by elevation difference within the inversion layer.

2.7.2.4.1 Mixing Heights

Seasonal mixing heights for Greensboro, North Carolina, are shown in Table 2.7-77. These were obtained from the EPA Support Center for Regulatory Atmospheric Modeling (SCRAM) Mixing Height Data collection for the period 1984-1987 and 1990-1991 (Reference 6). The average mixing heights in the mornings are lowest during the fall, and the average mixing heights in the afternoon are lowest in the winter.

Based on the EPA's SCRAM mixing height data for Greensboro, North Carolina (Reference 6), the mean morning mixing height for the area is approximately 470 meters in the winter, 475 meters in the spring, 470 meters in the summer, 380 meters in the fall, and 450 meters annually. The mean afternoon mixing height for the area is about 860 meters in the winter, 1540 meters in the spring, 1610 meters in the summer, 1140 meters in the fall, and 1290 meters annually (see Table 2.7-77). Greensboro, North Carolina is the nearest upper air observation location to the site but data from the Athens, Georgia first order weather station was also evaluated. Data obtained from the Athens station, located approximately 130 miles southwest of the Lee Nuclear Station site, showed that the mean ventilation rate at this station was roughly the same as that reported for Greensboro.

The ventilation rate is a measure of the dispersion of pollutants. Higher ventilation rates are better for dispersing pollution than lower ventilation rates. Mean ventilation rates by month for Greensboro, North Carolina, are given in Table 2.7-7. This data was obtained from EPA (Reference 6) for the years 1984-1987 and 1989-1991.

Morning ventilation is less than 4000 m^2/s throughout the year and is less than 2700 m^2/s from May through October. Afternoon ventilation is higher than 7000 m^2/s from February through July but lower than 6300 m^2/s from August through January. Based on this and the tendency of pollutants to increase in the surface layer during the course of a day, the highest daily air pollution potentials exist during the afternoon from August through January when ventilation rates are lower. Lowest air pollution potentials occur in the spring due to the relatively high mean ventilation rates.

2.7.2.5 Potential Influence of the Plant and Its Facilities on Local Meteorology

The potential for the operation of Units 1 and 2 at the Lee Nuclear Station site to influence the local climatology is discussed in this section.

The only aspects of the Lee Nuclear Station site that could be categorized as a unique micro-climate are the presence of the Ninety-Nine Islands Reservoir and the Broad River. The proximity of the river increases the local humidity by a small amount. There is also a slight tendency for lower level winds to be channeled along the river valley.

Although there will be some ground leveling, there are no significant climate-shaping topographic features to be changed. The site is already a relatively flat area with more significant hills to the northwest and southwest that will not be impacted by construction (refer to FSAR Figure 2.1-204 for a depiction of topography around the site). There may be some tree removal, but the trees within the construction area are small in number compared to the surrounding forested land. There are no significant changes anticipated or proposed in terms of local hydrologic features. There are no changes to local roadways anticipated in support of the proposed new facility which would impact the local climate. The impacts of more structures, facilities, or activities in this relatively remote, rural area are not expected to be noticeable in terms of local meteorology. The topography of the regional areas within 50 miles and 5 miles of the Lee Nuclear Site are shown on Figure 2.7-45.

Operation of power generation units can affect the local environment in three ways, additional generation of particulates (increased fog or haze), temperature effects on local water sources, and cooling tower plume effects. Since the proposed unit is nuclear, any increase in particulate emissions during operation would be due to a modest increase in automobile traffic and the infrequent operation of diesel generators. Therefore it can be concluded that the net increase in particulates will be negligible and will not cause any noticeable environmental effects.

The impact on Broad River water temperature is discussed in FSAR Section 10.4. In brief, the proposed new facility would utilize cooling towers, so that the vast majority of rejected heat would go to the atmosphere. The amount of heat input to the flow of the Broad River would be relatively small, with little impact on local meteorology.

The remainder of this section discusses the cooling tower plume effects. From the wind rose of Figure 2.7-3, it can be seen that the prevailing winds are from the northwest. This means that the cooling tower plumes will usually extend out over the Lee Nuclear Station site itself. Therefore, it can be concluded that most of the local climatological effects such as increased moisture and shading will be limited to the Lee Nuclear Station site.

2.7.2.5.1 Cooling Tower Plumes

The operation of three circular mechanical draft cooling towers (CMDCTs) for each unit at the site will result in the emission of small water droplets entrained in the tower air flow (i.e., drift). The droplets contain the dissolved solids found in the circulating water (e.g., salts) that may eventually deposit on the ground as well as on structures and vegetation. The drift droplet emissions are controlled by the use of drift eliminators that rely on inertial separation caused by exhaust flow direction changes. Subsection 5.3.3 gives the aesthetic and physical impacts of the operational heat discharge system.

2.7.2.6 Topographical Description of the Surrounding Area

The Lee Nuclear site is located approximately 1000 yards west of the Broad River with mountain ridges of 1000 to 2500 feet above msl to the northwest, north, and northeast. The elevation range over most of the site is approximately 500 to 660 feet above msl.

The terrain surrounding the Lee Nuclear Station site is dominated by Silver Mine Ridge 2.8 miles across the Broad River to the northwest . This ridge runs in a northeast to southwest direction and is 800 feet above mean sea level (MSL) through this area. To the north and west, the terrain is flatter and wooded. The only significant feature in this direction is Draytonville Mountain, located 4.7 miles west, which has an elevation of approximately 1000 feet above mean sea level. The terrain in the immediate vicinity of the Lee Nuclear Station site can be described as gently rolling hills. The only notable terrain feature in the immediate vicinity of the site is McKowns Mountain to the SSW with an elevation of approximately 800 feet (approximately 200 feet above the site grade elevation). Figure 2.7-46 presents the terrain elevation profiles within 50 miles of the Lee Nuclear Station site. (Reference 27). Topographic maps of the areas within 50 miles and 5 miles of the Lee Nuclear Site are shown on Figure 2.7-45.

2.7.2.7 Current and Projected Site Air Quality Conditions

Attainment areas are areas where the ambient air quality levels are better than the EPA-designated (national) ambient air quality standards. The Lee Nuclear Station site is located within the Greenville-Spartanburg Intrastate Air Quality Control Region (AQCR). Currently, Cherokee County is designated as attainment for all criteria pollutants although the other counties in the AQCR have been designated as non-attainment. This region is designated as being in non-attainment for 8-Hr Ozone (Reference 28).

Criteria pollutants are those for which National Ambient Air Quality Standards (NAAQS) have been established (i.e., sulfur dioxide (SO_2), fine particulate matter (PM_{10}), carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), and lead (Pb)) (National Ambient Air Quality Standards, 40 CFR Part 50). South Carolina is also subject to the revised 8-hour O_3 standard and the new standard for $PM_{2.5}$ (fine particulate matter with an aerodynamic diameter of less than or equal to 2.5 microns), both promulgated by the EPA in July 1997 in accordance with 62 CFR Part 38711.

These air quality characteristics are not expected to be a significant factor in the design and operating bases of Units 1 and 2. The new nuclear steam supply system and other related radiological systems are not sources of criteria pollutants or other air toxics. The addition of supporting auxiliary boilers, emergency diesel generators, station blackout generators (and other non-radiological emission sources) are not expected to be significant sources of criteria pollutant emissions because these units operate on an intermittent test and/or emergency basis. Permitting requirements are considered in ER Section 5.5. Emissions and dust control during construction are discussed in ER 4.4.1.6.

2.7.3 SHORT-TERM ATMOSPHERIC DISPERSION ESTIMATES FOR ACCIDENT RELEASES

The consequences of a design basis accident in terms of human exposure is a function of the atmospheric dispersion conditions at the site of the potential release. Atmospheric dispersion consists of two components: 1) atmospheric transport due to organized or mean airflow within the atmosphere and 2) atmospheric diffusion due to disorganized or random air motions. Atmospheric diffusion conditions are represented by relative air concentration (χ/Q) values. This section describes the development of the short-term diffusion estimates for the site boundary and LPZ and the control room.

2.7.3.1 Calculation Methodology

The efficiency of diffusion is primarily dependent on winds (speed and direction) and atmospheric stability characteristics. Dispersion is rapid during periods of Stability Classes A through D and much slower during periods of Stability Classes E through G. That is, atmospheric dispersion capabilities decrease with progression from Class A to G, with an abrupt reduction from Classes D to E. (see, Regulatory Guide 1.145 and NUREG/CR-2858).

Relative concentrations of released gases, χ/Q values, as a function of direction for various time periods at the exclusion area boundary (EAB) and the outer boundary of the low population zone (LPZ), were determined by the use of the computer code PAVAN, NUREG/CR-2858 (Reference 33). This code implements the guidance provided in Regulatory Guide 1.145. The χ/Q calculations are based on the theory that material released to the atmosphere will be normally distributed (Gaussian) about the plume centerline. A straight-line trajectory is assumed between the point of release and all distances for which χ/Q values are calculated in accordance with NUREG/CR-2858 and Regulatory Guide 1.145.

Using joint frequency distributions of wind direction and wind speed by atmospheric stability, PAVAN provides the χ/Q values as functions of direction for various time periods at the EAB and the LPZ. The meteorological data needed for this calculation includes wind speed, wind direction, and atmospheric stability. The meteorological data used for this analysis was obtained from the onsite meteorological Tower 2 data monitoring equipment from December 1, 2005 through November 30, 2006. The joint frequency distribution for this period is reported in Table 2.7-35 through 2.7-41. Other plant specific data included tower height at which wind speed was measured (10.0 m) and distances to the EAB and LPZ. The Exclusion Area Boundary (EAB) for Lee Nuclear Station is shown in FSAR Figure 2.1-209. The minimum EAB distances are reported in Table 2.7-78. In this table, the distances are measured from a 550 foot radius effluent release boundary to the EAB. The LPZ is defined as a circle with a 2-mile radius centered on the midpoint between the Unit 1 and Unit 2 containment buildings.

Within the ground release category, two sets of meteorological conditions are treated differently. During neutral (D) or stable (E, F, or G) atmospheric stability conditions when the wind speed at the 10-meter level is less than 6 meters per second (m/s), horizontal plume meander is considered. χ/Q values are determined through the selective use of the following set of equations for ground-level relative concentrations at the plume centerline:

$$\chi/Q = \frac{1}{\bar{U}_{10}(\pi\sigma_y\sigma_z + A/2)} \qquad \text{Equation 1}$$

$$\chi/Q = \frac{1}{\bar{U}_{10}(3\pi\sigma_y\sigma_z)} \qquad \text{Equation 2}$$

$$\chi/Q = \frac{1}{\bar{U}_{10}\pi\Sigma_y\sigma_z} \qquad \text{Equation 3}$$

where:

χ/Q is relative concentration, in sec/m^3,

$\bar{U}_{10}$ is wind speed at 10 meters above plant grade, in m/sec

σ_y is lateral plume spread, in meters, a function of atmospheric stability and distance

σ_z is vertical plume spread, in meters, a function of atmospheric stability and distance

Σ_y is lateral plume spread with meander and building wake effects, in meters, a function of atmospheric stability, wind speed, and distance

A is the smallest vertical-plane cross-sectional area of the reactor building, in m^2

For wind speeds less than 6 m/sec and neutral or stable Stability classes (D through G), PAVAN calculates χ/Q values using Equations 1, 2, and 3. The values from Equations 1 and 2 are compared and the higher value is selected. This value is then compared with the value from Equation 3, and the lower value of these two is selected as the appropriate χ/Q value.

During all other meteorological conditions, unstable (A, B, or C) atmospheric stability and/or 10-meter level wind speeds of 6 m/s or more, plume meander is not considered. The higher value calculated from equation 1 or 2 is used as the appropriate χ/Q value.

From here, PAVAN constructs a cumulative probability distribution of χ/Q values for each of the 16 directional sectors. This distribution is the probability of the given χ/Q values being exceeded in that sector during the total time. The sector χ/Q values and the maximum sector χ/Q value are determined by effectively "plotting" the χ/Q versus probability of being exceeded and selecting the χ/Q value that is exceeded 50 percent of the total time.

The χ/Q value for the EAB or LPZ boundary evaluations will be the maximum sector χ/Q or the 5 percent overall site χ/Q, whichever is greater in accordance with Regulatory Guide 1.145. All direction-dependent sector values are also calculated.

2.7.3.2 Calculations and Results

The methodology described in Regulatory Guide 1.145 divides release configurations into two modes, ground release and stack release. A stack or elevated release includes all release points that are effectively higher than two and one-half times the height of the adjacent solid structures. Since the AP1000 release points do not meet this criterion, releases are considered to be ground level releases. This analysis also assumed a 550 ft. radius circle encompassing all release points (sources), when calculating distances to the receptors.

PAVAN requires the meteorological data in the form of joint frequency distributions of wind direction and wind speed by atmospheric stability class. These analyses were completed using data from the Tower 2 meteorological instrumentation during the 12 month period of (December 2005 - November 2006).

The stability classes were based on the classification system given in Table 2 of U.S. Nuclear Regulatory Commission Regulatory Guide 1.23, as follows:

Classification of Atmospheric Stability
(Reference, Regulatory Guide 1.23)

Stability Classification	Pasquill Categories	Temperature change with height (ºC/100m)
Extremely unstable	A	$\Delta T \leq -1.9$
Moderately unstable	B	$-1.9 < \Delta T \leq -1.7$
Slightly unstable	C	$-1.7 < \Delta T \leq -1.5$
Neutral	D	$-1.5 < \Delta T \leq -0.5$
Slightly stable	E	$-0.5 < \Delta T \leq 1.5$
Moderately stable	F	$1.5 < \Delta T \leq 4.0$
Extremely stable	G	$\Delta T > 4.0$

Joint frequency distribution tables were developed from the meteorological data with the assumption that if data required as input to the PAVAN program (i.e., lower level wind direction, lower wind speed, and temperature differential) was missing from the hourly data record, all data for that hour was discarded. Also, the data in the joint frequency distribution tables was rounded for input into the PAVAN code.

Building cross-sectional area is defined as the smallest vertical-plane area of the reactor building, in square meters. The area of the reactor building to be used in the determination of building-wake effects will be conservatively estimated as the above grade, cross-sectional area of the shield building. This area was determined to be 2909 m^2. Building height is the height above plant grade of the containment structure used in the building-wake term for the annual-average calculations. The Passive Containment Cooling System (PCCS) tank roof is at Elevation 334 ft. The Design Grade Elevation for the AP1000 DCD is 100 ft; therefore, the height above plant grade of the containment structure or building height is 234 ft.

As described in Regulatory Guide 1.145, a ground release includes all release points that are effectively lower than two and one-half times the height of adjacent solid structures. Therefore, as stated above, a ground release was assumed.

The tower height is the height at which the wind speed was measured. Based on the ground level release assumption, the lower measurement level (i.e., 10-meter level) on the tower was used.

Table 2.7-79 gives the 50 percent probability level χ/Q values at the EAB and LPZ.

2.7.4 LONG-TERM ATMOSPHERIC DISPERSION ESTIMATES FOR ROUTINE RELEASES

For a routine gaseous effluent release, the concentration of radioactive material in the surrounding region depends on the amount of effluent released, the height of the release, the momentum and buoyancy of the emitted plume, the wind speed, atmospheric stability, airflow patterns of the site, and various effluent removal mechanisms. Annual average relative concentration, χ/Q, and annual average relative deposition, D/Q, for gaseous effluent routine releases were calculated.

2.7.4.1 Calculation Methodology and Assumptions

The XOQDOQ Computer Program NUREG/CR-2919 (Reference 31) which implements the assumptions outlined in Regulatory Guide 1.111 was used to generate the annual average relative concentration, χ/Q, and annual average relative deposition, D/Q. Values of χ/Q and D/Q were determined at points of maximum potential concentration outside the site boundary, at points of maximum individual exposure and at points within a radial grid of sixteen 22-1/2º sectors and extending to a distance of 50 miles. Radioactive decay and dry deposition were considered. Distances to the EAB are the same as in the short-term atmospheric dispersion estimates.

Meteorological data for the period from December 2005 through November 2006 was used in the analysis. In addition to the gridded receptor locations, receptor locations were determined from the locations obtained from the current (February 2007) Land Use Census. Hourly meteorological data was used in the development of joint frequency distributions, in hours, of wind direction and wind speed by atmospheric stability class. The wind speed categories used were consistent with the Lee Nuclear short-term (accident) diffusion χ/Q calculation discussed above. Calms (wind speeds below the anemometer start speed of 1-mph) were distributed into the first wind speed class with the same proportion and direction as the direction frequency for the 2nd wind speed class.

Joint frequency distribution tables were developed from the hourly meteorological data with the assumption that if data required as input to the XOQDOQ program (i.e., lower level wind direction and wind speed, and temperature differential as opposed to upper level wind direction and wind speed) was missing from the hourly data record, all data for that hour would be discarded. This assumption maximizes the data being included in the calculation of the χ/Q and D/Q values since hourly data is not discarded if only upper data is missing. The joint frequency distribution tables generated using the methodology and data described above are given in Tables 2.7-35, 2.7-36, 2.7-37, 2.7-38, 2.7-39, 2.7-40, and 2.7-41.

The analysis assumed a ground level point source at the center of the facility midway between the Unit 1 and Unit 2 containment buildings for special offsite receptor locations and the low population zone (LPZ). For EAB dose evaluations, the release is assumed to be within a 550 ft. radius circle encompassing all potential release points. At ground level locations beyond several miles from the plant, the annual average concentration of effluents are essentially independent of release mode; however, for ground level concentrations within a few miles, the release mode is important. Gaseous effluents released from tall stacks generally produce peak ground-level air concentrations near or beyond the site boundary. Near ground level releases usually produce concentrations that decrease from the release point to all locations downwind. Guidance for selection of the release mode is provided in Regulatory Guide 1.111. In general, in order for an elevated release to be assumed, either the release height must be at least twice the height of adjacent buildings or detailed information must be known about the wind speed at the height of the release. For this analysis, the routine releases were conservatively modeled as ground level releases.

The building cross-sectional area and building height are used in calculation of building wake effects. Regulatory Guide 1.111 identifies the tallest adjacent building, in many cases, the reactor building, as appropriate for use. The AP1000 plant arrangement is comprised of five principal building structures; the nuclear island, the turbine building, the annex building, the diesel generator building, and the radwaste building. The nuclear island consists of a free-standing steel containment building, a concrete shield building, and an auxiliary building. As the shield building is the tallest building in the AP1000 arrangement, the shield building cross-sectional area and building height will be used in calculation of building wake effects. The use of the shield building area, as opposed to the area of the nuclear island, is a conservative assumption since use of a smaller area minimizes wake effects resulting in higher calculated relative offsite concentrations.

Consistent with Regulatory Guide 1.111 guidance regarding radiological impact evaluations, radioactive decay and deposition were considered. For conservative estimates of radioactive decay, an overall half-life of 2.26 days is acceptable for short-lived noble gases and a half-life of 8 days for all iodines released to the atmosphere. At sites where there is not a well-defined rainy season associated with a local grazing season such as the region around the Lee Nuclear Site, wet deposition does not have a significant impact. In addition, the dry deposition rate of noble gases is so slow that the depletion is negligible within 50 miles. Therefore, in this analysis only the effects of dry deposition of iodines were considered. The calculation results with and without consideration of dry deposition are identified in the output as "depleted" and "undepleted". Terrain recirculation as described in Regulatory Guide 1.111 was not considered for the Lee Nuclear Site.

2.7.4.2 Results

Receptor locations for the long-term atmospheric dispersion at the Lee Nuclear Station site were also evaluated. χ/Q and/or D/Q at points of potential maximum concentration outside the site boundary, at points of maximum individual exposure, and at points within a radial grid of sixteen 22½ degree sectors (centered on true north, north-northeast, northeast, etc.) and extending to a distance of 50 miles from the station were determined. Receptor locations included in the evaluation are given in Table 2.7-80. A set of data points were located within each sector at increments of 0.25 miles to a distance of 1 mi from the plant, at increments of 0.5 miles from a distance of 1 mi to 5 mi, at increments of 2.5 miles from a distance of 5 miles to 10 miles, and at increments of 5 mi thereafter to a distance of 50 mi. Estimates of χ/Q (undecayed and undepleted; depleted for radioiodines) and D/Q radioiodines and particulates is provided at each of these grid points.

The results of the analysis, based on one year of data collected on site, are presented in Tables 2.7-81, 2.7-82, 2.7-83, 2.7-84, 2.7-85, and 2.7-86. The limiting atmospheric dispersion at the EAB is in the SE direction at 1339 meters. The limiting atmospheric dispersion factor (χ/Q) at the nearest residence is also in the SE direction at 1607 meters. Atmospheric dispersion factors for other receptors are given in Table 2.7-83.

2.7.5 REFERENCES

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TABLE 2.7-1
RAINFALL FREQUENCY DISTRIBUTION
GREENVILLE/SPARTANBURG, SOUTH CAROLINA
NUMBER OF HOURS PER MONTH, AVERAGE YEAR

Rainfall (inch/hr)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average Annual Hours
0.01-0.019	18.2	17.0	19.4	17.1	15.4	14.3	14.2	9.6	12.2	13.6	15.6	17.2	15.3
0.02-.099	33.2	34.0	30.6	26.0	17.9	19.6	14.8	9.2	20.4	17.1	30.2	26.6	23.3
0.10-0.249	8.3	10.8	12.3	9.4	7.3	7.2	5.3	3.6	9.4	5.9	6.9	13.1	8.3
0.25-0.499	1.3	0.6	2.4	2.7	2.0	3.4	3.2	1.3	2.7	2.3	1.4	1.4	2.1
0.50-0.99	0.2	0.1	0.4	0.2	0.9	1.7	1.6	1.6	1.0	0.8	0.4	0.2	0.8
1.00-1.99	0.0	0.0	0.0	0.2	0.0	0.1	0.8	0.3	0.3	0.1	0.0	0.0	0.2
2.0 & over	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0
Total	61.2	62.5	65.1	55.6	43.5	46.3	40.1	25.7	46.0	39.8	54.5	58.5	49.9

NOTES:

1. Data from NCDC, 1997-2005.

TABLE 2.7-2 (Sheet 1 of 3)
HURRICANE LANDFALLS IN NORTH CAROLINA AND SOUTH CAROLINA 1899 – 2005

Year	Month	Name	Category	States Affected With Category by Each State
1899	AUG	-	3	NC 3
1899	OCT	-	1	SC 1, NC 1
1901	JUL	-	1	NC 1
1904	SEP	-	1	SC 1
1906	SEP	-	3	SC 3, NC 3
1908	JUL	-	1	NC 1
1911	AUG	-	2	GA 2, SC 2
1913	SEP	-	1	NC 1
1916	JUL	-	1	SC 1
1920	SEP	-	1	NC 1
1928	SEP	-	4	FL 4, GA 1, SC 1
1933	AUG	-	2	NC 2, VA 2
1933	SEP	-	3	NC 3
1936	SEP	-	2	NC 2
1940	AUG	-	2	GA 2, SC 2
1944	AUG	-	1	NC 1
1944	SEP	-	3*	NC 3*, VA 3*, NY 3*, CT 3*, RI 3*, MA 2*
1947	OCT	-	2	FL 1, GA 2, SC 2

TABLE 2.7-2 (Sheet 2 of 3)
HURRICANE LANDFALLS IN NORTH CAROLINA AND SOUTH CAROLINA 1899 – 2005

Year	Month	Name	Category	States Affected With Category by Each State
1949	AUG	-	1	NC 1
1952	AUG	Able	1	SC 1
1953	AUG	Barbara	1	NC 1
1954	AUG	Carol	3*	NC 2, NY 3*, CT 3*, RI 3*
1954	OCT	Hazel	4*	SC 4*, NC 4*, MD 2*
1955	AUG	Connie	3	NC 3, VA 1
1955	AUG	Diane	1	NC 1
1955	SEP	Ione	3	NC 3
1959	JUL	Cindy	1	SC 1
1959	SEP	Gracie	3	SC 3
1960	SEP	Donna	4	FL 4, NC 3*, NY 3*, CT 2*, RI 2*, MA 1*,
1971	SEP	Ginger	1	NC 1
1979	SEP	David	2	FL 2, GA 2, SC 2
1984	SEP	Diana	3	NC 3
1985	JUL	Bob	1	SC 1
1985	SEP	Gloria	3	NC 3, NY 3*, CT 2*, NH 2*, ME 1*
1986	AUG	Charley	1	NC 1, VA 1
1989	SEP	Hugo	4	SC 4

TABLE 2.7-2 (Sheet 3 of 3)
HURRICANE LANDFALLS IN NORTH CAROLINA AND SOUTH CAROLINA 1899 – 2005

Year	Month	Name	Category	States Affected With Category by Each State
1993	AUG	Emily	3	NC 3
1996	JUL	Bertha	2	NC 2
1996	SEP	Fran	3	NC 3
1998	AUG	Bonnie	2	NC 2
1999	SEP	Floyd	2	NC 2
2002	OCT	Kyle	1	SC 1
2004	AUG	Gaston	1	SC 1
2005	SEP	Ophelia	1	NC 1

NOTES:

1. Data is from "Atlantic Tropical Storms And Hurricanes Affecting The United States:1899-2002," NOAA Technical Memorandum NWS SR-206 (Updated through 2002).

2. Asterisks (*) indicate that all hurricanes in this category were moving in excess of 30 mph.

3. Data for 2004 and 2005 from South Carolina Climatology Office, http://www.dnr.sc.gov/climate/sco/index.html

TABLE 2.7-3 (SHEET 1 OF 2)
FREQUENCY OF TROPICAL CYCLONES (BY MONTH) FOR THE STATES OF SOUTH CAROLINA AND NORTH CAROLINA

	Category of Storm (Saffir-Simpson Scale) 1899 – 2005							
	1 (No.)	2 (No.)	3 (No.)	4 (No.)	5 (No.)	Monthly Total (No.)	Annual Frequency (yr-1)	% of Total
Jun	0	0	0	0	0	0	0.00	0%
Jul	5	1	0	0	0	6	0.06	14%
Aug	7	5	3	0	0	15	0.14	34%
Sep	6	3	9	1	0	19	0.18	43%
Oct	2	1	0	1	0	4	0.04	9%
Nov	0	0	0	0	0	0	0.00	0%
Total	20	10	12	2	0	44	0.41	100%

Note: Storm category is category of the storm at landfall in either North Carolina or South Carolina.

TABLE 2.7-3 (SHEET 2 OF 2)
FREQUENCY OF TROPICAL CYCLONES (BY MONTH) FOR THE STATES OF SOUTH CAROLINA AND NORTH CAROLINA

	Number of Hurricanes: 1899 – 2005 Saffir/Simpson Category Number						Landfall Frequency (storms per year)	Return Period (years)
Area	1	2	3	4	5	Total		
North Carolina (NC)	12	6	11	1	0	30	0.28	3.57
South Carolina (SC)	9	4	2	2	0	17	0.16	6.29

NOTES:

1. Three storms affected both North and South Carolina. These storms were included in the above totals for each state.
2. Data is from "Atlantic Tropical Storms And Hurricanes Affecting The United States:1899-2002," NOAA Technical Memorandum NWS SR-206 (Updated through 2002), and NOAA Technical Memorandum NWS TPC-4 for data through 2004.
3. Data for 2004 and 2005 from South Carolina Climatology Office, http://www.dnr.sc.gov/climate/sco/index.html
4. Where the definition of Storm Category is as follows:

Storm Category (Saffir-Simpson Scale)	Wind Speed (mph)	Storm Surge (ft. above normal)
1	74 to 95	4 to 5
2	96 to 110	6 to 8
3	111 to 130	9 to 12
4	131 to 155	13 to 18
5	Greater than 155	Greater than 18

TABLE 2.7-4 (Sheet 1 of 9)
TORNADOES IN CHEROKEE, SPARTANBURG, UNION, CHESTER, AND YORK COUNTIES, SOUTH CAROLINA AND CLEVELAND, GASTON, AND MECKLENBURG COUNTIES, NORTH CAROLINA

Location or County	Date	Time	Magnitude Fujita Scale	Length (mi.)	Width (yards)	Area (mi^2)
Cherokee County, SC						
1 CHEROKEE	2/16/1954	1902	F1	1	33	0.02
2 CHEROKEE	5/22/1963	1715	F1	1	100	0.06
3 CHEROKEE	7/15/1964	1530	F0	1	100	0.06
4 CHEROKEE	4/18/1969	1430	F2	1	83	0.05
5 CHEROKEE	5/27/1973	1820	F3	20	100	1.14
6 CHEROKEE	12/5/1977	1342	F1	0	17	
7 CHEROKEE	4/4/1989	1645	F1	8	50	0.23
8 CHEROKEE	5/5/1989	1633	F4	3	700	1.19
9 CHEROKEE	2/10/1990	0742	F1	3	50	0.09
10 CHEROKEE	4/28/1990	1655	F1	5	40	0.11
11 COWPENS	8/16/1994	1656	F1	3	75	0.13
12 BLACKSBURG	8/16/1994	1736	F2	4	100	0.23
13 GAFFNEY	5/1/1995	2025	F0	9	50	0.26
14 BLACKSBURG	5/29/1996	1610	F0	0	30	

TABLE 2.7-4 (Sheet 2 of 9)
TORNADOES IN CHEROKEE, SPARTANBURG, UNION, CHESTER, AND YORK COUNTIES, SOUTH CAROLINA AND CLEVELAND, GASTON, AND MECKLENBURG COUNTIES, NORTH CAROLINA

Location or County	Date	Time	Magnitude Fujita Scale	Length (mi.)	Width (yards)	Area (mi^2)
15 GAFFNEY	9/27/2004	2115	F1	1	50	0.03
Spartanburg County, SC						
1 SPARTANBURG	5/10/1952	1415	F3	16	83	0.75
2 SPARTANBURG	4/7/1964	1208	F1	0	100	
3 SPARTANBURG	4/28/1964	1730	F0	0	0	
4 SPARTANBURG	4/28/1964	1830	F0	0	0	
5 SPARTANBURG	3/22/1968	1730	F1	1	13	0.01
6 SPARTANBURG	5/18/1969	2100	F1	0	50	
7 SPARTANBURG	5/27/1973	1730	F3	11	150	0.94
8 SPARTANBURG	6/19/1976	1630	F1	0	50	
9 SPARTANBURG	9/7/1977	1400	F1	0	77	
10 SPARTANBURG	12/5/1977	1335	F1	0	20	
11 SPARTANBURG	5/23/1980	1910	F2	3	100	0.17
12 SPARTANBURG	8/17/1985	1050	F2	9	100	0.51
13 SPARTANBURG	4/4/1989	1618	F2	2	73	0.08

TABLE 2.7-4 (Sheet 3 of 9)
TORNADOES IN CHEROKEE, SPARTANBURG, UNION, CHESTER, AND YORK COUNTIES, SOUTH CAROLINA AND CLEVELAND, GASTON, AND MECKLENBURG COUNTIES, NORTH CAROLINA

Location or County	Date	Time	Magnitude Fujita Scale	Length (mi.)	Width (yards)	Area (mi^2)
14 SPARTANBURG	5/5/1989	1620	F4	6	700	2.39
15 SPARTANBURG	2/10/1990	0738	F1	2	50	0.06
16 SPARTANBURG	4/28/1990	1610	F0	2	30	0.03
17 SPARTANBURG	4/28/1990	1620	F1	6	50	0.17
18 INMAN	3/27/1994	1655	F2	25	75	1.07
19 LYMAN	3/27/1994	1730	F1	33	100	1.88
20 CROSS ANCHOR	10/22/1994	1810	F0	2	75	0.09
21 WALNUT GROVE	7/26/1996	1555	F1	0	10	
22 ROEBUCK	2/21/1997	1633	F2	1	75	0.04
23 PACELET MILLS	6/6/1998	1600	F0	1	10	0.01
24 CHEROKEE SPGS	3/11/2000	1500	F0	0	20	
25 CHESNEE	7/7/2005	0951	F0	0	50	
Union County, SC						
1 UNION	4/8/1957	1500	F2	15	100	0.85
2 UNION	8/17/1985	1315	F0	3	30	0.05

TABLE 2.7-4 (Sheet 4 of 9)
TORNADOES IN CHEROKEE, SPARTANBURG, UNION, CHESTER, AND YORK COUNTIES, SOUTH CAROLINA AND CLEVELAND, GASTON, AND MECKLENBURG COUNTIES, NORTH CAROLINA

Location or County	Date	Time	Magnitude Fujita Scale	Length (mi.)	Width (yards)	Area (mi^2)
3 UNION	6/4/1992	1050	F0	0	40	
4 UNION	6/4/1992	1115	F0	0	23	
5 SOUTHSIDE	4/15/1993	1626	F2	6	600	2.05
6 UNION	7/26/1996	1625	F0	0	10	
7 CARLISLE	6/6/1998	1610	F1	2	50	0.06
8 ADAMSBURG	5/25/2000	1900	F1	1	20	0.01
9 CARLISLE	6/9/2001	1415	F0	1	0	
10 UNION	9/7/2004	2300	F1	4	225	0.51
11 SANTUC	11/24/2004	1425	F0	1	50	0.03
Chester County, SC						
1 CHESTER	4/6/1955	1230	F1	2	100	0.11
2 CHESTER	5/15/1975	1200	F1	0	3	
3 CHESTER	4/19/1981	1845	F1	2	33	0.04
4 LOWRYS	4/16/1994	0111	F2	3	75	0.13
5 CHESTER	8/16/1994	1755	F1	0	75	

TABLE 2.7-4 (Sheet 5 of 9)
TORNADOES IN CHEROKEE, SPARTANBURG, UNION, CHESTER, AND YORK COUNTIES, SOUTH CAROLINA AND CLEVELAND, GASTON, AND MECKLENBURG COUNTIES, NORTH CAROLINA

Location or County	Date	Time	Magnitude Fujita Scale	Length (mi.)	Width (yards)	Area (mi^2)
6 CHESTER	5/1/1995	2305	F0	0	20	
7 RICHBURG	5/29/1996	1700	F1	1	100	0.06
8 FT LAWN	7/24/1997	1200	F1	0	25	
9 CHESTER	6/4/1998	1730	F0	0	50	
10 CHESTER	9/7/2004	1915	F1	1	50	0.03
York County, SC						
1 YORK	7/16/1961	1400	F0	0	7	
2 YORK	6/22/1964	1820	F1	2	53	0.06
3 YORK	5/24/1973	1520	F2	2	67	0.08
4 YORK	5/28/1973	1630	F2	2	100	0.11
5 YORK	3/24/1975	1115	F1	9	100	0.51
6 YORK	12/5/1977	1640	F1	2	100	0.11
7 YORK	5/3/1984	1525	F1	6	10	0.03
8 YORK	8/17/1985	1255	F1	3	30	0.05
9 YORK	8/17/1985	1300	F0	1	30	0.02

TABLE 2.7-4 (Sheet 6 of 9)
TORNADOES IN CHEROKEE, SPARTANBURG, UNION, CHESTER, AND YORK COUNTIES, SOUTH CAROLINA AND CLEVELAND, GASTON, AND MECKLENBURG COUNTIES, NORTH CAROLINA

Location or County	Date	Time	Magnitude Fujita Scale	Length (mi.)	Width (yards)	Area (mi^2)
10 YORK	3/6/1989	1230	F0	1	10	0.01
11 CLOVER	3/27/1994	1843	F1	1	30	0.02
12 YORK	8/16/1994	1650	F0	0	50	
13 YORK	5/1/1995	2103	F0	1	50	0.03
14 CLOVER	2/21/1997	1720	F0	2	100	0.11
15 CLOVER	4/19/1998	1430	F0	0	20	
16 ROCK HILL	4/19/1998	1508	F0	0	10	
17 ROCK HILL	2/22/2003	1005	F0	0	25	
18 ROCK HILL	9/7/2004	1043	F1	1	100	0.06
Cleveland County, NC						
1 CLEVELAND	5/27/1973	1900	F3	13	100	0.74
2 CLEVELAND	5/15/1975	1430	F1	0	0	
3 CLEVELAND	6/24/1979	0030	F1	1	300	0.17
4 CLEVELAND	5/5/1989	1654	F4	5	800	2.27
5 CLEVELAND	2/10/1990	0800	F2	0	50	

TABLE 2.7-4 (Sheet 7 of 9)
TORNADOES IN CHEROKEE, SPARTANBURG, UNION, CHESTER, AND YORK COUNTIES, SOUTH CAROLINA AND CLEVELAND, GASTON, AND MECKLENBURG COUNTIES, NORTH CAROLINA

Location or County	Date	Time	Magnitude Fujita Scale	Length (mi.)	Width (yards)	Area (mi^2)
6 CLEVELAND	4/10/1990	1950	F0	0	30	
7 CLEVELAND	6/4/1992	1602	F0	0	200	
8 CLEVELAND	11/22/1992	2115	F1	5	500	1.42
9 EARL	8/16/1994	1730	F1	2	200	0.23
10 SHELBY	9/16/1996	1735	F0	0	180	
11 POLKVILLE	7/12/2003	1925	F1	6	200	0.68
12 WACO	9/17/2004	0505	F0	1	40	0.02
13 PATTERSON SPGS	9/27/2004	2200	F1	2	30	0.03
Gaston County, NC						
1 GASTON	4/6/1956	1300	F1	56	100	3.18
2 GASTON	5/28/1973	1800	F0	0	0	
3 GASTON	4/2/1974	0153	F1	10	100	0.57
4 GASTON	5/15/1975	1530	F1	0	0	
5 Crowders	2/21/1997	1722	F1	15	200	1.70
6 CHERRYVILLE	7/12/2003	2000	F1	18	200	2.05

TABLE 2.7-4 (Sheet 8 of 9)
TORNADOES IN CHEROKEE, SPARTANBURG, UNION, CHESTER, AND YORK COUNTIES, SOUTH CAROLINA AND CLEVELAND, GASTON, AND MECKLENBURG COUNTIES, NORTH CAROLINA

Location or County	Date	Time	Magnitude Fujita Scale	Length (mi.)	Width (yards)	Area (mi^2)
7 GASTONIA	3/8/2005	0715	F0	0	50	
Mecklenburg County, NC						
1 MECKLENBURG	2/18/1960	1245	F1	24	33	0.45
2 MECKLENBURG	4/12/1961	1710	F1	1	200	0.11
3 MECKLENBURG	8/10/1964	1645	F1	0	0	
4 MECKLENBURG	9/12/1965	1930	F2	0	70	
5 MECKLENBURG	6/7/1968	1430	F2	17	200	1.93
6 MECKLENBURG	5/28/1973	0500	F2	10	100	0.57
7 MECKLENBURG	5/28/1973	1700	F1	0	0	
8 MECKLENBURG	10/8/1975	1425	F1	0	50	
9 MECKLENBURG	9/16/1977	1330	F1	0	7	
10 MECKLENBURG	8/14/1978	1145	F0	0	0	
11 MECKLENBURG	5/3/1984	1545	F1	14	100	0.80
12 MECKLENBURG	6/6/1985	1620	F0	1	267	0.15
13 MECKLENBURG	11/28/1990	1940	F1	0	20	

TABLE 2.7-4 (Sheet 9 of 9)
TORNADOES IN CHEROKEE, SPARTANBURG, UNION, CHESTER, AND YORK COUNTIES, SOUTH CAROLINA AND CLEVELAND, GASTON, AND MECKLENBURG COUNTIES, NORTH CAROLINA

Location or County	Date	Time	Magnitude Fujita Scale	Length (mi.)	Width (yards)	Area (mi^2)
14 MECKLENBURG	3/10/1992	2107	F2	3	180	0.31
15 MINT HILL	3/20/1998	1442	F0	0	25	
16 CORNELIUS	5/7/1998	1845	F0	6	50	0.17
17 PINEVILLE	8/1/1999	1935	F0	0	10	
18 CHARLOTTE	9/7/2004	1045	F2	2	200	0.23
19 CHARLOTTE	3/8/2005	0740	F1	3	50	0.09

	F0	F1	F2	F3	F4
Total Number	37	55	18	4	3
Frequency (per Year)	0.7	1.0	0.3	0.1	0.1

NOTES:

1. Tornado data from all years were used to calculate the annual frequencies given in text.
2. Tornadoes with a zero (or missing) reported area, path length, or width do not represent valid data for statistical purposes.
3. Data recorded in the NOAA's National Environmental Satellite, Data, and Information Service (NEDSIS) - NCDC Storm Event database, 1950-2005, http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms

TABLE 2.7-5
THUNDERSTORMS AND HIGH WIND EVENTS
CHEROKEE, SPARTANBURG, UNION, CHESTER, AND YORK COUNTIES, SOUTH CAROLINA
CLEVELAND, GASTON, AND MECKLENBURG COUNTIES, NORTH CAROLINA

Month	Cherokee, SC (#)	Spartanburg, SC (#)	Union, SC (#)	Chester, SC (#)	York, SC (#)	Cleveland, NC (#)	Gaston, NC (#)	Mecklenburg, NC (#)	All Eight Areas (#)	Average per Year (#/yr)
Jan	4	6	1	1	3	2	1	6	24	0.43
Feb	3	8	5	3	9	6	4	6	44	0.79
Mar	13	18	8	8	15	7	11	13	93	1.66
Apr	7	30	8	9	11	8	5	15	93	1.66
May	18	33	9	19	19	23	19	28	168	3.00
Jun	32	63	27	18	30	10	24	38	242	4.32
Jul	31	82	21	11	29	31	37	45	287	5.13
Aug	17	37	12	6	27	15	23	33	170	3.04
Sep	3	6	3	6	8	3	1	8	38	0.68
Oct	1	3	0	0	2	2	1	0	9	0.16
Nov	5	12	6	3	8	3	2	4	43	0.77
Dec	0	1	3	1	1	1	0	1	8	0.14
Total	134	299	103	85	162	111	128	197	1219	21.77
Percent	11.0	24.5	8.4	7.0	13.3	9.1	10.5	16.2		

NOTES:

1. Storms listed at different sites in the same county on the same day were counted as separate events.
2. Average/yr was based on the period 1950 - 2005. Prior to 1981, the yearly storm averages were markedly less frequent, suggesting less thorough storm data collection.
3. Lee Nuclear Station site is in Cherokee County. The other counties listed are surrounding Cherokee County.
4. Data recorded in the NOAA Storm Events Database, 1950 - 2005 http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms (Reference 5).

TABLE 2.7-6
HAIL STORM EVENTS
CHEROKEE, SPARTANBURG, UNION, CHESTER, AND YORK COUNTIES, SOUTH CAROLINA
CLEVELAND, GASTON, AND MECKLENBURG COUNTIES, NORTH CAROLINA

County	Number of Events	Percentage	Events with Property Damage
Cherokee, SC	58	9%	3
Spartanburg, SC	157	23%	7
Union, SC	52	8%	1
Chester, SC	42	6%	0
York, SC	67	10%	2
Cleveland, NC	71	11%	0
Gaston, NC	85	13%	1
Mecklenburg, NC	138	21%	1
Total	670	100%	15

Number per year = 12

NOTES:

1. Data from NOAA's Satellite & Information System - NCDC Storm Events Database, 1950 - 2005, http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms

2. For this table, each occurrence of hail was counted as an individual event, even if two counties recorded hail simultaneously.

TABLE 2.7-7
MEAN VENTILATION RATE BY MONTH
GREENSBORO, NC

	Morning Ventilation Rate (m^2/s)	Afternoon Ventilation Rate (m^2/s)	Mean Ventilation Rate (m^2/s)
Jan	3914	6289	5101
Feb	3937	7379	5658
Mar	3979	9203	6591
Apr	3490	12736	8113
May	2631	9404	6017
Jun	2373	9469	5921
July	2338	7779	5059
Aug	2129	6096	4113
Sep	2172	6228	4200
Oct	2025	6262	4143
Nov	2882	5743	4312
Dec	3719	5904	4811

NOTES:

1. Source of data is National Climatic Data Center for 1984-1987, 1989-1991 for Greensboro, High Point, NC, Station 13723 (Lat 36.083, Long 79.950), http://www.epa.gov/scram001/mixingheightdata.htm

2. Atmospheric ventilation rate is numerically equal to the product of the mixing height and the wind speed within the mixing layer.

TABLE 2.7-8 (Sheet 1 of 19)
ICE STORMS
CHEROKEE, SPARTANBURG, UNION, CHESTER, AND YORK COUNTIES, SOUTH CAROLINA
CLEVELAND, GASTON, AND MECKLENBURG COUNTIES, NORTH CAROLINA

Date	Time	Type	Deaths	Injuries	Property Damage	Crop Damage
Cherokee County, SC						
3/13/1993	0200	Winter Storm	0	0	0	0
12/22/1993	2100	Snow	0	0	0	0
2/10/1994	1800	Freezing Rain/sleet	0	0	0	0
2/11/1994	1110	Ice Storm	0	0	5.0M	0
1/6/1995	1400	Freezing Rain	0	0	100K	0
1/23/1995	1400	Snow	0	0	0	0
2/7/1995	1800	Snow	0	0	0	0
2/10/1995	0500	Snow Freezing Rain	0	0	0	0
1/6/1996	1800	Winter Storm	0	0	50K	0
1/6/1996	0800	Winter Storm	0	0	0	0
1/7/1996	0000	Winter Storm	0	0	50K	0
1/11/1996	2000	Winter Storm	0	0	0	0
2/2/1996	0100	Freezing Rain	0	0	0	0
2/2/1996	1630	Ice Storm	0	0	0	0
2/2/1996	0500	Ice Storm	0	0	0	0

TABLE 2.7-8 (Sheet 2 of 19)
ICE STORMS
CHEROKEE, SPARTANBURG, UNION, CHESTER, AND YORK COUNTIES, SOUTH CAROLINA
CLEVELAND, GASTON, AND MECKLENBURG COUNTIES, NORTH CAROLINA

Date	Time	Type	Deaths	Injuries	Property Damage	Crop Damage
2/16/1996	0600	Snow	0	0	0	0
1/9/1997	0000	Ice Storm	0	0	200K	0
2/13/1997	1200	Ice Storm	0	0	0	0
12/29/1997	0530	Snow	0	0	0	0
1/19/1998	0600	Snow	0	0	0	0
12/23/1998	0900	Freezing Rain/sleet	0	0	0	0
12/24/1998	0500	Ice Storm	0	0	0	0
1/2/1999	1800	Ice Storm	0	0	20.0M	0
1/31/1999	1200	Snow And Sleet	0	0	0	0
2/1/1999	0000	Freezing Rain	0	0	0	0
2/19/1999	1200	Snow	0	0	0	0
1/22/2000	1800	Heavy Snow	0	0	0	0
1/24/2000	1000	Heavy Snow	0	0	0	0
1/29/2000	2100	Ice Storm	0	0	0	0
11/19/2000	0600	Snow	0	0	0	0
12/3/2000	0200	Snow	0	0	0	0

TABLE 2.7-8 (Sheet 3 of 19)
ICE STORMS
CHEROKEE, SPARTANBURG, UNION, CHESTER, AND YORK COUNTIES, SOUTH CAROLINA
CLEVELAND, GASTON, AND MECKLENBURG COUNTIES, NORTH CAROLINA

Date	Time	Type	Deaths	Injuries	Property Damage	Crop Damage
12/13/2000	1300	Freezing Rain	0	0	0	0
12/19/2000	0200	Snow	0	0	0	0
12/21/2000	1400	Freezing Rain	0	0	0	0
4/17/2001	0700	Snow Showers	0	0	0	0
1/3/2002	0000	Heavy Snow	0	0	0	0
12/4/2002	1500	Ice Storm	0	0	100.0M	0
1/16/2003	1800	Winter Weather/mix	0	0	0	0
1/23/2003	0600	Heavy Snow	0	0	0	0
12/4/2003	0600	Winter Weather/mix	0	0	0	0
1/27/2004	0000	Winter Weather/mix	0	0	0	0
2/26/2004	1000	Heavy Snow	0	0	1.9M	0
1/29/2005	1300	Winter Storm	0	0	0	0
1/29/2005	0400	Winter Weather/mix	0	0	0	0
12/8/2005	1600	Winter Weather	0	0	0	0
12/15/2005	0600	Ice Storm	0	0	900K	0
12/15/2005	0000	Winter Weather	0	0	0	0

TABLE 2.7-8 (Sheet 4 of 19)
ICE STORMS
CHEROKEE, SPARTANBURG, UNION, CHESTER, AND YORK COUNTIES, SOUTH CAROLINA
CLEVELAND, GASTON, AND MECKLENBURG COUNTIES, NORTH CAROLINA

Date	Time	Type	Deaths	Injuries	Property Damage	Crop Damage
Spartanburg County, SC						
1/11/1994	0300	Freezing Rain	0	0	0	0
2/10/1994	1800	Freezing Rain/sleet	0	0	0	0
2/11/1994	1110	Ice Storm	0	0	5.0M	0
1/6/1995	1400	Freezing Rain	0	0	100K	0
2/7/1995	1800	Snow	0	0	0	0
2/10/1995	0500	Snow Freezing Rain	0	0	0	0
1/6/1996	1800	Winter Storm	0	0	50K	0
1/6/1996	0800	Winter Storm	0	0	0	0
1/7/1996	0000	Winter Storm	0	0	50K	0
1/11/1996	2000	Winter Storm	0	0	0	0
2/2/1996	0100	Freezing Rain	0	0	0	0
2/2/1996	1630	Ice Storm	0	0	0	0
2/16/1996	0600	Snow	0	0	0	0
12/18/1996	1800	Heavy Snow	0	0	0	0
1/9/1997	0000	Ice Storm	0	0	200K	0

TABLE 2.7-8 (Sheet 5 of 19)
ICE STORMS
CHEROKEE, SPARTANBURG, UNION, CHESTER, AND YORK COUNTIES, SOUTH CAROLINA
CLEVELAND, GASTON, AND MECKLENBURG COUNTIES, NORTH CAROLINA

Date	Time	Type	Deaths	Injuries	Property Damage	Crop Damage
2/13/1997	1200	Ice Storm	0	0	0	0
12/29/1997	0530	Heavy Snow	0	0	0	0
1/19/1998	0600	Snow	0	0	0	0
12/23/1998	0900	Freezing Rain/sleet	0	0	0	0
12/24/1998	0500	Ice Storm	0	0	0	0
1/2/1999	1800	Ice Storm	0	0	20.0M	0
1/31/1999	1200	Snow And Sleet	0	0	0	0
2/1/1999	0000	Freezing Rain	0	0	0	0
2/24/1999	0000	Snow	0	0	0	0
3/9/1999	0400	Winter Storm	0	0	0	0
1/22/2000	1800	Heavy Snow	0	0	0	0
1/23/2000	0300	Ice Storm	0	0	0	0
1/24/2000	1000	Heavy Snow	0	0	0	0
1/29/2000	2100	Ice Storm	0	0	0	0
11/19/2000	0600	Snow	0	0	0	0
12/3/2000	0200	Snow	0	0	0	0

TABLE 2.7-8 (Sheet 6 of 19)
ICE STORMS
CHEROKEE, SPARTANBURG, UNION, CHESTER, AND YORK COUNTIES, SOUTH CAROLINA
CLEVELAND, GASTON, AND MECKLENBURG COUNTIES, NORTH CAROLINA

Date	Time	Type	Deaths	Injuries	Property Damage	Crop Damage
12/13/2000	1300	Freezing Rain	0	0	0	0
12/19/2000	0200	Snow	0	0	0	0
12/21/2000	1400	Freezing Rain	0	0	0	0
3/20/2001	0700	Heavy Snow	0	0	0	0
4/17/2001	0700	Snow Showers	0	0	0	0
1/3/2002	0000	Heavy Snow	0	0	0	0
12/4/2002	1500	Ice Storm	0	0	100.0M	0
1/16/2003	1800	Winter Weather/mix	0	0	0	0
1/23/2003	0600	Heavy Snow	0	0	0	0
2/16/2003	1400	Winter Storm	0	0	0	0
12/4/2003	0600	Winter Weather/mix	0	0	0	0
1/27/2004	0000	Winter Weather/mix	0	0	0	0
2/2/2004	1800	Winter Weather/mix	0	0	0	0
2/26/2004	1000	Heavy Snow	0	0	1.9M	0
1/29/2005	1300	Winter Storm	0	0	0	0
1/29/2005	0400	Winter Weather/mix	0	0	0	0

TABLE 2.7-8 (Sheet 7 of 19)
ICE STORMS
CHEROKEE, SPARTANBURG, UNION, CHESTER, AND YORK COUNTIES, SOUTH CAROLINA
CLEVELAND, GASTON, AND MECKLENBURG COUNTIES, NORTH CAROLINA

Date	Time	Type	Deaths	Injuries	Property Damage	Crop Damage
12/8/2005	1600	Winter Weather	0	0	0	0
12/15/2005	0600	Ice Storm	0	0	900K	0
12/15/2005	0000	Winter Weather	0	0	0	0
Union County, SC						
12/22/1993	2100	Snow	0	0	0	0
2/10/1994	1800	Freezing Rain/sleet	0	0	0	0
2/11/1994	1110	Ice Storm	0	0	5.0M	0
1/6/1995	1400	Freezing Rain	0	0	100K	0
1/7/1996	0300	Winter Storm	0	0	0	0
2/3/1996	0200	Freezing Rain	0	0	0	0
2/16/1996	0600	Snow	0	0	0	0
12/29/1997	0530	Snow	0	0	0	0
1/19/1998	0600	Snow	0	0	0	0
1/2/1999	1800	Ice Storm	0	0	20.0M	0
1/22/2000	1800	Heavy Snow	0	0	0	0
1/23/2000	0300	Ice Storm	0	0	0	0

TABLE 2.7-8 (Sheet 8 of 19)
ICE STORMS
CHEROKEE, SPARTANBURG, UNION, CHESTER, AND YORK COUNTIES, SOUTH CAROLINA
CLEVELAND, GASTON, AND MECKLENBURG COUNTIES, NORTH CAROLINA

Date	Time	Type	Deaths	Injuries	Property Damage	Crop Damage
1/24/2000	1000	Heavy Snow	0	0	0	0
1/29/2000	2100	Ice Storm	0	0	0	0
11/19/2000	0600	Snow	0	0	0	0
4/17/2001	0700	Snow Showers	0	0	0	0
1/3/2002	0000	Heavy Snow	0	0	0	0
12/4/2002	1500	Ice Storm	0	0	100.0M	0
1/23/2003	0600	Heavy Snow	0	0	0	0
2/16/2003	1400	Winter Storm	0	0	0	0
1/27/2004	0000	Winter Weather/mix	0	0	0	0
2/26/2004	1000	Heavy Snow	0	0	1.9M	0
1/29/2005	0400	Winter Weather/mix	0	0	0	0
12/15/2005	0700	Ice Storm	0	0	250K	0
12/15/2005	0000	Winter Weather	0	0	0	0
Chester County, SC						
2/10/1994	1800	Freezing Rain/sleet	0	0	0	0
2/11/1994	1110	Ice Storm	0	0	5.0M	0

TABLE 2.7-8 (Sheet 9 of 19)
ICE STORMS
CHEROKEE, SPARTANBURG, UNION, CHESTER, AND YORK COUNTIES, SOUTH CAROLINA
CLEVELAND, GASTON, AND MECKLENBURG COUNTIES, NORTH CAROLINA

Date	Time	Type	Deaths	Injuries	Property Damage	Crop Damage
1/6/1996	1200	Ice Storm	0	0	0	0
1/7/1996	0300	Winter Storm	0	0	0	0
1/7/1996	0600	Ice Storm	0	0	0	0
1/11/1996	2200	Ice Storm	0	0	0	0
2/3/1996	0200	Freezing Rain	0	0	0	0
12/29/1997	0530	Snow	0	0	0	0
1/19/1998	0600	Snow	0	0	0	0
1/23/2000	0300	Ice Storm	0	0	0	0
1/24/2000	1000	Heavy Snow	0	0	0	0
1/29/2000	2100	Ice Storm	0	0	0	0
11/19/2000	0600	Snow	0	0	0	0
12/3/2000	0200	Snow	0	0	0	0
1/2/2002	2000	Heavy Snow	0	0	0	0
1/2/2002	2120	Winter Storm	0	0	0	0
12/4/2002	1500	Ice Storm	0	0	100.0M	0
12/4/2002	0755	Ice Storm	0	0	0	0

TABLE 2.7-8 (Sheet 10 of 19)
ICE STORMS
CHEROKEE, SPARTANBURG, UNION, CHESTER, AND YORK COUNTIES, SOUTH CAROLINA
CLEVELAND, GASTON, AND MECKLENBURG COUNTIES, NORTH CAROLINA

Date	Time	Type	Deaths	Injuries	Property Damage	Crop Damage
1/23/2003	0600	Heavy Snow	0	0	0	0
1/23/2003	0600	Winter Storm	0	0	0	0
2/16/2003	1400	Winter Storm	0	0	0	0
2/16/2003	2206	Ice Storm	0	22	0	0
1/25/2004	1500	Winter Storm	0	0	0	0
1/27/2004	0000	Winter Weather/mix	0	0	0	0
2/26/2004	0722	Winter Storm	0	0	0	0
2/26/2004	1000	Heavy Snow	0	0	1.9M	0
12/26/2004	0415	Ice Storm	0	0	0	0
12/26/2004	0600	Winter Weather/mix	0	0	0	0
1/29/2005	0400	Winter Weather/mix	0	0	0	0
1/29/2005	1220	Ice Storm	0	0	0	0
12/15/2005	0300	Winter Weather	0	0	0	0
York County, SC						
2/10/1994	1800	Freezing Rain/sleet	0	0	0	0
2/11/1994	1110	Ice Storm	0	0	5.0M	0

TABLE 2.7-8 (Sheet 11 of 19)
ICE STORMS
CHEROKEE, SPARTANBURG, UNION, CHESTER, AND YORK COUNTIES, SOUTH CAROLINA
CLEVELAND, GASTON, AND MECKLENBURG COUNTIES, NORTH CAROLINA

Date	Time	Type	Deaths	Injuries	Property Damage	Crop Damage
1/6/1996	1800	Winter Storm	0	0	50K	0
1/6/1996	0800	Winter Storm	0	0	0	0
1/7/1996	0600	Ice Storm	0	0	0	0
1/7/1996	0000	Winter Storm	0	0	50K	0
1/11/1996	2000	Winter Storm	0	0	0	0
2/2/1996	1630	Ice Storm	0	0	0	0
2/16/1996	0600	Snow	0	0	0	0
2/13/1997	1200	Ice Storm	0	0	0	0
12/29/1997	0530	Snow	0	0	0	0
1/19/1998	0600	Snow	0	0	0	0
12/23/1998	0900	Freezing Rain/sleet	0	0	0	0
12/24/1998	0500	Ice Storm	0	0	0	0
2/19/1999	1200	Snow	0	0	0	0
1/22/2000	1800	Snow	0	0	0	0
1/23/2000	0300	Ice Storm	0	0	0	0
1/24/2000	1000	Heavy Snow	0	0	0	0

TABLE 2.7-8 (Sheet 12 of 19)
ICE STORMS
CHEROKEE, SPARTANBURG, UNION, CHESTER, AND YORK COUNTIES, SOUTH CAROLINA
CLEVELAND, GASTON, AND MECKLENBURG COUNTIES, NORTH CAROLINA

Date	Time	Type	Deaths	Injuries	Property Damage	Crop Damage
1/29/2000	2100	Ice Storm	0	0	0	0
11/19/2000	0600	Snow	0	0	0	0
12/21/2000	1400	Freezing Rain	0	0	0	0
4/17/2001	0700	Snow Showers	0	0	0	0
1/2/2002	2000	Heavy Snow	0	0	0	0
12/4/2002	1500	Ice Storm	0	0	100.0M	0
1/23/2003	0600	Heavy Snow	0	0	0	0
1/27/2004	0000	Winter Weather/mix	0	0	0	0
2/26/2004	1000	Heavy Snow	0	0	1.9M	0
1/29/2005	1300	Winter Storm	0	0	0	0
1/29/2005	0400	Winter Weather/mix	0	0	0	0
12/15/2005	0300	Winter Weather	0	0	0	0
Cleveland County, NC						
2/10/1994	1000	Ice Storm	0	0	0	0
1/11/1996	1800	Winter Storm	0	0	0	0
2/2/1996	0600	Ice Storm	0	0	10.0M	0

TABLE 2.7-8 (Sheet 13 of 19)
ICE STORMS
CHEROKEE, SPARTANBURG, UNION, CHESTER, AND YORK COUNTIES, SOUTH CAROLINA
CLEVELAND, GASTON, AND MECKLENBURG COUNTIES, NORTH CAROLINA

Date	Time	Type	Deaths	Injuries	Property Damage	Crop Damage
2/3/1996	1800	Snow	0	0	0	0
2/16/1996	0200	Snow	0	0	0	0
2/13/1997	1500	Ice Storm	0	0	0	0
2/13/1997	1000	Winter Storm	0	0	0	0
12/29/1997	0530	Snow	0	0	0	0
12/23/1998	0900	Freezing Rain/sleet	0	0	0	0
1/2/1999	1800	Ice Storm	0	0	0	0
2/1/1999	0000	Freezing Rain	0	0	0	0
2/19/1999	1200	Snow	0	0	0	0
3/9/1999	0300	Snow And Sleet	0	0	0	0
1/18/2000	0400	Snow	0	0	0	0
1/22/2000	1500	Heavy Snow	0	0	0	0
1/24/2000	1300	Heavy Snow	0	0	0	0
1/29/2000	2100	Freezing Rain	0	0	0	0
11/19/2000	0600	Snow	0	0	0	0
12/3/2000	0300	Snow	0	0	0	0

TABLE 2.7-8 (Sheet 14 of 19)
ICE STORMS
CHEROKEE, SPARTANBURG, UNION, CHESTER, AND YORK COUNTIES, SOUTH CAROLINA
CLEVELAND, GASTON, AND MECKLENBURG COUNTIES, NORTH CAROLINA

Date	Time	Type	Deaths	Injuries	Property Damage	Crop Damage
12/13/2000	1700	Freezing Rain	0	0	0	0
2/22/2001	0300	Snow/sleet	0	0	0	0
3/20/2001	0800	Heavy Snow	0	0	0	0
4/17/2001	0700	Snow Showers	0	0	0	0
1/3/2002	0000	Heavy Snow	0	0	0	0
12/4/2002	1500	Ice Storm	0	0	99.0M	0
1/16/2003	1800	Winter Weather/mix	0	0	0	0
1/23/2003	0400	Heavy Snow	0	0	0	0
2/27/2003	0000	Winter Weather/mix	0	0	0	0
12/4/2003	0600	Winter Weather/mix	0	0	0	0
12/14/2003	0800	Ice Storm	0	0	3K	0
1/27/2004	0000	Winter Weather/mix	0	0	0	0
2/26/2004	1000	Heavy Snow	0	0	3.1M	0
1/29/2005	1300	Winter Storm	0	0	0	0
1/29/2005	0400	Winter Weather/mix	0	0	0	0
3/17/2005	0200	Winter Weather/mix	0	0	0	0

TABLE 2.7-8 (Sheet 15 of 19)
ICE STORMS
CHEROKEE, SPARTANBURG, UNION, CHESTER, AND YORK COUNTIES, SOUTH CAROLINA
CLEVELAND, GASTON, AND MECKLENBURG COUNTIES, NORTH CAROLINA

Date	Time	Type	Deaths	Injuries	Property Damage	Crop Damage
12/8/2005	1600	Winter Weather	0	0	0	0
12/15/2005	0600	Ice Storm	0	0	450K	0
12/15/2005	0000	Winter Weather	0	0	0	0
3/20/2006	1200	Winter Weather	0	0	0	0
Gaston County, NC						
2/10/1994	1000	Ice Storm	0	0	0	0
1/6/1996	1800	Winter Storm	0	0	0	0
1/11/1996	1800	Winter Storm	0	0	0	0
2/2/1996	0600	Ice Storm	0	0	10.0M	0
2/3/1996	1800	Snow	0	0	0	0
2/16/1996	0200	Snow	0	0	0	0
2/13/1997	1500	Ice Storm	0	0	0	0
2/13/1997	1000	Winter Storm	0	0	0	0
12/29/1997	0530	Snow	0	0	0	0
1/19/1998	0600	Snow	0	0	0	0
12/23/1998	0900	Freezing Rain/sleet	0	0	0	0

TABLE 2.7-8 (Sheet 16 of 19)
ICE STORMS
CHEROKEE, SPARTANBURG, UNION, CHESTER, AND YORK COUNTIES, SOUTH CAROLINA
CLEVELAND, GASTON, AND MECKLENBURG COUNTIES, NORTH CAROLINA

Date	Time	Type	Deaths	Injuries	Property Damage	Crop Damage
12/24/1998	0500	Ice Storm	0	0	0	0
1/2/1999	1800	Ice Storm	0	0	0	0
2/1/1999	0000	Freezing Rain	0	0	0	0
2/19/1999	1200	Snow	0	0	0	0
3/9/1999	0300	Snow And Sleet	0	0	0	0
1/18/2000	0400	Snow	0	0	0	0
1/22/2000	1500	Heavy Snow	0	0	0	0
1/24/2000	1300	Heavy Snow	0	0	0	0
1/29/2000	2100	Ice Storm	0	0	0	0
11/19/2000	0600	Snow	0	0	0	0
4/17/2001	0700	Snow Showers	0	0	0	0
1/3/2002	0000	Heavy Snow	0	0	0	0
12/4/2002	1500	Ice Storm	0	0	99.0M	0
1/16/2003	1800	Winter Weather/mix	0	0	0	0
1/23/2003	0600	Heavy Snow	0	0	0	0
2/27/2003	0000	Winter Weather/mix	0	0	0	0

TABLE 2.7-8 (Sheet 17 of 19)
ICE STORMS
CHEROKEE, SPARTANBURG, UNION, CHESTER, AND YORK COUNTIES, SOUTH CAROLINA
CLEVELAND, GASTON, AND MECKLENBURG COUNTIES, NORTH CAROLINA

Date	Time	Type	Deaths	Injuries	Property Damage	Crop Damage
1/27/2004	0000	Winter Weather/mix	0	0	0	0
2/26/2004	1000	Heavy Snow	0	0	3.1M	0
1/29/2005	1300	Winter Storm	0	0	0	0
1/29/2005	0400	Winter Weather/mix	0	0	0	0
12/15/2005	0600	Ice Storm	0	0	450K	0
12/15/2005	0000	Winter Weather	0	0	0	0
Mecklenburg County, NC						
2/10/1994	1000	Ice Storm	0	0	0	0
1/6/1996	1800	Winter Storm	0	0	0	0
1/11/1996	1800	Winter Storm	0	0	0	0
2/2/1996	0600	Ice Storm	0	0	10.0M	0
2/3/1996	1800	Snow	0	0	0	0
2/16/1996	0200	Snow	0	0	0	0
2/13/1997	1500	Ice Storm	0	0	0	0
12/29/1997	0530	Snow	0	0	0	0
1/19/1998	0600	Snow	0	0	0	0

TABLE 2.7-8 (Sheet 18 of 19)
ICE STORMS
CHEROKEE, SPARTANBURG, UNION, CHESTER, AND YORK COUNTIES, SOUTH CAROLINA
CLEVELAND, GASTON, AND MECKLENBURG COUNTIES, NORTH CAROLINA

Date	Time	Type	Deaths	Injuries	Property Damage	Crop Damage
12/23/1998	0900	Freezing Rain/sleet	0	0	0	0
12/24/1998	0500	Ice Storm	0	0	0	0
2/19/1999	1200	Snow	0	0	0	0
1/18/2000	0400	Snow	0	0	0	0
1/22/2000	1500	Heavy Snow	0	0	0	0
1/24/2000	1300	Heavy Snow	0	0	0	0
1/29/2000	2100	Ice Storm	0	0	0	0
11/19/2000	0600	Snow	0	0	0	0
1/2/2002	2000	Heavy Snow	0	0	0	0
12/4/2002	1500	Ice Storm	0	0	99.0M	0
1/16/2003	1800	Winter Weather/mix	0	0	0	0
1/23/2003	0600	Heavy Snow	0	0	0	0
2/27/2003	0000	Winter Weather/mix	0	0	0	0
12/4/2003	0600	Winter Weather/mix	0	0	0	0
1/27/2004	0000	Winter Weather/mix	0	0	0	0
2/26/2004	1000	Heavy Snow	0	0	3.1M	0

TABLE 2.7-8 (Sheet 19 of 19)
ICE STORMS
CHEROKEE, SPARTANBURG, UNION, CHESTER, AND YORK COUNTIES, SOUTH CAROLINA
CLEVELAND, GASTON, AND MECKLENBURG COUNTIES, NORTH CAROLINA

Date	Time	Type	Deaths	Injuries	Property Damage	Crop Damage
1/29/2005	1300	Winter Storm	0	0	0	0
1/29/2005	0400	Winter Weather/mix	0	0	0	0
12/15/2005	1100	Ice Storm	1	0	300K	0

NOTES:

1. Lee Nuclear Station site is in Cherokee County. The other counties are surrounding Cherokee County.
2. Data recorded in the NOAA Storm Events Database, 01/01/1950 - 12/31/2005 http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms.

TABLE 2.7-9 (Sheet 1 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
GREENVILLE/SPARTANBURG, SOUTH CAROLINA
JANUARY, 1997 – 2005

January	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
N	0.70%	2.36%	3.18%	0.96%	0.33%	0.03%	0.00%	7.56%	9.19
NNE	0.90%	2.76%	2.23%	0.40%	0.15%	0.01%	0.00%	6.45%	7.72
NE	1.00%	3.51%	3.57%	0.90%	0.09%	0.04%	0.00%	9.11%	8.24
ENE	0.55%	2.51%	2.20%	0.64%	0.12%	0.00%	0.00%	6.02%	8.34
E	0.60%	1.43%	1.06%	0.13%	0.04%	0.00%	0.00%	3.27%	7.30
ESE	0.25%	0.63%	0.07%	0.01%	0.00%	0.00%	0.00%	0.97%	5.32
SE	0.27%	0.51%	0.13%	0.00%	0.00%	0.00%	0.00%	0.91%	5.21
SSE	0.33%	0.76%	0.25%	0.00%	0.00%	0.00%	0.00%	1.34%	5.65
S	0.99%	2.24%	0.97%	0.25%	0.00%	0.00%	0.00%	4.45%	6.61
SSW	0.87%	2.17%	2.06%	0.42%	0.04%	0.01%	0.00%	5.57%	7.59
SW	0.76%	2.91%	5.59%	2.24%	0.45%	0.04%	0.01%	12.01%	9.97
WSW	0.42%	2.99%	5.36%	2.26%	0.61%	0.06%	0.00%	11.69%	10.43
W	0.66%	1.99%	2.30%	0.55%	0.09%	0.04%	0.00%	5.63%	8.35
WNW	0.24%	0.75%	0.31%	0.10%	0.01%	0.00%	0.00%	1.42%	6.74

TABLE 2.7-9 (Sheet 2 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
GREENVILLE/SPARTANBURG, SOUTH CAROLINA
JANUARY, 1997 – 2005

January	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
NW	0.25%	0.76%	0.55%	0.12%	0.00%	0.00%	0.00%	1.69%	7.41
NNW	0.37%	1.02%	1.51%	0.51%	0.18%	0.04%	0.00%	3.63%	9.62
CALM	14.22%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	14.22%	
MISSING	4.06%							4.06%	
Total	27.43%	29.29%	31.35%	9.50%	2.12%	0.30%	0.01%	100.00%	7.73

NOTES:

1. Calm is classified as a wind speed less than 2.3 mph (anemometer start speed).
2. Missing data is data with missing wind speed, missing wind direction, or a variable wind direction.
3. Data from Unedited Local Climatological Data, National Oceanic and Atmospheric Administration, U. S. Department of Commerce, Asheville, NC, Greenville/ Spartanburg International Airport, Station No. 03870.
4. Period of Record - 9 years (1997 - 2005).

TABLE 2.7-10 (Sheet 1 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
GREENVILLE/SPARTANBURG, SOUTH CAROLINA
FEBRUARY, 1997 – 2005

February	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
N	0.95%	2.44%	2.40%	0.80%	0.15%	0.00%	0.00%	6.74%	8.28
NNE	0.64%	2.87%	2.82%	0.66%	0.07%	0.02%	0.00%	7.07%	8.02
NE	1.02%	4.18%	5.00%	1.38%	0.51%	0.20%	0.00%	12.29%	9.18
ENE	0.80%	2.46%	2.77%	0.80%	0.33%	0.20%	0.00%	7.37%	9.12
E	0.43%	1.67%	1.35%	0.07%	0.00%	0.02%	0.00%	3.53%	7.17
ESE	0.28%	0.71%	0.23%	0.00%	0.00%	0.00%	0.00%	1.21%	5.71
SE	0.28%	0.74%	0.18%	0.00%	0.00%	0.00%	0.00%	1.20%	5.60
SSE	0.34%	1.28%	0.23%	0.00%	0.00%	0.00%	0.00%	1.85%	5.60
S	0.72%	2.30%	0.95%	0.07%	0.02%	0.00%	0.00%	4.05%	6.41
SSW	0.80%	2.07%	1.62%	0.38%	0.15%	0.05%	0.00%	5.07%	7.96
SW	0.59%	2.72%	3.64%	1.30%	0.43%	0.05%	0.02%	8.74%	9.56
WSW	0.75%	2.23%	3.89%	1.59%	0.43%	0.11%	0.03%	9.04%	10.04
W	0.46%	1.79%	2.13%	0.69%	0.26%	0.05%	0.00%	5.38%	9.25
WNW	0.31%	0.59%	0.51%	0.23%	0.08%	0.02%	0.00%	1.74%	8.56

TABLE 2.7-10 (Sheet 2 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
GREENVILLE/SPARTANBURG, SOUTH CAROLINA
FEBRUARY, 1997 – 2005

February	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
NW	0.33%	0.62%	0.31%	0.20%	0.00%	0.00%	0.00%	1.46%	7.15
NNW	0.25%	0.89%	0.80%	0.34%	0.15%	0.00%	0.00%	2.43%	8.88
CALM	15.76%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	15.76%	
MISSING	5.07%							5.07%	
Total	29.79%	29.56%	28.84%	8.50%	2.56%	0.71%	0.05%	100.00%	7.90

NOTES:

1. Calm is classified as a wind speed less than 2.3 mph (anemometer start speed).

2. Missing data is data with missing wind speed, missing wind direction, or a variable wind direction.

3. Data from Unedited Local Climatological Data, National Oceanic and Atmospheric Administration, U. S. Department of Commerce, Asheville, NC, Greenville/ Spartanburg International Airport, Station No. 03870.

4. Period of Record - 9 years (1997 - 2005).

TABLE 2.7-11 (Sheet 1 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
GREENVILLE/SPARTANBURG, SOUTH CAROLINA
MARCH, 1997 – 2005

March	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
N	0.54%	1.88%	2.70%	1.24%	0.37%	0.00%	0.01%	6.75%	9.66
NNE	0.48%	2.72%	3.24%	0.64%	0.18%	0.00%	0.00%	7.26%	8.60
NE	0.72%	3.23%	5.12%	1.34%	0.30%	0.07%	0.00%	10.78%	9.25
ENE	0.51%	2.33%	3.54%	1.11%	0.09%	0.01%	0.00%	7.59%	8.92
E	0.33%	1.45%	1.52%	0.19%	0.00%	0.00%	0.00%	3.49%	7.57
ESE	0.27%	0.63%	0.28%	0.01%	0.00%	0.00%	0.00%	1.19%	6.07
SE	0.18%	0.75%	0.33%	0.00%	0.00%	0.00%	0.00%	1.25%	6.07
SSE	0.27%	1.31%	0.34%	0.00%	0.00%	0.00%	0.00%	1.93%	6.00
S	0.72%	2.37%	1.57%	0.10%	0.01%	0.00%	0.00%	4.78%	7.03
SSW	0.54%	2.12%	2.27%	0.70%	0.15%	0.01%	0.00%	5.79%	8.69
SW	0.52%	2.09%	3.67%	1.70%	0.51%	0.13%	0.01%	8.65%	10.44
WSW	0.45%	2.08%	3.99%	1.94%	0.76%	0.33%	0.03%	9.57%	11.26
W	0.45%	1.94%	2.42%	1.00%	0.37%	0.16%	0.03%	6.38%	10.03
WNW	0.27%	0.66%	0.61%	0.24%	0.06%	0.07%	0.00%	1.91%	9.21

TABLE 2.7-11 (Sheet 2 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
GREENVILLE/SPARTANBURG, SOUTH CAROLINA
MARCH, 1997 – 2005

March	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
NW	0.16%	0.73%	0.70%	0.12%	0.04%	0.01%	0.00%	1.78%	8.00
NNW	0.30%	0.94%	1.16%	0.51%	0.18%	0.04%	0.00%	3.14%	9.72
CALM	11.66%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	11.66%	
MISSING	6.09%							6.09%	
Total	24.45%	27.23%	33.48%	10.86%	3.03%	0.87%	0.09%	100.00%	8.53

NOTES:

1. Calm is classified as a wind speed less than 2.3 mph (anemometer start speed).
2. Missing data is data with missing wind speed, missing wind direction, or a variable wind direction.
3. Data from Unedited Local Climatological Data, National Oceanic and Atmospheric Administration, U. S. Department of Commerce, Asheville, NC, Greenville/Spartanburg International Airport, Station No. 03870.
4. Period of Record - 9 years (1997 - 2005).

TABLE 2.7-12 (Sheet 1 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
GREENVILLE/SPARTANBURG, SOUTH CAROLINA
APRIL, 1997-2005

April	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
N	0.82%	1.71%	2.48%	0.76%	0.29%	0.06%	0.00%	6.13%	9.13
NNE	0.56%	1.84%	2.07%	0.68%	0.02%	0.03%	0.02%	5.20%	8.52
NE	0.51%	2.47%	3.43%	1.54%	0.23%	0.03%	0.00%	8.21%	9.62
ENE	0.66%	1.84%	2.05%	0.71%	0.32%	0.00%	0.00%	5.59%	8.85
E	0.42%	1.05%	1.19%	0.11%	0.00%	0.00%	0.00%	2.76%	7.37
ESE	0.03%	0.42%	0.37%	0.02%	0.00%	0.00%	0.00%	0.83%	7.26
SE	0.17%	0.66%	0.46%	0.03%	0.00%	0.00%	0.00%	1.33%	6.74
SSE	0.17%	1.20%	0.80%	0.09%	0.00%	0.00%	0.00%	2.27%	6.86
S	0.82%	2.92%	2.33%	0.40%	0.06%	0.00%	0.00%	6.53%	7.54
SSW	0.62%	2.76%	3.58%	1.02%	0.20%	0.00%	0.00%	8.18%	8.93
SW	0.48%	3.43%	5.54%	2.11%	0.59%	0.11%	0.02%	12.27%	10.11
WSW	0.54%	2.90%	4.20%	2.07%	0.80%	0.29%	0.02%	10.82%	10.46
W	0.43%	2.21%	2.31%	1.02%	0.45%	0.19%	0.06%	6.67%	10.31
WNW	0.17%	0.63%	0.66%	0.25%	0.11%	0.08%	0.00%	1.90%	9.75

TABLE 2.7-12 (Sheet 2 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
GREENVILLE/SPARTANBURG, SOUTH CAROLINA
APRIL, 1997-2005

April	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
NW	0.29%	0.69%	0.54%	0.15%	0.06%	0.00%	0.00%	1.74%	7.89
NNW	0.28%	0.65%	0.97%	0.42%	0.12%	0.00%	0.00%	2.44%	9.25
CALM	11.62%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	11.62%	
MISSING	5.52%							5.52%	
Total	24.10%	27.38%	32.99%	11.37%	3.26%	0.79%	0.11%	100.00%	8.66

NOTES:

1. Calm is classified as a wind speed less than 2.3 mph (anemometer start speed).
2. Missing data is data with missing wind speed, missing wind direction, or a variable wind direction.
3. Data from Unedited Local Climatological Data, National Oceanic and Atmospheric Administration, U. S. Department of Commerce, Asheville, NC, Greenville/Spartanburg International Airport, Station No. 03870.
4. Period of Record - 9 years (1997 - 2005).

TABLE 2.7-13 (Sheet 1 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
GREENVILLE/SPARTANBURG, SOUTH CAROLINA
MAY, 1997-2005

May	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
N	0.85%	1.96%	1.51%	0.22%	0.06%	0.01%	0.00%	4.61%	7.36
NNE	0.76%	2.99%	2.43%	0.30%	0.03%	0.00%	0.00%	6.51%	7.39
NE	0.55%	2.97%	3.39%	0.90%	0.04%	0.00%	0.00%	7.86%	8.58
ENE	0.45%	1.48%	2.08%	0.48%	0.12%	0.00%	0.00%	4.60%	8.65
E	0.34%	1.14%	1.08%	0.12%	0.03%	0.00%	0.00%	2.70%	7.55
ESE	0.21%	0.49%	0.34%	0.00%	0.00%	0.00%	0.00%	1.05%	6.54
SE	0.21%	0.57%	0.46%	0.00%	0.00%	0.00%	0.00%	1.24%	6.56
SSE	0.27%	1.48%	0.42%	0.01%	0.00%	0.00%	0.00%	2.18%	6.10
S	0.75%	2.70%	1.58%	0.07%	0.00%	0.00%	0.00%	5.11%	6.67
SSW	0.69%	2.39%	2.72%	0.67%	0.12%	0.00%	0.00%	6.59%	8.38
SW	0.57%	3.00%	5.63%	1.87%	0.43%	0.15%	0.01%	11.66%	9.99
WSW	0.55%	3.54%	5.03%	1.85%	0.40%	0.01%	0.00%	11.39%	9.51
W	0.45%	2.49%	2.69%	0.90%	0.21%	0.01%	0.00%	6.75%	8.75
WNW	0.16%	0.67%	0.57%	0.19%	0.03%	0.01%	0.00%	1.64%	8.20

TABLE 2.7-13 (Sheet 2 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
GREENVILLE/SPARTANBURG, SOUTH CAROLINA
MAY, 1997-2005

May	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
NW	0.19%	0.51%	0.36%	0.04%	0.01%	0.00%	0.00%	1.12%	7.32
NNW	0.39%	0.64%	0.39%	0.07%	0.01%	0.00%	0.00%	1.51%	6.70
CALM	16.58%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	16.58%	
MISSING	6.90%							6.90%	
Total	30.87%	29.02%	30.68%	7.71%	1.51%	0.21%	0.01%	100.00%	7.77

NOTES:

1. Calm is classified as a wind speed less than 2.3 mph (anemometer start speed).
2. Missing data is data with missing wind speed, missing wind direction, or a variable wind direction.
3. Data from Unedited Local Climatological Data, National Oceanic and Atmospheric Administration, U. S. Department of Commerce, Asheville, NC, Greenville/ Spartanburg International Airport, Station No. 03870.
4. Period of Record - 9 years (1997 - 2005).

TABLE 2.7-14 (Sheet 1 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
GREENVILLE/SPARTANBURG, SOUTH CAROLINA
JUNE, 1997-2005

June	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
N	0.82%	2.01%	1.22%	0.23%	0.02%	0.00%	0.00%	4.29%	7.00
NNE	0.88%	3.07%	2.24%	0.35%	0.02%	0.00%	0.00%	6.56%	7.26
NE	0.77%	4.06%	3.33%	0.71%	0.06%	0.00%	0.00%	8.94%	7.89
ENE	0.59%	2.19%	2.58%	0.56%	0.03%	0.00%	0.00%	5.94%	8.19
E	0.62%	1.74%	2.07%	0.34%	0.00%	0.02%	0.00%	4.78%	7.92
ESE	0.26%	0.85%	0.48%	0.02%	0.00%	0.00%	0.00%	1.60%	6.33
SE	0.31%	0.69%	0.45%	0.06%	0.00%	0.00%	0.00%	1.51%	6.54
SSE	0.34%	1.37%	0.74%	0.03%	0.00%	0.00%	0.00%	2.48%	6.34
S	0.88%	2.15%	1.62%	0.26%	0.06%	0.02%	0.00%	4.98%	7.25
SSW	0.43%	1.74%	1.90%	0.23%	0.02%	0.02%	0.00%	4.34%	8.04
SW	0.65%	3.64%	3.83%	0.96%	0.05%	0.00%	0.00%	9.12%	8.28
WSW	0.71%	3.16%	4.65%	0.96%	0.17%	0.05%	0.00%	9.69%	8.80
W	0.62%	2.61%	2.82%	0.42%	0.11%	0.02%	0.00%	6.59%	7.83
WNW	0.39%	1.03%	0.49%	0.08%	0.02%	0.00%	0.00%	2.01%	6.53

TABLE 2.7-14 (Sheet 2 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
GREENVILLE/SPARTANBURG, SOUTH CAROLINA
JUNE, 1997-2005

June	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
NW	0.35%	0.71%	0.26%	0.03%	0.00%	0.00%	0.00%	1.36%	5.99
NNW	0.43%	0.65%	0.45%	0.05%	0.00%	0.00%	0.00%	1.57%	6.33
CALM	17.87%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	17.87%	
MISSING	6.36%							6.36%	
Total	33.27%	31.68%	29.12%	5.28%	0.54%	0.11%	0.00%	100.00%	7.28

NOTES:

1. Calm is classified as a wind speed less than 2.3 mph (anemometer start speed).
2. Missing data is data with missing wind speed, missing wind direction, or a variable wind direction.
3. Data from Unedited Local Climatological Data, National Oceanic and Atmospheric Administration, U. S. Department of Commerce, Asheville, NC, Greenville/ Spartanburg International Airport, Station No. 03870.
4. Period of Record - 9 years (1997 - 2005).

TABLE 2.7-15 (Sheet 1 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
GREENVILLE/SPARTANBURG, SOUTH CAROLINA
JULY, 1997-2005

July	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
N	1.28%	2.42%	0.97%	0.06%	0.00%	0.00%	0.00%	4.73%	5.84
NNE	1.02%	3.70%	1.51%	0.13%	0.01%	0.00%	0.00%	6.38%	6.45
NE	0.97%	3.79%	2.97%	0.54%	0.03%	0.01%	0.00%	8.32%	7.37
ENE	0.43%	1.88%	1.76%	0.12%	0.00%	0.00%	0.00%	4.20%	7.18
E	0.36%	1.84%	1.15%	0.12%	0.00%	0.01%	0.00%	3.48%	7.06
ESE	0.30%	0.81%	0.45%	0.03%	0.00%	0.00%	0.00%	1.58%	6.45
SE	0.46%	1.08%	0.36%	0.06%	0.00%	0.00%	0.00%	1.96%	6.19
SSE	0.39%	1.36%	0.63%	0.04%	0.01%	0.00%	0.00%	2.43%	6.46
S	0.79%	2.06%	1.08%	0.13%	0.03%	0.00%	0.00%	4.09%	6.73
SSW	0.69%	1.85%	1.67%	0.30%	0.06%	0.00%	0.00%	4.57%	7.53
SW	0.73%	3.14%	3.81%	0.64%	0.06%	0.00%	0.00%	8.38%	8.16
WSW	0.84%	3.49%	2.84%	0.42%	0.03%	0.00%	0.00%	7.62%	7.56
W	1.06%	3.21%	2.12%	0.16%	0.01%	0.00%	0.00%	6.57%	6.77
WNW	0.63%	1.21%	0.49%	0.04%	0.01%	0.00%	0.00%	2.39%	6.08

TABLE 2.7-15 (Sheet 2 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
GREENVILLE/SPARTANBURG, SOUTH CAROLINA
JULY, 1997-2005

July	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
NW	0.75%	0.94%	0.43%	0.00%	0.00%	0.00%	0.00%	2.12%	5.65
NNW	0.48%	0.81%	0.49%	0.06%	0.00%	0.00%	0.00%	1.84%	6.15
CALM	21.64%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	21.64%	
MISSING	7.71%							7.71%	
Total	40.52%	33.59%	22.73%	2.87%	0.27%	0.03%	0.00%	100.00%	6.73

NOTES:

1. Calm is classified as a wind speed less than 2.3 mph (anemometer start speed).
2. Missing data is data with missing wind speed, missing wind direction, or a variable wind direction.
3. Data from Unedited Local Climatological Data, National Oceanic and Atmospheric Administration, U. S. Department of Commerce, Asheville, NC, Greenville/ Spartanburg International Airport, Station No. 03870.
4. Period of Record - 9 years (1997 - 2005).

TABLE 2.7-16 (Sheet 1 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
GREENVILLE/SPARTANBURG, SOUTH CAROLINA
AUGUST, 1997-2005

August	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
N	1.45%	2.03%	0.93%	0.09%	0.00%	0.00%	0.00%	4.50%	5.87
NNE	1.43%	4.05%	2.33%	0.18%	0.01%	0.00%	0.00%	8.00%	6.59
NE	1.34%	5.68%	4.21%	0.25%	0.00%	0.00%	0.00%	11.48%	7.06
ENE	0.82%	2.97%	2.30%	0.25%	0.00%	0.00%	0.00%	6.35%	7.11
E	0.64%	1.96%	1.93%	0.19%	0.01%	0.00%	0.00%	4.73%	7.24
ESE	0.24%	0.94%	0.54%	0.01%	0.00%	0.00%	0.00%	1.73%	6.60
SE	0.31%	0.99%	0.42%	0.04%	0.01%	0.00%	0.00%	1.78%	6.39
SSE	0.42%	1.39%	0.61%	0.04%	0.00%	0.00%	0.00%	2.46%	6.26
S	0.76%	2.30%	1.05%	0.06%	0.07%	0.01%	0.00%	4.26%	6.69
SSW	0.51%	2.20%	1.42%	0.15%	0.00%	0.01%	0.00%	4.29%	7.09
SW	0.66%	3.15%	2.43%	0.25%	0.04%	0.00%	0.00%	6.54%	7.40
WSW	0.81%	2.64%	1.94%	0.33%	0.00%	0.00%	0.00%	5.72%	7.12
W	0.75%	1.93%	1.31%	0.07%	0.00%	0.00%	0.00%	4.06%	6.22
WNW	0.30%	0.60%	0.31%	0.01%	0.00%	0.00%	0.00%	1.22%	5.90

TABLE 2.7-16 (Sheet 2 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
GREENVILLE/SPARTANBURG, SOUTH CAROLINA
AUGUST, 1997-2005

August	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
NW	0.27%	0.48%	0.21%	0.00%	0.00%	0.00%	0.00%	0.96%	5.72
NNW	0.33%	0.57%	0.21%	0.03%	0.00%	0.01%	0.00%	1.15%	6.13
CALM	23.72%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	23.72%	
MISSING	7.05%							7.05%	
Total	41.80%	33.86%	22.15%	1.99%	0.16%	0.04%	0.00%	100.00%	6.59

NOTES:

1. Calm is classified as a wind speed less than 2.3 mph (anemometer start speed).
2. Missing data is data with missing wind speed, missing wind direction, or a variable wind direction.
3. Data from Unedited Local Climatological Data, National Oceanic and Atmospheric Administration, U. S. Department of Commerce, Asheville, NC, Greenville/ Spartanburg International Airport, Station No. 03870.
4. Period of Record - 9 years (1997 - 2005).

TABLE 2.7-17 (Sheet 1 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
GREENVILLE/SPARTANBURG, SOUTH CAROLINA
SEPTEMBER, 1997-2005

September	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
N	1.45%	2.61%	1.45%	0.42%	0.02%	0.02%	0.00%	5.96%	6.81
NNE	1.77%	6.76%	4.20%	1.11%	0.12%	0.00%	0.00%	13.97%	7.42
NE	1.65%	5.82%	6.30%	1.73%	0.23%	0.08%	0.00%	15.80%	8.44
ENE	0.76%	2.65%	3.77%	0.76%	0.17%	0.00%	0.00%	8.10%	8.63
E	0.54%	1.94%	1.87%	0.17%	0.09%	0.00%	0.00%	4.61%	7.76
ESE	0.40%	1.03%	0.39%	0.03%	0.03%	0.00%	0.00%	1.88%	6.50
SE	0.31%	1.19%	0.43%	0.06%	0.02%	0.03%	0.00%	2.04%	6.64
SSE	0.32%	1.33%	0.43%	0.03%	0.02%	0.00%	0.00%	2.13%	6.18
S	0.39%	2.08%	1.05%	0.26%	0.02%	0.00%	0.00%	3.80%	7.36
SSW	0.46%	0.94%	0.62%	0.17%	0.03%	0.00%	0.00%	2.22%	7.42
SW	0.28%	1.25%	1.33%	0.15%	0.02%	0.00%	0.00%	3.02%	7.96
WSW	0.42%	1.22%	1.44%	0.19%	0.00%	0.00%	0.00%	3.26%	7.62
W	0.37%	1.22%	1.13%	0.09%	0.02%	0.00%	0.00%	2.82%	7.53
WNW	0.22%	0.59%	0.32%	0.03%	0.02%	0.00%	0.00%	1.17%	6.97

TABLE 2.7-17 (Sheet 2 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
GREENVILLE/SPARTANBURG, SOUTH CAROLINA
SEPTEMBER, 1997-2005

September	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
NW	0.20%	0.39%	0.32%	0.03%	0.02%	0.00%	0.00%	0.96%	7.13
NNW	0.19%	0.51%	0.48%	0.06%	0.05%	0.00%	0.00%	1.28%	7.82
CALM	21.40%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	21.40%	
MISSING	5.57%							5.57%	
Total	36.70%	31.53%	25.51%	5.29%	0.85%	0.12%	0.00%	100.00%	7.39

NOTES:

1. Calm is classified as a wind speed less than 2.3 mph (anemometer start speed).
2. Missing data is data with missing wind speed, missing wind direction, or a variable wind direction.
3. Data from Unedited Local Climatological Data, National Oceanic and Atmospheric Administration, U. S. Department of Commerce, Asheville, NC, Greenville/ Spartanburg International Airport, Station No. 03870.
4. Period of Record - 9 years (1997 - 2005).

TABLE 2.7-18 (Sheet 1 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
GREENVILLE/SPARTANBURG, SOUTH CAROLINA
OCTOBER, 1997-2005

October	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
N	1.19%	1.76%	2.49%	0.46%	0.07%	0.00%	0.00%	5.99%	7.77
NNE	1.16%	4.79%	3.84%	0.40%	0.00%	0.00%	0.00%	10.20%	7.13
NE	1.75%	5.48%	5.70%	0.78%	0.04%	0.00%	0.00%	13.75%	7.68
ENE	0.90%	3.09%	2.84%	0.39%	0.00%	0.00%	0.00%	7.21%	7.52
E	0.60%	1.96%	0.88%	0.07%	0.01%	0.00%	0.00%	3.52%	6.45
ESE	0.16%	0.69%	0.13%	0.00%	0.00%	0.00%	0.00%	0.99%	5.56
SE	0.30%	0.91%	0.15%	0.00%	0.00%	0.00%	0.00%	1.36%	5.43
SSE	0.37%	1.25%	0.30%	0.03%	0.01%	0.00%	0.00%	1.97%	5.82
S	0.72%	2.12%	0.60%	0.03%	0.01%	0.00%	0.00%	3.48%	5.89
SSW	0.67%	1.88%	1.06%	0.15%	0.00%	0.00%	0.00%	3.76%	6.66
SW	0.72%	2.45%	2.31%	0.57%	0.04%	0.00%	0.00%	6.09%	7.90
WSW	0.64%	1.81%	2.05%	0.37%	0.07%	0.00%	0.00%	4.94%	8.01
W	0.49%	1.34%	1.08%	0.19%	0.04%	0.03%	0.00%	3.18%	7.62
WNW	0.24%	0.42%	0.12%	0.06%	0.03%	0.00%	0.00%	0.87%	6.50

TABLE 2.7-18 (Sheet 2 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
GREENVILLE/SPARTANBURG, SOUTH CAROLINA
OCTOBER, 1997-2005

October	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
NW	0.27%	0.61%	0.33%	0.06%	0.00%	0.00%	0.00%	1.27%	6.77
NNW	0.25%	0.64%	0.84%	0.19%	0.01%	0.01%	0.00%	1.96%	8.61
CALM	24.16%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	24.16%	
MISSING	5.29%							5.29%	
Total	39.89%	31.21%	24.72%	3.76%	0.37%	0.04%	0.00%	100.00%	6.96

NOTES:

1. Calm is classified as a wind speed less than 2.3 mph (anemometer start speed).
2. Missing data is data with missing wind speed, missing wind direction, or a variable wind direction.
3. Data from Unedited Local Climatological Data, National Oceanic and Atmospheric Administration, U. S. Department of Commerce, Asheville, NC, Greenville/ Spartanburg International Airport, Station No. 03870.
4. Period of Record - 9 years (1997 - 2005).

TABLE 2.7-19 (Sheet 1 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
GREENVILLE/SPARTANBURG, SOUTH CAROLINA
NOVEMBER, 1997-2005

November	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
N	1.36%	2.58%	1.96%	0.51%	0.14%	0.03%	0.00%	6.57%	7.63
NNE	1.45%	3.56%	1.94%	0.35%	0.03%	0.02%	0.00%	7.36%	6.76
NE	1.42%	4.18%	3.13%	0.57%	0.03%	0.00%	0.00%	9.34%	7.28
ENE	0.57%	2.61%	1.94%	0.22%	0.09%	0.00%	0.00%	5.43%	7.52
E	0.52%	1.28%	0.94%	0.03%	0.00%	0.00%	0.00%	2.78%	6.58
ESE	0.23%	0.59%	0.20%	0.02%	0.00%	0.00%	0.00%	1.03%	5.85
SE	0.28%	0.40%	0.17%	0.02%	0.00%	0.00%	0.00%	0.86%	5.81
SSE	0.31%	0.71%	0.39%	0.06%	0.02%	0.00%	0.00%	1.48%	6.91
S	1.00%	2.08%	1.11%	0.46%	0.09%	0.00%	0.00%	4.75%	7.19
SSW	0.91%	2.41%	2.21%	0.49%	0.19%	0.02%	0.00%	6.22%	7.74
SW	0.83%	3.56%	3.86%	1.19%	0.11%	0.02%	0.00%	9.57%	8.52
WSW	0.66%	2.87%	2.98%	1.13%	0.32%	0.05%	0.00%	8.01%	9.14
W	0.57%	1.71%	1.45%	0.31%	0.02%	0.02%	0.00%	4.07%	8.04
WNW	0.31%	0.79%	0.25%	0.05%	0.00%	0.02%	0.00%	1.40%	6.46

TABLE 2.7-19 (Sheet 2 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
GREENVILLE/SPARTANBURG, SOUTH CAROLINA
NOVEMBER, 1997-2005

November	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
NW	0.25%	0.74%	0.48%	0.09%	0.00%	0.00%	0.00%	1.56%	7.04
NNW	0.32%	0.97%	1.37%	0.25%	0.12%	0.00%	0.00%	3.04%	8.68
CALM	22.82%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	22.82%	
MISSING	3.69%							3.69%	
Total	37.52%	31.05%	24.38%	5.74%	1.16%	0.15%	0.00%	100.00%	7.32

NOTES:

1. Calm is classified as a wind speed less than 2.3 mph (anemometer start speed).
2. Missing data is data with missing wind speed, missing wind direction, or a variable wind direction.
3. Data from Unedited Local Climatological Data, National Oceanic and Atmospheric Administration, U. S. Department of Commerce, Asheville, NC, Greenville/ Spartanburg International Airport, Station No. 03870.
4. Period of Record - 9 years (1997 - 2005).

TABLE 2.7-20 (Sheet 1 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
GREENVILLE/SPARTANBURG, SOUTH CAROLINA
DECEMBER, 1997-2005

December	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
N	1.11%	2.06%	1.91%	0.52%	0.06%	0.00%	0.00%	5.66%	7.86
NNE	0.81%	3.24%	2.06%	0.36%	0.00%	0.00%	0.00%	6.47%	7.22
NE	1.14%	4.08%	5.56%	1.08%	0.01%	0.01%	0.00%	11.87%	8.41
ENE	0.73%	2.76%	2.97%	0.46%	0.03%	0.00%	0.00%	6.96%	7.80
E	0.52%	1.21%	0.78%	0.00%	0.00%	0.00%	0.00%	2.51%	5.98
ESE	0.22%	0.39%	0.07%	0.00%	0.00%	0.00%	0.00%	0.69%	5.28
SE	0.24%	0.42%	0.04%	0.00%	0.00%	0.00%	0.00%	0.70%	4.89
SSE	0.36%	0.79%	0.07%	0.01%	0.00%	0.00%	0.00%	1.24%	5.14
S	0.75%	1.66%	0.66%	0.07%	0.01%	0.01%	0.00%	3.17%	5.91
SSW	0.81%	2.49%	1.57%	0.18%	0.10%	0.00%	0.00%	5.15%	7.03
SW	1.00%	3.30%	4.21%	1.14%	0.30%	0.00%	0.00%	9.95%	8.66
WSW	0.82%	3.12%	4.96%	1.69%	0.43%	0.06%	0.00%	11.08%	9.50
W	0.63%	2.66%	2.37%	0.55%	0.21%	0.01%	0.00%	6.44%	8.34
WNW	0.31%	0.67%	0.39%	0.18%	0.01%	0.00%	0.00%	1.57%	7.51

TABLE 2.7-20 (Sheet 2 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
GREENVILLE/SPARTANBURG, SOUTH CAROLINA
DECEMBER, 1997-2005

December	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
NW	0.28%	0.85%	0.69%	0.13%	0.00%	0.00%	0.00%	1.96%	7.18
NNW	0.43%	0.97%	1.46%	0.19%	0.06%	0.00%	0.00%	3.12%	8.28
CALM	18.32%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	18.32%	
MISSING	3.32%							3.32%	
Total	31.63%	30.68%	29.78%	6.57%	1.24%	0.10%	0.00%	100.00%	7.19

NOTES:

1. Calm is classified as a wind speed less than 2.3 mph (anemometer start speed).
2. Missing data is data with missing wind speed, missing wind direction, or a variable wind direction.
3. Data from Unedited Local Climatological Data, National Oceanic and Atmospheric Administration, U. S. Department of Commerce, Asheville, NC, Greenville/ Spartanburg International Airport, Station No. 03870.
4. Period of Record - 9 years (1997 - 2005).

TABLE 2.7-21 (Sheet 1 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
GREENVILLE/SPARTANBURG, SOUTH CAROLINA
ALL MONTHS, 1997-2005

All Months	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
N	1.04%	2.15%	1.93%	0.52%	0.13%	0.01%	0.00%	5.78%	7.86
NNE	0.99%	3.53%	2.57%	0.46%	0.05%	0.01%	0.00%	7.62%	7.40
NE	1.07%	4.12%	4.31%	0.97%	0.13%	0.04%	0.00%	10.63%	8.25
ENE	0.65%	2.40%	2.56%	0.54%	0.11%	0.02%	0.00%	6.27%	8.21
E	0.49%	1.56%	1.31%	0.13%	0.02%	0.00%	0.00%	3.51%	7.25
ESE	0.24%	0.68%	0.30%	0.01%	0.00%	0.00%	0.00%	1.23%	6.22
SE	0.28%	0.74%	0.30%	0.02%	0.00%	0.00%	0.00%	1.34%	6.13
SSE	0.32%	1.19%	0.43%	0.03%	0.01%	0.00%	0.00%	1.98%	6.19
S	0.77%	2.25%	1.21%	0.18%	0.03%	0.00%	0.00%	4.45%	6.83
SSW	0.67%	2.09%	1.89%	0.40%	0.09%	0.01%	0.00%	5.15%	7.90
SW	0.65%	2.89%	3.82%	1.18%	0.25%	0.04%	0.01%	8.84%	9.14
WSW	0.63%	2.68%	3.61%	1.23%	0.34%	0.08%	0.01%	8.57%	9.44
W	0.58%	2.10%	2.01%	0.50%	0.15%	0.04%	0.01%	5.38%	8.37
WNW	0.30%	0.72%	0.42%	0.12%	0.03%	0.02%	0.00%	1.60%	7.48

TABLE 2.7-21 (Sheet 2 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
GREENVILLE/SPARTANBURG, SOUTH CAROLINA
ALL MONTHS, 1997-2005

All Months	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
NW	0.30%	0.67%	0.43%	0.08%	0.01%	0.00%	0.00%	1.50%	7.01
NNW	0.34%	0.77%	0.85%	0.22%	0.07%	0.01%	0.00%	2.26%	8.38
Total	9.30%	30.51%	27.97%	6.60%	1.41%	0.29%	0.02%		7.63
CALM	18.33%								
MISSING	5.56%								

NOTES:

1. Calm is classified as a wind speed less than 2.3 mph (anemometer start speed).
2. Missing data is data with missing wind speed, missing wind direction, or a variable wind direction.
3. Data from Unedited Local Climatological Data, National Oceanic and Atmospheric Administration, U. S. Department of Commerce, Asheville, NC, Greenville/ Spartanburg International Airport, Station No. 03870.
4. Period of Record - 9 years (1997 - 2005).

TABLE 2.7-22 (Sheet 1 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
LEE NUCLEAR STATION SITE
JANUARY

January	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
N	2.33%	1.51%	0.55%	0.00%	0.00%	0.00%	0.00%	4.38%	4.52
NNE	2.88%	2.19%	0.41%	0.00%	0.00%	0.00%	0.00%	5.48%	4.32
NE	1.37%	0.82%	0.68%	0.00%	0.00%	0.00%	0.00%	2.88%	4.68
ENE	2.74%	0.27%	0.14%	0.00%	0.00%	0.00%	0.00%	3.15%	2.58
E	2.05%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	2.05%	2.02
ESE	4.11%	0.27%	0.00%	0.00%	0.00%	0.00%	0.00%	4.38%	2.44
SE	5.07%	1.37%	0.27%	0.00%	0.00%	0.00%	0.00%	6.71%	3.51
SSE	4.79%	1.78%	0.68%	0.82%	0.27%	0.00%	0.00%	8.36%	5.90
S	2.19%	6.44%	1.51%	0.27%	0.14%	0.00%	0.00%	10.55%	6.28
SSW	0.96%	3.42%	5.48%	0.14%	0.00%	0.00%	0.00%	10.00%	8.00
SW	0.41%	1.78%	4.25%	0.82%	0.27%	0.00%	0.00%	7.53%	9.60
WSW	1.51%	1.10%	0.96%	0.14%	0.00%	0.00%	0.00%	3.70%	5.93
W	1.78%	1.23%	0.14%	0.00%	0.00%	0.00%	0.00%	3.15%	4.30
WNW	3.29%	3.29%	1.37%	1.37%	0.41%	0.00%	0.00%	9.73%	7.00

TABLE 2.7-22 (Sheet 2 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
LEE NUCLEAR STATION SITE
JANUARY

January	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
NW	6.44%	2.47%	0.55%	0.82%	0.14%	0.00%	0.00%	10.41%	4.89
NNW	2.60%	2.05%	0.68%	0.55%	0.55%	0.00%	0.00%	6.44%	6.93
Calm	1.10%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.10%	0.00
Total	44.52%	30.00%	17.67%	4.93%	1.78%	0.00%	0.00%	100.00%	5.71

NOTES:

1. Calm is classified as a wind speed less than or equal to 1.0 mph.
2. Lee Nuclear Station site Data, 12/1/2005 - 11/30/2006.

TABLE 2.7-23 (Sheet 1 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
LEE NUCLEAR STATION SITE
FEBRUARY

February	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
N	1.49%	2.24%	1.19%	0.60%	0.00%	0.00%	0.00%	5.52%	6.69
NNE	1.64%	2.09%	0.45%	0.00%	0.00%	0.00%	0.00%	4.18%	5.41
NE	0.90%	1.79%	0.00%	0.00%	0.00%	0.00%	0.00%	2.69%	4.77
ENE	2.39%	0.45%	0.00%	0.00%	0.00%	0.00%	0.00%	2.84%	2.98
E	2.54%	0.15%	0.00%	0.00%	0.00%	0.00%	0.00%	2.69%	2.81
ESE	3.88%	0.15%	0.00%	0.00%	0.00%	0.00%	0.00%	4.03%	2.60
SE	2.54%	1.34%	0.00%	0.00%	0.00%	0.00%	0.00%	3.88%	3.22
SSE	2.69%	1.94%	0.15%	0.00%	0.00%	0.00%	0.00%	4.78%	4.18
S	2.39%	4.78%	1.49%	0.15%	0.00%	0.00%	0.00%	8.81%	5.64
SSW	1.49%	5.97%	3.88%	0.15%	0.00%	0.00%	0.00%	11.49%	7.35
SW	1.19%	3.13%	3.43%	0.90%	0.30%	0.00%	0.00%	8.96%	8.72
WSW	1.19%	2.84%	3.28%	0.60%	0.15%	0.00%	0.00%	8.06%	8.01
W	0.75%	2.54%	0.90%	0.30%	0.00%	0.00%	0.00%	4.48%	6.75
WNW	3.28%	3.58%	1.64%	0.30%	0.30%	0.00%	0.00%	9.10%	6.00

TABLE 2.7-23 (Sheet 2 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
LEE NUCLEAR STATION SITE
FEBRUARY

February	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
NW	7.76%	2.99%	1.04%	0.15%	0.00%	0.00%	0.00%	11.94%	4.39
NNW	2.39%	2.24%	0.45%	0.00%	0.00%	0.00%	0.00%	5.07%	4.38
Calm	1.49%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.49%	0.00
Total	38.51%	38.21%	17.91%	3.13%	0.75%	0.00%	0.00%	100.00%	5.69

NOTES:

1. Calm is classified as a wind speed less than or equal to 1.0 mph.

2. Lee Nuclear Site Data, 12/1/2005 - 11/30/2006.

TABLE 2.7-24 (Sheet 1 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
LEE NUCLEAR STATION SITE
MARCH

	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
N	2.44%	2.84%	2.71%	0.14%	0.00%	0.00%	0.00%	8.12%	6.62
NNE	1.35%	2.98%	0.27%	0.00%	0.00%	0.00%	0.00%	4.60%	5.06
NE	1.76%	1.62%	0.27%	0.00%	0.00%	0.00%	0.00%	3.65%	4.83
ENE	2.03%	0.68%	0.00%	0.00%	0.00%	0.00%	0.00%	2.71%	3.32
E	2.98%	0.68%	0.00%	0.00%	0.00%	0.00%	0.00%	3.65%	2.96
ESE	2.03%	0.41%	0.00%	0.00%	0.00%	0.00%	0.00%	2.44%	3.00
SE	3.79%	0.95%	0.00%	0.00%	0.00%	0.00%	0.00%	4.74%	3.35
SSE	1.76%	3.25%	0.27%	0.27%	0.00%	0.00%	0.00%	5.55%	5.43
S	1.08%	5.82%	0.95%	0.41%	0.00%	0.00%	0.00%	8.25%	6.22
SSW	0.41%	4.06%	4.74%	1.49%	0.27%	0.00%	0.00%	10.96%	9.38
SW	0.54%	1.22%	2.71%	2.30%	0.41%	0.00%	0.00%	7.17%	11.40
WSW	0.54%	1.35%	0.41%	0.14%	0.00%	0.00%	0.00%	2.44%	6.51
W	0.54%	0.81%	0.41%	0.00%	0.00%	0.00%	0.00%	1.76%	5.32
WNW	2.57%	4.74%	2.44%	1.22%	0.27%	0.00%	0.00%	11.23%	7.36

TABLE 2.7-24 (Sheet 2 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
LEE NUCLEAR STATION SITE
MARCH

	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
NW	4.47%	5.28%	2.71%	0.68%	0.41%	0.00%	0.00%	13.53%	6.46
NNW	3.38%	3.79%	1.62%	0.00%	0.00%	0.00%	0.00%	8.80%	5.38
Calm	0.41%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.41%	0.00
Total	31.66%	40.46%	19.49%	6.63%	1.35%	0.00%	0.00%	100.00%	6.47

NOTES:

1. Calm is classified as a wind speed less than or equal to 1.0 mph.
2. Lee Nuclear Site Data, 12/1/2005 - 11/30/2006.

TABLE 2.7-25 (Sheet 1 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
LEE NUCLEAR STATION SITE
APRIL

April	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
N	1.39%	2.50%	0.70%	0.00%	0.00%	0.00%	0.00%	4.59%	5.48
NNE	1.53%	1.25%	1.53%	0.00%	0.00%	0.00%	0.00%	4.31%	5.83
NE	2.36%	4.17%	0.42%	0.00%	0.00%	0.00%	0.00%	6.95%	4.87
ENE	1.67%	2.09%	0.83%	0.00%	0.00%	0.00%	0.00%	4.59%	5.13
E	2.92%	1.11%	0.00%	0.00%	0.00%	0.00%	0.00%	4.03%	3.38
ESE	3.06%	0.56%	0.00%	0.00%	0.00%	0.00%	0.00%	3.62%	2.70
SE	4.31%	1.95%	0.00%	0.00%	0.00%	0.00%	0.00%	6.26%	3.48
SSE	2.23%	3.48%	0.00%	0.00%	0.00%	0.00%	0.00%	5.70%	4.29
S	1.25%	4.03%	0.83%	0.14%	0.00%	0.00%	0.00%	6.26%	5.72
SSW	0.56%	2.36%	4.31%	0.83%	0.28%	0.00%	0.00%	8.34%	9.27
SW	0.97%	3.62%	4.87%	1.11%	0.14%	0.00%	0.00%	10.71%	9.01
WSW	1.25%	2.92%	4.31%	0.56%	0.42%	0.00%	0.00%	9.46%	8.63
W	0.70%	0.70%	0.97%	0.14%	0.00%	0.00%	0.00%	2.50%	6.59
WNW	3.06%	1.81%	1.39%	0.00%	0.14%	0.00%	0.00%	6.40%	5.55

TABLE 2.7-25 (Sheet 2 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
LEE NUCLEAR STATION SITE
APRIL

April	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
NW	5.84%	3.06%	0.70%	0.14%	0.14%	0.00%	0.00%	9.87%	4.59
NNW	3.34%	1.11%	0.00%	0.00%	0.00%	0.00%	0.00%	4.45%	3.04
Calm	1.95%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.95%	0.00
Total	36.44%	36.72%	20.86%	2.92%	1.11%	0.00%	0.00%	100.00%	5.81

NOTES:

1. Calm is classified as a wind speed less than or equal to 1.0 mph.

2. Lee Nuclear Site Data, 12/1/2005 - 11/30/2006.

TABLE 2.7-26 (Sheet 1 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
LEE NUCLEAR STATION SITE
MAY

May	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
N	2.30%	2.17%	0.27%	0.00%	0.00%	0.00%	0.00%	4.74%	4.49
NNE	1.90%	3.12%	0.00%	0.00%	0.00%	0.00%	0.00%	5.01%	4.76
NE	4.20%	2.71%	0.27%	0.00%	0.00%	0.00%	0.00%	7.18%	4.08
ENE	3.39%	2.44%	0.14%	0.00%	0.00%	0.00%	0.00%	5.96%	3.96
E	2.71%	1.63%	0.00%	0.00%	0.00%	0.00%	0.00%	4.34%	3.43
ESE	3.66%	0.41%	0.00%	0.00%	0.00%	0.00%	0.00%	4.07%	2.64
SE	4.07%	0.68%	0.00%	0.00%	0.00%	0.00%	0.00%	4.74%	3.03
SSE	2.71%	1.63%	0.00%	0.00%	0.00%	0.00%	0.00%	4.34%	3.61
S	1.36%	1.76%	0.00%	0.00%	0.00%	0.00%	0.00%	3.12%	4.77
SSW	1.36%	2.71%	1.90%	0.00%	0.00%	0.00%	0.00%	5.96%	6.66
SW	1.49%	2.17%	5.01%	1.90%	0.14%	0.00%	0.00%	10.70%	9.57
WSW	1.36%	3.25%	1.90%	0.95%	0.14%	0.00%	0.00%	7.59%	8.18
W	1.90%	1.08%	1.22%	0.14%	0.00%	0.00%	0.00%	4.34%	5.71
WNW	4.47%	2.17%	0.27%	0.14%	0.00%	0.00%	0.00%	7.05%	4.25

TABLE 2.7-26 (Sheet 2 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
LEE NUCLEAR STATION SITE
MAY

May	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
NW	9.76%	2.71%	1.08%	0.41%	0.00%	0.00%	0.00%	13.96%	4.44
NNW	5.01%	1.49%	0.14%	0.00%	0.00%	0.00%	0.00%	6.64%	3.32
Calm	0.27%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.27%	0.00
Total	51.63%	32.11%	12.20%	3.52%	0.27%	0.00%	0.00%	100.00%	5.12

NOTES:

1. Calm is classified as a wind speed less than or equal to 1.0 mph.
2. Lee Nuclear Site Data, 12/1/2005 - 11/30/2006.

TABLE 2.7-27 (Sheet 1 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
LEE NUCLEAR STATION SITE
JUNE

June	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
N	2.23%	1.25%	2.37%	0.00%	0.00%	0.00%	0.00%	5.85%	6.30
NNE	2.65%	2.65%	1.11%	0.00%	0.00%	0.00%	0.00%	6.41%	5.03
NE	2.23%	2.23%	0.00%	0.00%	0.00%	0.00%	0.00%	4.46%	4.10
ENE	3.06%	1.67%	0.42%	0.00%	0.00%	0.00%	0.00%	5.15%	4.03
E	5.15%	1.39%	0.00%	0.00%	0.00%	0.00%	0.00%	6.55%	3.08
ESE	4.46%	2.09%	0.28%	0.00%	0.00%	0.00%	0.00%	6.82%	3.54
SE	4.74%	3.76%	0.00%	0.00%	0.00%	0.00%	0.00%	8.50%	3.74
SSE	2.51%	4.46%	0.70%	0.00%	0.00%	0.00%	0.00%	7.66%	5.20
S	1.67%	3.62%	0.14%	0.00%	0.00%	0.00%	0.00%	5.43%	5.15
SSW	1.53%	1.53%	0.42%	0.00%	0.00%	0.00%	0.00%	3.48%	4.76
SW	0.70%	3.20%	1.95%	0.14%	0.00%	0.00%	0.00%	5.99%	7.10
WSW	0.97%	2.37%	0.28%	0.00%	0.00%	0.00%	0.00%	3.62%	5.14
W	0.56%	2.37%	0.56%	0.00%	0.00%	0.00%	0.00%	3.48%	6.08
WNW	4.74%	1.81%	0.14%	0.00%	0.00%	0.00%	0.00%	6.69%	3.66

TABLE 2.7-27 (Sheet 2 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
LEE NUCLEAR STATION SITE
JUNE

June	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
NW	9.19%	2.51%	0.56%	0.00%	0.14%	0.00%	0.00%	12.40%	3.88
NNW	4.74%	2.23%	0.56%	0.00%	0.00%	0.00%	0.00%	7.52%	4.12
Calm	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00
Total	51.11%	39.14%	9.47%	0.14%	0.14%	0.00%	0.00%	100.00%	4.55

NOTES:

1. Calm is classified as a wind speed less than or equal to 1.0 mph.
2. Lee Nuclear Site Data, 12/1/2005 - 11/30/2006.

TABLE 2.7-28 (Sheet 1 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
LEE NUCLEAR STATION SITE
JULY

July	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
N	4.17%	0.81%	0.00%	0.00%	0.00%	0.00%	0.00%	4.97%	2.76
NNE	2.28%	1.48%	0.00%	0.00%	0.00%	0.00%	0.00%	3.76%	3.37
NE	4.17%	2.28%	0.27%	0.00%	0.00%	0.00%	0.00%	6.72%	3.79
ENE	4.03%	2.42%	0.13%	0.00%	0.00%	0.00%	0.00%	6.59%	3.81
E	4.57%	0.94%	0.00%	0.00%	0.00%	0.00%	0.00%	5.51%	2.88
ESE	4.30%	1.34%	0.13%	0.00%	0.00%	0.00%	0.00%	5.78%	3.37
SE	4.17%	1.48%	0.00%	0.00%	0.00%	0.00%	0.00%	5.65%	3.12
SSE	4.57%	3.36%	0.27%	0.00%	0.00%	0.00%	0.00%	8.20%	4.11
S	4.17%	4.30%	0.27%	0.13%	0.00%	0.00%	0.00%	8.87%	4.53
SSW	2.69%	5.11%	1.34%	0.00%	0.00%	0.00%	0.00%	9.14%	5.60
SW	0.94%	4.84%	1.88%	0.13%	0.00%	0.00%	0.00%	7.80%	6.69
WSW	1.75%	2.96%	1.08%	0.00%	0.00%	0.00%	0.00%	5.78%	5.56
W	0.67%	1.34%	0.40%	0.00%	0.00%	0.00%	0.00%	2.42%	5.68
WNW	2.02%	1.21%	0.54%	0.13%	0.00%	0.00%	0.00%	3.90%	4.76

TABLE 2.7-28 (Sheet 2 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
LEE NUCLEAR STATION SITE
JULY

July	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
NW	7.66%	1.48%	0.00%	0.00%	0.00%	0.00%	0.00%	9.14%	3.12
NNW	4.84%	0.67%	0.00%	0.00%	0.00%	0.00%	0.00%	5.51%	2.66
Calm	0.27%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.27%	0.00
Total	56.99%	36.02%	6.32%	0.40%	0.00%	0.00%	0.00%	100.00%	4.15

NOTES:

1. Calm is classified as a wind speed less than or equal to 1.0 mph.

2. Lee Nuclear Site Data, 12/1/2005 - 11/30/2006.

TABLE 2.7-29 (Sheet 1 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
LEE NUCLEAR STATION SITE
AUGUST

August	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
N	5.53%	0.81%	0.13%	0.00%	0.00%	0.00%	0.00%	6.47%	2.81
NNE	4.72%	2.56%	0.00%	0.00%	0.00%	0.00%	0.00%	7.28%	3.61
NE	4.58%	4.45%	0.94%	0.00%	0.00%	0.00%	0.00%	9.97%	4.78
ENE	4.04%	3.91%	0.54%	0.00%	0.00%	0.00%	0.00%	8.49%	4.68
E	4.72%	2.96%	0.54%	0.00%	0.00%	0.00%	0.00%	8.22%	3.99
ESE	3.77%	1.35%	0.00%	0.00%	0.00%	0.00%	0.00%	5.12%	3.13
SE	4.45%	2.16%	0.00%	0.00%	0.00%	0.00%	0.00%	6.60%	3.52
SSE	4.04%	2.43%	0.00%	0.00%	0.00%	0.00%	0.00%	6.47%	3.84
S	3.10%	2.43%	0.13%	0.00%	0.00%	0.00%	0.00%	5.66%	4.00
SSW	1.75%	2.83%	0.40%	0.00%	0.00%	0.00%	0.00%	4.99%	5.09
SW	1.89%	2.43%	0.40%	0.00%	0.00%	0.00%	0.00%	4.72%	4.89
WSW	1.08%	1.75%	0.00%	0.00%	0.00%	0.00%	0.00%	2.83%	4.78
W	1.21%	0.94%	0.13%	0.00%	0.00%	0.00%	0.00%	2.29%	4.44
WNW	2.29%	2.02%	0.13%	0.00%	0.00%	0.00%	0.00%	4.45%	4.00

TABLE 2.7-29 (Sheet 2 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
LEE NUCLEAR STATION SITE
AUGUST

August	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
NW	6.87%	3.50%	0.00%	0.00%	0.00%	0.00%	0.00%	10.38%	3.49
NNW	4.58%	1.08%	0.00%	0.13%	0.00%	0.00%	0.00%	5.80%	3.22
Calm	0.27%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.27%	0.00
Total	58.63%	37.60%	3.37%	0.13%	0.00%	0.00%	0.00%	100.00%	3.97

NOTES:

1. Calm is classified as a wind speed less than or equal to 1.0 mph.
2. Lee Nuclear Site Data, 12/1/2005 - 11/30/2006.

TABLE 2.7-30 (Sheet 1 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
LEE NUCLEAR STATION SITE
SEPTEMBER

September	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
N	5.28%	3.47%	0.42%	0.00%	0.00%	0.00%	0.00%	9.17%	3.94
NNE	4.72%	2.92%	0.14%	0.00%	0.00%	0.00%	0.00%	7.78%	3.78
NE	4.86%	2.36%	0.00%	0.00%	0.00%	0.00%	0.00%	7.22%	3.39
ENE	3.75%	2.36%	0.00%	0.00%	0.00%	0.00%	0.00%	6.11%	3.68
E	3.75%	2.08%	0.14%	0.00%	0.00%	0.00%	0.00%	5.97%	3.61
ESE	3.61%	1.81%	0.00%	0.00%	0.00%	0.00%	0.00%	5.42%	3.45
SE	2.50%	1.11%	0.00%	0.00%	0.00%	0.00%	0.00%	3.61%	3.54
SSE	2.50%	1.39%	0.28%	0.00%	0.00%	0.00%	0.00%	4.17%	4.12
S	2.36%	2.08%	0.00%	0.00%	0.00%	0.00%	0.00%	4.44%	4.19
SSW	0.28%	3.75%	1.67%	0.00%	0.00%	0.00%	0.00%	5.69%	7.14
SW	1.11%	1.67%	2.36%	0.56%	0.00%	0.00%	0.00%	5.69%	8.06
WSW	0.28%	0.83%	0.69%	0.00%	0.00%	0.00%	0.00%	1.81%	7.23
W	0.00%	0.69%	0.00%	0.00%	0.00%	0.00%	0.00%	0.69%	6.12
WNW	2.22%	2.22%	0.00%	0.00%	0.00%	0.00%	0.00%	4.44%	4.17

TABLE 2.7-30 (Sheet 2 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
LEE NUCLEAR STATION SITE
SEPTEMBER

September	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
NW	14.03%	4.58%	0.14%	0.00%	0.00%	0.00%	0.00%	18.75%	3.53
NNW	6.11%	2.64%	0.14%	0.00%	0.00%	0.00%	0.00%	8.89%	3.39
Calm	0.14%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.14%	0.00
Total	57.36%	35.97%	5.97%	0.56%	0.00%	0.00%	0.00%	100.00%	4.20

NOTES:

1. Calm is classified as a wind speed less than or equal to 1.0 mph.

2. Lee Nuclear Site Data, 12/1/2005 - 11/30/2006.

TABLE 2.7-31 (Sheet 1 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
LEE NUCLEAR STATION SITE
OCTOBER

October	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
N	3.10%	2.70%	0.27%	0.00%	0.00%	0.00%	0.00%	6.06%	4.12
NNE	2.29%	3.91%	0.94%	0.00%	0.00%	0.00%	0.00%	7.14%	5.73
NE	3.50%	1.89%	2.43%	0.13%	0.00%	0.00%	0.00%	7.95%	5.71
ENE	3.50%	2.02%	0.00%	0.00%	0.00%	0.00%	0.00%	5.53%	3.36
E	4.58%	0.54%	0.13%	0.00%	0.00%	0.00%	0.00%	5.26%	2.61
ESE	2.83%	0.27%	0.00%	0.00%	0.00%	0.00%	0.00%	3.10%	2.75
SE	3.10%	0.27%	0.00%	0.00%	0.00%	0.00%	0.00%	3.37%	2.88
SSE	2.16%	1.08%	0.54%	0.00%	0.00%	0.00%	0.00%	3.77%	4.55
S	1.62%	2.56%	0.13%	0.00%	0.00%	0.00%	0.00%	4.31%	4.66
SSW	0.67%	2.70%	1.08%	0.00%	0.00%	0.00%	0.00%	4.45%	6.32
SW	0.67%	2.02%	1.35%	0.00%	0.00%	0.00%	0.00%	4.04%	6.94
WSW	1.21%	2.02%	1.48%	0.00%	0.00%	0.00%	0.00%	4.72%	6.41
W	1.08%	0.94%	1.08%	0.13%	0.00%	0.00%	0.00%	3.23%	6.02
WNW	4.31%	2.02%	1.35%	0.67%	0.13%	0.00%	0.00%	8.49%	5.82

TABLE 2.7-31 (Sheet 2 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
LEE NUCLEAR STATION SITE
OCTOBER

October	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
NW	12.26%	5.39%	2.29%	0.54%	0.00%	0.00%	0.00%	2049%	4.78
NNW	5.66%	1.62%	0.67%	0.00%	0.00%	0.00%	0.00%	7.95%	3.79
Calm	0.13%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.13%	0.00
Total	52.56%	31.94%	13.75%	1.48%	0.13%	0.00%	0.00%	100.00%	4.82

NOTES:

1. Calm is classified as a wind speed less than or equal to 1.0 mph.

2. Lee Nuclear Site Data, 12/1/2005 - 11/30/2006.

TABLE 2.7-32 (Sheet 1 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
LEE NUCLEAR STATION SITE
NOVEMBER

November	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
N	3.36%	2.24%	1.12%	0.56%	0.00%	0.00%	0.00%	7.28%	5.56
NNE	0.98%	3.50%	4.20%	0.70%	0.00%	0.00%	0.00%	9.38%	8.25
NE	1.54%	1.54%	0.56%	0.28%	0.00%	0.00%	0.00%	3.92%	5.58
ENE	1.96%	1.40%	0.00%	0.00%	0.00%	0.00%	0.00%	3.36%	3.73
E	2.38%	0.56%	0.00%	0.00%	0.00%	0.00%	0.00%	2.94%	2.65
ESE	2.66%	0.14%	0.00%	0.00%	0.00%	0.00%	0.00%	2.80%	2.42
SE	3.78%	1.40%	0.56%	0.00%	0.00%	0.00%	0.00%	5.74%	3.82
SSE	1.68%	0.98%	1.12%	0.00%	0.00%	0.00%	0.00%	3.78%	5.31
S	3.08%	1.54%	0.98%	0.14%	0.00%	0.00%	0.00%	5.74%	5.13
SSW	0.84%	1.12%	0.70%	0.00%	0.00%	0.00%	0.00%	2.66%	6.00
SW	0.56%	1.40%	0.42%	1.12%	0.28%	0.00%	0.00%	3.78%	9.77
WSW	0.84%	0.84%	0.42%	0.28%	0.00%	0.00%	0.00%	2.38%	6.34
W	0.98%	0.98%	0.14%	0.00%	0.00%	0.00%	0.00%	2.10%	4.75
WNW	2.52%	2.10%	0.42%	0.00%	0.00%	0.00%	0.00%	5.04%	4.26

TABLE 2.7-32 (Sheet 2 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
LEE NUCLEAR STATION SITE
NOVEMBER

November	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
NW	9.38%	14.29%	0.98%	0.56%	0.00%	0.00%	0.00%	25.21%	4.69
NNW	4.34%	3.50%	2.80%	0.42%	0.00%	0.00%	0.00%	11.06%	6.18
Calm	2.80%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	2.80%	0.00
Total	40.90%	37.54%	14.43%	4.06%	0.28%	0.00%	0.00%	100.00%	5.26

NOTES:

1. Calm is classified as a wind speed less than or equal to 1.0 mph.
2. Lee Nuclear Site Data, 12/1/2005 - 11/30/2006.

TABLE 2.7-33 (Sheet 1 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
LEE NUCLEAR STATION SITE
DECEMBER

December	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
N	3.35%	1.54%	0.28%	0.00%	0.00%	0.00%	0.00%	5.17%	3.67
NNE	1.68%	2.23%	0.98%	0.00%	0.00%	0.00%	0.00%	4.89%	5.14
NE	1.54%	5.31%	0.28%	0.00%	0.00%	0.00%	0.00%	7.12%	5.36
ENE	3.07%	1.96%	0.42%	0.00%	0.00%	0.00%	0.00%	5.45%	3.83
E	2.09%	0.70%	0.00%	0.00%	0.00%	0.00%	0.00%	2.79%	2.96
ESE	3.63%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	3.63%	2.56
SE	4.05%	0.56%	0.00%	0.00%	0.00%	0.00%	0.00%	4.61%	2.66
SSE	3.63%	0.98%	0.00%	0.00%	0.00%	0.00%	0.00%	4.61%	3.28
S	1.54%	3.21%	0.28%	0.00%	0.00%	0.00%	0.00%	5.03%	4.85
SSW	1.12%	3.07%	0.98%	0.00%	0.00%	0.00%	0.00%	5.17%	6.16
SW	1.54%	2.37%	2.65%	0.00%	0.00%	0.00%	0.00%	6.56%	6.83
WSW	1.54%	2.65%	2.09%	0.28%	0.00%	0.00%	0.00%	6.56%	6.77
W	1.26%	1.12%	0.70%	0.14%	0.00%	0.00%	0.00%	3.21%	5.68
WNW	3.91%	2.79%	1.68%	0.70%	0.00%	0.00%	0.00%	9.08%	5.93

TABLE 2.7-33 (Sheet 2 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
LEE NUCLEAR STATION SITE
DECEMBER

December	Wind Speed (mph)								
	0-3	4-7	8-12	13-17	18-22	23-27	≥28		
Direction From	Frequency of Occurrence (%)							Total (%)	Avg. Speed
NW	10.34%	6.98%	1.54%	0.14%	0.00%	0.00%	0.00%	18.99%	4.38
NNW	4.33%	0.84%	0.56%	0.00%	0.00%	0.00%	0.00%	5.73%	3.71
Calm	1.40%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.40%	0.00
Total	48.60%	36.31%	12.43%	1.26%	0.00%	0.00%	0.00%	100.00%	4.70

NOTES:

1. Calm is classified as a wind speed less than or equal to 1.0 mph.
2. Lee Nuclear Site Data, 12/1/2005 - 11/30/2006.

TABLE 2.7-34 (Sheet 1 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
LEE NUCLEAR STATION SITE
ALL MONTHS

Direction From	Wind Speed 0–3	4–7	8–12	13–17	18–22	23–27	≥28	Total	Avg. Speed
N	3.09%	2.00%	0.83%	0.10%	0.00%	0.00%	0.00%	6.03%	4.78
NNE	2.39%	2.58%	0.83%	0.06%	0.00%	0.00%	0.00%	5.86%	5.15
NE	2.77%	2.60%	0.52%	0.03%	0.00%	0.00%	0.00%	5.92%	4.64
ENE	2.98%	1.82%	0.22%	0.00%	0.00%	0.00%	0.00%	5.02%	3.89
E	3.38%	1.07%	0.07%	0.00%	0.00%	0.00%	0.00%	4.52%	3.17
ESE	3.50%	0.74%	0.03%	0.00%	0.00%	0.00%	0.00%	4.27%	2.97
SE	3.89%	1.42%	0.07%	0.00%	0.00%	0.00%	0.00%	5.37%	3.38
SSE	2.95%	2.23%	0.33%	0.09%	0.02%	0.00%	0.00%	5.63%	4.56
S	2.15%	3.54%	0.55%	0.10%	0.01%	0.00%	0.00%	6.36%	5.24
SSW	1.14%	3.21%	2.23%	0.22%	0.05%	0.00%	0.00%	6.85%	7.21
SW	1.00%	2.49%	2.60%	0.75%	0.13%	0.00%	0.00%	6.96%	8.42
WSW	1.13%	2.07%	1.39%	0.24%	0.06%	0.00%	0.00%	4.89%	6.99
W	0.95%	1.22%	0.55%	0.07%	0.00%	0.00%	0.00%	2.80%	5.67
WNW	3.22%	2.47%	0.94%	0.38%	0.10%	0.00%	0.00%	7.12%	5.55
NW	8.66%	4.59%	0.97%	0.29%	0.07%	0.00%	0.00%	14.58%	4.44

TABLE 2.7-34 (Sheet 2 of 2)
PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED (MPH)
LEE NUCLEAR STATION SITE
ALL MONTHS

Direction From	Wind Speed 0–3	4–7	8–12	13–17	18–22	23–27	≥28	Total	Avg. Speed
NNW	4.29%	1.93%	0.63%	0.09%	0.05%	0.00%	0.00%	6.99%	4.34
Calm	0.84%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.84%	0.00
Total	47.50%	35.98%	12.77%	2.43%	0.48%	0.00%	0.00%	100.00%	5.03

NOTES:

1. Calm is classified as a wind speed less than or equal to 1.0 mph.
2. Lee Nuclear Site Data, 12/1/2005 - 11/30/2006.

TABLE 2.7-35 (Sheet 1 of 2)
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION BY ATMOSPHERIC STABILITY CLASS A
HOURS AT EACH WIND SPEED AND DIRECTION

	Wind Speed (m/sec)												Average Wind Speed (m/sec)
DIR	≤0.5	≤0.8	≤1.0	≤1.3	≤1.5	≤2.0	≤3.0	≤4.0	≤5.0	≤6.0	≤8.0	≥8	Total	
N	0	0	0	0	2	5	10	6	7	2	2	0	35	3.2
NNE	0	0	0	0	0	7	11	16	3	1	2	0	40	3.1
NE	0	0	0	0	0	13	29	16	2	1	0	0	61	2.8
ENE	0	0	0	1	3	8	24	16	3	0	0	0	55	2.7
E	0	0	0	1	1	8	22	3	0	0	0	0	35	2.3
ESE	0	0	0	1	3	15	10	0	0	0	0	0	29	1.9
SE	0	0	0	2	1	13	19	3	0	0	0	0	38	2.1
SSE	0	0	0	1	3	15	30	11	2	0	2	0	64	2.7
S	0	0	0	0	2	13	22	15	3	3	1	0	59	2.8
SSW	0	0	0	0	3	8	24	35	20	16	5	2	113	3.8
SW	0	0	0	0	1	1	16	33	21	25	11	2	110	4.4
WSW	0	0	0	0	2	3	12	26	12	7	2	0	65	3.7
W	0	0	0	1	0	3	6	2	10	1	0	0	24	3.4
WNW	0	0	1	0	4	2	11	8	10	6	10	3	57	4.3
NW	0	0	0	0	1	2	11	6	8	9	9	1	49	4.5

TABLE 2.7-35 (Sheet 2 of 2)
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION BY ATMOSPHERIC STABILITY CLASS A
HOURS AT EACH WIND SPEED AND DIRECTION

	Wind Speed (m/sec)													Average Wind Speed (m/sec)
DIR	≤0.5	≤0.8	≤1.0	≤1.3	≤1.5	≤2.0	≤3.0	≤4.0	≤5.0	≤6.0	≤8.0	≥8	Total	
NNW	0	0	0	0	0	4	6	5	2	4	0	0	22	3.4
CALM	0													
TOTAL	0	0	1	7	27	122	264	201	105	76	46	8	857	

NOTES:

1. Data from Lee Nuclear Station site Data, 12/1/2005 - 11/30/2006.
2. Stability class is determined by the upper temperature gradient between 60m and 10m.
3. Wind direction data is from the 10 m level.
4. Calms are wind speeds below 1 mph (0.45 m/sec).

TABLE 2.7-36 (Sheet 1 of 2)
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION BY ATMOSPHERIC STABILITY CLASS B
HOURS AT EACH WIND SPEED AND DIRECTION

	Wind Speed (m/sec)													Average Wind Speed (m/sec)
DIR	≤0.5	≤0.8	≤1.0	≤1.3	≤1.5	≤2.0	≤3.0	≤4.0	≤5.0	≤6.0	≤8.0	≥8	Total	
N	0	0	0	1	1	4	5	12	10	1	0	0	35	3.3
NNE	0	0	0	0	0	8	13	7	4	3	1	0	37	3.1
NE	0	0	0	0	3	15	10	9	3	1	0	0	41	2.5
ENE	0	0	0	2	7	3	15	5	0	0	0	0	32	2.3
E	0	0	0	2	0	6	11	1	0	0	0	0	21	2.1
ESE	0	0	0	0	2	3	7	1	0	0	0	0	13	2.2
SE	0	0	0	1	0	8	6	0	0	0	0	0	16	2.0
SSE	0	0	0	2	4	7	13	1	0	0	1	0	29	2.2
S	0	0	0	1	4	8	17	6	0	1	0	0	37	2.3
SSW	0	0	0	0	0	3	13	16	15	7	3	2	59	4.0
SW	0	0	0	0	0	4	13	21	23	16	7	1	85	4.2
WSW	0	0	0	0	0	4	16	19	9	6	5	0	59	3.8
W	0	0	0	0	1	0	7	7	4	5	1	0	26	3.7

TABLE 2.7-36 (Sheet 2 of 2)
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION BY ATMOSPHERIC STABILITY CLASS B
HOURS AT EACH WIND SPEED AND DIRECTION

	Wind Speed (m/sec)													Average Wind Speed (m/sec)
DIR	≤0.5	≤0.8	≤1.0	≤1.3	≤1.5	≤2.0	≤3.0	≤4.0	≤5.0	≤6.0	≤8.0	≥8	Total	
WNW	0	0	0	0	0	4	10	8	6	7	5	3	45	4.3
NW	0	0	0	0	1	9	12	5	3	9	3	0	44	3.5
NNW	0	0	1	1	1	0	4	4	5	2	0	1	20	3.6
CALM	0													
TOTAL	0	0	1	10	25	88	175	123	83	59	27	7	599	

NOTES:

1. Data from Lee Nuclear Station site Data, 12/1/2005 - 11/30/2006.

2. Calms are wind speeds below 1 mph (0.45 m/sec).

TABLE 2.7-37 (Sheet 1 of 2)
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION BY ATMOSPHERIC STABILITY CLASS C
HOURS AT EACH WIND SPEED AND DIRECTION

	Wind Speed (m/sec)													Average Wind Speed (m/sec)
DIR	≤0.5	≤0.8	≤1.0	≤1.3	≤1.5	≤2.0	≤3.0	≤4.0	≤5.0	≤6.0	≤8.0	≥8	Total	
N	0	0	1	1	2	7	10	2	4	1	1	0	30	2.7
NNE	0	0	0	0	3	2	11	10	5	3	0	0	35	3.2
NE	0	0	0	2	3	12	21	7	3	0	0	0	49	2.5
ENE	0	0	0	2	3	6	12	7	1	0	0	0	32	2.4
E	0	0	0	0	1	10	2	2	0	0	0	0	16	2.0
ESE	0	0	0	0	2	8	6	1	0	0	0	0	18	2.0
SE	0	0	0	3	4	16	10	0	0	0	0	0	33	1.8
SSE	0	0	0	0	5	13	18	5	0	1	0	0	42	2.3
S	0	0	1	0	2	5	24	4	2	3	0	0	41	2.7
SSW	0	0	0	0	0	2	21	12	10	5	4	1	56	3.7
SW	0	0	1	0	2	3	18	17	11	4	16	7	79	4.5
WSW	0	0	0	1	3	5	24	15	7	4	0	2	61	3.3
W	0	0	0	1	1	2	11	4	2	1	2	0	25	3.1
WNW	0	0	0	3	0	1	10	9	5	3	4	1	37	3.9
NW	0	0	0	0	0	9	16	4	4	6	2	0	41	3.3

TABLE 2.7-37 (Sheet 2 of 2)
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION BY ATMOSPHERIC STABILITY CLASS C
HOURS AT EACH WIND SPEED AND DIRECTION

	Wind Speed (m/sec)													Average Wind Speed (m/sec)
DIR	≤0.5	≤0.8	≤1.0	≤1.3	≤1.5	≤2.0	≤3.0	≤4.0	≤5.0	≤6.0	≤8.0	≥8	Total	
NNW	0	0	0	1	0	2	9	5	1	4	0	1	24	3.3
CALM	0													0.0
TOTAL	0	0	3	15	32	106	224	106	57	36	29	12	620	

NOTES:

1. Data from Lee Nuclear Station site Data, 12/1/2005 - 11/30/2006.

2. Calms are wind speeds below 1 mph (0.45 m/sec).

TABLE 2.7-38 (Sheet 1 of 2)
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION BY ATMOSPHERIC STABILITY CLASS D
HOURS AT EACH WIND SPEED AND DIRECTION

	Wind Speed (m/sec)													Average Wind Speed (m/sec)
DIR	≤0.5	≤0.8	≤1.0	≤1.3	≤1.5	≤2.0	≤3.0	≤4.0	≤5.0	≤6.0	≤8.0	≥8	Total	
N	0	0	6	8	16	25	59	32	17	9	2	0	174	2.7
NNE	0	0	7	8	15	27	78	52	24	6	2	0	219	2.8
NE	0	0	4	7	12	26	65	34	11	5	1	0	167	2.6
ENE	0	1	9	18	12	25	40	20	5	1	0	0	132	2.2
E	0	0	9	7	10	18	22	7	2	0	0	0	76	1.9
ESE	0	1	9	6	15	24	12	2	0	1	0	0	70	1.7
SE	0	0	4	10	26	32	25	2	5	0	0	0	105	1.9
SSE	1	0	6	8	16	36	52	6	8	3	4	3	144	2.5
S	0	0	6	5	21	48	64	25	12	3	5	0	190	2.5
SSW	0	0	5	3	7	23	79	38	34	17	2	0	208	3.1
SW	0	1	3	4	9	17	48	39	27	26	16	1	191	3.6
WSW	0	0	3	5	3	17	27	20	16	5	10	3	109	3.5
W	0	0	3	6	3	10	19	12	6	3	1	0	64	2.7
WNW	0	2	4	6	7	9	18	13	13	6	7	3	90	3.3
NW	0	1	6	10	22	26	34	16	15	10	4	5	149	2.8

TABLE 2.7-38 (Sheet 2 of 2)
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION BY ATMOSPHERIC STABILITY CLASS D
HOURS AT EACH WIND SPEED AND DIRECTION

	Wind Speed (m/sec)												Average Wind Speed (m/sec)
DIR	≤0.5	≤0.8	≤1.0	≤1.3	≤1.5	≤2.0	≤3.0	≤4.0	≤5.0	≤6.0	≤8.0	≥8	Total	
NNW	0	1	6	10	13	25	31	22	10	9	2	1	132	2.7
CALM	0													
TOTAL	1	7	93	124	207	386	672	341	206	106	57	17	2218	

NOTES:

1. Data from Lee Nuclear Station site Data, 12/1/2005 - 11/30/2006.
2. Calms are wind speeds below 1 mph (0.45 m/sec).

TABLE 2.7-39 (Sheet 1 of 2)
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION BY ATMOSPHERIC STABILITY CLASS E
HOURS AT EACH WIND SPEED AND DIRECTION

	Wind Speed (m/sec)												Average Wind Speed (m/sec)
DIR	≤0.5	≤0.8	≤1.0	≤1.3	≤1.5	≤2.0	≤3.0	≤4.0	≤5.0	≤6.0	≤8.0	≥8	Total	
N	0	4	22	12	17	27	18	7	2	2	1	0	112	1.8
NNE	0	3	10	12	21	16	11	6	1	0	0	0	81	1.7
NE	0	5	15	20	18	20	16	7	1	0	0	0	100	1.6
ENE	0	6	21	6	15	15	8	0	0	0	0	0	70	1.3
E	0	6	22	23	21	18	3	0	0	0	0	0	92	1.3
ESE	0	3	21	21	18	13	3	1	0	0	0	0	80	1.3
SE	0	0	19	23	27	25	16	0	0	0	0	0	109	1.4
SSE	0	0	7	19	27	32	23	5	1	1	0	0	115	1.8
S	0	0	5	9	15	44	66	25	0	0	0	0	164	2.2
SSW	0	2	3	12	9	12	42	25	21	8	0	0	136	2.8
SW	0	1	6	8	3	16	27	30	27	9	2	0	129	3.1
WSW	0	0	5	10	2	19	25	18	10	3	0	0	92	2.6
W	0	2	7	3	2	13	20	11	2	0	0	0	61	2.2
WNW	0	0	9	16	19	28	39	11	7	4	0	0	134	2.2
NW	0	1	9	34	38	41	40	24	6	0	1	0	196	2.0

TABLE 2.7-39 (Sheet 2 of 2)
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION BY ATMOSPHERIC STABILITY CLASS E
HOURS AT EACH WIND SPEED AND DIRECTION

	Wind Speed (m/sec)													Average Wind Speed (m/sec)
DIR	≤0.5	≤0.8	≤1.0	≤1.3	≤1.5	≤2.0	≤3.0	≤4.0	≤5.0	≤6.0	≤8.0	≥8	Total	
NNW	0	5	21	18	27	29	32	24	3	0	1	0	160	1.9
CALM	5													
TOTAL	5	39	202	247	277	367	390	195	82	28	5	0	1836	

NOTES:

1. Data from Lee Nuclear Station site Data, 12/1/2005 - 11/30/2006.
2. Calms are wind speeds below 1 mph (0.45 m/sec).

TABLE 2.7-40 (Sheet 1 of 2)
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION BY ATMOSPHERIC STABILITY CLASS F
HOURS AT EACH WIND SPEED AND DIRECTION

	Wind Speed (m/sec)													Average Wind Speed (m/sec)
DIR	≤0.5	≤0.8	≤1.0	≤1.3	≤1.5	≤2.0	≤3.0	≤4.0	≤5.0	≤6.0	≤8.0	≥8	Total	
N	1	10	20	9	7	3	3	0	0	0	0	0	54	1.0
NNE	1	9	13	5	5	5	1	0	0	0	0	0	40	1.0
NE	1	11	9	8	7	3	0	0	0	0	0	0	40	1.0
ENE	1	10	21	13	5	0	1	0	0	0	0	0	52	1.0
E	0	7	30	15	5	2	0	0	0	0	0	0	59	1.0
ESE	1	10	20	25	6	3	0	0	0	0	0	0	65	1.0
SE	0	1	15	16	18	15	3	0	0	0	0	0	66	1.3
SSE	0	3	6	13	16	12	7	0	1	0	0	0	59	1.5
S	1	1	7	3	6	7	18	2	0	0	0	0	46	1.8
SSW	0	0	5	3	5	3	8	2	0	1	0	0	28	2.0
SW	0	0	2	3	6	6	1	0	0	0	0	0	19	1.5
WSW	0	2	7	6	1	6	6	0	0	0	0	0	29	1.4
W	0	3	4	1	3	3	4	1	0	0	0	0	20	1.5
WNW	0	5	22	13	17	26	27	2	1	0	0	0	113	1.6
NW	1	5	28	34	50	48	36	3	0	0	0	0	205	1.5

TABLE 2.7-40 (Sheet 2 of 2)
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION BY ATMOSPHERIC STABILITY CLASS F
HOURS AT EACH WIND SPEED AND DIRECTION

	Wind Speed (m/sec)												Average Wind Speed (m/sec)
DIR	≤0.5	≤0.8	≤1.0	≤1.3	≤1.5	≤2.0	≤3.0	≤4.0	≤5.0	≤6.0	≤8.0	≥8	Total	
NNW	0	5	22	20	19	10	8	2	0	0	0	0	86	1.3
CALM	5													
TOTAL	12	85	231	189	176	153	124	12	2	1	0	0	986	

NOTES:

1. Data from Lee Nuclear Station site Data, 12/1/2005 - 11/30/2006.
2. Calms are wind speeds below 1 mph (0.45 m/sec).

TABLE 2.7-41 (Sheet 1 of 2)
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION BY ATMOSPHERIC STABILITY CLASS G
HOURS AT EACH WIND SPEED AND DIRECTION

	Wind Speed (m/sec)												Average Wind Speed (m/sec)
DIR	≤0.5	≤0.8	≤1.0	≤1.3	≤1.5	≤2.0	≤3.0	≤4.0	≤5.0	≤6.0	≤8.0	>8	Total	
N	3	23	37	20	2	1	0	0	0	0	0	0	86	0.9
NNE	2	32	17	8	1	0	0	0	0	0	0	0	60	0.8
NE	2	25	26	5	4	0	1	0	0	0	0	0	63	0.8
ENE	3	25	36	7	1	0	0	0	0	0	0	0	73	0.8
E	4	19	39	18	17	2	0	0	0	0	0	0	98	0.9
ESE	3	12	40	25	13	2	0	0	0	0	0	0	96	1.0
SE	1	21	41	19	12	9	2	0	0	0	0	0	106	1.0
SSE	1	6	17	11	8	4	0	0	0	0	0	0	48	1.0
S	0	7	2	3	2	1	1	0	0	0	0	0	17	1.0
SSW	0	0	2	1	1	2	1	0	0	0	0	0	7	1.4
SW	0	2	2	1	0	1	0	0	0	0	0	0	6	1.0
WSW	0	4	5	2	1	0	0	0	0	0	0	0	12	0.9
W	0	2	8	8	3	1	3	0	0	0	0	0	26	1.2
WNW	2	10	20	21	28	44	27	1	0	0	0	0	152	1.5

TABLE 2.7-41 (Sheet 2 of 2)
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION BY ATMOSPHERIC STABILITY CLASS G
HOURS AT EACH WIND SPEED AND DIRECTION

	Wind Speed (m/sec)												Average Wind Speed (m/sec)
DIR	≤0.5	≤0.8	≤1.0	≤1.3	≤1.5	≤2.0	≤3.0	≤4.0	≤5.0	≤6.0	≤8.0	>8	Total	
NW	4	23	60	83	121	180	90	0	0	0	0	0	561	1.5
NNW	2	26	58	51	23	9	1	0	0	0	0	0	170	1.0
CALM	63													
TOTAL	91	237	411	283	238	257	126	1	0	0	0	0	1645	

NOTES:

1. Data from Lee Nuclear Station site Data, 12/1/2005 - 11/30/2006.
2. Calms are wind speeds below 1 mph (0.45 m/sec).

TABLE 2.7-42 (Sheet 1 of 2)
MAXIMUM NUMBER OF CONSECUTIVE HOURS WITH WIND FROM A SINGLE SECTOR
GREENVILLE/SPARTANBURG, SOUTH CAROLINA

Sector	1997	1998	1999	2000	2001	2002	2003	2004	2005	Maximum	Average
N	8	13	12	10	8	7	10	10	9	13	9.8
NNE	7	5	4	11	13	12	15	10	12	15	9.6
NE	11	13	14	15	13	12	23	11	14	23	14.0
ENE	15	17	13	11	5	6	8	8	6	17	10.4
E	5	9	7	7	7	7	7	8	7	9	7.1
ESE	5	3	5	5	3	6	3	3	3	6	4.1
SE	3	4	4	3	4	7	5	6	5	7	4.5
SSE	4	4	5	4	6	6	5	4	7	6	4.8
S	7	13	6	10	10	10	9	8	12	13	9.1
SSW	5	8	5	8	8	8	9	6	9	9	7.1
SW	5	10	7	10	10	9	12	11	11	12	9.3
WSW	16	19	12	14	9	8	7	11	10	19	12.0
W	8	12	7	8	7	7	6	7	9	12	7.8
WNW	4	4	6	3	4	5	5	3	3	6	4.3

TABLE 2.7-42 (Sheet 2 of 2)
MAXIMUM NUMBER OF CONSECUTIVE HOURS WITH WIND FROM A SINGLE SECTOR
GREENVILLE/SPARTANBURG, SOUTH CAROLINA

Sector	1997	1998	1999	2000	2001	2002	2003	2004	2005	Maximum	Average
NW	3	3	2	6	4	5	4	4	4	6	3.9
NNW	6	6	8	7	7	7	5	5	7	8	6.4

NOTES:

1. Wind values which were either not provided, had a zero speed value, or a VRB wind direction were not included, and assumed to break any consecutive wind direction count.

2. Data from Unedited Local Climatological Data, National Oceanic and Atmospheric Administration, U. S. Department of Commerce, Asheville, NC, Greenville/Spartanburg International Airport, Station No. 03870.

3. Period of Record - 9 years (1997 - 2005).

TABLE 2.7-43 (Sheet 1 of 2)
MAXIMUM NUMBER OF CONSECUTIVE HOURS WITH WIND FROM THREE ADJACENT SECTORS, GREENVILLE/SPARTANBURG, SOUTH CAROLINA

Sector	1997	1998	1999	2000	2001	2002	2003	2004	2005	Maximum	Average
N	17	32	23	28	21	19	25	29	20	32	24.3
NNE	20	17	26	46	24	54	45	32	48	54	33.0
NE	37	60	61	82	32	78	65	47	66	82	57.8
ENE	41	70	66	62	30	16	37	35	23	70	44.6
E	18	22	36	21	11	10	16	19	13	36	19.1
ESE	8	14	9	10	14	10	12	20	13	20	12.1
SE	8	8	9	8	20	12	14	13	14	20	11.5
SSE	8	14	17	11	25	15	11	12	21	25	14.1
S	12	14	16	15	16	27	17	18	26	27	16.9
SSW	16	21	14	18	40	29	21	34	27	40	24.1
SW	24	38	37	26	49	36	49	36	32	49	36.9
WSW	35	53	46	48	43	31	38	45	31	53	42.4
W	33	48	34	28	18	18	25	21	18	48	28.1
WNW	13	16	18	14	18	8	18	10	19	18	14.4
NW	7	7	14	11	16	12	10	8	12	16	10.6

TABLE 2.7-43 (Sheet 2 of 2)
MAXIMUM NUMBER OF CONSECUTIVE HOURS WITH WIND FROM THREE ADJACENT SECTORS, GREENVILLE/SPARTANBURG, SOUTH CAROLINA

Sector	1997	1998	1999	2000	2001	2002	2003	2004	2005	Maximum	Average
NNW	24	27	20	29	41	22	32	19	23	41	26.8

NOTES:

1. Wind values which were either not provided, had a zero speed value, or a VRB wind direction were not included, and assumed to break any consecutive wind direction count.

2. Data from Unedited Local Climatological Data, National Oceanic and Atmospheric Administration, U. S. Department of Commerce, Asheville, NC, Greenville/Spartanburg International Airport, Station No. 03870.

3. Period of Record - 9 years (1997 - 2005).

TABLE 2.7-44 (Sheet 1 of 2)
MAXIMUM NUMBER OF CONSECUTIVE HOURS WITH WIND FROM FIVE ADJACENT SECTORS, GREENVILLE/SPARTANBURG, SOUTH CAROLINA

Sector	1997	1998	1999	2000	2001	2002	2003	2004	2005	Maximum	Average
N	29	44	32	48	43	54	45	41	48	54	42.0
NNE	38	69	64	82	44	96	75	69	114	96	67.1
NE	54	70	107	82	88	150	80	97	146	150	91.0
ENE	61	70	111	82	53	128	66	79	110	128	81.3
E	43	70	76	62	30	18	37	35	38	76	46.4
ESE	18	22	36	24	20	12	17	30	20	36	22.4
SE	10	19	22	13	26	23	18	22	27	26	19.1
SSE	12	14	22	15	26	27	18	22	33	27	19.5
S	16	21	30	18	42	36	24	34	35	42	27.6
SSW	26	49	38	49	54	61	77	65	38	77	52.4
SW	49	114	68	66	81	60	93	76	49	114	75.9
WSW	42	57	67	56	77	70	99	49	83	99	64.6
W	35	55	49	48	43	38	41	45	38	55	44.3
WNW	33	48	45	28	18	19	29	21	24	48	30.1

TABLE 2.7-44 (Sheet 2 of 2)
MAXIMUM NUMBER OF CONSECUTIVE HOURS WITH WIND FROM FIVE ADJACENT SECTORS, GREENVILLE/SPARTANBURG, SOUTH CAROLINA

Sector	1997	1998	1999	2000	2001	2002	2003	2004	2005	Maximum	Average
NW	24	27	20	29	41	22	35	25	34	41	27.9
NNW	28	36	23	47	41	23	33	29	26	47	32.5

NOTES:

1. Wind values which were either not provided, had a zero speed value, or a VRB wind direction were not included, and assumed to break any consecutive wind direction count.

2. Data from Unedited Local Climatological Data, National Oceanic and Atmospheric Administration, U. S. Department of Commerce, Asheville, NC, Greenville/Spartanburg International Airport, Station No. 03870.

3. Period of Record - 9 years (1997 - 2005).

TABLE 2.7-45 (Sheet 1 of 2)
COMPARISON OF MAXIMUM WIND PERSISTENCE
AT LEE NUCLEAR STATION SITE AND GREENVILLE/SPARTANBURG
SOUTH CAROLINA

	Wind Persistence (hrs)								
	Single Sector			Three Adjacent Sectors			Five Adjacent Sectors		
Sector	WLS	GSP[5]	GSP[4]	WLS	GSP[5]	GSP[4]	WLS	GSP[5]	GSP[4]
N	9	15	13	34	32	32	55	76	54
NNE	12	6	15	36	50	54	71	68	96
NE	12	13	23	31	43	82	66	56	150
ENE	6	4	17	20	31	70	34	43	128
E	4	6	9	23	11	36	25	31	76
ESE	5	5	6	19	11	20	26	11	36
SE	6	3	7	15	8	20	26	20	26
SSE	11	5	6	20	19	25	25	19	27
S	7	12	13	22	19	27	40	26	42
SSW	9	7	9	30	23	40	42	70	77
SW	10	11	12	41	33	49	62	88	114
WSW	7	10	19	31	44	53	53	88	99

TABLE 2.7-45 (Sheet 2 of 2)
COMPARISON OF MAXIMUM WIND PERSISTENCE
AT LEE NUCLEAR STATION SITE AND GREENVILLE/SPARTANBURG
SOUTH CAROLINA

	Wind Persistence (hrs)								
	Single Sector			Three Adjacent Sectors			Five Adjacent Sectors		
Sector	WLS	GSP[5]	GSP[4]	WLS	GSP[5]	GSP[4]	WLS	GSP[5]	GSP[4]
W	8	8	12	21	20	48	45	44	55
WNW	6	3	6	30	9	18	48	20	48
NW	15	4	6	45	8	16	47	31	41
NNW	14	8	8	27	31	41	62	36	47
Max	15	15	23	45	50	82	71	88	150
Average	8.8	7.5	11.3	27.8	24.5	39.4	45.4	45.4	69.8

NOTES:

1. Wind values which were either not provided, had a zero speed value, or a VRB wind direction were not included, and assumed to break any consecutive wind direction count.
2. Wind persistence values above are the maximum persistence durations for the period of record.
3. Period of record at Lee Nuclear Station site, 12/1/2005 through 11/30/2006, Tower 2 at 10 meter level.
4. Period of record at Greenville/Spartanburg, 1997 - 2005.
5. Period of record at Greenville/Spartanburg, 12/1/2005 through 11/30/2006.

TABLE 2.7-46 (Sheet 1 of 2)
NINETY-NINE ISLANDS MONTHLY CLIMATE SUMMARY
NCDC 1971-2000 MONTHLY NORMALS

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean Max. Temperature (°F)	50.5	55.1	62.9	71.3	77.7	83.9	87.5	86	80.4	71.7	62	53.2	70.2
Highest Mean Max. Temperature (°F)	59.3	64.3	68.6	76.4	82.9	89.2	94.4	91.8	84.5	77.9	68.4	62.1	94.4
Year Highest Occurred	1974	1976	2000	1986	2000	1986	1993	1999	1973	1984	1999	1984	1993
Lowest Mean Max. Temperature (°F)	39.7	46.1	56.9	66	73.2	77.9	83	81.9	77	66.2	54.4	45.1	39.7
Year Lowest Occurred	1977	1978	1971	1984	1997	1997	1979	1992	1974	1976	1996	2000	1977
Mean Temperature (°F)	39	42.3	49.6	57.1	65.2	72.6	76.8	75.7	69.5	58.5	49	41.4	58.1
Highest Mean Temperature (°F)	50	48.6	54.1	61.4	70.3	76.9	81.2	79.4	73.1	65.8	57	49.6	81.2
Year Highest Occurred	1974	1990	2000	1999	1991	1986	1993	1999	1973	1984	1985	1971	1993
Lowest Mean Temperature (°F)	28.5	34	44.1	52.5	60.7	68.2	73.7	72.9	66.8	52.2	42	34.1	28.5
Year Lowest Occurred	1977	1978	1971	1983	1997	1972	1979	1997	1984	1987	1976	2000	1977
Mean Min. Temperature (°F)	27.4	29.5	36.2	42.9	52.7	61.3	66.1	65.3	58.5	45.2	35.9	29.5	45.9
Highest Mean Min. Temperature (°F)	40.7	36.4	42.7	49.2	60.6	65.6	69	69.1	62.2	53.9	48	38.8	69.1
Year Highest Occurred	1974	1998	1973	1991	1991	1994	1991	1995	1980	1971	1985	1971	1995
Lowest Mean Min. Temperature (°F)	17.2	21.5	30.5	37.7	47.9	55.5	62.9	61.1	53.5	35.7	28.4	23	17.2
Year Lowest Occurred	1977	1977	1981	1971	1981	1972	1976	1997	1999	1987	1976	2000	1977

TABLE 2.7-46 (Sheet 2 of 2)
NINETY-NINE ISLANDS MONTHLY CLIMATE SUMMARY
NCDC 1971-2000 MONTHLY NORMALS

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean Precipitation (in.)	4.53	4.07	4.93	3.05	4.15	3.76	3.78	4.83	4.08	3.85	3.67	3.67	48.37
Highest Precipitation (in.)	8.25	6.6	9.54	6.65	10.5	10.5	10.9	11.9	9.73	14.9	8.83	8.75	14.93
Year Highest Occurred	1978	1997	1980	1998	1975	1995	1971	1994	1987	1990	1985	1983	1990
Lowest Precipitation (in.)	0.3	0.64	1.15	0.39	1.13	0.17	0.85	0.88	0.59	0	0.88	0.83	0
Year Lowest Occurred	1981	1978	1985	1976	1988	1986	1977	1999	1985	2000	1973	1980	2000
Heating Degree Days (°F)	807	637	480	243	88	8	0	0	21	236	483	734	3737
Cooling Degree Days (°F)	0	0	0	7	94	236	366	330	155	33	2	0	1223

NOTES:

1. Ninety-Nine Islands, South Carolina (Station No. 386293), Monthly Climate Summary, Period of Record: 1971 to 2000.

2. Reference: Southeast Regional Climate Center, http://cirrus.dnr.state.sc.us/cgi-bin/sercc/cliMAIN.pl?sc6293

TABLE 2.7-47 (Sheet 1 of 2)
HOURLY METEOROLOGICAL DATA
GREENVILLE/SPARTANBURG,
SOUTH CAROLINA WORST 1-DAY - JULY 31, 1999

Hour	Dry Bulb Temperature (ºF)	Wet Bulb Temperature (ºF)
1	81	75
2	81	74
3	83	74
4	82	74
5	79	74
6	80	74
7	83	75
8	87	77
9	92	77
10	95	77
11	97	77
12	99	78
13	98	77
14	103	79
15	103	77
16	91	77
17	92	77
18	93	78
19	91	79
20	88	78
21	86	77
22	84	77
23	83	77

TABLE 2.7-47 (Sheet 2 of 2)
HOURLY METEOROLOGICAL DATA
GREENVILLE/SPARTANBURG,
SOUTH CAROLINA WORST 1-DAY - JULY 31, 1999

Hour	Dry Bulb Temperature (ºF)	Wet Bulb Temperature (ºF)
24	81	75
AVERAGE	88.8	76.4

NOTES:

1. The average wet bulb temperature above (76.4°F) is calculated from 24 hourly observations for this date.

2. Period of Record - 9 years (1997 - 2005).

3. Data from Unedited Local Climatological Data, National Oceanic and Atmospheric Administration, U. S. Department of Commerce, Asheville, NC, Greenville/Spartanburg International Airport, Station No. 03870.

4. Worst 1-Day defined as the calender day with the highest average wet bulb temperature.

TABLE 2.7-48
DAILY AVERAGE METEOROLOGICAL DATA
GREENVILLE/SPARTANBURG, SOUTH CAROLINA DAILY AVERAGE -
WORST 5 CONSECUTIVE DAY PERIOD

Date	Daily Average Dry Bulb Temperature (°F)	Daily Average Wet Bulb Temperature (°F)
8/6/2000	80.2	74.7
8/7/2000	83.9	75.7
8/8/2000	82.6	74.9
8/9/2000	84.8	75.7
8/10/2000	81.3	74.3
AVERAGE	82.6	75.1

NOTES:

1. Period of Record - 9 years (1997 - 2005).

2. Data from Unedited Local Climatological Data, National Oceanic and Atmospheric Administration, U. S. Department of Commerce, Asheville, NC, Greenville/Spartanburg International Airport, Station No. 03870.

3. Worst 5 Consecutive Day Period defined as the 5 consecutive calender days with the highest average wet bulb temperature.

TABLE 2.7-49 (Sheet 1 of 2)
DAILY AVERAGE METEOROLOGICAL DATA
GREENVILLE/SPARTANBURG, SOUTH CAROLINA
WORST 30 CONSECUTIVE DAY PERIOD

			Daily Average	
Year	Month	Day	Dry Bulb (°F)	Wet Bulb (°F)
2005	June	29	75.8	71.8
2005	June	30	79.2	72.9
2005	July	1	78.7	73.2
2005	July	2	78.1	71.3
2005	July	3	75.0	71.6
2005	July	4	76.8	72.5
2005	July	5	80.1	73.7
2005	July	6	77.7	72.0
2005	July	7	72.2	69.7
2005	July	8	74.9	67.6
2005	July	9	77.5	70.1
2005	July	10	76.4	72.0
2005	July	11	77.4	74.2
2005	July	12	78.0	73.4
2005	July	13	75.6	72.1
2005	July	14	76.0	72.5
2005	July	15	77.6	72.6
2005	July	16	78.1	73.0
2005	July	17	80.7	74.1
2005	July	18	81.0	74.3
2005	July	19	81.3	74.3
2005	July	20	79.0	73.3

TABLE 2.7-49 (Sheet 2 of 2)
DAILY AVERAGE METEOROLOGICAL DATA
GREENVILLE/SPARTANBURG, SOUTH CAROLINA
WORST 30 CONSECUTIVE DAY PERIOD

			Daily Average	
Year	Month	Day	Dry Bulb (°F)	Wet Bulb (°F)
2005	July	21	79.9	73.8
2005	July	22	79.7	73.4
2005	July	23	81.6	73.0
2005	July	24	80.4	72.4
2005	July	25	83.3	75.4
2005	July	26	86.1	75.7
2005	July	27	85.7	75.6
2005	July	28	79.0	72.2
AVERAGE			78.8	72.8

NOTES:

1. Data from Unedited Local Climatological Data, National Oceanic and Atmospheric Administration, U. S. Department of Commerce, Asheville, NC, Greenville/Spartanburg International Airport, Station No. 03870.

2. Period of Record - 9 years (1997 - 2005).

3. Worst 30 Consecutive Day Period defined as the 30 consecutive calender days with the highest average wet bulb temperature.

TABLE 2.7-50 (Sheet 1 of 2)
HOURLY METEOROLOGICAL DATA
LEE NUCLEAR STATION SITE
WORST 1-DAY - AUGUST 1, 2006

Hour	Dry Bulb Temperature (F)	Wet Bulb Temperature (F)
1	76.4	75.8
2	75.4	75.1
3	74.7	74.2
4	74.0	73.8
5	72.8	72.5
6	72.7	72.5
7	72.5	72.2
8	72.9	72.7
9	76.8	75.3
10	80.9	77.1
11	85.5	78.3
12	88.8	78.9
13	91.5	78.8
14	93.4	77.8
15	94.8	77.4
16	92.6	77.4
17	87.4	76.7
18	89.9	79.1
19	91.1	79.5
20	88.8	80.2
21	85.5	80.3
22	83.2	79.4

TABLE 2.7-50 (Sheet 2 of 2)
HOURLY METEOROLOGICAL DATA
LEE NUCLEAR STATION SITE
WORST 1-DAY - AUGUST 1, 2006

Hour	Dry Bulb Temperature (F)	Wet Bulb Temperature (F)
23	80.6	79.1
24	79.1	78.2
AVERAGE	82.5	76.8

NOTES:

1. Lee Nuclear Station site data, 12/1/2005 - 11/30/2006.

2. Worst 1-day defined as the calendar day with the highest average wet bulb temperature.

TABLE 2.7-51
DAILY AVERAGE METEOROLOGICAL DATA
LEE NUCLEAR STATION SITE
DAILY AVERAGE - WORST 5 CONSECUTIVE DAY PERIOD

Date	Daily Average Dry Bulb Temperature (F)	Daily Average Wet Bulb Temperature (F)
7/31/2006	81.1	74.4
8/1/2006	82.5	76.8
8/2/2006	82.1	76.8
8/3/1006	80.6	75.8
8/4/2006	84.3	75.8
Average	82.1	75.9

NOTES:

1. Lee Nuclear Station Site data, 12/1/2005 - 11/30/2006.

2. Worst 5 consecutive day period defined as the 5 consecutive calendar days with the highest average wet bulb temperature.

TABLE 2.7-52 (Sheet 1 of 2)
DAILY AVERAGE METEOROLOGICAL DATA
LEE NUCLEAR STATION SITE
WORST 30 CONSECUTIVE DAY PERIOD

			Daily Average	
Year	Month	Day	Dry Bulb (ºF)	Wet Bulb (ºF)
2006	July	12	80.0	73.1
2006	July	13	79.7	73.3
2006	July	14	77.7	73.6
2006	July	15	78.4	73.1
2006	July	16	80.0	72.2
2006	July	17	78.4	70.4
2006	July	18	80.1	71.7
2006	July	19	81.9	72.8
2006	July	20	78.0	71.5
2006	July	21	80.0	73.2
2006	July	22	77.6	73.1
2006	July	23	75.3	72.2
2006	July	24	75.5	71.7
2006	July	25	76.5	73.0
2006	July	26	79.9	74.3
2006	July	27	80.8	73.7
2006	July	28	82.7	74.5
2006	July	29	75.1	70.9
2006	July	30	78.6	72.7
2006	August	1	81.1	74.4
2006	August	2	82.5	76.8
2006	August	3	82.1	76.8

TABLE 2.7-52 (Sheet 2 of 2)
DAILY AVERAGE METEOROLOGICAL DATA
LEE NUCLEAR STATION SITE
WORST 30 CONSECUTIVE DAY PERIOD

			Daily Average	
Year	Month	Day	Dry Bulb (ºF)	Wet Bulb (ºF)
2006	August	4	80.6	75.8
2006	August	5	84.3	75.8
2006	August	6	80.7	74.3
2006	August	7	78.9	74.5
2006	August	8	80.9	75.3
2006	August	9	79.7	74.9
2006	August	10	80.0	74.5
2006	August	11	80.6	74.7
Average			79.6	73.6

NOTES:

1. Lee Nuclear Station site data, 12/1/2005 - 11/30/2006.

2. Worst 30 consecutive day period defined as the 30 consecutive calendar days with the highest average wet bulb temperature.

TABLE 2.7-53
RELATIVE HUMIDITY
GREENVILLE/SPARTANBURG, SOUTH CAROLINA
FOR 4 TIME PERIODS PER DAY
1997-2005[(a)]

Time	00:00 - 06:00	06:00-12:00	12:00-18:00	18:00-24:00
Jan	75%	69%	53%	67%
Feb	76%	69%	52%	66%
Mar	73%	65%	49%	63%
Apr	78%	65%	50%	66%
May	84%	68%	53%	71%
Jun	87%	71%	58%	76%
Jul	89%	72%	59%	79%
Aug	87%	72%	56%	77%
Sep	85%	71%	56%	77%
Oct	86%	72%	57%	78%
Nov	81%	71%	56%	74%
Dec	77%	70%	54%	69%
Annual	81%	69%	54%	72%

a) Data from Unedited Local Climatological Data, National Oceanic and Atmospheric Administration, U. S. Department of Commerce, Asheville, NC, Greenville/Spartanburg International Airport, Station No. 03870.

TABLE 2.7-54
NINETY-NINE ISLANDS MONTHLY CLIMATE SUMMARY
NINETY-NINE ISLANDS, SOUTH CAROLINA (386293)
PERIOD OF RECORD: 8/1/1948 TO 12/31/2005

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	51.5	55.6	63.8	72.6	79.4	85.4	89.0	87.6	82.1	73.2	63.7	54.0	71.5
Average Min. Temperature (F)	26.7	29.1	35.7	43.3	52.7	61.3	65.9	65.1	58.2	45.1	35.6	28.4	45.6
Average Total Precipitation (in.)	4.10	4.06	4.99	3.40	3.94	3.89	4.12	4.69	3.89	3.32	3.30	3.81	47.52
Average Total Snowfall (in.)	1.1	1.1	0.5	0	0	0	0	0	0	0	0	0.4	3.1
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0

Percent of valid observations for period of record.

Snowfall: 84.1%, Snow Depth: 84.2%, Max. Temp.: 76.3%, Min. Temp.: 76.3%, Precipitation: 99.6%.

NOTES:

1. Data from: Southeast Regional Climate Center, http://cirrus.dnr.state.sc.us/cgi-bin/sercc/cliMAIN.pl?sc6293

TABLE 2.7-55
COMPARISON OF RELATIVE HUMIDITY FOR LEE NUCLEAR SITE AND[(a)]
GREENVILLE/SPARTANBURG, SOUTH CAROLINA[(b)]
4 TIME PERIODS PER DAY

	00:00 - 06:00		06:00 - 12:00		12:00 - 18:00		18:00 - 24:00	
Time	WLS	GSP	WLS	GSP	WLS	GSP	WLS	GSP
Jan	78%	75%	69%	69%	53%	53%	67%	67%
Feb	76%	76%	68%	69%	44%	52%	58%	66%
Mar	73%	73%	63%	65%	41%	49%	54%	63%
Apr	78%	78%	75%	65%	43%	50%	55%	66%
May	88%	84%	77%	68%	50%	53%	67%	71%
Jun	92%	87%	80%	71%	51%	58%	72%	76%
Jul	94%	89%	83%	72%	55%	59%	75%	79%
Aug	94%	87%	86%	72%	60%	56%	78%	77%
Sep	93%	85%	86%	71%	59%	56%	82%	77%
Oct	90%	86%	83%	72%	52%	57%	74%	78%
Nov	85%	81%	74%	71%	46%	56%	74%	74%
Dec	86%	77%	78%	70%	49%	54%	71%	69%
Annual	86%	81%	77%	69%	50%	54%	69%	72%

a) Lee Nuclear Station site data, 12/1/2005 - 11/30/2006.

b) Data from Unedited Local Climatological Data, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Ashville, NC, Greenville/Spartanburg International Airport, Station No. 03870. (GSP), 1997-2005.

TABLE 2.7-56
PRECIPITATION DATA (INCHES OF RAIN)
GREENVILLE/SPARTANBURG, SOUTH CAROLINA

Month	Monthly Mean	Max Monthly Precipitation	Min Monthly Precipitation	Max 24 hour	Mean No. days >0 in
Jan	3.4	6.7	1.4	2.2	10.9
Feb	3.5	6.9	1.4	2.3	9.2
Mar	4.4	6.7	1.3	3.2	10.9
Apr	4.0	9.1	0.7	2.4	10.2
May	3.2	7.6	1.4	3.3	9.8
Jun	4.6	10.0	0.5	3.4	12.6
Jul	5.3	8.9	1.4	4.7	12.9
Aug	3.2	11.4	0.6	4.1	10.0
Sep	4.5	11.2	0.5	4.9	8.2
Oct	3.2	5.9	0.0	3.7	8.1
Nov	3.4	4.4	2.0	2.3	9.6
Dec	3.9	6.5	1.9	3.5	9.2
Annual	46.4	63.1	34.8	4.9	121.6

NOTES:

1. Data from NCDC, 1997-2005.

TABLE 2.7-57 (Sheet 1 of 2)
POINT PRECIPITATION FREQUENCY

	Recurrence Intervals (Years)						
Duration	1	2	5	10	25	50	100
5 minutes	0.4	0.5	0.6	0.6	0.7	0.8	0.8
10 minutes	0.7	0.8	0.9	1.0	1.1	1.2	1.3
15 minutes	0.8	1.0	1.2	1.3	1.4	1.5	1.7
30 minutes	1.1	1.4	1.6	1.9	2.1	2.3	2.5
1 hour	1.4	1.7	2.1	2.4	2.8	3.2	3.5
2 hours	1.6	2.0	2.4	2.8	3.4	3.8	4.2
3 hours	1.7	2.1	2.6	3.0	3.6	4.1	4.7
6 hours	2.1	2.6	3.2	3.7	4.5	5.1	5.8
12 hours	2.6	3.1	3.9	4.5	5.4	6.2	7.1
24 hours	3.1	3.7	4.6	5.4	6.4	7.3	8.1
2 days	3.6	4.4	5.4	6.3	7.5	8.4	9.4
4 days	4.1	4.9	6.0	6.9	8.2	9.2	10.2
7 days	4.7	5.7	6.9	7.9	9.2	10.3	11.5
10 days	5.4	6.4	7.7	8.7	10.1	11.2	12.3

TABLE 2.7-57 (Sheet 2 of 2)
POINT PRECIPITATION FREQUENCY

NOTES:

1. Precipitation (inches) grouped by recurrence interval for given duration.

2. From "Precipitation-Frequency Atlas of the United States" NOAA Atlas 14, Volume 2, Version 3, G. M. Bonnin, D. Martin, B. Lin, T. Parzybok, M. Yekta, and D. Riley, NOAA, National Weather Service, Silver Spring, Maryland, 2004, Extracted:Aug 24 2006. Location: South Carolina 35.024 N 81.524 W 777 feet. http://hdsc.nws.noaa.gov/hdsc/pfds/orb/sc_pfds.html

TABLE 2.7-58 (Sheet 1 of 2)
PERCENT OF TOTAL OBSERVATIONS (BY MONTH) OF INDICATED WIND DIRECTIONS AND PRECIPITATION
GREENVILLE/SPARTANBURG, SOUTH CAROLINA

Sector	January	February	March	April	May	June	July	August	September	October	November	December	Total
N	1.55	1.39	1.27	1.25	1.25	1.25	1.13	1.09	1.49	0.94	1.35	1.76	15.71
NNE	1.30	0.92	1.60	0.97	0.89	0.73	0.57	0.45	1.00	1.42	1.02	1.20	12.06
NE	2.21	2.57	2.99	2.00	1.03	1.06	1.13	0.65	1.09	1.46	1.25	2.77	20.21
ENE	1.65	1.59	1.78	1.36	0.36	0.43	0.61	0.34	0.59	0.78	0.73	1.42	11.64
E	0.57	0.43	0.39	0.32	0.18	0.41	0.46	0.29	0.31	0.24	0.33	0.39	4.33
ESE	0.15	0.09	0.11	0.13	0.17	0.34	0.20	0.13	0.15	0.04	0.13	0.04	1.68
SE	0.10	0.04	0.05	0.27	0.09	0.17	0.19	0.13	0.17	0.06	0.15	0.03	1.44
SSE	0.10	0.09	0.13	0.29	0.11	0.22	0.29	0.22	0.31	0.11	0.24	0.13	2.24
S	0.69	0.31	0.36	0.65	0.42	0.69	0.29	0.33	0.55	0.20	0.65	0.24	5.37
SSW	0.48	0.38	0.41	0.74	0.50	0.46	0.41	0.15	0.20	0.18	0.66	0.25	4.82
SW	0.93	0.66	0.57	0.60	0.69	0.59	0.60	0.33	0.28	0.28	0.88	0.59	6.98
WSW	0.45	0.65	0.46	0.48	0.62	0.62	0.38	0.43	0.27	0.24	0.59	0.47	5.66
W	0.33	0.37	0.33	0.34	0.39	0.42	0.34	0.22	0.20	0.14	0.31	0.32	3.71
WNW	0.09	0.01	0.11	0.10	0.19	0.24	0.11	0.13	0.06	0.08	0.05	0.04	1.22

TABLE 2.7-58 (Sheet 2 of 2)
PERCENT OF TOTAL OBSERVATIONS (BY MONTH) OF INDICATED WIND DIRECTIONS AND PRECIPITATION
GREENVILLE/SPARTANBURG, SOUTH CAROLINA

Sector	January	February	March	April	May	June	July	August	September	October	November	December	Total
NW	0.11	0.08	0.25	0.14	0.15	0.22	0.15	0.06	0.09	0.08	0.10	0.09	1.53
NNW	0.20	0.08	0.13	0.15	0.09	0.14	0.14	0.09	0.06	0.04	0.10	0.18	1.40
Total	10.93	9.64	10.95	9.78	7.12	7.96	7.02	5.04	6.82	6.30	8.52	9.91	100

NOTES:

1. Instances of "trace" precipitation were counted as precipitation.

2. Data from Unedited Local Climatological Data, National Oceanic and Atmospheric Administration, U. S. Department of Commerce, Asheville, NC, Greenville/Spartanburg International Airport, Station No. 03870.

3. Period of Record - 9 years (1997 - 2005).

TABLE 2.7-59
PERCENT OF TOTAL OBSERVATIONS (BY MONTH) OF PRECIPITATION AND WIND DIRECTION
LEE NUCLEAR SITE

Sector	January	February	March	April	May	June	July	August	September	October	November	December	Total
N	1.38	1.58	0.59	0.40	0.79	0.79	0.20	0.59	0.99	0.59	1.38	1.98	11.26
NNE	1.58	0.59	1.19	0.40	0.59	1.38	0.00	0.79	0.99	0.99	3.56	2.37	14.43
NE	0.00	0.40	0.00	0.79	0.40	0.99	0.00	0.40	1.58	0.99	0.79	2.17	8.50
ENE	0.59	0.40	0.40	0.00	0.40	1.19	0.59	1.38	0.40	0.79	0.40	0.40	6.92
E	0.00	0.00	0.79	0.20	0.20	0.99	0.59	1.78	0.00	0.00	0.00	0.59	5.14
ESE	0.40	0.00	0.00	0.00	0.40	0.99	0.20	0.40	0.00	0.40	0.20	0.40	3.36
SE	1.19	0.20	0.00	0.40	0.20	0.40	0.20	0.00	0.00	0.20	0.99	0.99	4.74
SSE	1.19	0.20	0.00	0.59	0.00	0.40	0.59	0.59	0.00	1.58	0.20	0.20	5.53
S	3.56	1.19	0.20	0.99	0.20	0.20	0.40	0.40	0.20	0.20	0.00	0.40	7.91
SSW	0.79	0.79	0.20	0.99	0.20	0.00	0.40	0.40	0.00	0.20	0.20	0.00	4.15
SW	0.40	0.79	0.40	0.00	0.40	0.40	0.20	0.20	0.00	0.00	0.20	0.99	3.95
WSW	0.00	0.20	0.00	0.40	0.20	0.00	0.59	0.20	0.00	0.20	0.20	0.40	2.37
W	0.40	0.20	0.00	0.20	0.20	0.59	0.59	0.59	0.40	0.00	0.20	0.20	3.56
WNW	0.40	0.00	0.00	0.00	0.59	0.40	0.40	0.40	0.00	1.19	0.20	0.20	3.75
NW	1.19	0.00	0.20	0.59	0.40	0.59	0.59	0.00	0.40	1.98	0.99	0.59	7.51
NNW	0.59	0.79	0.20	0.40	0.00	0.79	0.20	0.59	0.59	0.79	0.99	0.99	6.92
Total	13.64	7.31	4.15	6.32	5.14	10.0	5.73	8.70	5.53	10.08	10.47	12.85	100

NOTES:

1. Instances of "trace" precipitation were counted as precipitation.
2. Data from Lee Nuclear Site Data, 12/1/2005 - 11/30/2006.
3. Hours of missing wind direction or missing precipitation were not included in the frequency calculation.
4. Calm values classified by precipitation occurrences under variable wind direction conditions.

TABLE 2.7-60
RAINFALL FREQUENCY DISTRIBUTION
LEE NUCLEAR STATION SITE
NUMBER OF HOURS PER MONTH

Rainfall (inch/hr)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.01-0.019	23	16	8	8	7	15	7	14	8	16	8	10
0.02-.099	37	19	10	15	10	19	13	21	9	22	27	37
0.10-0.249	6	2	4	7	9	13	6	4	7	11	16	19
0.25-0.499	2	0	0	2	3	2	2	3	3	2	1	1
0.50-0.99	1	0	0	0	0	2	0	2	1	0	1	0
1.00-1.99	0	0	0	0	0	0	1	0	0	0	0	0
2.0 & over	0	0	0	0	0	0	0	0	0	0	0	0
Total	69.0	37.0	22.0	32.0	29.0	51.0	29.0	44.0	28.0	51.0	53.0	67.0

NOTES:

1. Lee Nuclear Station Site data, 12/1/2005 - 11/30/2006.

TABLE 2.7-61
PRECIPITATION DATA (INCHES OF RAIN)
LEE NUCLEAR STATION SITE

Month	Monthly Hours	Max 24 hour Rain (in)	Number of days with rainfall >0 in
Jan	69	1.35	15
Feb	37	0.29	10
Mar	22	0.97	8
Apr	32	0.92	11
May	29	1.14	9
Jun	51	1.38	13
Jul	29	2.55	9
Aug	44	1.38	11
Sep	28	2.68	10
Oct	51	1.80	13
Nov	53	1.87	7
Dec	67	1.75	8
Annual	512	2.68	124

NOTES:

1. Lee Nuclear Station site Data, 12/1/2005 - 11/30/2006.

TABLE 2.7-62 (Sheet 1 of 5)
NINETY-NINE ISLANDS, SOUTH CAROLINA
MONTHLY TOTAL SNOWFALL (INCHES)
1947 - 2006

YEAR(S)	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	Annual
1947-48	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00
1948-49	0.00z	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1949-50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1950-51	0.00	0.00	0.00	0.00	0.00	0.00z	0.00	0.00	0.00z	0.00z	0.00	0.00	0.00
1951-52	0.00	0.00	0.00	0.00	0.00z	0.00z	0.00	0.00z	0.00z	0.00z	0.00z	0.00z	0.00
1952-53	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00
1953-54	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00
1954-55	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00
1955-56	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00
1956-57	0.00z	0.00z	0.00z	0.00	0.00z	0.00	0.00z	0.00z	0.00z	0.00z	0.00z	0.00	0.00
1957-58	0.00	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00
1958-59	0.00z	0.00	0.00	0.00	0.00	0.00z	0.00	0.00z	0.00z	0.00z	0.00	0.00z	0.00
1959-60	0.00z	0.00	0.00	0.00	0.00	0.00	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00
1960-61	0.00z	0.00z	0.00z	0.00	0.00	0.00	1.00	0.50	0.00	0.00	0.00	0.00	1.50
1961-62	0.00	0.00	0.00	0.00	0.00	0.00	0.00z	0.00a	1.00	0.00	0.00	0.00	1.00

TABLE 2.7-62 (Sheet 2 of 5)
NINETY-NINE ISLANDS, SOUTH CAROLINA
MONTHLY TOTAL SNOWFALL (INCHES)
1947 - 2006

YEAR(S)	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	Annual
1962-63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00z	0.00	0.00a	0.00	0.00	0.00
1963-64	0.00	0.00a	0.00	0.00	0.00	2.50	1.50	0.00	0.00	0.00	0.00	0.00	4.00
1964-65	0.00	0.00	0.00	0.00	0.00	0.00z	8.50	2.00	0.00	0.00	0.00	0.00	10.50
1965-66	0.00	0.00	0.00	0.00	0.00	0.00	9.00	1.00	0.00	0.00	0.00	0.00	10.00
1966-67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	2.00
1967-68	0.00	0.00	0.00	0.00	0.00	0.00	3.00	2.00	0.00	0.00	0.00	0.00	5.00
1968-69	0.00	0.00	0.00	0.00	0.00c	0.00	0.00	12.30	5.00	0.00	0.00z	0.00	17.30
1969-70	0.00	0.00	0.00	0.00	0.00	0.00	1.70	0.00	0.00	0.00	0.00	0.00	1.70
1970-71	0.00	0.00	0.00	0.00	0.00	3.00	0.00	0.00a	6.30	0.00	0.00	0.00	9.30
1971-72	0.00	0.00	0.00	0.00	0.00	12.00	0.00	1.00	2.00	0.00	0.00	0.00	15.00
1972-73	0.00	0.00	0.00	0.00	0.00	0.00	3.80	2.00	0.00	0.00	0.00	0.00	5.80
1973-74	0.00	0.00	0.00	0.00	0.00	0.00a	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1974-75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1975-76	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1976-77	0.00	0.00	0.00	0.00	0.00	0.00	5.50	0.00	0.00	0.00	0.00	0.00	5.50

TABLE 2.7-62 (Sheet 3 of 5)
NINETY-NINE ISLANDS, SOUTH CAROLINA
MONTHLY TOTAL SNOWFALL (INCHES)
1947 - 2006

YEAR(S)	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	Annual
1977-78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.50	0.00	0.00	0.00	2.50
1978-79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.00	0.00	0.00	0.00	0.00	14.00
1979-80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00b	0.00b	0.00	0.00	0.00	0.00
1980-81	0.00	0.00	0.00	0.00	0.00	0.00	0.00a	0.00	0.00	0.00	0.00	0.00	0.00
1981-82	0.00	0.00	0.00	0.00	0.00	0.00	5.20	0.00a	0.00	0.00	0.00	0.00	5.20
1982-83	0.00	0.00	0.00	0.00	0.00	0.00	0.00a	0.00a	6.00	0.00	0.00	0.00	6.00
1983-84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	0.00	0.00	0.00	0.00	4.00
1984-85	0.00	0.00	0.00	0.00	0.00	0.00	0.00z	0.00	0.00	0.00	0.00	0.00	0.00
1985-86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00a	0.00	0.00	0.00	0.00	0.00
1986-87	0.00	0.00	0.00	0.00	0.00	0.00	0.00d	0.00	0.00	0.00	0.00	0.00	0.00
1987-88	0.00	0.00	0.00	0.00	0.00	0.00	13.00	0.00	0.00	0.00	0.00	0.00	13.00
1988-89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.10	0.00	0.00	0.00	0.00	2.10
1989-90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1990-91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1991-92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TABLE 2.7-62 (Sheet 4 of 5)
NINETY-NINE ISLANDS, SOUTH CAROLINA
MONTHLY TOTAL SNOWFALL (INCHES)
1947 - 2006

YEAR(S)	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	Annual
1992-93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00b	2.00	0.00	0.00	0.00	2.00
1993-94	0.00	0.00	0.00	0.00	0.00	1.00	0.00a	0.00	0.00	0.00	0.00	0.00	1.00
1994-95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1995-96	0.00	0.00	0.00	0.00	0.00	0.00	0.00a	0.00	0.00	0.00	0.00	0.00	0.00
1996-97	0.00	0.00	0.00	0.00	0.00	0.00	0.00a	0.00a	0.00	0.00	0.00	0.00	0.00
1997-98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1998-99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1999-00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2000-01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2001-02	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	2.00
2002-03	0.00	0.00	0.00a	0.00	0.00	0.00	0.00	0.00a	0.00b	0.00a	0.00a	0.00	0.00
2003-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00a	0.00	0.00	0.00	0.00	8.00
2004-05	0.00	0.00	0.00	0.00	0.00b	0.00	0.00a	0.00	0.00	0.00	0.00	0.00	0.00
2005-06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TABLE 2.7-62 (Sheet 5 of 5)
NINETY-NINE ISLANDS, SOUTH CAROLINA
MONTHLY TOTAL SNOWFALL (INCHES)
1947 - 2006

YEAR(S)	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	Annual
MEAN	0.00	0.00	0.00	0.00	0.00	0.38	1.11	1.06	0.52	0.00	0.00	0.00	2.88
S.D.	0.00	0.00	0.00	0.00	0.00	1.79	2.71	2.90	1.48	0.00	0.00	0.00	4.22
SKEW	0.00	0.00	0.00	0.00	0.00	5.89	2.86	3.44	3.02	0.00	0.00	0.00	1.53
MAX	0.00	0.00	0.00	0.00	0.00	12.00	13.00	14.00	6.30	0.00	0.00	0.00	15.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NO YRS	49	51	51	53	51	49	49	48	48	48	49	50	41

NOTES:

1. Long-term means based on columns; thus, the monthly row may not sum (or average) to the long-term annual value.

2. Maximum allowable number of missing days: 5
   a = 1 day missing, b = 2 days missing, c = 3 days missing, etc.,
   z = 26 or more days missing,

3. Individual months not used for annual or monthly statistics if more than 5 days are missing. Individual years not used for annual statistics if any month in that year has more than 5 days missing.

4. Data from Southeast Regional Climate Center, http://cirrus.dnr.state.sc.us/cgi-bin/sercc/cliMAIN.pl?sc629

5. A = Accumulations present

6. *** Note *** Provisional Data *** After Year/Month 2006/03

TABLE 2.7-63
AVERAGE HOURS OF FOG AND HAZE AT GREENVILLE/SPARTANBURG, SOUTH CAROLINIA

	Fog (hours/month)			Haze (hours/month)		
Month	Average	Maximum	Minimum	Average	Maximum	Minimum
Jan	6.8	21.2	0.3	0.3	2.0	0.0
Feb	4.5	10.5	0.0	0.9	2.7	0.0
Mar	2.4	5.3	0.0	0.8	2.8	0.0
Apr	2.5	5.2	0.0	0.4	0.9	0.0
May	0.9	4.9	0.0	2.9	8.0	0.0
Jun	0.9	2.2	0.0	5.8	14.5	1.4
Jul	1.2	2.4	0.1	10.1	20.1	0.9
Aug	1.3	3.7	0.0	7.5	24.4	2.1
Sep	2.1	5.7	0.0	4.2	14.6	0.0
Oct	2.5	6.1	0.0	3.0	13.4	0.0
Nov	6.7	11.6	1.4	1.0	3.9	0.0
Dec	6.3	10.8	2.2	0.1	0.8	0.0
Annual (hours/yr)	38.1	46.5	29.4	37.0	61.6	24.3

NOTES:

1. Data from Unedited Local Climatological Data, National Oceanic and Atmospheric Administration, U. S. Department of Commerce, Asheville, NC, Greenville/Spartanburg International Airport, Station No. 03870.

2. Period of Record - 9 years (1997 - 2005).

TABLE 2.7-64
INVERSION HEIGHTS AND STRENGTHS, GREENSBORO, NORTH CAROLINA
JANUARY, 1999 - 2005

January	Mornings with Inversions[1]	Average Morning Height[2] (m)	Average Morning Strength[3] (0.1°C/m)	Afternoons with Inversions[1]	Average Afternoon Height[2] (m)	Average Afternoon Strength[3] (0.1°C/m)
1999	7	632	0.435	9	899	0.301
2000	15	1069	0.181	7	1108	0.334
2001	10	774	0.349	3	938	0.101
2002	12	949	0.256	9	983	0.250
2003	10	961	0.299	4	1131	0.085
2004	12	654	0.443	9	1251	0.263
2005	1	820	0.467	3	1582	0.164
Total	67	864	0.315	44	1092	0.245

NOTES:

1. Inversion is defined as three or more NOAA weather balloon elevation readings showing consecutive increases in temperature at heights below 3000 m.

2. Balloons were released each day at 0:00 Greenwich Mean Time (GMT) and 12:00 GMT. Height is defined as elevation in meters where temperature first increases and is averaged only over those days with inversions.

3. Strength is the maximum temperature gradient in tenths of a degree centigrade per meter within the inversion layer.

4. Data from: FSL/NCDC Radiosonde Data Archive, http://raob.fsl.noaa.gov/

TABLE 2.7-65
INVERSION HEIGHTS AND STRENGTHS, GREENSBORO, NORTH CAROLINA
FEBRUARY, 1999 - 2005

February	Mornings with Inversions[1]	Average Morning Height[2] (m)	Average Morning Strength[3] (0.1°C/m)	Afternoons with Inversions[1]	Average Afternoon Height[2] (m)	Average Afternoon Strength[3] (0.1°C/m)
1999	9	664	0.704	4	933	0.344
2000	8	955	0.228	7	1217	0.155
2001	7	1107	0.188	6	1787	0.390
2002	7	938	0.523	6	1529	0.225
2003	11	933	0.229	11	874	0.265
2004	14	1035	0.244	13	1146	0.252
2005	0			2	429	0.629
Total	56	941	0.341	49	1174	0.277

NOTES:

1. Inversion is defined as three or more NOAA weather balloon elevation readings showing consecutive increases in temperature at heights below 3000 m.

2. Balloons were released each day at 0:00 GMT and 12:00 GMT. Height is defined as elevation in meters where temperature first increases and is averaged only over those days with inversions.

3. Strength is the maximum temperature gradient in tenths of a degree centigrade per meter within the inversion layer.

4. Data from: FSL/NCDC Radiosonde Data Archive, http://raob.fsl.noaa.gov/

TABLE 2.7-66
INVERSION HEIGHTS AND STRENGTHS, GREENSBORO, NORTH CAROLINA
MARCH, 1999 - 2005

March	Mornings with Inversions[1]	Average Morning Height[2] (m)	Average Morning Strength[3] (0.1°C/m)	Afternoons with Inversions[1]	Average Afternoon Height[2] (m)	Average Afternoon Strength[3] (0.1°C/m)
1999	5	943	0.290	3	1463	0.277
2000	7	883	0.245	2	1770	0.323
2001	2	1702	0.217	3	2019	0.234
2002	12	842	0.267	6	1281	0.146
2003	3	680	0.338	3	552	0.236
2004	11	1125	0.389	3	2324	0.299
2005	0			1	2891	1.636
Total	40	970	0.303	21	1580	0.300

NOTES:

1. Inversion is defined as three or more NOAA weather balloon elevation readings showing consecutive increases in temperature at heights below 3000 m.

2. Balloons were released each day at 0:00 GMT and 12:00 GMT. Height is defined as elevation in meters where temperature first increases and is averaged only over those days with inversions.

3. Strength is the maximum temperature gradient in tenths of a degree centigrade per meter within the inversion layer.

4. Data from: FSL/NCDC Radiosonde Data Archive, http://raob.fsl.noaa.gov/

TABLE 2.7-67
INVERSION HEIGHTS AND STRENGTHS, GREENSBORO, NORTH CAROLINA
APRIL, 1999 - 2005

April	Mornings with Inversions[1]	Average Morning Height[2] (m)	Average Morning Strength[3] (0.1°C/m)	Afternoons with Inversions[1]	Average Afternoon Height[2] (m)	Average Afternoon Strength[3] (0.1°C/m)
1999	5	1299	0.321	0		
2000	7	568	0.398	0		
2001	2	1712	0.444	1	2372	0.103
2002	7	956	0.182	0		
2003	8	751	0.294	2	1300	0.302
2004	10	614	0.379	2	647	0.179
2005	1	760	0.162	0		
Total	40	837	0.322	5	1253	0.213

NOTES:

1. Inversion is defined as three or more NOAA weather balloon elevation readings showing consecutive increases in temperature at heights below 3000 m.

2. Balloons were released each day at 0:00 GMT and 12:00 GMT. Height is defined as elevation in meters where temperature first increases and is averaged only over those days with inversions.

3. Strength is the maximum temperature gradient in tenths of a degree centigrade per meter within the inversion layer.

4. Data from: FSL/NCDC Radiosonde Data Archive, http://raob.fsl.noaa.gov/

TABLE 2.7-68
INVERSION HEIGHTS AND STRENGTHS, GREENSBORO, NORTH CAROLINA
MAY, 1999 – 2005

May	Mornings with Inversion[1]	Average Morning Height[2] (m)	Average Morning Strength[3] (0.1°C/m)	Afternoons with Inversions[1]	Average Afternoon Height[2] (m)	Average Afternoon Strength[3] (0.1°C/m)
1999	5	513	0.401	0		
2000	4	950	0.225	0		
2001	4	1290	0.175	0		
2002	3	627	0.196	2	1187	0.090
2003	1	1576	0.099	2	1248	0.175
2004	1	389	0.104	0		
2005	2	631	0.268	0		
Total	20	832	0.247	4	1217	0.132

NOTES:

1. Inversion is defined as three or more NOAA weather balloon elevation readings showing consecutive increases in temperature at heights below 3000 m.

2. Balloons were released each day at 0:00 GTM and 12:00 GMT. Height is defined as elevation in meters where temperature first increases and is averaged only over those days with inversions.

3. Strength is the maximum temperature gradient in tenths of a degree centigrade per meter within the inversion layer.

4. Data from: FSL/NCDC Radiosonde Data Archive, http://raob.fsl.noaa.gov/

TABLE 2.7-69
INVERSION HEIGHTS AND STRENGTHS, GREENSBORO, NORTH CAROLINA
JUNE, 1999 – 2005

June	Mornings with Inversions[1]	Average Morning Height[2] (m)	Average Morning Strength[3] (0.1°C/m)	Afternoons with Inversions[1]	Average Afternoon Height[2] (m)	Average Afternoon Strength[3] (0.1°C/m)
1999	4	1479	0.284	0		
2000	1	277	0.667	0		
2001	2	2153	0.255	1	2403	0.667
2002	5	1008	0.456	0		
2003	2	1693	0.436	1	2038	0.211
2004	0			0		
2005	0			1	2548	0.277
Total	14	1352	0.390	3	2330	0.385

NOTES:

1. Inversion is defined as three or more NOAA weather balloon elevation readings showing consecutive increases in temperature at heights below 3000 m.
2. Balloons were released each day at 0:00 GMT and 12:00 GMT. Height is defined as elevation in meters where temperature first increases and is averaged only over those days with inversions.
3. Strength is the maximum temperature gradient in tenths of a degree centigrade per meter within the inversion layer.
4. Data from: FSL/NCDC Radiosonde Data Archive, http://raob.fsl.noaa.gov/

TABLE 2.7-70
INVERSION HEIGHTS AND STRENGTHS, GREENSBORO, NORTH CAROLINA
JULY, 1999 - 2005

July	Mornings with Inversions[1]	Average Morning Height[2] (m)	Average Morning Strength[3] (0.1°C/m)	Afternoons with Inversions[1]	Average Afternoon Height[2] (m)	Average Afternoon Strength[3] (0.1°C/m)
1999	1	640	0.079	0		
2000	0			0		
2001	1	277	0.101	1	1896	0.238
2002	0			0		
2003	0			0		
2004	0			0		
2005	0			0		
Total	2	459	0.090	1	1896	0.238

NOTES:

1. Inversion is defined as three or more NOAA weather balloon elevation readings showing consecutive increases in temperature at heights below 3000 m.

2. Balloons were released each day at 0:00 GMT and 12:00 GMT. Height is defined as elevation in meters where temperature first increases and is averaged only over those days with inversions.

3. Strength is the maximum temperature gradient in tenths of a degree centigrade per meter within the inversion layer.

4. Data from: FSL/NCDC Radiosonde Data Archive, http://raob.fsl.noaa.gov/

TABLE 2.7-71
INVERSION HEIGHTS AND STRENGTHS, GREENSBORO, NORTH CAROLINA
AUGUST, 1999 - 2005

August	Mornings with Inversions[1]	Average Morning Height[2] (m)	Average Morning Strength[3] (0.1°C/m)	Afternoons with Inversions[1]	Average Afternoon Height[2] (m)	Average Afternoon Strength[3] (0.1°C/m)
1999	3	661	0.371	0		
2000	3	829	0.461	2	2287	0.306
2001	2	1285	0.515	0		
2002	2	1340	0.188	0		
2003	1	277	0.329	0		
2004	2	1309	0.258	3	2420	0.303
2005	2	1429	0.630	1	1941	0.476
Total	15	1031	0.400	6	2296	0.333

NOTES:

1. Inversion is defined as three or more NOAA weather balloon elevation readings showing consecutive increases in temperature at heights below 3000 m.

2. Balloons were released each day at 0:00 GMT and 12:00 GMT. Height is defined as elevation in meters where temperature first increases and is averaged only over those days with inversions.

3. Strength is the maximum temperature gradient in tenths of a degree centigrade per meter within the inversion layer.

4. Data from: FSL/NCDC Radiosonde Data Archive, http://raob.fsl.noaa.gov/

TABLE 2.7-72
INVERSION HEIGHTS AND STRENGTHS, GREENSBORO, NORTH CAROLINA
SEPTEMBER, 1999 - 2005

September	Mornings with Inversions[1]	Average Morning Height[2] (m)	Average Morning Strength[3] (0.1°C/m)	Afternoons with Inversions[1]	Average Afternoon Height[2] (m)	Average Afternoon Strength[3] (0.1°C/m)
1999	5	1022	0.427	4	2064	0.232
2000	8	1364	0.233	7	1569	0.279
2001	7	1877	0.318	4	1935	0.425
2002	3	1583	0.223	2	1586	0.105
2003	3	1631	0.217	1	2001	0.118
2004	13	1440	0.248	5	1414	0.272
2005	10	1469	0.387	6	2227	0.331
Total	49	1474	0.299	29	1813	0.285

NOTES:

1. Inversion is defined as three or more NOAA weather balloon elevation readings showing consecutive increases in temperature at heights below 3000 m.

2. Balloons were released each day at 0:00 GMT and 12:00 GMT. Height is defined as elevation in meters where temperature first increases and is averaged only over those days with inversions.

3. Strength is the maximum temperature gradient in tenths of a degree centigrade per meter within the inversion layer.

4. Data from: FSL/NCDC Radiosonde Data Archive, http://raob.fsl.noaa.gov/

TABLE 2.7-73
INVERSION HEIGHTS AND STRENGTHS, GREENSBORO, NORTH CAROLINA
OCTOBER, 1999 - 2005

October	Mornings with Inversions[1]	Average Morning Height[2] (m)	Average Morning Strength[3] (0.1°C/m)	Afternoons with Inversions[1]	Average Afternoon Height[2] (m)	Average Afternoon Strength[3] (0.1°C/m)
1999	13	1122	0.364	9	1690	0.331
2000	4	596	0.696	1	2089	0.200
2001	9	1890	0.254	3	1925	0.319
2002	7	727	0.291	4	1654	0.215
2003	4	1500	0.338	4	1901	0.365
2004	3	1395	0.263	4	1202	0.311
2005	8	1248	0.358	5	1629	0.360
Total	48	1234	0.351	30	1675	0.317

NOTES:

1. Inversion is defined as three or more NOAA weather balloon elevation readings showing consecutive increases in temperature at heights below 3000 m.

2. Balloons were released each day at 0:00 GMT and 12:00 GMT. Height is defined as elevation in meters where temperature first increases and is averaged only over those days with inversions.

3. Strength is the maximum temperature gradient in tenths of a degree centigrade per meter within the inversion layer.

4. Data from: FSL/NCDC Radiosonde Data Archive, http://raob.fsl.noaa.gov/

TABLE 2.7-74
INVERSION HEIGHTS AND STRENGTHS, GREENSBORO, NORTH CAROLINA
NOVEMBER, 1999 – 2005

November	Mornings with Inversions[1]	Average Morning Height[2] (m)	Average Morning Strength[3] (0.1°C/m)	Afternoons with Inversions[1]	Average Afternoon Height[2] (m)	Average Afternoon Strength[3] (0.1°C/m)
1999	5	1235	0.464	2	1109	0.177
2000	4	690	0.279	4	1287	0.300
2001	12	941	0.397	5	1987	0.228
2002	9	990	0.525	2	1320	0.198
2003	12	767	0.346	5	1211	0.409
2004	6	907	0.169	3	1185	0.501
2005	14	662	0.593	5	964	0.293
Total	62	856	0.426	26	1322	0.312

NOTES:

1. Inversion is defined as three or more NOAA weather balloon elevation readings showing consecutive increases in temperature at heights below 3000 m.

2. Balloons were released each day at 0:00 GMT and 12:00 GMT. Height is defined as elevation in meters where temperature first increases and is averaged only over those days with inversions.

3. Strength is the maximum temperature gradient in tenths of a degree centigrade per meter within the inversion layer.

4. Data from: FSL/NCDC Radiosonde Data Archive, http://raob.fsl.noaa.gov/

TABLE 2.7-75
INVERSION HEIGHTS AND STRENGTHS, GREENSBORO, NORTH CAROLINA
DECEMBER, 1999 – 2005

December	Mornings with Inversions[1]	Average Morning Height[2] (m)	Average Morning Strength[3] (0.1°C/m)	Afternoons with Inversions[1]	Average Afternoon Height[2] (m)	Average Afternoon Strength[3] (0.1°C/m)
1999	18	748	0.723	6	1561	0.347
2000	15	873	0.272	14	1026	0.229
2001	11	1398	0.340	7	1035	0.225
2002	18	776	0.333	16	1030	0.273
2003	14	762	0.339	10	1354	0.278
2004	11	840	0.519	9	1566	0.318
2005	12	900	0.294	9	1099	0.233
Total	99	875	0.412	71	1197	0.267

NOTES:

1. Inversion is defined as three or more NOAA weather balloon elevation readings showing consecutive increases in temperature at heights below 3000 m.

2. Balloons were released each day at 0:00 GMT and 12:00 GMT. Height is defined as elevation in meters where temperature first increases and is averaged only over those days with inversions.

3. Strength is the maximum temperature gradient in tenths of a degree centigrade per meter within the inversion layer.

4. Data from: FSL/NCDC Radiosonde Data Archive, http://raob.fsl.noaa.gov/

TABLE 2.7-76
INVERSION HEIGHTS AND STRENGTHS, GREENSBORO, NORTH CAROLINA
ANNUAL, 1999 – 2005

Annual	Mornings with Inversions[1]	Average Morning Height[2] (m)	Average Morning Strength[3] (0.1°C/m)	Afternoons with Inversions[1]	Average Afternoon Height[2] (m)	Average Afternoon Strength[3] (0.1°C/m)
1999	80	901	0.487	37	1386	0.304
2000	76	915	0.287	44	1295	0.255
2001	69	1325	0.311	34	1675	0.286
2002	85	907	0.328	47	1212	0.223
2003	69	926	0.305	43	1212	0.268
2004	83	981	0.339	51	1396	0.290
2005	50	1009	0.420	33	1491	0.348
Total	512	988	0.352	289	1366	0.279

NOTES:

1. Inversion is defined as three or more NOAA weather balloon elevation readings showing consecutive increases in temperature at heights below 3000 m.

2. Balloons were released each day at 0:00 GMT and 12:00 GMT. Height is defined as elevation in meters where temperature first increases and is averaged only over those days with inversions.

3. Strength is the maximum temperature gradient in tenths of a degree centigrade per meter within the inversion layer.

4. Data from: FSL/NCDC Radiosonde Data Archive, http://raob.fsl.noaa.gov/

TABLE 2.7-77
MIXING HEIGHTS AT GREENSBORO, NORTH CAROLINA

Month	Morning (m)	Afternoon (m)
January	480	825
February	477	982
March	502	1310
April	489	1735
May	431	1578
June	445	1764
July	473	1629
August	495	1435
September	394	1384
October	342	1187
November	402	853
December	450	781
Annual	448	1289

NOTES:

1. Data is from the NCDC SCRAM Mixing Height Data collection for the period of 1984-1987 and 1990-1991 http://www.epa.gov/scram001/surfacemetdata.htm#tn

TABLE 2.7-78
MINIMUM EXCLUSION AREA BOUNDARY (EAB) DISTANCES
[FROM INNER 168 M (550 FT) RADIUS CIRCLE ENCOMPASSING ALL SITE RELEASE POINTS]

Direction	Distance (ft)	Distance (m)
S	4576	1395
SSW	4576	1395
SW	5075	1547
WSW	5411	1649
W	3964	1208
WNW	3964	1208
NW	3985	1215
NNW	2192	668
N	2113	644
NNE	2113	644
NE	2313	705
ENE	3124	952
E	4207	1282
ESE	5065	1544
SE	4393	1339
SSE	4393	1339

NOTE:

1. Exclusion Area Boundary (EAB) for Lee Nuclear Station is shown in FSAR Figure 2.1-209.

2. In accordance with Regulatory Guide 1.145, the distance to the EAB is the closest distance within a 45-degree sector centered on the compass direction of interest.

TABLE 2.7-79
LEE NUCLEAR STATION OFFSITE ATMOSPHERIC DISPERSION
SHORT-TERM DIFFUSION ESTIMATES FOR ACCIDENTAL RELEASES

Limiting Relative Dispersion Values

Lee Nuclear 50% Probability Level χ/Q Values (sec/m^3)

	0 – 2 Hrs	0 – 8 Hrs	8 – 24 Hrs	24 – 96 Hrs	96 – 720 Hrs
EAB (NNW, 668 m)	6.64E-05	N/A	N/A	N/A	N/A
LPZ (SE, 3219 m)	N/A	8.60E-06	7.29E-06	5.10E-06	3.05E-06

TABLE 2.7-80
LEE NUCLEAR SITE OFFSITE RECEPTOR LOCATIONS

Sector	Garden	Milk Cow/Goat	House	Animal for Meat
S			2578	
SSW	2410	1705		1705
SW	1927	2026		2026
WSW	4123	4494	4143	4494
W	3968	3850	2846	3850
WNW	4094	4016		4016
NW	3258	6143	4025	3876
NNW	2431		3245	2360
N	2246	3715		3715
NNE	2203	5449		5449
NE	1794			1792
ENE	1567	1957		1957
E	4469	4926		4469
ESE	4355	5017		5017
SE	6591	7437	1607	2373
SSE	1627	1749	1775	1749

NOTES:

1. Distances, in meters, from the midpoint between Units 1 and 2 to the nearest receptor, of each type for a given 22.5° sector.

2. February 2007 survey results.

TABLE 2.7-81 (Sheet 1 of 3)

ANNUAL AVERAGE χ/Q (SEC/M^3) FOR NORMAL RELEASES NO DECAY, UNDEPLETED

(FOR EACH 22.5° SECTOR AT THE DISTANCES (MILES) SHOWN AT THE TOP)

Sector	0.250	0.500	.750	1.000	1.500	2.000	2.500	3.000	3.500	4.000	4.500
S	1.794E-05	5.298E-06	2.650E-06	1.679E-06	9.275E-07	6.161E-07	4.507E-07	3.581E-07	2.951E-07	2.496E-07	2.153E-07
SSW	1.439E-05	4.283E-06	2.156E-06	1.368E-06	7.541E-07	4.997E-07	3.647E-07	2.888E-07	2.373E-07	2.003E-07	1.724E-07
SW	1.475E-05	4.366E-06	2.195E-06	1.394E-06	7.690E-07	5.100E-07	3.724E-07	2.949E-07	2.423E-07	2.044E-07	1.760E-07
SWS	1.662E-05	4.897E-06	2.439E-06	1.541E-06	8.505E-07	5.650E-07	4.133E-07	3.286E-07	2.708E-07	2.291E-07	1.977E-07
W	1.875E-05	5.487E-06	2.719E-06	1.718E-06	9.491E-07	6.316E-07	4.630E-07	3.695E-07	3.055E-07	2.591E-07	2.241E-07
WNW	1.734E-05	5.082E-06	2.519E-06	1.591E-06	8.818E-07	5.881E-07	4.316E-07	3.442E-07	2.844E-07	2.411E-07	2.084E-07
NW	1.662E-05	4.898E-06	2.450E-06	1.553E-06	8.585E-07	5.706E-07	4.175E-07	3.318E-07	2.734E-07	2.312E-07	1.995E-07
NNW	1.122E-05	3.345E-06	1.706E-06	1.090E-06	6.061E-07	4.029E-07	2.944E-07	2.318E-07	1.895E-07	1.592E-07	1.365E-07
N	8.164E-06	2.487E-06	1.314E-06	8.524E-07	4.779E-07	3.176E-07	2.314E-07	1.799E-07	1.455E-07	1.211E-07	1.030E-07
NNE	5.527E-06	1.693E-06	9.056E-07	5.899E-07	3.296E-07	2.180E-07	1.582E-07	1.220E-07	9.807E-08	8.117E-08	6.872E-08
NE	5.083E-06	1.556E-06	8.276E-07	5.369E-07	2.975E-07	1.958E-07	1.416E-07	1.091E-07	8.763E-08	7.249E-08	6.134E-08
ENE	5.195E-06	1.565E-06	8.105E-07	5.198E-07	2.893E-07	1.917E-07	1.395E-07	1.087E-07	8.801E-08	7.336E-08	6.250E-08
E	4.540E-06	1.357E-06	6.958E-07	4.456E-07	2.475E-07	1.643E-07	1.199E-07	9.425E-08	7.695E-08	6.457E-08	5.534E-08
ESE	1.831E-05	5.358E-06	2.652E-06	1.672E-06	9.285E-07	6.199E-07	4.553E-07	3.631E-07	3.000E-07	2.543E-07	2.199E-07
SE	4.815E-05	1.402E-0	6.850E-06	4.296E-06	2.359E-06	1.567E-06	1.149E-06	9.219E-07	7.657E-07	6.519E-07	5.657E-07
SSE	2.382E-05	6.987E-06	3.469E-06	2.194E-0	1.211E-06	8.049E-07	5.897E-07	4.706E-07	3.891E-07	3.300E-07	2.855E-07

TABLE 2.7-81 (Sheet 2 of 3)
ANNUAL AVERAGE χ/Q (SEC/M^3) FOR NORMAL RELEASES NO DECAY, UNDEPLETED
(FOR EACH 22.5° SECTOR AT THE DISTANCES (MILES) SHOWN AT THE TOP)

SECTOR	5.000	7.500	10.000	15.000	20.000	25.000	30.000	35.000	40.000	45.000	50.000
S	1.888E-07	1.139E-07	7.976E-08	4.841E-08	3.406E-08	2.596E-08	2.081E-08	1.728E-08	1.471E-08	1.276E-08	1.125E-08
SSW	1.509E-07	9.054E-08	6.315E-08	3.815E-08	2.676E-08	2.035E-08	1.629E-08	1.350E-08	1.148E-08	9.955E-09	8.765E-09
SW	1.540E-07	9.243E-08	6.448E-08	3.897E-08	2.735E-08	2.081E-08	1.666E-08	1.382E-08	1.175E-08	1.019E-08	8.973E-09
SWS	1.733E-07	1.047E-07	7.338E-08	4.459E-08	3.140E-08	2.395E-08	1.921E-08	1.595E-08	1.358E-08	1.179E-08	1.040E-08
W	1.969E-07	1.197E-07	8.424E-08	5.146E-08	3.634E-08	2.778E-08	2.232E-08	1.856E-08	1.582E-08	1.375E-08	1.213E-08
WNW	1.830E-07	1.111E-07	7.804E-08	4.758E-08	3.356E-08	2.563E-08	2.057E-08	1.710E-08	1.457E-08	1.265E-08	1.116E-08
NW	1.748E-07	1.055E-07	7.384E-08	4.482E-08	3.154E-08	2.404E-08	1.927E-08	1.600E-08	1.362E-08	1.182E-08	1.042E-08
NNW	1.191E-07	7.058E-08	4.881E-08	2.916E-08	2.031E-08	1.537E-08	1.225E-08	1.011E-08	8.575E-09	7.415E-09	6.513E-09
N	8.919E-08	5.142E-08	3.488E-08	2.029E-08	1.387E-08	1.035E-08	8.153E-09	6.670E-09	5.609E-09	4.816E-09	4.204E-09
NNE	5.925E-08	3.364E-08	2.258E-08	1.294E-08	8.769E-09	6.495E-09	5.089E-09	4.144E-09	3.470E-09	2.969E-09	2.583E-09
NE	5.289E-08	3.006E-08	2.020E-08	1.161E-08	7.892E-09	5.861E-09	4.602E-09	3.755E-09	3.150E-09	2.699E-09	2.352E-09
ENE	5.420E-08	3.149E-08	2.149E-08	1.262E-08	8.700E-09	6.532E-09	5.174E-09	4.252E-09	3.590E-09	3.093E-09	2.708E-09
E	4.823E-08	2.851E-08	1.969E-08	1.173E-08	8.163E-09	6.169E-09	4.913E-09	4.055E-09	3.436E-09	2.970E-09	2.608E-09
ESE	1.931E-07	1.172E-07	8.237E-08	5.023E-08	3.544E-08	2.707E-08	2.173E-08	1.806E-08	1.539E-08	1.336E-08	1.178E-08
SE	4.983E-07	3.061E-07	2.168E-07	1.336E-07	9.490E-08	7.284E-08	5.871E-08	4.895E-08	4.182E-08	3.641E-08	3.218E-08
SSE	2.508E-07	1.525E-07	1.073E-07	6.551E-08	4.626E-08	3.536E-08	2.841E-08	2.362E-08	2.013E-08	1.750E-08	1.543E-08

TABLE 2.7-81 (Sheet 3 of 3)
ANNUAL AVERAGE χ/Q (SEC/M^3) FOR NORMAL RELEASES NO DECAY, UNDEPLETED
(FOR EACH 22.5° SECTOR AT THE DISTANCES (MILES) SHOWN AT THE TOP)

SECTOR	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	2.807E-06	9.562E-07	4.578E-07	2.958E-07	2.156E-07	1.154E-07	4.900E-08	2.606E-08	1.731E-08	1.278E-08
SSW	2.278E-06	7.775E-07	3.704E-07	2.379E-07	1.727E-07	9.178E-08	3.864E-08	2.043E-08	1.353E-08	9.966E-09
SW	2.321E-06	7.927E-07	3.781E-07	2.429E-07	1.763E-07	9.370E-08	3.948E-08	2.090E-08	1.384E-08	1.020E-08
WSW	2.586E-06	8.770E-07	4.199E-07	2.714E-07	1.980E-07	1.060E-07	4.513E-08	2.404E-08	1.598E-08	1.181E-08
W	2.889E-06	9.789E-07	4.705E-07	3.061E-07	2.244E-07	1.211E-07	5.202E-08	2.788E-08	1.859E-08	1.376E-08
WNW	2.676E-06	9.087E-07	4.384E-07	2.850E-07	2.087E-07	1.124E-07	4.812E-08	2.572E-08	1.713E-08	1.267E-08
NW	2.595E-06	8.849E-07	4.240E-07	2.740E-07	1.997E-07	1.068E-07	4.536E-08	2.413E-08	1.603E-08	1.183E-08
NNW	1.796E-06	6.233E-07	2.983E-07	1.900E-07	1.368E-07	7.169E-08	2.960E-08	1.544E-08	1.014E-08	7.425E-09
N	1.370E-06	4.899E-07	2.338E-07	1.460E-07	1.033E-07	5.246E-08	2.068E-08	1.041E-08	6.690E-09	4.824E-09
NNE	9.402E-07	3.378E-07	1.597E-07	9.848E-08	6.890E-08	3.441E-08	1.323E-08	6.539E-09	4.157E-09	2.975E-09
NE	8.603E-07	3.055E-07	1.431E-07	8.801E-08	6.151E-08	3.075E-08	1.187E-08	5.899E-09	3.766E-09	2.704E-09
ENE	8.489E-07	2.971E-07	1.411E-07	8.833E-08	6.264E-08	3.209E-08	1.285E-08	6.567E-09	4.263E-09	3.097E-09
E	7.316E-07	2.546E-07	1.215E-07	7.718E-08	5.544E-08	2.897E-08	1.191E-08	6.198E-09	4.064E-09	2.974E-09
ESE	2.818E-06	9.566E-07	4.623E-07	3.006E-07	2.202E-07	1.186E-07	5.080E-08	2.716E-08	1.809E-08	1.338E-08
SE	7.309E-06	2.437E-06	1.170E-06	7.670E-07	5.663E-07	3.092E-07	1.349E-07	7.307E-08	4.902E-08	3.645E-08
SSE	3.684E-06	1.249E-06	5.994E-07	3.899E-07	2.858E-07	1.542E-07	6.624E-08	3.549E-08	2.366E-08	1.751E-08

TABLE 2.7-82 (Sheet 1 of 3)
ANNUAL AVERAGE χ/Q (SEC/M^3) FOR NORMAL RELEASES NO DECAY, DEPLETED
(FOR EACH 22.5° SECTOR AT THE DISTANCES (MILES) SHOWN AT THE TOP)

Sector	0.250	0.500	.750	1.000	1.500	2.000	2.500	3.000	3.500	4.000	4.500
S	1.669E-05	4.819E-06	2.361E-06	1.470E-06	7.877E-07	5.101E-07	3.651E-07	2.845E-07	2.303E-07	1.916E-07	1.628E-07
SSW	1.339E-05	3.896E-06	1.921E-06	1.198E-06	6.404E-07	4.138E-07	2.954E-07	2.294E-07	1.852E-07	1.537E-07	1.304E-07
SW	1.373E-05	3.971E-06	1.956E-06	1.220E-06	6.531E-07	4.223E-07	3.017E-07	2.342E-07	1.891E-07	1.569E-07	1.331E-07
WSW	1.546E-05	4.454E-06	2.173E-06	1.349E-06	7.223E-07	4.678E-07	3.348E-07	2.610E-07	2.113E-07	1.759E-07	1.495E-07
W	1.745E-05	4.991E-06	2.423E-06	1.504E-06	8.060E-07	5.230E-07	3.750E-07	2.935E-07	2.384E-07	1.989E-07	1.694E-07
WNW	1.614E-05	4.622E-06	2.245E-06	1.392E-06	7.489E-07	4.870E-07	3.496E-07	2.734E-07	2.219E-07	1.851E-07	1.576E-07
NW	1.547E-05	4.455E-06	2.183E-06	1.360E-06	7.291E-07	4.725E-07	3.382E-07	2.635E-07	2.133E-07	1.775E-07	1.508E-07
NNW	1.044E-05	3.042E-06	1.520E-06	9.539E-07	5.147E-07	3.336E-07	2.385E-07	1.841E-07	1.479E-07	1.222E-07	1.032E-07
N	7.597E-06	2.262E-06	1.171E-06	7.461E-07	4.059E-07	2.630E-07	1.875E-07	1.429E-07	1.135E-07	9.295E-08	7.788E-08
NNE	5.144E-06	1.540E-06	8.070E-07	5.164E-07	2.799E-07	1.805E-07	1.281E-07	9.694E-08	7.652E-08	6.231E-08	5.195E-08
NE	4.730E-06	1.415E-06	7.375E-07	4.700E-07	2.527E-07	1.621E-07	1.147E-07	8.669E-08	6.838E-08	5.564E-08	4.638E-08
ENE	4.835E-06	1.423E-06	7.222E-07	4.550E-07	2.457E-07	1.587E-07	1.130E-07	8.631E-08	6.867E-08	5.631E-08	4.725E-08
E	4.225E-06	1.235E-06	6.200E-07	3.901E-07	2.102E-07	1.360E-07	9.712E-08	7.486E-08	6.004E-08	4.957E-08	4.184E-08
ESE	1.704E-05	4.874E-06	2.363E-06	1.464E-06	7.885E-07	5.133E-07	3.688E-07	2.884E-07	2.341E-07	1.952E-07	1.662E-07
SE	4.481E-05	1.275E-05	6.104E-06	3.761E-06	2.003E-06	1.298E-06	9.307E-07	7.322E-07	5.975E-07	5.004E-07	4.277E-07
SSE	2.217E-05	6.355E-06	3.091E-06	1.921E-06	1.028E-06	6.665E-07	4.777E-07	3.738E-07	3.036E-07	2.534E-07	2.158E-07

TABLE 2.7-82 (Sheet 2 of 3)
ANNUAL AVERAGE χ/Q (SEC/M^3) FOR NORMAL RELEASES NO DECAY, DEPLETED
(FOR EACH 22.5° SECTOR AT THE DISTANCES (MILES) SHOWN AT THE TOP)

SECTOR	5.000	7.500	10.000	15.000	20.000	25.000	30.000	35.000	40.000	45.000	50.000
S	1.407E-07	8.031E-08	5.359E-08	3.011E-08	1.989E-08	1.437E-08	1.098E-08	8.722E-09	7.132E-09	5.960E-09	5.068E-09
SSW	1.125E-07	6.383E-08	4.243E-08	2.372E-08	1.563E-08	1.126E-08	8.591E-09	6.817E-09	5.568E-09	4.649E-09	3.950E-09
SW	1.148E-07	6.516E-08	4.332E-08	2.423E-08	1.597E-08	1.152E-08	8.788E-09	6.975E-09	5.698E-09	4.759E-09	4.044E-09
WSW	1.292E-07	7.383E-08	4.930E-08	2.773E-08	1.834E-08	1.325E-08	1.013E-08	8.054E-09	6.588E-09	5.507E-09	4.685E-09
W	1.468E-07	8.440E-08	5.660E-08	3.200E-08	2.122E-08	1.537E-08	1.177E-08	9.369E-09	7.672E-09	6.420E-09	5.465E-09
WNW	1.364E-07	7.829E-08	5.243E-08	2.958E-08	1.960E-08	1.418E-08	1.085E-08	8.632E-09	7.064E-09	5.909E-09	5.028E-09
NW	1.303E-07	7.436E-08	4.961E-08	2.787E-08	1.842E-08	1.330E-08	1.017E-08	8.078E-09	6.605E-09	5.520E-09	4.694E-09
NNW	8.878E-08	4.976E-08	3.280E-08	1.813E-08	1.186E-08	8.503E-09	6.459E-09	5.107E-09	4.158E-09	3.463E-09	2.935E-09
N	6.649E-08	3.625E-08	2.343E-08	1.262E-08	8.102E-09	5.726E-09	4.300E-09	3.368E-09	2.720E-09	2.249E-09	1.894E-09
NNE	4.417E-08	2.372E-08	1.517E-08	8.048E-09	5.121E-09	3.594E-09	2.684E-09	2.092E-09	1.683E-09	1.387E-09	1.164E-09
NE	3.943E-08	2.119E-08	1.357E-08	7.219E-09	4.609E-09	3.243E-09	2.427E-09	1.896E-09	1.527E-09	1.260E-09	1.060E-09
ENE	4.040E-08	2.220E-08	1.443E-08	7.845E-09	5.081E-09	3.615E-09	2.729E-09	2.147E-09	1.741E-09	1.444E-09	1.220E-09
E	3.595E-08	2.010E-08	1.323E-08	7.297E-09	4.767E-09	3.414E-09	2.591E-09	2.047E-09	1.666E-09	1.387E-09	1.175E-09
ESE	1.439E-07	8.263E-08	5.534E-08	3.124E-08	2.070E-08	1.498E-08	1.146E-08	9.117E-09	7.462E-09	6.241E-09	5.311E-09
SE	3.715E-07	2.158E-07	1.457E-07	8.308E-08	5.542E-08	4.031E-08	3.097E-08	2.471E-08	2.028E-08	1.701E-08	1.450E-08
SSE	1.869E-07	1.075E-07	7.207E-08	4.074E-08	2.702E-08	1.957E-08	1.498E-08	1.192E-08	9.764E-09	8.171E-09	6.955E-09

TABLE 2.7-82 (Sheet 3 of 3)
ANNUAL AVERAGE χ/Q (SEC/M^3) FOR NORMAL RELEASES NO DECAY, DEPLETED
(FOR EACH 22.5° SECTOR AT THE DISTANCES (MILES) SHOWN AT THE TOP)

SECTOR	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	2.511E-06	8.160E-07	3.715E-07	2.310E-07	1.632E-07	8.185E-08	3.078E-08	1.448E-08	8.761E-09	5.977E-09
SSW	2.038E-06	6.635E-07	3.006E-07	1.859E-07	1.307E-07	6.513E-08	2.428E-08	1.136E-08	6.848E-09	4.662E-09
SW	2.077E-06	6.765E-07	3.069E-07	1.897E-07	1.334E-07	6.649E-08	2.480E-08	1.161E-08	7.007E-09	4.772E-09
WSW	2.314E-06	7.484E-07	3.408E-07	2.120E-07	1.498E-07	7.523E-08	2.835E-08	1.336E-08	8.089E-09	5.523E-09
W	2.585E-06	8.354E-07	3.819E-07	2.391E-07	1.698E-07	8.590E-08	3.268E-08	1.549E-08	9.409E-09	6.437E-09
WNW	2.394E-06	7.754E-07	3.557E-07	2.226E-07	1.579E-07	7.971E-08	3.022E-08	1.429E-08	8.669E-09	5.925E-09
NW	2.322E-06	7.552E-07	3.441E-07	2.140E-07	1.511E-07	7.579E-08	2.850E-08	1.341E-08	8.114E-09	5.536E-09
NNW	1.607E-06	5.318E-07	2.421E-07	1.484E-07	1.035E-07	5.089E-08	1.860E-08	8.581E-09	5.132E-09	3.474E-09
N	1.225E-06	4.180E-07	1.898E-07	1.141E-07	7.813E-08	3.727E-08	1.301E-08	5.789E-09	3.388E-09	2.257E-09
NNE	8.406E-07	2.883E-07	1.296E-07	7.694E-08	5.214E-08	2.446E-08	8.329E-09	3.637E-09	2.105E-09	1.392E-09
NE	7.692E-07	2.607E-07	1.161E-07	6.876E-08	4.655E-08	2.186E-08	7.470E-09	3.281E-09	1.907E-09	1.265E-09
ENE	7.592E-07	2.535E-07	1.145E-07	6.900E-08	4.740E-08	2.279E-08	8.081E-09	3.651E-09	2.159E-09	1.449E-09
E	3.595E-08	2.010E-08	1.323E-08	7.297E-09	4.767E-09	3.414E-09	2.591E-09	2.047E-09	1.666E-09	1.387E-09
ESE	2.521E-06	8.163E-07	3.752E-07	2.348E-07	1.666E-07	8.412E-08	3.191E-08	1.510E-08	9.156E-09	6.258E-09
SE	6.540E-06	2.080E-06	9.492E-07	5.990E-07	4.284E-07	2.192E-07	8.470E-08	4.060E-08	2.481E-08	1.705E-08
SSE	3.296E-06	1.066E-06	4.865E-07	3.045E-07	2.162E-07	1.094E-07	4.160E-08	1.972E-08	1.198E-08	8.193E-09

TABLE 2.7-83 (Sheet 1 of 4)
χ/Q AND D/Q VALUES FOR NORMAL RELEASES
NO DECAY, DEPLETED AND UNDEPLETED, AT EACH RECEPTOR LOCATION

Type of Location	Sector	Distance (miles)	Distance (meters)	χ/Q (sec/m^3) No Decay Undepleted	χ/Q (sec/m^3) No Decay Depleted	D/Q (m^{-2})
EAB	S	0.87	1395	2.10E-06	1.90E-06	4.80E-09
EAB	SSW	0.87	1395	1.70E-06	1.50E-06	4.60E-09
EAB	SW	0.96	1547	1.50E-06	1.30E-06	4.00E-09
EAB	WSW	1.02	1649	1.50E-06	1.30E-06	3.10E-09
EAB	W	0.75	1208	2.70E-06	2.40E-06	4.70E-09
EAB	WNW	0.75	1208	2.50E-06	2.20E-06	4.30E-09
EAB	NW	0.75	1215	2.40E-06	2.20E-06	5.40E-09
EAB	NNW	0.42	668	4.60E-06	4.20E-06	1.50E-08
EAB	N	0.4	644	3.60E-06	3.30E-06	1.80E-08
EAB	NNE	0.4	644	2.40E-06	2.20E-06	1.90E-08
EAB	NE	0.44	705	1.90E-06	1.80E-06	1.70E-08
EAB	ENE	0.59	952	1.20E-06	1.10E-06	7.30E-09
EAB	E	0.8	1282	6.30E-07	5.60E-07	2.50E-09
EAB	ESE	0.96	1544	1.80E-06	1.60E-06	4.80E-09
EAB	**SE**	**0.83**	**1339**	**5.70E-06**	5.10E-06	1.20E-08
EAB	SSE	0.83	1339	2.90E-06	2.60E-06	5.90E-09
NEAREST HOUSE	S	1.6	2578	8.30E-07	7.10E-07	1.70E-09

TABLE 2.7-83 (Sheet 2 of 4)
χ/Q AND D/Q VALUES FOR NORMAL RELEASES
NO DECAY, DEPLETED AND UNDEPLETED, AT EACH RECEPTOR LOCATION

Type of Location	Sector	Distance (miles)	Distance (meters)	χ/Q (sec/m^3) No Decay Undepleted	χ/Q (sec/m^3) No Decay Depleted	D/Q (m^{-2})
NEAREST HOUSE	WSW	2.57	4143	3.90E-07	3.20E-07	6.20E-10
NEAREST HOUSE	W	1.77	2846	7.40E-07	6.30E-07	1.10E-09
NEAREST HOUSE	NW	2.5	4025	4.10E-07	3.40E-07	6.90E-10
NEAREST HOUSE	NNW	2.02	3245	3.90E-07	3.30E-07	1.10E-09
NEAREST HOUSE	SE	1	1607	4.30E-06	3.80E-06	8.90E-09
NEAREST HOUSE	SSE	1.1	1775	1.90E-06	1.60E-06	3.70E-09
NEAREST GARDEN	SSW	1.50	2410	7.50E-07	6.40E-07	1.80E-09
NEAREST GARDEN	SW	1.20	1927	1.10E-06	9.20E-07	2.70E-09
NEAREST GARDEN	WSW	2.56	4123	3.90E-07	3.20E-07	6.30E-10
NEAREST GARDEN	W	2.47	3968	4.60E-07	3.80E-07	6.00E-10
NEAREST GARDEN	WNW	2.54	4094	4.10E-07	3.40E-07	5.30E-10
NEAREST GARDEN	NW	2.02	3258	5.50E-07	4.60E-07	1.00E-09
NEAREST GARDEN	NNW	1.51	2431	5.90E-07	5.10E-07	1.70E-09
NEAREST GARDEN	N	1.4	2246	5.30E-07	4.50E-07	2.20E-09
NEAREST GARDEN	NNE	1.37	2203	3.70E-07	3.20E-07	2.50E-09
NEAREST GARDEN	NE	1.11	1794	4.60E-07	4.00E-07	3.60E-09
NEAREST GARDEN	ENE	0.97	1567	5.40E-07	4.70E-07	3.20E-09

TABLE 2.7-83 (Sheet 3 of 4)
χ/Q AND D/Q VALUES FOR NORMAL RELEASES
NO DECAY, DEPLETED AND UNDEPLETED, AT EACH RECEPTOR LOCATION

Type of Location	Sector	Distance (miles)	Distance (meters)	χ/Q (sec/m^3) No Decay Undepleted	χ/Q (sec/m^3) No Decay Depleted	D/Q (m^{-2})
NEAREST GARDEN	E	2.78	4469	1.00E-07	8.30E-08	2.90E-10
NEAREST GARDEN	ESE	2.71	4355	4.10E-07	3.30E-07	7.90E-10
NEAREST GARDEN	SE	4.1	6591	6.20E-07	4.80E-07	7.50E-10
NEAREST GARDEN	SSE	1.01	1627	2.10E-06	1.90E-06	4.30E-09
MILK COW/GOAT	SSW	1.06	1705	1.20E-06	1.10E-06	3.30E-09
MILK COW/GOAT	SW	1.26	2026	9.80E-07	8.50E-07	2.50E-09
MILK COW/GOAT	WSW	2.79	4494	3.50E-07	2.90E-07	5.40E-10
MILK COW/GOAT	W	2.39	3850	4.80E-07	4.00E-07	6.30E-10
MILK COW/GOAT	WNW	2.5	4016	4.20E-07	3.50E-07	5.50E-10
MILK COW/GOAT	NW	3.82	6143	2.40E-07	1.90E-07	3.30E-10
MILK COW/GOAT	N	2.31	3715	2.60E-07	2.10E-07	9.20E-10
MILK COW/GOAT	NNE	3.39	5449	1.00E-07	8.00E-08	5.10E-10
MILK COW/GOAT	ENE	1.22	1957	3.90E-07	3.40E-07	2.20E-09
MILK COW/GOAT	E	3.06	4926	9.00E-08	7.20E-08	2.40E-10
MILK COW/GOAT	ESE	3.12	5017	3.40E-07	2.70E-07	6.10E-10
MILK COW/GOAT	SE	4.62	7437	5.30E-07	4.10E-07	6.10E-10
MILK COW/GOAT	SSE	1.09	1749	1.90E-06	1.70E-06	3.80E-09

TABLE 2.7-83 (Sheet 4 of 4)
χ/Q AND D/Q VALUES FOR NORMAL RELEASES
NO DECAY, DEPLETED AND UNDEPLETED, AT EACH RECEPTOR LOCATION

Type of Location	Sector	Distance (miles)	Distance (meters)	χ/Q (sec/m^3) No Decay Undepleted	χ/Q (sec/m^3) No Decay Depleted	D/Q (m^{-2})
ANIMAL FOR MEAT	SSW	1.06	1705	1.20E-06	1.10E-06	3.30E-09
ANIMAL FOR MEAT	SW	1.26	2026	9.80E-07	8.50E-07	2.50E-09
ANIMAL FOR MEAT	WSW	2.79	4494	3.50E-07	2.90E-07	5.40E-10
ANIMAL FOR MEAT	W	2.39	3850	4.80E-07	4.00E-07	6.30E-10
ANIMAL FOR MEAT	WNW	2.5	4016	4.20E-07	3.50E-07	5.50E-10
ANIMAL FOR MEAT	NW	2.41	3876	4.30E-07	3.60E-07	7.40E-10
ANIMAL FOR MEAT	NNW	1.47	2360	6.20E-07	5.30E-07	1.80E-09
ANIMAL FOR MEAT	N	2.31	3715	2.60E-07	2.10E-07	9.20E-10
ANIMAL FOR MEAT	NNE	3.39	5449	1.00E-07	8.00E-08	5.10E-10
ANIMAL FOR MEAT	NE	1.11	1792	4.60E-07	4.00E-07	3.60E-09
ANIMAL FOR MEAT	ENE	1.22	1957	3.90E-07	3.40E-07	2.20E-09
ANIMAL FOR MEAT	E	2.78	4469	1.00E-07	8.30E-08	2.90E-10
ANIMAL FOR MEAT	ESE	3.12	5017	3.40E-07	2.70E-07	6.10E-10
ANIMAL FOR MEAT	SE	1.47	2373	2.40E-06	2.10E-06	4.50E-09
ANIMAL FOR MEAT	SSE	1.09	1749	1.90E-06	1.70E-06	3.80E-09

TABLE 2.7-84 (Sheet 1 of 3)
ANNUAL AVERAGE χ/Q (SEC/M^3) FOR NORMAL RELEASES
2.26 DAY DECAY, UNDEPLETED
(FOR EACH 22.5° SECTOR AT THE DISTANCES (MILES) SHOWN AT THE TOP)

SECTOR	0.25	0.5	0.75	1	1.5	2	2.5	3	3.5	4	4.5
S	1.79E-05	5.27E-06	2.63E-06	1.67E-06	9.16E-07	6.06E-07	4.41E-07	3.49E-07	2.86E-07	2.41E-07	2.07E-07
SSW	1.44E-05	4.27E-06	2.14E-06	1.36E-06	7.45E-07	4.92E-07	3.57E-07	2.82E-07	2.30E-07	1.94E-07	1.66E-07
SW	1.47E-05	4.35E-06	2.18E-06	1.38E-06	7.60E-07	5.02E-07	3.65E-07	2.88E-07	2.35E-07	1.98E-07	1.69E-07
WSW	1.66E-05	4.87E-06	2.42E-06	1.53E-06	8.39E-07	5.55E-07	4.04E-07	3.20E-07	2.62E-07	2.21E-07	1.90E-07
W	1.87E-05	5.46E-06	2.70E-06	1.70E-06	9.36E-07	6.20E-07	4.53E-07	3.59E-07	2.96E-07	2.50E-07	2.15E-07
WNW	1.73E-05	5.06E-06	2.50E-06	1.58E-06	8.70E-07	5.78E-07	4.22E-07	3.35E-07	2.76E-07	2.33E-07	2.00E-07
NW	1.66E-05	4.88E-06	2.44E-06	1.54E-06	8.50E-07	5.63E-07	4.11E-07	3.25E-07	2.67E-07	2.25E-07	1.94E-07
NNW	1.12E-05	3.33E-06	1.70E-06	1.08E-06	6.01E-07	3.98E-07	2.90E-07	2.28E-07	1.85E-07	1.55E-07	1.33E-07
N	8.15E-06	2.48E-06	1.31E-06	8.49E-07	4.75E-07	3.15E-07	2.29E-07	1.78E-07	1.43E-07	1.19E-07	1.01E-07
NNE	5.52E-06	1.69E-06	9.03E-07	5.88E-07	3.28E-07	2.17E-07	1.57E-07	1.21E-07	9.69E-08	8.01E-08	6.77E-08
NE	5.08E-06	1.55E-06	8.26E-07	5.35E-07	2.96E-07	1.94E-07	1.40E-07	1.08E-07	8.65E-08	7.15E-08	6.04E-08
ENE	5.19E-06	1.56E-06	8.08E-07	5.18E-07	2.87E-07	1.90E-07	1.38E-07	1.07E-07	8.66E-08	7.20E-08	6.12E-08
E	4.53E-06	1.35E-06	6.93E-07	4.44E-07	2.46E-07	1.63E-07	1.18E-07	9.29E-08	7.56E-08	6.33E-08	5.41E-08
ESE	1.83E-05	5.34E-06	2.64E-06	1.66E-06	9.20E-07	6.12E-07	4.48E-07	3.56E-07	2.93E-07	2.48E-07	2.14E-07
SE	4.81E-05	1.40E-05	6.82E-06	4.27E-06	2.34E-06	1.55E-06	1.13E-06	9.05E-07	7.50E-07	6.36E-07	5.50E-07
SSE	2.38E-05	6.96E-06	3.45E-06	2.18E-06	1.20E-06	7.94E-07	5.80E-07	4.61E-07	3.80E-07	3.21E-07	2.77E-07

TABLE 2.7-84 (Sheet 2 of 3)
ANNUAL AVERAGE χ/Q (SEC/M^3) FOR NORMAL RELEASES
2.26 DAY DECAY, UNDEPLETED
(FOR EACH 22.5° SECTOR AT THE DISTANCES (MILES) SHOWN AT THE TOP)

SECTOR	5	7.5	10	15	20	25	30	35	40	45	50
S	1.81E-07	1.07E-07	7.29E-08	4.23E-08	2.85E-08	2.08E-08	1.60E-08	1.27E-08	1.04E-08	8.63E-09	7.31E-09
SSW	1.45E-07	8.48E-08	5.78E-08	3.34E-08	2.24E-08	1.63E-08	1.25E-08	9.91E-09	8.08E-09	6.72E-09	5.67E-09
SW	1.48E-07	8.66E-08	5.91E-08	3.42E-08	2.30E-08	1.67E-08	1.29E-08	1.02E-08	8.34E-09	6.95E-09	5.88E-09
WSW	1.65E-07	9.75E-08	6.67E-08	3.86E-08	2.59E-08	1.89E-08	1.45E-08	1.15E-08	9.35E-09	7.77E-09	6.56E-09
W	1.88E-07	1.12E-07	7.66E-08	4.47E-08	3.01E-08	2.20E-08	1.69E-08	1.35E-08	1.10E-08	9.15E-09	7.75E-09
WNW	1.75E-07	1.04E-07	7.14E-08	4.16E-08	2.81E-08	2.06E-08	1.58E-08	1.26E-08	1.03E-08	8.63E-09	7.32E-09
NW	1.69E-07	1.00E-07	6.90E-08	4.05E-08	2.76E-08	2.03E-08	1.58E-08	1.27E-08	1.04E-08	8.76E-09	7.48E-09
NNW	1.15E-07	6.73E-08	4.58E-08	2.64E-08	1.78E-08	1.31E-08	1.01E-08	8.07E-09	6.63E-09	5.56E-09	4.74E-09
N	8.71E-08	4.96E-08	3.32E-08	1.89E-08	1.26E-08	9.16E-09	7.04E-09	5.62E-09	4.61E-09	3.87E-09	3.30E-09
NNE	5.82E-08	3.28E-08	2.18E-08	1.23E-08	8.17E-09	5.95E-09	4.58E-09	3.66E-09	3.01E-09	2.53E-09	2.17E-09
NE	5.19E-08	2.92E-08	1.95E-08	1.10E-08	7.32E-09	5.33E-09	4.11E-09	3.29E-09	2.71E-09	2.28E-09	1.95E-09
ENE	5.30E-08	3.04E-08	2.05E-08	1.17E-08	7.90E-09	5.78E-09	4.47E-09	3.58E-09	2.95E-09	2.48E-09	2.12E-09
E	4.70E-08	2.74E-08	1.87E-08	1.09E-08	7.36E-09	5.42E-09	4.20E-09	3.38E-09	2.79E-09	2.35E-09	2.01E-09
ESE	1.87E-07	1.12E-07	7.72E-08	4.55E-08	3.11E-08	2.30E-08	1.79E-08	1.45E-08	1.20E-08	1.01E-08	8.65E-09
SE	4.83E-07	2.93E-07	2.04E-07	1.22E-07	8.42E-08	6.28E-08	4.92E-08	3.99E-08	3.32E-08	2.81E-08	2.42E-08
SSE	2.42E-07	1.45E-07	9.99E-08	5.89E-08	4.02E-08	2.96E-08	2.30E-08	1.85E-08	1.52E-08	1.28E-08	1.09E-08

TABLE 2.7-84 (Sheet 3 of 3)
ANNUAL AVERAGE χ/Q (SEC/M^3) FOR NORMAL RELEASES
2.26 DAY DECAY, UNDEPLETED
(FOR EACH 22.5° SECTOR AT THE DISTANCES (MILES) SHOWN AT THE TOP)

SECTOR	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	2.79E-06	9.44E-07	4.48E-07	2.87E-07	2.07E-07	1.08E-07	4.30E-08	2.09E-08	1.27E-08	8.65E-09
SSW	2.27E-06	7.68E-07	3.63E-07	2.31E-07	1.66E-07	8.61E-08	3.39E-08	1.64E-08	9.95E-09	6.73E-09
SW	2.31E-06	7.83E-07	3.71E-07	2.36E-07	1.70E-07	8.80E-08	3.47E-08	1.68E-08	1.03E-08	6.96E-09
WSW	2.57E-06	8.65E-07	4.10E-07	2.63E-07	1.90E-07	9.89E-08	3.92E-08	1.90E-08	1.15E-08	7.79E-09
W	2.87E-06	9.66E-07	4.60E-07	2.96E-07	2.15E-07	1.13E-07	4.53E-08	2.21E-08	1.35E-08	9.17E-09
WNW	2.66E-06	8.97E-07	4.29E-07	2.76E-07	2.01E-07	1.05E-07	4.22E-08	2.07E-08	1.27E-08	8.65E-09
NW	2.58E-06	8.77E-07	4.17E-07	2.68E-07	1.94E-07	1.02E-07	4.11E-08	2.04E-08	1.27E-08	8.78E-09
NNW	1.79E-06	6.18E-07	2.94E-07	1.86E-07	1.33E-07	6.84E-08	2.69E-08	1.31E-08	8.09E-09	5.57E-09
N	1.37E-06	4.87E-07	2.31E-07	1.44E-07	1.01E-07	5.07E-08	1.93E-08	9.22E-09	5.64E-09	3.88E-09
NNE	9.38E-07	3.36E-07	1.58E-07	9.73E-08	6.79E-08	3.36E-08	1.26E-08	5.99E-09	3.68E-09	2.54E-09
NE	8.58E-07	3.04E-07	1.42E-07	8.69E-08	6.05E-08	2.99E-08	1.12E-08	5.37E-09	3.30E-09	2.28E-09
ENE	8.46E-07	2.95E-07	1.40E-07	8.69E-08	6.14E-08	3.10E-08	1.20E-08	5.82E-09	3.60E-09	2.49E-09
E	7.29E-07	2.53E-07	1.20E-07	7.58E-08	5.42E-08	2.79E-08	1.10E-08	5.45E-09	3.39E-09	2.36E-09
ESE	2.81E-06	9.48E-07	4.55E-07	2.94E-07	2.14E-07	1.13E-07	4.62E-08	2.32E-08	1.45E-08	1.01E-08
SE	7.28E-06	2.42E-06	1.15E-06	7.51E-07	5.51E-07	2.96E-07	1.23E-07	6.31E-08	4.00E-08	2.82E-08
SSE	3.67E-06	1.24E-06	5.89E-07	3.81E-07	2.77E-07	1.46E-07	5.97E-08	2.98E-08	1.85E-08	1.28E-08

TABLE 2.7-85 (Sheet 1 of 3)

ANNUAL AVERAGE χ/Q (SEC/M^3) FOR NORMAL RELEASES 8.00 DAY DECAY, DEPLETED

(FOR EACH 22.5° SECTOR AT THE DISTANCES (MILES) SHOWN AT THE TOP)

SECTOR	0.25	0.5	0.75	1	1.5	2	2.5	3	3.5	4	4.5
S	1.67E-05	4.81E-06	2.36E-06	1.47E-06	7.85E-07	5.08E-07	3.63E-07	2.82E-07	2.28E-07	1.90E-07	1.61E-07
SSW	1.34E-05	3.89E-06	1.92E-06	1.20E-06	6.38E-07	4.12E-07	2.94E-07	2.28E-07	1.84E-07	1.52E-07	1.29E-07
SW	1.37E-05	3.97E-06	1.95E-06	1.22E-06	6.51E-07	4.20E-07	3.00E-07	2.33E-07	1.88E-07	1.55E-07	1.32E-07
WSW	1.55E-05	4.45E-06	2.17E-06	1.35E-06	7.20E-07	4.65E-07	3.33E-07	2.59E-07	2.09E-07	1.74E-07	1.48E-07
W	1.74E-05	4.98E-06	2.42E-06	1.50E-06	8.03E-07	5.20E-07	3.73E-07	2.91E-07	2.36E-07	1.97E-07	1.67E-07
WNW	1.61E-05	4.62E-06	2.24E-06	1.39E-06	7.46E-07	4.85E-07	3.48E-07	2.71E-07	2.20E-07	1.83E-07	1.56E-07
NW	1.55E-05	4.45E-06	2.18E-06	1.36E-06	7.27E-07	4.71E-07	3.37E-07	2.62E-07	2.12E-07	1.76E-07	1.50E-07
NNW	1.04E-05	3.04E-06	1.52E-06	9.52E-07	5.13E-07	3.33E-07	2.38E-07	1.83E-07	1.47E-07	1.21E-07	1.02E-07
N	7.60E-06	2.26E-06	1.17E-06	7.45E-07	4.05E-07	2.62E-07	1.87E-07	1.42E-07	1.13E-07	9.25E-08	7.74E-08
NNE	5.14E-06	1.54E-06	8.06E-07	5.16E-07	2.80E-07	1.80E-07	1.28E-07	9.67E-08	7.63E-08	6.21E-08	5.17E-08
NE	4.73E-06	1.42E-06	7.37E-07	4.70E-07	2.52E-07	1.62E-07	1.14E-07	8.64E-08	6.81E-08	5.54E-08	4.62E-08
ENE	4.83E-06	1.42E-06	7.22E-07	4.54E-07	2.45E-07	1.58E-07	1.13E-07	8.60E-08	6.84E-08	5.60E-08	4.70E-08
E	4.22E-06	1.23E-06	6.19E-07	3.90E-07	2.10E-07	1.36E-07	9.68E-08	7.45E-08	5.98E-08	4.93E-08	4.16E-08
ESE	1.70E-05	4.87E-06	2.36E-06	1.46E-06	7.86E-07	5.12E-07	3.67E-07	2.87E-07	2.33E-07	1.94E-07	1.65E-07
SE	4.48E-05	1.27E-05	6.10E-06	3.75E-06	2.00E-06	1.29E-06	9.27E-07	7.29E-07	5.94E-07	4.97E-07	4.24E-07
SSE	2.22E-05	6.35E-06	3.09E-06	1.92E-06	1.03E-06	6.64E-07	4.75E-07	3.72E-07	3.02E-07	2.51E-07	2.14E-07

TABLE 2.7-85 (Sheet 2 of 3)
ANNUAL AVERAGE χ/Q (SEC/M^3) FOR NORMAL RELEASES 8.00 DAY DECAY, DEPLETED
(FOR EACH 22.5° SECTOR AT THE DISTANCES (MILES) SHOWN AT THE TOP)

SECTOR	5	7.5	10	15	20	25	30	35	40	45	50
S	1.39E-07	7.88E-08	5.22E-08	2.90E-08	1.89E-08	1.35E-08	1.01E-08	7.95E-09	6.42E-09	5.29E-09	4.44E-09
SSW	1.11E-07	6.26E-08	4.14E-08	2.28E-08	1.48E-08	1.06E-08	7.94E-09	6.22E-09	5.01E-09	4.13E-09	3.46E-09
SW	1.13E-07	6.40E-08	4.23E-08	2.33E-08	1.52E-08	1.08E-08	8.14E-09	6.38E-09	5.14E-09	4.24E-09	3.56E-09
WSW	1.28E-07	7.23E-08	4.80E-08	2.66E-08	1.73E-08	1.24E-08	9.31E-09	7.30E-09	5.89E-09	4.85E-09	4.07E-09
W	1.45E-07	8.27E-08	5.51E-08	3.07E-08	2.01E-08	1.43E-08	1.08E-08	8.50E-09	6.87E-09	5.67E-09	4.76E-09
WNW	1.35E-07	7.68E-08	5.11E-08	2.85E-08	1.86E-08	1.33E-08	1.00E-08	7.88E-09	6.37E-09	5.26E-09	4.42E-09
NW	1.29E-07	7.33E-08	4.87E-08	2.71E-08	1.77E-08	1.27E-08	9.59E-09	7.54E-09	6.11E-09	5.05E-09	4.26E-09
NNW	8.80E-08	4.91E-08	3.22E-08	1.76E-08	1.14E-08	8.11E-09	6.10E-09	4.77E-09	3.85E-09	3.17E-09	2.67E-09
N	6.60E-08	3.59E-08	2.31E-08	1.24E-08	7.88E-09	5.53E-09	4.12E-09	3.20E-09	2.57E-09	2.11E-09	1.76E-09
NNE	4.40E-08	2.35E-08	1.50E-08	7.93E-09	5.02E-09	3.51E-09	2.60E-09	2.02E-09	1.62E-09	1.33E-09	1.11E-09
NE	3.92E-08	2.10E-08	1.34E-08	7.10E-09	4.51E-09	3.16E-09	2.35E-09	1.83E-09	1.46E-09	1.20E-09	1.00E-09
ENE	4.01E-08	2.20E-08	1.42E-08	7.69E-09	4.94E-09	3.49E-09	2.62E-09	2.04E-09	1.65E-09	1.36E-09	1.14E-09
E	3.57E-08	1.99E-08	1.30E-08	7.14E-09	4.63E-09	3.29E-09	2.48E-09	1.94E-09	1.57E-09	1.30E-09	1.09E-09
ESE	1.43E-07	8.15E-08	5.43E-08	3.04E-08	1.99E-08	1.43E-08	1.08E-08	8.53E-09	6.92E-09	5.73E-09	4.83E-09
SE	3.68E-07	2.13E-07	1.43E-07	8.09E-08	5.35E-08	3.86E-08	2.94E-08	2.33E-08	1.89E-08	1.57E-08	1.33E-08
SSE	1.85E-07	1.06E-07	7.06E-08	3.95E-08	2.59E-08	1.86E-08	1.41E-08	1.11E-08	8.99E-09	7.45E-09	6.28E-09

TABLE 2.7-85 (Sheet 3 of 3)
ANNUAL AVERAGE χ/Q (SEC/M^3) FOR NORMAL RELEASES 8.00 DAY DECAY, DEPLETED
(FOR EACH 22.5° SECTOR AT THE DISTANCES (MILES) SHOWN AT THE TOP)

SECTOR	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	2.51E-06	8.13E-07	3.69E-07	2.29E-07	1.61E-07	8.04E-08	2.96E-08	1.36E-08	7.99E-09	5.31E-09
SSW	2.04E-06	6.61E-07	2.99E-07	1.84E-07	1.29E-07	6.40E-08	2.34E-08	1.07E-08	6.25E-09	4.14E-09
SW	2.07E-06	6.74E-07	3.05E-07	1.88E-07	1.32E-07	6.53E-08	2.39E-08	1.09E-08	6.41E-09	4.25E-09
WSW	2.31E-06	7.46E-07	3.39E-07	2.10E-07	1.48E-07	7.38E-08	2.72E-08	1.25E-08	7.34E-09	4.87E-09
W	2.58E-06	8.32E-07	3.79E-07	2.37E-07	1.68E-07	8.42E-08	3.14E-08	1.45E-08	8.55E-09	5.69E-09
WNW	2.39E-06	7.73E-07	3.54E-07	2.21E-07	1.56E-07	7.82E-08	2.91E-08	1.34E-08	7.92E-09	5.28E-09
NW	2.32E-06	7.53E-07	3.43E-07	2.13E-07	1.50E-07	7.48E-08	2.77E-08	1.28E-08	7.58E-09	5.07E-09
NNW	1.61E-06	5.31E-07	2.41E-07	1.48E-07	1.03E-07	5.02E-08	1.81E-08	8.19E-09	4.80E-09	3.19E-09
N	1.22E-06	4.17E-07	1.89E-07	1.14E-07	7.77E-08	3.69E-08	1.28E-08	5.59E-09	3.22E-09	2.12E-09
NNE	8.40E-07	2.88E-07	1.29E-07	7.67E-08	5.19E-08	2.43E-08	8.21E-09	3.55E-09	2.03E-09	1.33E-09
NE	7.69E-07	2.60E-07	1.16E-07	6.85E-08	4.63E-08	2.17E-08	7.36E-09	3.20E-09	1.84E-09	1.21E-09
ENE	7.59E-07	2.53E-07	1.14E-07	6.87E-08	4.71E-08	2.26E-08	7.92E-09	3.53E-09	2.06E-09	1.36E-09
E	6.54E-07	2.17E-07	9.83E-08	6.00E-08	4.17E-08	2.04E-08	7.33E-09	3.32E-09	1.95E-09	1.30E-09
ESE	2.52E-06	8.14E-07	3.74E-07	2.33E-07	1.65E-07	8.30E-08	3.10E-08	1.44E-08	8.57E-09	5.75E-09
SE	6.53E-06	2.08E-06	9.45E-07	5.95E-07	4.25E-07	2.17E-07	8.26E-08	3.89E-08	2.34E-08	1.58E-08
SSE	3.29E-06	1.06E-06	4.84E-07	3.02E-07	2.14E-07	1.08E-07	4.04E-08	1.87E-08	1.12E-08	7.47E-09

TABLE 2.7-86 (Sheet 1 of 3)
D/Q (M^{-2}) AT EACH 22.5° SECTOR FOR NORMAL RELEASES
(FOR EACH DISTANCE (MILES) SHOWN AT THE TOP)

SECTOR	0.25	0.5	0.75	1	1.5	2	2.5	3	3.5	4	4.5
S	3.52E-08	1.19E-08	6.12E-09	3.76E-09	1.87E-09	1.14E-09	7.68E-10	5.57E-10	4.23E-10	3.33E-10	2.70E-10
SSW	3.42E-08	1.16E-08	5.93E-09	3.64E-09	1.82E-09	1.10E-09	7.44E-10	5.39E-10	4.10E-10	3.23E-10	2.62E-10
SW	3.49E-08	1.18E-08	6.06E-09	3.72E-09	1.85E-09	1.12E-09	7.60E-10	5.51E-10	4.19E-10	3.30E-10	2.67E-10
WSW	3.00E-08	1.01E-08	5.21E-09	3.20E-09	1.59E-09	9.66E-10	6.53E-10	4.74E-10	3.60E-10	2.84E-10	2.30E-10
W	2.70E-08	9.12E-09	4.68E-09	2.87E-09	1.43E-09	8.69E-10	5.88E-10	4.26E-10	3.24E-10	2.55E-10	2.07E-10
WNW	2.51E-08	8.47E-09	4.35E-09	2.67E-09	1.33E-09	8.08E-10	5.46E-10	3.96E-10	3.01E-10	2.37E-10	1.92E-10
NW	3.16E-08	1.07E-08	5.49E-09	3.37E-09	1.68E-09	1.02E-09	6.89E-10	4.99E-10	3.80E-10	2.99E-10	2.42E-10
NNW	3.32E-08	1.12E-08	5.77E-09	3.54E-09	1.77E-09	1.07E-09	7.24E-10	5.25E-10	3.99E-10	3.14E-10	2.54E-10
N	3.67E-08	1.24E-08	6.37E-09	3.91E-09	1.95E-09	1.18E-09	8.00E-10	5.80E-10	4.41E-10	3.47E-10	2.81E-10
NNE	4.01E-08	1.36E-08	6.96E-09	4.28E-09	2.13E-09	1.29E-09	8.74E-10	6.34E-10	4.82E-10	3.80E-10	3.07E-10
NE	4.11E-08	1.39E-08	7.14E-09	4.38E-09	2.19E-09	1.33E-09	8.96E-10	6.49E-10	4.94E-10	3.89E-10	3.15E-10
ENE	2.83E-08	9.56E-09	4.91E-09	3.01E-09	1.50E-09	9.11E-10	6.16E-10	4.47E-10	3.40E-10	2.68E-10	2.17E-10
E	1.59E-08	5.38E-09	2.76E-09	1.70E-09	8.45E-10	5.13E-10	3.47E-10	2.51E-10	1.91E-10	1.50E-10	1.22E-10
ESE	4.16E-08	1.41E-08	7.23E-09	4.44E-09	2.21E-09	1.34E-09	9.07E-10	6.57E-10	5.00E-10	3.94E-10	3.19E-10
SE	8.31E-08	2.81E-08	1.44E-08	8.86E-09	4.42E-09	2.68E-09	1.81E-09	1.31E-09	9.98E-10	7.86E-10	6.36E-10
SSE	4.08E-08	1.38E-08	7.09E-09	4.35E-09	2.17E-09	1.32E-09	8.90E-10	6.45E-10	4.90E-10	3.86E-10	3.13E-10

TABLE 2.7-86 (Sheet 2 of 3)
D/Q (M^{-2}) AT EACH 22.5° SECTOR FOR NORMAL RELEASES
(FOR EACH DISTANCE (MILES) SHOWN AT THE TOP)

SECTOR	5	7.5	10	15	20	25	30	35	40	45	50
S	2.23E-10	1.09E-10	6.86E-11	3.47E-11	2.10E-11	1.41E-11	1.01E-11	7.58E-12	5.89E-12	4.71E-12	3.84E-12
SSW	2.16E-10	1.06E-10	6.65E-11	3.36E-11	2.04E-11	1.37E-11	9.78E-12	7.34E-12	5.71E-12	4.56E-12	3.72E-12
SW	2.21E-10	1.08E-10	6.80E-11	3.44E-11	2.08E-11	1.39E-11	9.99E-12	7.50E-12	5.83E-12	4.66E-12	3.80E-12
WSW	1.90E-10	9.31E-11	5.84E-11	2.95E-11	1.79E-11	1.20E-11	8.58E-12	6.45E-12	5.01E-12	4.00E-12	3.27E-12
W	1.71E-10	8.37E-11	5.25E-11	2.66E-11	1.61E-11	1.08E-11	7.72E-12	5.80E-12	4.51E-12	3.60E-12	2.94E-12
WNW	1.59E-10	7.78E-11	4.88E-11	2.47E-11	1.49E-11	1.00E-11	7.18E-12	5.39E-12	4.19E-12	3.35E-12	2.73E-12
NW	2.00E-10	9.82E-11	6.16E-11	3.11E-11	1.88E-11	1.26E-11	9.05E-12	6.80E-12	5.29E-12	4.22E-12	3.45E-12
NNW	2.10E-10	1.03E-10	6.47E-11	3.27E-11	1.98E-11	1.33E-11	9.51E-12	7.14E-12	5.55E-12	4.44E-12	3.62E-12
N	2.33E-10	1.14E-10	7.15E-11	3.61E-11	2.19E-11	1.47E-11	1.05E-11	7.89E-12	6.14E-12	4.90E-12	4.00E-12
NNE	2.54E-10	1.25E-10	7.81E-11	3.95E-11	2.39E-11	1.60E-11	1.15E-11	8.62E-12	6.71E-12	5.36E-12	4.37E-12
NE	2.60E-10	1.28E-10	8.01E-11	4.05E-11	2.45E-11	1.64E-11	1.18E-11	8.84E-12	6.87E-12	5.49E-12	4.48E-12
ENE	1.79E-10	8.78E-11	5.51E-11	2.78E-11	1.69E-11	1.13E-11	8.09E-12	6.08E-12	4.73E-12	3.78E-12	3.08E-12
E	1.01E-10	4.94E-11	3.10E-11	1.57E-11	9.47E-12	6.35E-12	4.55E-12	3.42E-12	2.66E-12	2.12E-12	1.73E-12
ESE	2.64E-10	1.29E-10	8.11E-11	4.10E-11	2.48E-11	1.66E-11	1.19E-11	8.95E-12	6.96E-12	5.56E-12	4.54E-12
SE	5.26E-10	2.58E-10	1.62E-10	8.18E-11	4.95E-11	3.32E-11	2.38E-11	1.79E-11	1.39E-11	1.11E-11	9.06E-12
SSE	2.59E-10	1.27E-10	7.95E-11	4.02E-11	2.43E-11	1.63E-11	1.17E-11	8.78E-12	6.82E-12	5.45E-12	4.45E-12

TABLE 2.7-86 (Sheet 3 of 3)
D/Q (M^{-2}) AT EACH 22.5° SECTOR FOR NORMAL RELEASES
(FOR EACH DISTANCE (MILES) SHOWN AT THE TOP)

SECTOR	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	6.36E-09	1.96E-09	7.81E-10	4.27E-10	2.71E-10	1.17E-10	3.62E-11	1.43E-11	7.65E-12	4.74E-12
SSW	6.16E-09	1.90E-09	7.57E-10	4.14E-10	2.63E-10	1.13E-10	3.50E-11	1.39E-11	7.42E-12	4.59E-12
SW	6.29E-09	1.94E-09	7.74E-10	4.23E-10	2.69E-10	1.15E-10	3.58E-11	1.42E-11	7.57E-12	4.69E-12
WSW	5.41E-09	1.67E-09	6.65E-10	3.63E-10	2.31E-10	9.92E-11	3.08E-11	1.22E-11	6.51E-12	4.03E-12
W	4.86E-09	1.50E-09	5.98E-10	3.27E-10	2.08E-10	8.92E-11	2.77E-11	1.10E-11	5.86E-12	3.62E-12
WNW	4.52E-09	1.40E-09	5.56E-10	3.04E-10	1.93E-10	8.29E-11	2.57E-11	1.02E-11	5.44E-12	3.37E-12
NW	5.70E-09	1.76E-09	7.01E-10	3.83E-10	2.44E-10	1.05E-10	3.24E-11	1.29E-11	6.87E-12	4.25E-12
NNW	5.99E-09	1.85E-09	7.37E-10	4.03E-10	2.56E-10	1.10E-10	3.41E-11	1.35E-11	7.21E-12	4.46E-12
N	6.62E-09	2.05E-09	8.14E-10	4.45E-10	2.83E-10	1.21E-10	3.77E-11	1.49E-11	7.97E-12	4.93E-12
NNE	7.24E-09	2.24E-09	8.90E-10	4.86E-10	3.09E-10	1.33E-10	4.12E-11	1.63E-11	8.71E-12	5.39E-12
NE	7.42E-09	2.29E-09	9.12E-10	4.98E-10	3.17E-10	1.36E-10	4.22E-11	1.67E-11	8.93E-12	5.53E-12
ENE	5.10E-09	1.58E-09	6.27E-10	3.43E-10	2.18E-10	9.35E-11	2.90E-11	1.15E-11	6.14E-12	3.80E-12
E	2.87E-09	8.86E-10	3.53E-10	1.93E-10	1.23E-10	5.26E-11	1.63E-11	6.47E-12	3.45E-12	2.14E-12
ESE	7.51E-09	2.32E-09	9.23E-10	5.04E-10	3.21E-10	1.38E-10	4.27E-11	1.69E-11	9.04E-12	5.59E-12
SE	1.50E-08	4.63E-09	1.84E-09	1.01E-09	6.40E-10	2.75E-10	8.52E-11	3.38E-11	1.80E-11	1.12E-11
SSE	7.36E-09	2.28E-09	9.05E-10	4.95E-10	3.14E-10	1.35E-10	4.19E-11	1.66E-11	8.86E-12	5.49E-12

2.8 RELATED FEDERAL PROJECT ACTIVITIES

The purpose of this section is to identify federal activities directly related to the proposed Lee Nuclear Station in order to (1) determine the need for other federal agencies (i.e., cooperating agencies) to participate in the preparation of an environmental impact statement; and (2) assess the interrelationship and cumulative environmental impacts of the proposed project and related federal activities.

In accordance with NUREG-1555, *Standard Review Plans for Environmental Reviews for Nuclear Power Plants*, the scope of this review was limited to federal actions that are directly related to the proposed project. Therefore, actions related only to granting of licenses, permits, or approvals by other federal agencies were not included in the scope of this review.

No directly related federal activities or relevant cooperating agencies that would affect station siting, station water supply, transmission line routing, or need for power were identified.