HARRIS-HARNETT 500 kV TRANSMISSION LINE ROUTE SELECTION

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Harris-Harnett
Environmental Inventory

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1.0 INTRODUCTION

The process used by Carolina Power & Light Company for optimum transmission line route location involves four distinct steps. These are: 1) study area selection, 2) environmental inventory, 3) alternate route selection, and 4) optimum route selection. The optimum route for the Harris-Harnett 500 kV transmission line will be determined by this process. Generally, the environmental inventory consists of land use, cultural resource, soil, topography, hydrology, and ecological evaluations.

1.1 Delineation of the Study Area

The Harris-Harnett 500 kV transmission line will originate at the switchyard of the Shearon Harris Nuclear Power Plant, presently under construction in southwestern Wake County, North Carolina. From this point, the line will be constructed to the proposed Erwin 500 kV substation near the town of Erwin in Harnett County, North Carolina. The total straight-line distance of the line is approximately 26 miles, oriented in a northwest-southeast direction.

In order to adequately describe and assess the features of the environment through which the line would pass, a study area based primarily upon the transmission line end points and an economically reasonable length of the line was delineated. This study area is approximately 27 miles long and

varies from 9 to 11 miles wide. The size of the study area is adequate to allow reasonable flexibility for routing the line in a way to minimize environmental impact without unreasonably increasing the cost of construction.

1.2 Environmental Inventory

After the study area was delineated, the next step was an environmental inventory of important natural and man-made features which have specific bearing on the location of the transmission line. Present and projected land use surveys were made. Information ranging from county land use documents to notes made during field inspections of the study area were included in the land use inventory. Interviews with county planners and other appropriate state and federal agency officials were conducted. Evaluations of topography, hydrology, and soil features were made to determine the general character of the terrain. Locations of steep slopes and waterways that should be avoided and the soils that have the greatest erosion potential were mapped. An ecology survey was made to describe the existing wildlife habitat and locate any "natural" or "scenic" areas within the study area. Known locations of endangered, threatened, or other "special" status species were mapped. A cultural resources survey was conducted to locate the known archaeological and historical sites and structures that exist within the study area.

The purpose of this report is to present and document the results of the environmental inventory of the Harris-Harnett study area. Maps showing the locations of all significant features identified during the inventory are included. The selection of several alternate routes and, eventually, the

optimum route will be based upon information presented in this document.

2.0 Present and Projected Land Use

Land use characteristics are extremely important in the process of selecting a transmission line route. The significance of specific land use features to the routing process varies greatly. Some features must be totally avoided by the route at any cost, while others should be avoided if possible. Generally, undeveloped lands present the least concern when considering the land use criteria.

The purpose of the land use inventory of the Harris-Harnett study area was to identify all significant features which would influence the selection of the transmission line route. Both present and projected land uses were considered. The principal sources of information were the local planning offices of Chatham, Harnett, Johnston, and Wake Counties.

The Wake County planner recently had provided applicable information during the environmental inventory study for the Wake-Harris transmission line (letter dated June 27, 1978 from John G. Scott, Wake County Director of Planning, Raleigh, North Carolina). That information was verified and updated by personnel of the Wake County Planning Office for specific application to the Harris-Harnett study area.

The planners for each county except Wake County provided a copy of a recent land use or classification document: "Land Use Plan - Harnett County" (Lynch 1976), "Sketch Land Use and Development Plant - Johnston County" (Windley 1975) and "Land Classification Plan - Chatham County" (Triangle J. Council of Governments 1977). Each planner was requested to provide updated information, if necessary, to reflect any changes or additions that had occurred after the respective publication dates.

Other sources of land use information included U.S. Department of Agriculture, Soil Conservation Service, appraisals of the potentials for outdoor recreational development in Chatham, Harnett, Johnston, and Wake Counties (USDA 1970a, 1974, 1973a, and 1973b). These documents were useful in supplementing information provided by the local planners. In addition, various other federal, state, and county officials and documents were consulted for specific land use facts.

The following discussions summarize the significant present and projected land use information obtained during the inventory of the Harris-Harnett study area. This information is presented on Figure 2.0-1.

2.1 Population

The Harris-Harnett study area is generally rural in nature with major population centers located within and adjacent to the five towns identified in Table 2.1-1 (Directory of North Carolina Municipal Officials 1978). The populations of these towns as of July 1, 1976 including areas annexed through July 1, 1977 are included in that table. There are no cities, municipalities with populations of 25,000 or greater, in the study area. A portion of Corinth in Chatham County was classified as a "community" (Figure 2.0-1). A number of unincorporated communities were identified from North Carolina highway maps (North Carolina Department of Transportation 1972) in Harnett, Johnston, and Wake Counties (Table 2.1-2). The significance of unincorporated communities may be minimal in that at least one of them, Burt, does not include a single residence. The locations of the towns and unincorporated communities are shown on Figure 2.0-1.

Three of the towns listed in Table 2.1-1 are actually located outside the boundaries of the study area. These are Erwin, Lillington, and Fuquay-Varina. The significance of these is that some suburban and residential development exists adjacent to these towns within the study area. In addition, future development is expected to expand further into the study area.

Three subdivisions were identified in rural areas of the study area during the inventory. One, Captain's Landing, is located west of Harnett County SR 1418 near the Cape Fear River in the northern section of the study area. Another, Keith Hills, is located south of Buies Creek near the Cape Fear River at the end of Harnett County SR 1513. The third, Dams Farms, is at the junction of the study area boundary and Wake County SR 1301 just southeast of Fuquay-Varina. Two additional subdivisions were identified just west of Fuquay-Varina in areas classified by the Wake County planner as "transition" and "future urban" zones (letter dated June 27, 1978 from John G. Scott, Wake County Director of Planning, Raleigh, North Carolina). The names of these subdivisions are Pine Ridge Estates and Piney Grove. The locations of all five subdivisions are shown on Figure 2.0-1.

Future residential development is most probable in areas immediately adjacent to the five towns listed in Table 2.1-1. These areas are located in Harnett and Wake Counties. Classifications for such future development included on Figure 2.0-1 are "Developing Area," "Transition (20 years)," and "Future Urban (20-70 years)." The "Developing Area" is defined as an area outside the present urban areas that is expected to shown concentrated growth during the next 24 years (Lynch 1976). Definitions for the "Transition" and "Future Urban" areas are those as given in the letter from the Wake County Director

of Planning. The "Transition" areas are expected to urbanize within the next 20 years, while the "Future Urban" areas are now experiencing some development and should urbanize within 20-70 years. The information regarding future development near Fuquay-Varina on Figure 2.0-1 was obtained from the Wake County Director of Planning. Predictions of the future development areas in Harnett County were made by the county planner (personal interview on April 18, 1979 with T. Tucker, Harnett County Planner, Lillington, North Carolina). Significant residential development is not predicted in the near future for portions of the study area in Chatham and Johnston Counties (Triangle J Council of Governments 1977, Windley 1975 and letter dated April 9, 1979 from R. Cannity, Johnston County Planner, Smithfield, North Carolina).

In addition to the subdivisions and areas of future development shown on Figure 2.0-1, there are many dwellings located individually and in clusters throughout the study area. These will be located during the alternate route selection phase of the routing process.

2.2 Commercial and Industrial Development

Based on the information contained in the county land use documents and on communications with county planners, there are few existing commercial and industrial developments outside the corporate limits of the towns within the study area. In Harnett County, existing commercial development exists at three locations. Only one existing industrial site was identified outside corporate limits within the study area. That was the South Fuquay Tobacco Warehouse complex located on the study area boundary as indicated in the letter from the Wake County Director of Planning. Future industrial sites

were predicted only for Harnett County. These existing and predicted developments are shown on Figure 2.0-1.

2.3 Transportation

Major federal and state highways traversing the study area are US 401, US 421, NC 27, NC 42, NC 55, and NC 210. There are no Interstate highways in the study area. Beyond these major highways, there are many state roads which form a complex network throughout the study area. Figure 2.0-1 illustrates all highways and roads which currently exist in the study area.

Two proposed highways near Fuquay-Varina were identified by the Wake County Director of Planning. One is the proposed realignment of NC 55 and the other is a proposed by-pass around Fuquay-Varina. The proposed routes are indicated on Figure 2.0-1.

Several railroad rights-of-way exist in the study area. These are designated on Figure 2.0-1 as Norfolk-Southern Railroad and Durham-Southern Railroad lines.

Two airports exist in the study area. The Fuquay-Angier Airport is located along NC 55 midway between Fuquay-Varina and Angier. The Steward Airport is near the intersection of Harnett County SR 2005 and Harnett County SR 2008 southwest of Coats. An additional airport, the Harnett County Airport, is proposed for an area south of Buies Creek near the Cape Fear River. The principal source of information regarding airport locations was the North Carolina Department of Transportation (letter dated April 9, 1979 from

B. E. Matthews, Airport Development Specialist, Raleigh, North Carolina). The location of the three airports are indicated on Figure 2.0-1.

2.4 Schools and Other Institutions

Information obtained from the Harnett County Superintendent of Schools indicated that eight public schools are within the study area. These are Lafayette Elementary School, North Harnett Elementary, North Harnett Central, Buies Creek Elementary School, Angier High School, Coats School, Gentry Elementary School, and a new high school near Slocomb's Crossroads. The locations of these schools, although not by name, are included on Figure 2.0-1. Based on the land use documents and letters from John G. Scott, Wake County Director of Planning and Rick Cannity, Johnston County Planner (dated June 27, 1978 and April 19, 1979), there are no public schools within the portions of the study area located in Chatham, Johnston, and Wake Counties. No private schools were identified in the study area.

The only college or university located in the study area is Campbell University at Buies Creek (Figure 2.0-1). No community colleges or technical schools were identified in the study area.

The locations of churches and cemeteries in the study area were determined primarily from United States Geological Survey topographic maps and North Carolina county highway maps. Figure 2.0-1 indicates the locations of churches and cemeteries separately, but in many instances cemeteries also exist at the church locations. Some of these locations may be approximated on the map and others may have been omitted.

No hospitals, prisons, or other institutions were identified in the study area.

2.5 Utilities

A number of existing utility corridors transverse the study area. These are important in that these existing corridors should be considered for the possible parallel routing of the Harris-Harnett line.

The existing Carolina Power & Light Company transmission corridors, which cross the study area, include the Harris-Cape Fear 230 kV, the Tillery-Cape Fear 115 kV, the Fuquay 115 kV tap (de-energized), the Cape Fear-Method South 115 kV, the Harris-Erwin North 230 kV, and the Milburnie-Fayetteville 230 kV. A proposed corridor for the Harris-Harnett 230 kV transmission line parallels the existing Tillery-Cape Fear 115 kV corridor.

Three existing pipeline corridors are in the study area. A portion of the Dixie Pipeline gas line is located near the Shearon Harris Nuclear Power Plant site. An oil pipeline crosses the study area between the Cape Fear River and Fuquay-Varina. A natural gas pipeline connects Lillington and Erwin along NC 210 and US 421. The locations of these corridors were determined from John G. Scott, Wake County Director of Planning (letter dated June 27, 1978) and the Harnett County land use plan (Lynch 1976).

Public water lines recently have been installed along NC 210 north of Lillington, along US 421 between Lillington and Erwin, and along NC 55 between Erwin and Coats. According to T. Tucker, Harnett County Planner (personal

interview on April 18, 1979, Lillington, North Carolina), these improvements are expected to increase the rate of commercial, industrial, and residential development along these routes.

The described transmission line corridors, pipelines, and water lines are illustrated on Figure 2.0-1. The figure also shows the location of several radio and telephone towers.

2.6 Recreational Land Use

Reviews of U.S. Department of Agriculture documents (1970a, 1974, 1973a, and 1973b) indicated medium to high potential for nearly all of the recreational categories assessed. However, few existing and proposed recreational facilities were identified in the study area.

Probably the most significant recreational site is Raven Rock State Park located along the Cape Fear River. As indicated on Figure 2.0-1, the portion of the park in the study area includes both existing park land and proposed acquisition areas.

A series of proposed scenic roads included in a preliminary report by the U.S. Army Corps of Engineers (1972) was noted in the Harnett County land use plan (Lynch 1976). However, the U.S. Army Corps of Engineers final environmental inventory report (1973) did not include the scenic road designations (telephone interview on April 9, 1979 with T. Zeber,

N.C. Department of Parks and Recreation, Raleigh, North Carolina). The Harnett County planner (telephone interview on April 9, 1979 with T. Tucker, Harnett County Planner, Lillington, North Carolina) suggested that the proposed scenic roads not be considered in the routing of the Harris-Harnett line.

Limited fishing and boating opportunities exist in the study area along the Cape Fear River and on the other lakes, ponds, and streams discussed in Section 4.3 and illustrated in Figure 4.3-1. The natural scenic value of the land along the banks of the Cape Fear River is an important feature to be considered during the route selection process.

Hunting opportunities exist throughout the study area. The value of the land as wildlife habitat is discussed in Section 4.4. Two tracts of land in the study area have been included in the North Carolina Wildlife Resources Commission's Game Lands Program (North Carolina Wildlife Resources Commission 1978). These are part of the Merry Oaks Game Lands and the W. D. Farms Game Lands (Figure 4.4-1).

Two golf courses are in the study area (Figure 2.0-1). One, Kennebec Golf Course, is located along NC 55 northeast of Kennebec. The other, Keith Hills Golf Course, is southwest of Buies Creek at the end of Harnett County SR 1513.

2.7 Agricultural Land Use

Much of the study area currently is being cultivated for a wide variety of

agricultural crops and livestock production. During the later phases of the routing process, the specific agricultural uses of the land in the study area will be identified as necessary to select the optimum route.

3.0 Cultural Resources

The archaeological and historical resources of the Harris-Harnett study area were inventoried by contacting the N.C. Department of Cultural Resources, Division of Archives and History. From information supplied by this Division, known locations of archaeological sites and structures of architectual and/or historic interest were mapped. Further, comments were received from the Research Laboratories of Archaeology at Chapel Hill regarding archaeological sites. The National Register of Historic Places was checked to identify properties within the study area which are included or nominated to the Register. A literature review was conducted, and locations of structures of historic and/or architectural interest were verified by site visits.

3.1 Archaeological Sites

The archaeological resources of the Harris-Harnett study area have never been completely surveyed. Table 3.1-1 lists the known sites and their cultural affiliation. The numbers in the table correspond to the numbered archaeological sites on the Cultural Resources map (Figure 3.0-1). The majority of these sites are of the Prehistoric and Archaic periods. The Prehistoric period dates to before 8000 B.C., and the Archaic covered a period of time from 7000 B.C. to 1000 B.C.

The known sites in Wake and Chatham Counties and most of Harnett County (all but Ht. 4, 6, and 24) have been evaluated by the Research Laboratories of Anthropology and were determined to be ineligible for inclusion in the National Register of Historic Places (letter dated April 11, 1979 from Trawick Ward, Archaeologist, Research Laboratories of Archaeology, the University of North Carolina, Chapel Hill, North Carolina, and telephone interview on April 25, 1979 with Delores Hall, Archaeologist, North Carolina Department of Cultural Resources, Division of Archives and History, Archaeology Branch, Raleigh, North Carolina).

A systematic search of the study area would undoubtedly reveal more sites. Trawick Ward indicated in his letter that those would, most likely, be mitigable sites. However, he advised that the Cape Fear River area should be avoided in the routing process, as the potential for important sites existing along waterways is high. At present, the mapped locations should be adequate for primary and alternative route selection. However, further inventory of archaeological resources may be necessary when the final route is selected.

3.2 Structures of Architectural and Historical Significance

Twenty-three sites of historical and/or architectural importance are within the boundaries of the Harris-Harnett study area (Table 3.2-1 and Figure 3.0-1). The James Archibald Campbell House, near Buies Creek, is listed on the National Register of Historic Places, and the William Avera House near Erwin is being evaluated for possible nomination to the National Register of Historic Places.

Most of the sites mapped in Figure 3.0-1 have been inventoried by the North Carolina Division of Archives and History. Two were found in documents entitled "An Appraisal of Potential for Outdoor Recreational Development" for Johnston and Wake Counties (USDA 1973a and 1973b).

4.0 Natural Features

4.1 Soils and Minerals

4.1.1 Soils

The soils of the Harris-Harnett 500 kV line study area are representative of both the lower Piedmont and upper Coastal Plain of North Carolina. The majority of the soils are of Coastal Plain origin and were formed in unconsolidated marine deposits laid down by the receding ocean (Lee 1955). The Piedmont soils were derived from the weathering of existing parent material.

There are six soil associations within the study area. Two of these occur in small isolated locations, while the remaining four are distributed widely throughout the area (Figure 4.1-1). The association maps and descriptions for Chatham and Johnston Counties were prepared using information from "Inventory and Evaluation - Soil and Water Resources, General Soil Map, Chatham County, North Carolina" (USDA 1970b) and "Inventory and Evaluation - Soil and Water Resources, General Soil Map, Johnston County, North Carolina" (USDA 1972). Soils information for Wake and Harnett Counties was derived from "Soil Survey of Wake County, North Carolina" (USDA 1970c) and "An

Appraisal of Potentials for Outdoor Recreational Development, Harnett County, North Carolina (USDA 1974). The erodability factors for each soil association are from "Soil Loss Prediction - North Carolina" (USDA 1961).

Wagram-Norfolk Association

Wagram-Norfolk soils cover more of the study area than any of the other associations. This association is made up of about 60 percent Wagram soil and 30 percent Norfolk soil.

This association is characterized by nearly level to sloping, well drained soils with sandy surfaces over friable sandy clay loam subsoils. The topography consists of very broad, nearly level to gently sloping ridges and short side slopes near the drainageways.

The soils of this association present slight to moderate limitations for construction, have a water table that remains below 6 feet, and have a moderate erodibility factor (0.24). About three-fourths of this association is cultivated or pastured and the remainder is forested.

Bibb-Chewacla Association

Bibb-Chewacla soils occur in the flood plains of the major and minor streams that dissect the southwestern portion of the study area, including that of the Cape Fear River. These are poorly drained, nearly level soils that have been formed from recent alluvium. The seasonal high water table is at or just below the surface. They have moderate permeability, low shrink-swell

potential, and are flooded very frequently for short periods. The seasonal high water table, surface ponding, and very frequent floods present major limitations in the use of these soils for construction. Most of this association is covered with bottomland hardwood forests. The frequent flooding restricts the use of these areas for agricultural purposes. No erodability factor was available for this association.

Cecil-Appling Association

Cecil-Appling soils are deep, well drained soils that occur on intermediate gently sloping ridges with steeper slopes grading to drainageways. These soils occur primarily in the northern portion of the study area.

Soils of this association have an erodibility factor of 0.32, which here is considered moderate to severe due to the composition of these soils. However, this can be overcome by the use of moderate conservation practices during and after clearing. The water table remains below 6 feet for this association, and there are no major limitations for construction of foundations.

White Store-Creedmoor Association

These soils occur in the extreme northern portion of the study area. This association consists of gently sloping soils on broad ridges and of steeper sloping soils near drainageways in the uplands and was formed from weathered Triassic sandstone, shale, and mudstone. These soils are slightly subject to erosion, as is evidenced by their erodibility factor of 0.04, but their plastic subsoil makes them poorly suited to construction of foundations.

This is due to the intermittant perched water table, as the subsoil is very slowly permeable.

Mayodan-Granville Association

Mayodan-Granville soils occur on uplands, as gently sloping soils of broad ridges, and near the major drainageways as moderately to steeply sloping soils. These were formed in material that weathered from sandstone, shale, and mudstone of Triassic age and are well drained, moderately deep soils.

This association occurs in only one small section in the northeast corner of the study area. About one-half of these soils are in cultivation and one-half in forest.

These soils are subject to moderate erosion, with an erodibility factor of 0.30. Also, in areas where the subsoil is very firm or very plastic, these soils present moderate limitations for construction of foundation footings.

Norfolk-Orangeburg Association

This association is composed of nearly level to moderately sloping, well drained sandy soils over clay loam subsoils. These soils were formed in Coastal Plain sediments. The topography consists of broad, nearly level to gently sloping ridges and short side slopes near drainageways. About three-fourths of the association is cultivated or pastured.

Norfolk-Orangeburg soils are located in one very small area which lies in

the extreme southeastern portion of the study area. The erodibility factor of these soils is a moderate 0.28. The association presents only slight limitations for buildings and foundations.

4.1.2 Minerals

The mineral resources of the study area consist mainly of crushed stone, sand, clay, and shale. According to the North Carolina Geological Survey Mineral Resources Section (personal interview on March 22, 1979 with Al Carpenter, Geologist, North Carolina Geological Survey, Raleigh, North Carolina), there are four sites on the study area that have potential for brick and tile production and one with potential for sand mining (Figure 4.2-1 and Table 4.1-1). There are no known active mines on the study area, however, historic mining sites include two iron mines and a crushed stone quarry.

The Becker Sand and Gravel Quarry, which contains fossilized plants and is a significant mineral site, was mentioned in testimony before the U.S. Nuclear Regulatory Commission regarding the location of the transmission lines associated with the Shearon Harris Nuclear Power Plant (Appendix B). This quarry will not be affected by the Harris-Harnett transmission corridor as it is across the Cape Fear from the study area (Figure 4.2-1).

4.2 Topography

The major portion of the study area lies in the upper portion of the Coastal Plain, which is characterized by level to gently rolling terrain with elevations ranging from 100 to 300 feet above sea level. Using United States

Geological Survey 7.5 minute series topographic maps for the Fuquay-Varina, Erwin, Lillington, Apex, Angier, Coats, Cokesbury, Benson, New Hill, Moncure, and Mamers quadrangles, slope percentages were calculated. Slopes in the Coastal Plain portion of the study area are generally less than 15%. Steeper areas are generally located near streams. Portions of the study area lying in the Piedmont are somewhat steeper, although most of these portions are also limited to slopes of less than 15%. Again, the areas of steeper slopes are generally located near streams and along the Cape Fear River.

Figure 4.2-1 shows the locations of major portions of the study area that exhibit slopes greater than 15%. Table 4.2-1 lists these areas which are considered to be potentially troublesome with respect to erosion, based on soil slope and soil type. The degree of potential erosion is also noted.

The type location for a marine escarpment (as reported by the North Carolina Natural Heritage Program) is located one mile south of Coats on the east side of N.C. 55 (Figure 4.2-1).

The location of North Carolina and United States Geodetic Survey benchmarks were provided by the North Carolina Geodetic Survey office. Although no special attempt need be made to avoid these benchmarks in choosing the route, the Geodetic Survey office should be notified as to which benchmarks will be destroyed in the clearing of the corridor.

4.3 Hydrology

Two aspects of the hydrology of the Harris-Harnett study area were explored during the inventory phase of the investigation. These were determination of the classification of the area's streams and a survey of the area's ponds and lakes greater than five acres (Figure 4.3-1).

4.3.1 Streams

The Harris-Harnett study area is traversed by streams included in two major drainages: the Cape Fear and the Neuse Rivers. The majority of the streams are tributaries of the Cape Fear River. All of the streams are classified by the North Carolina Division of Environmental Management as "Class C" streams with the exception of a small segment of Buckhorn Creek which is rated as "Class B" (North Carolina Department of Natural and Economic Resources 1977a, 1977b). "Class B" streams are defined as those streams suitable for bathing, boating, wading, and other uses requiring low quality water. "Class C" streams may be used for boating, wading, fish and wildlife propagation along with other uses requiring lower quality water.

4.3.2 Ponds and Lakes

Seventeen ponds and lakes, of 6 acres or more, were found within the study area (Table 4.3-1). These ponds range in size from 6 to 400 acres and most are privately owned and used for recreation and irrigation. The main source of information regarding ponds and lakes was the North Carolina Agricultural Experiment Station's Hydrologic Information System (Wiser 1975). Further

information was obtained from the U.S. Department of Agriculture documents entitled "An Appraisal of Potentials for Outdoor Recreational Development" for each of the four counties in the study area (USDA 1970a, 1973a, 1973b, 1974).

4.4 Biota

4.4.1 Vegetation

The vegetation of the Harris-Harnett 500 kV line study area consists of a mosaic of agricultural fields, cutover forests, pine plantations, and various mixed pine-hardwood and hardwood forests, typical of the upper Coastal Plain and lower Piedmont physiographic provinces.

The northern portion of the study area, lying in the Piedmont, is dominated by second and third growth pine and pine-hardwood forests, interpersed by a few agricultural fields. These forests are composed primarily of shortleaf pine (*Pinus echinata*) and loblolly pine (*P. taeda*), as well as various hardwood species which are dominant in a few areas. Hardwood species of importance are sweet gum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), sourwood (*Oxydendrum arboreum*), yellow poplar (*Liriodendron tulipifera*), as well as various oaks (*Quercus* spp.) and hickories (*Carya* spp.).

The majority of the study area lies in the upper Atlantic Coastal Plain, and the land use pattern there is dominated by agricultural fields in the upland areas. Consequently, the forests are confined, primarily, to the

bottomland areas which are associated with the streams that flow southward toward the Cape Fear River. These forests are defined by Braun (1950) as hardwood bottom. Such forests are dominated by mixtures of sweet gum, red maple, southern red oak (Quercus falcata), water oak (Q. nigra), willow oak (Q. phellos), several hickories, and other broadleaf hardwood species (Wells 1967).

In the upland areas where fields are absent, the forest are dominated by loblolly pine, except in the drier sandy areas where longleaf pine (Pinus palustris) is important. In areas where loblolly pines are mature, some hardwood species become co-dominant producing a forest of pines and various oaks and hickories. In the drier areas, longleaf pine maintains its dominance and is accompanied by an understory of turkey oak (Quercus laevis) and post oak (Q. stellata).

4.4.2 Wildlife

Information regarding the wildlife and wildlife habitat of the study area was obtained by contacting the North Carolina Wildlife Resources Commission, North Carolina Natural Heritage Program, North Carolina State University, and North Carolina State Museum of Natural History. Further information was obtained by reviewing pertinent literature.

4.4.2.1 Wildlife Habitat

The most important wildlife habitat within the study area is the bottomland

hardwoods along the creeks that drain into the Cape Fear River. These seasonally flooded wetlands provide quality habitat for a variety of non-game and game species. Gray squirrel (Sciurus carolinensis), eastern cottontail (Sylvilagus floridanus), mink (Mustela vison), raccoon (Procyon lotor), bobwhite (Colinus virginianus), and muskrats (Ondatra zibethica) are the most important game animals. Some of the bottomlands are also inhabited by wild turkey (Meleagris gallopavo), woodcock (Philohela minor), and whitetail deer (Odocoileus virginiana). Two areas are mapped as turkey habitat (Figure 4.4-1) according to the U.S. Army Corps of Engineers (1973).

The wetlands mapped in Figure 4.4-1 are reported to be of high value to wildlife (Wilson 1962); however, all stream bottomlands in the study area provide good wildlife habitat and are of special concern to the North Carolina Wildlife Recources Commission (letter dated March 22, 1979 from Stuart Critcher, Assistant Chief, Interagency Wildlife Coordination Section, North Carolina Wildlife Resources Commission, Raleigh, North Carolina).

Open fresh water, other than farm ponds, is not abundant in the study area. According to Wilson (1962), farm ponds are not included in this wetland classification.

Upland wildlife habitat exists on the study area mainly as farmlands, pine stands, and mixed pine-hardwood forests. These areas support a less varied fauna than the bottomlands hardwoods. Bobwhite and mourning doves (Zenaidura macroura) are important game animals that inhabit these upland areas.

4.4.2.2 Species with Special Status

The North Carolina State Museum of Natural History's publication entitled "Endangered and Threatened Plants and Animals of North Carolina" (Cooper, et al., 1977) was the source document for performing an inventory of species with special status within the Harris-Harnett study area. Although this document has no legal status, it represents the concerns of the biologists of North Carolina regarding threatened and endangered species. Plants and animals listed as endangered or threatened in North Carolina as stipulated in the Endangered Species Act of 1973 (as amended 1978) are included in the museum's publication. This information was supplemented by consulting with personnel of the North Carolina Natural Heritage Program, biologists at North Carolina State University, the Director of Research and Collections at North Carolina State Museum of Natural History (letter dated April 18, 1979 from Dr. J. E. Cooper, Director of Research and Collections, North Carolina State Museum of Natural History, Raleigh, North Carolina), and other staff members of the North Carolina State Museum of Natural History.

A list (Table 4.4-1) was compiled, based on the museum publication, of these special plants and animals that are known to occur in Chatham, Wake, Harnett, and Johnston Counties and in the Cape Fear River drainage. Birds were excluded from the list because their occurrence is not listed by county, and their mobility and migratory behavior preclude identifying specific locations in the study area where impact from the transmission line may occur. Table 4.4-2 is a key to the mapped known locations (Figure 4.4-1) of species with special status within the study area.

Cooper, et al. (1977) defines status as follows: Endangered status is assigned to species in danger of extirpation or extinction. Species of threatened status have exhibited decreases in population size not accounted for by normal population fluctuation, but are not in immediate danger of exterpation or extinction. The definitions of endangered and threatened species used in this publication approximate those used in the Endangered Species Act of 1973. Special concern status is given to species for various reasons including rare occurrence over broad range and exploitation which could become a threat to the species. Undetermined status was assigned due to insufficient data for evaluating the species of concern.

Natural features of the Harris-Harnett study area [direct testimony by Robert M. Reed to the Atomic Safety and Licensing Board regarding Shearon Harris Nuclear Power Plant (Appendix B)] include resinous joe-pye-weed (Eupatorium resinosum), Thorey's grayback dragonfly (Tachopterix thoreyi), a bee (Coelioxys hunteri), pine barrens treefrog (Hyla andersoni), eastern coral snake (Micrurus fulvius), and red-cockaded woodpecker (Picoides borealis). These species were identified in the U.S. Army Corps of Engineers' Environmental Reconnaissance Inventory of the State of North Carolina (1973).

Known locations of the resinous joe-pye-weed were mapped (Figure 4.4-1). For the remaining five species, specific locations could not be found. However, general information regarding habitat was obtained from various state agencies and North Carolina State University.

Thorey's grayback dragonfly breeds in the headwaters of small wooded streams, and the adults are restricted to similar habitats. Little else is known about

the insect. Dr. H. H. Neunzig (telephone interview on April 19, 1979), an entomologist at North Carolina State University, suggested that impact to this insect could most likely be avoided by staying away from headwaters of small woodland streams.

The bee (Coelioxys hunteri) is not listed in Cooper, et al. (1977). Nonetheless, it is considered a rare species in North Carolina (U.S. Army Corps of Engineers 1973). This bee parasitizes a species of leaf cutter bee which is a cavity nesting insect of forest edges. Dr. J. R. Baker, an entomologist at North Carolina State University, feels that a power line could enhance the habitat of the host bee and possibly the habitat of Coelioxys hunteri by creating edge habitat (telephone interview on April 17, 1979).

The pine barrens treefrog occurs in or near pocosins or shrub bogs with thick undergrowth. Cooper, et al. (1977) lists this frog as occurring in Harnett and Johnston Counties; however, William M. Palmer and Alvin L. Braswell, Curators of Lower Vertebrates at North Carolina Museum of Natural History, report its occurrence in the study area as questionable.

The eastern coral snake is a reptile of the sandhills and the southern Coastal Plain. It inhabits dry pine woodlands. William M. Palmer and Alvin L. Braswell classify its occurrence in the study area as doubtful.

Red-cockaded woodpeckers are restricted to mature pine flatwoods. There is one record of its occurrence within the study area according to a survey conducted by biologists at North Carolina State University (Figure 4.4-1). One woodpecker was sighted in Chatham County near Harnett and Wake Counties

(personal interview on March 25, 1979 with Tim Stamps, Wildlife Technician, North Carolina State University, Raleigh, North Carolina). The possibility of other woodpeckers and/or colonies occurring in the study area is unknown but the biologist at North Carolina State Unversity indicated that if mature pines occur in the area, it is likely that the red-cockaded woodpeckers would also occur.

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6.0 List of Correspondence

Cannity, Rick. Johnston County Planner. County of Johnston. Smithfield, North Carolina. Letter dated April 9, 1979.

Cooper, John E. Director of Research and Collections. North Carolina State Museum of Natural History. Raleigh, North Carolina. Letter dated April 18, 1979.

Critcher, Stuart T. Assistant Chief, Interagency Wildlife Coordination Section. North Carolina Wildlife Resources Commission. Raleigh, North Carolina. Letter dated March 22, 1979.

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Table 2.1-1 Incorporated municipalities located within or adjacent to the Harris-Harnett 500 kV transmission line study area and 1976 population statistics.

County/Municipality	Classification	1976 Population
CHATHAM		
None		
HARNETT		
Angier	Town	1660
Coats	Town	1410
Erwin*	Town	2930
Lillington*	Town	1230
JOHNSTON		
None		
WAKE		
Fuquay-Varina*	Town	3760

Source: 1977-1978 Directory of North Carolina Municipal Officials. Report No. 178. March 1978. Published by North Carolina League of Municipalities, Raleigh, N.C.

*Adjacent to the study area.

Table 2.1-2 Unincorporated communities located within the Harris-Harnett 500 kV transmission line study area.

County/Community	County/Community
CHATHAM	JOHNSTON
Corinth	Hardee
HARNETT	WAKE
Bardaysville	Burt
Buies Creek	Holland
Cape Fear	Holleman
Chalybeate	Hollemans Crossroads
Cokesbury	Kennebec
Kipling	Wilbon
Rawls	
Slocomb Crossroads	

Source: North Carolina Highway Maps. North Carolina Department of Transportation, Raleigh, N.C.

Table 3.1-1 Archaeological sites in the Harris-Harnett study area

Map Reference Number	Archaeology Branch Reference Number	Period
1	Wa 197	Archaic (ca. 7000 BC to 1000 BC)
2	Wa 195	Prehistoric
3	Wa 196	Archaic
4	Wa 194	Prehistoric
5	Wa 192	Prehistoric
6	Wa 193	Prehistoric
7	Wa 190	Woodland (ca 1000 BC to European contact)
8	Wa 191	Prehistoric
9	Ch 352	Archaic
10	Ch 353	Prehistoric
11	Ch 354	Prehistoric
12	Ch 355	Prehistoric
13	Ch 349	Prehistoric
14	Ch 350	Prehistoric
15	Ch 351	Archaic
16	Ch 333	Archaic & Woodland
17	Ch 334	Prehistoric
18	Ch 332	Archaic
19	Ch 1	Undetermined
20	Ch 335	Prehistoric
21	Ch 336	Prehistoric
22	Ch 337	Prehistoric
23	Ch 341	Prehistoric

Table 3.1-1 (continued)

Map Reference Number	Archaeology Branch Reference Number	Period
24	Ch 340	Prehistoric
25	Ch 339	Archaic
26	Ch 338	Archaic
27	Ch 346	Prehistoric
28	Ch. 342	Prehistoric
29	Ch 343	Archaic
30	Ch 347	Prehistoric
31	Ch 348	Prehistoric
32	Ch 344	Prehistoric
33	Ch 345	Prehistoric
34	Wa 184	Prehistoric
35	Wa 188	Prehistoric
36	Wa 185	Archaic
37	Wa 187	Prehistoric
38	Wa 186	Prehistoric
39	Wa 189	Historic (Post-European contact)
40	Wa 56	Historic
41	Wa 211	Undetermined
42	Ht 6	Prehistoric
43	Ht 24	Undetermined
44	Ht 20	Prehistoric
45	Ht 19	Archaic
46	Ht 23	Prehistoric
47	Ht 18	Prehistoric

Table 3.1-1 (continued)

Map Reference Number	Archaeology Branch Reference Number	Period
48	Ht 21	Archaic
49	Ht 4	Prehistoric
50	Ht 26	Prehistoric
51	Ht 28	Archaic
52	Ht 29	Prehistoric
53	Ht 30	Archaic
54	Ht 27	Prehistoric
55	Ht 22	Prehistoric

Source: Department of Cultural Resources Division of Archives and History Archaeology Branch.

Table 3.2-1. Structures of architectural and historic interest in the Harris-Harnett study area.

1	Christian Church	W side of SR 1912, 0.2 mi. N of SR 1913. One story with gabled roof, gravestones date to 1887.
2	Locks on Cape Fear River	ca 1850's
3	Buckhorn Dam and Power Plant	2 mi. S of Corinth at end of SR 1921. Non-operational hydroelectric generating plant owned by CP&L. ca 1908.
4	Buckhorn blast furnace	ca 1870's.
5	Bolin House	W side of SR 1513, 0.7 mi. N of jct. NC 27.
6	James Archibald Campbell	NE corner of jct. NC 27 and SR 1519. National Register of Historic Places
7	Duncan-Sexton House	S side SR 1516, 0.3 mi. W jct. SR 1513. Single pen, 1 story log house with gable roof. Pre-civil war.
8	Matthews House	NW corner of jct. SR 1542 and SR 1510. One story frame house with steep gable roof. ca. 1820.
9	Gaskin House	E side of SR 1919, 0.8 mi. S jct. SR 1516. Frame house with attached kitchen. ca 1840.
10	Indian Museum	Privately operated museum of Indian relics.
11	Green House	E side of SR 1542, 0.2 mi. S of jct. SR 1538. Single pen, one story log house built by grandfather of Playwright Paul Green. Pre-civil war.
12	Barbee's Inn (Barday's)	W side SR 1006, 0.4 mi. S jct. SR 1532. Frame building described in F. L. Olmsted's Journeys through the South. ca 1820, rebuilt 1890.
13	Sheriff Johnson House	SW corner of jct. SR 1516 and SR 1532. Frame house. Pre-civil war.

Table 3.2-1 (continued)

14	Alex Turlington House	S side of NC 27, 0.2 mi. W of jct. 1006. One story frame gabled building. ca. 1850.
15	William B. McKay House	E side of SR 1769 jct. SR 2015. Mid-nineteenth century, two-story frame house.
16	Dr. John McKay House	W side SR 1769, 0.1 mi. S of jct. SR 2015. Two-story frame house. ca. 1840's.
17	Dushee Shaw House	E side NC 55, 0.6 mi. N of jct SR 1723. Frame house features interior barrel ceiling, pine paneling, and chair rails. ca 1806.
18	Johnson House	End of dirt road W side of NC 55, 0.3 mi. S jct. SR 1726. One story frame early nineteenth century house with unusual stair ascending to loft from the facade porch.
19	William Avera House	E side of NC 55, 1 mi. N jct US 421. One story frame house with an entrance pilastered trim of federal design and engaged facade porch. Possible National Register candidate. ca. 1929.
20	Willis Turlington House	E side SR 1303, 0.3 mi. S jct SR 1307. Two-story frame house. ca. 1820.
21	Eli Turlington House	ca. 1840's.
22	Holleman's Crossroads House	Jct. SR 1130, SR 1115, and SR 1127. Large Neo-classical Revival house with many porches. ca. 1900.
23	Ragan House	1 mi. E of Holleman's Crossroads on SR 1115, S side. Two-story Federal Era house. Early 1800's.

Table 4.1-1 Mineral resources in the Harris-Harnett study area.

1. Potential for brick and tile
2. Potential for brick and tile
3. Potential for brick and tile
4. Potential for sand
5. Becker sand and gravel quarry*

Source: North Carolina Geological Survey
* Not in study area, but identified in direct testimony of Dr. Robert M. Reed before the Atomic Safety & Licensing Board (Appendix B).

Table 4.2-1. Topography of the Harris-Harnett study area.

Location Number	Slope (%)	Potential Erosion Problem*
1	25	moderate
2	16	moderate
3	16	moderate
4	20	moderate
5	25	moderate
6	20	moderate
7	23	severe
8	26	severe
9	38	severe
10	30	severe
11	30	severe
12	16	moderate
13	16	moderate
14	16	moderate
15	18	moderate
16	15	moderate
17	20	moderate
18	25	severe
19	30	severe
20	33	severe
21	40	severe
22	22	severe
23	23	moderate
24	18	moderate
25	35	severe
26	30	severe
27	35	severe
28	25	severe

*Based on % slope and soil association criteria.

Table 4.3-1. Ponds and lakes larger than five acres in the Harris-Harnett study area

Number	Name	Size (acres)	Use
1	Yarborough's Lake	60	Recreation
2	Buckhorn Lake	400	-
3	Capital Kiwanis Club Lake		Recreation
4	Evan's Pond	6	Recreation & Irrigation
5	Adcock Pond	6	Recreation
6	Akins' Pond	8	Recreation & Irrigation
7	Johnson's Pond	11	Recreation & Irrigation
8	Young's Pond	8	Recreation
9	Young's Pond	45	Recreation
10	Guy's Pond	15	Recreation
11	Pope's Lake	125	Recreation
12	Chesterfield Lake	14	Recreation
13	McLamb's Pond	7	Recreation
14	Jernigan's Pond	13	Recreation
15	McCullen's Pond	55	Recreation & Irrigation
16	Massengill Pond	15	Recreation & Irrigation
17	Upchurch's Pond	9	Recreation

Source: Wiser, Edward, H. Hydrologic Information, Storage, and Retrieval System. N.C. Agriculatural Expt. Station. 1975.

Table 4.4-1. Species of special status possibly occurring in Chatham, Harnett, Johnston, and Wake Counties

Scientific Name	Common Name	Status
PLANTS		
Calamovilfa brevipilis	Riverbank Sandreed	T
Isotria medeoloides	Small Whorled Pogonia	E
Nestronia umbellula	Nestronia	T
Hexastylis lewisii	Lewis' Heartleaf	T, En
Sarracenia rubra	Sweet Pitcher-Plant	T, Ex
Ilex amelanchier	Sarvis Holly	T
Pyxidanthera barbulata var. brevifolia	Wells' Pixie Moss	E, En
Eupatorium resinosum	Resinous Joe-Pye-Weed	T, D
Rudbeckia heliopsidis	Sun-Facing Coneflower	T
Solidago verna	Spring-Flowering Goldenrod	E, En
Isoetes piedmontana	Piedmont Quillwort	T
Trillium pusillum var. pusillum	Carolina Trillium	T
Habernaria peramoena	Purple Fringeless-Orchid	T
Portulaca smallii	Small's Portulaca	E
Rhus michauxii	False Poison Sumac	T
Panax quinquefolium	Ginseng	T, Ex
Ptilimnium fluviatile	Stream Mockbishop Weed	T
Habernaria flava	Southern Rein Orchid	T
FRESHWATER MOLLUSCS		
Fusconaia masoni	Atlantic Pigtoe Mussel	T
Alasmidonta varicosa	Brook Floater Mussel	SC
Anodonta implicata	Alewife Floater Mussel	U
Prolasmidonta heterodon	Ancient Floater Mussel	E
FRESHWATER AND TERRESTRIAL ARTHROPODS		
Procambarus lepidodactylus	Pee Dee Lotic Crayfish	T
Procambarus medialis	-	-
Procambarus pearsei	-	-
Orconectes sp.	-	-
Tachopteryx thoreyi	Thorey's Grayback Dragonfly	SC
FISH		
Lampetra aepyptera	Least Brook Lamprey	SC
Notropis mekistocholas	Cape Fear Shiner	SC
Etheostoma collis	Carolina Darter	SC
Amboplites cavifrons	Roanoke Bass	SC
AMPHIBIANS AND REPTILES		
Hyla andersoni	Pine Barrens Treefrog	T
Necturus lewisi	Neuse River Waterdog	SC
Hemidactylium scutatum	Four-Toed Salamander	U
Micrurus f. fulvius	Eastern Coral Snake	SC

Table 4.4-1 (continued)

Source: Cooper, et al. (1977) and the North Carolina State Museum of Natural History (letter dated April 18, 1979 from John E. Cooper, Director of Research and Collections, North Carolina Museum of Natural History, Raleigh, North Carolina).

Status Legend:

E = Endangered

En= Endemic

Ex= Exploited

SC= Special Concern

T = Threatened

U = Undetermined

D = Disjunct

Table 4.4-2. Species of special status known to occur in the Harris-Harnett study area

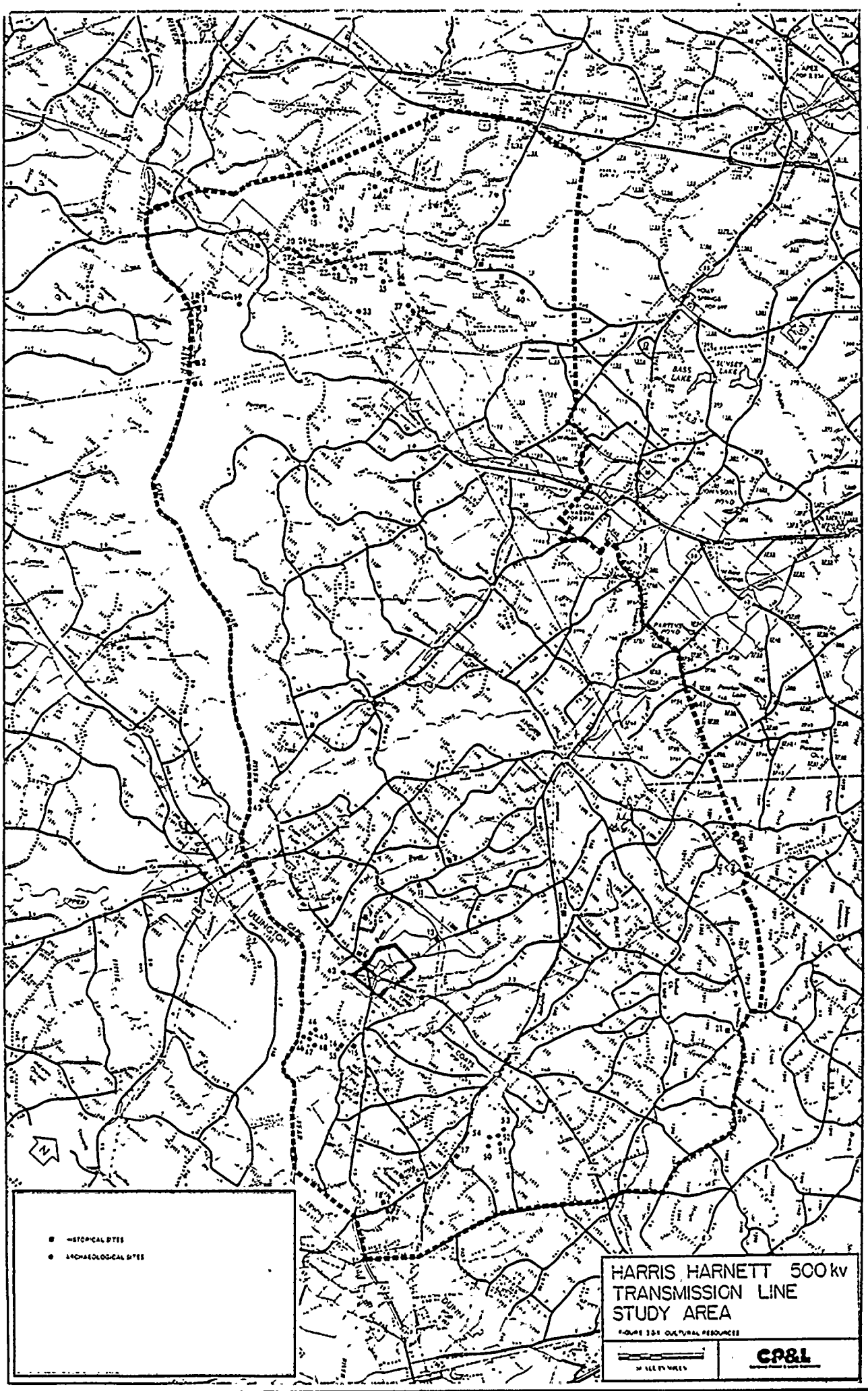
Scientific Name	Common Name	Location on Ecological Feature Map**
Heterotheca pilosa	Hairy Telegraph Plant	1
Hexastylis lewisii	Lewis' Heartleaf	2
Nestronia umbellula	Nestronia	3, 5
Solidago verna	Spring Flowering Goldenrod	4
Hemidactylium scutatum	Four-toed Salamander	6
Fusconaia masoni	Atlantic Pigtoe Mussel	7
*Picoides borealis**	Red-cockaded Woodpecker	8

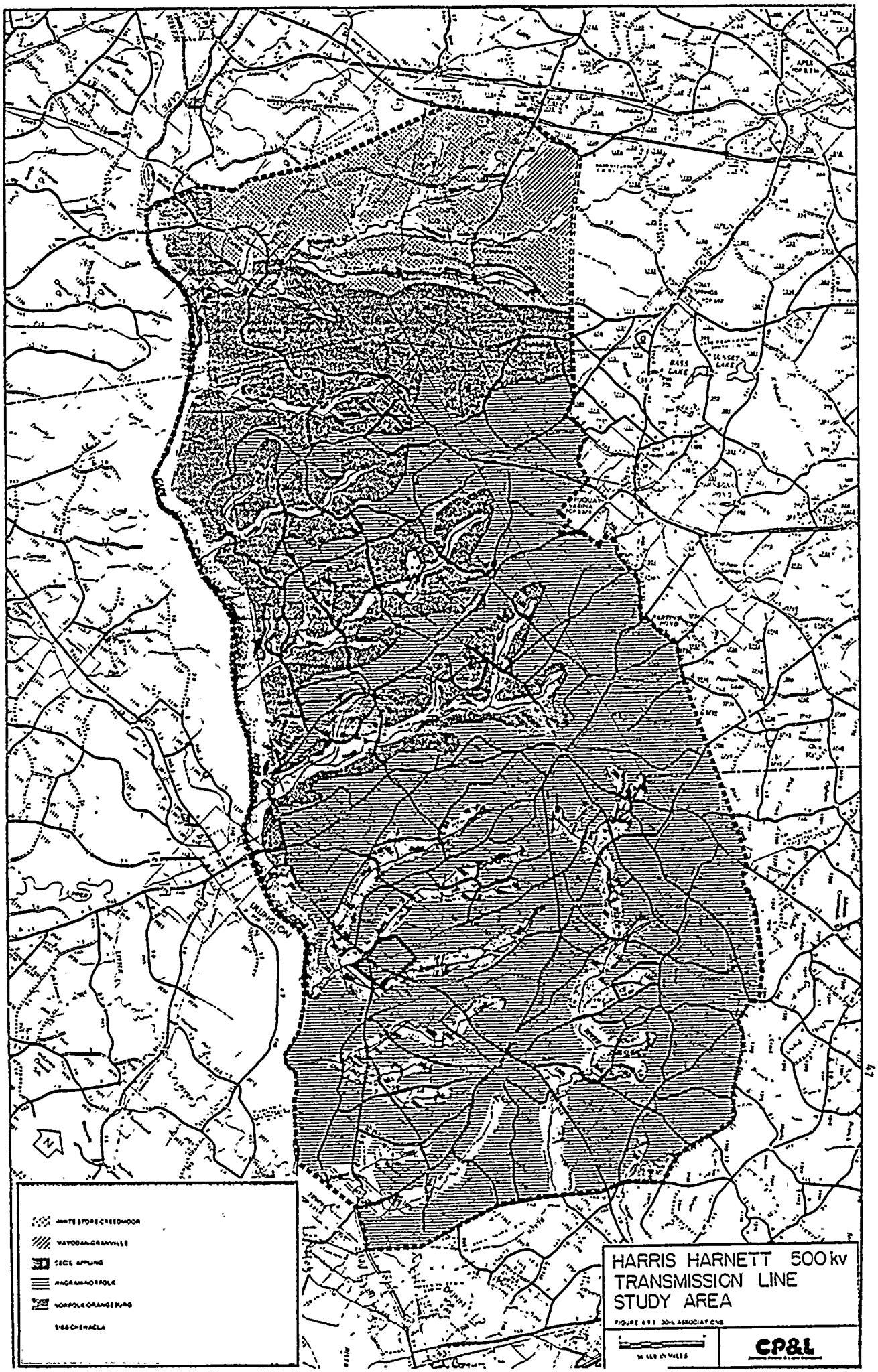
Source: North Carolina Natural Heritage files.

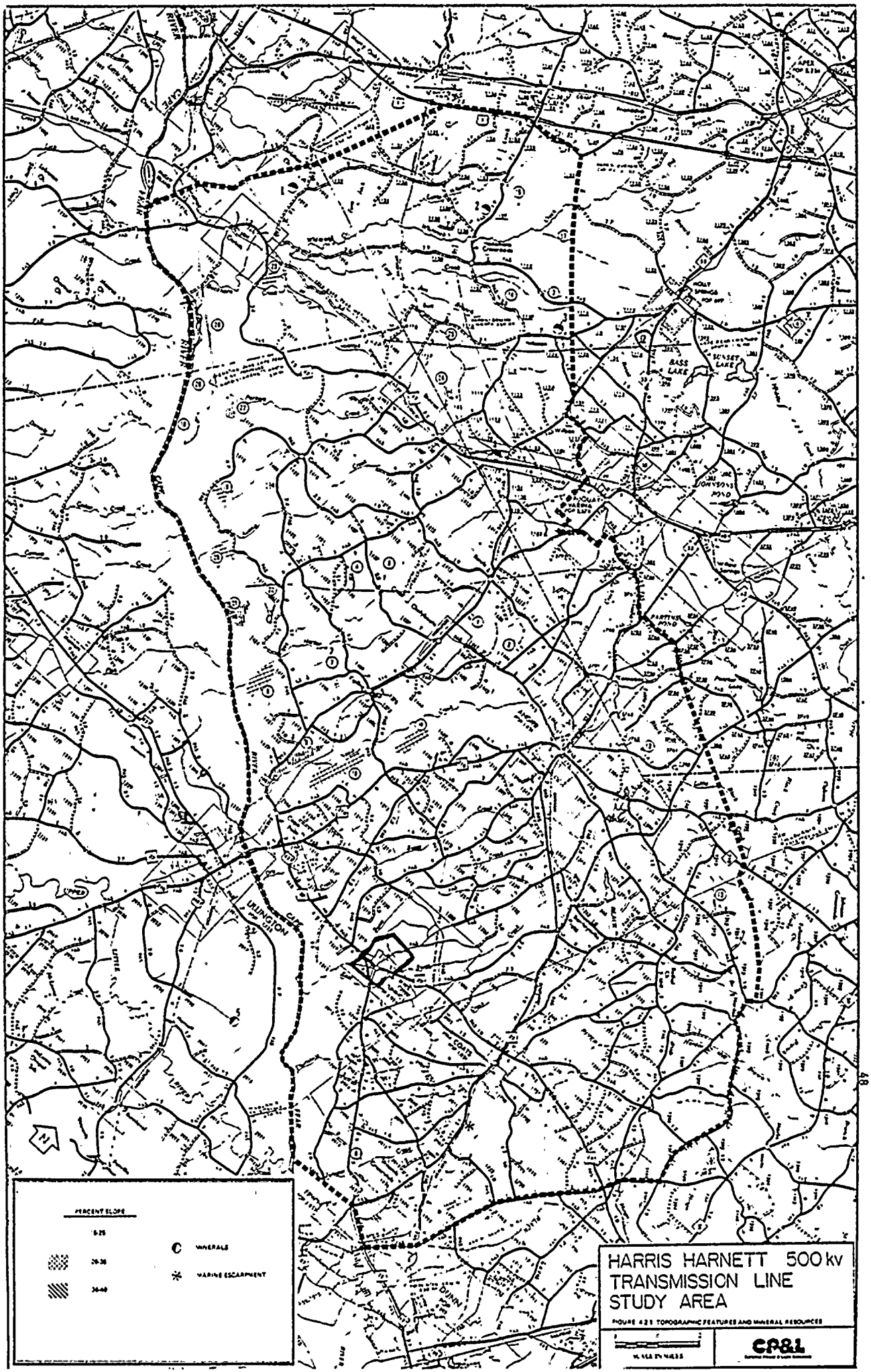
* North Carolina State University-Department of Zoology.

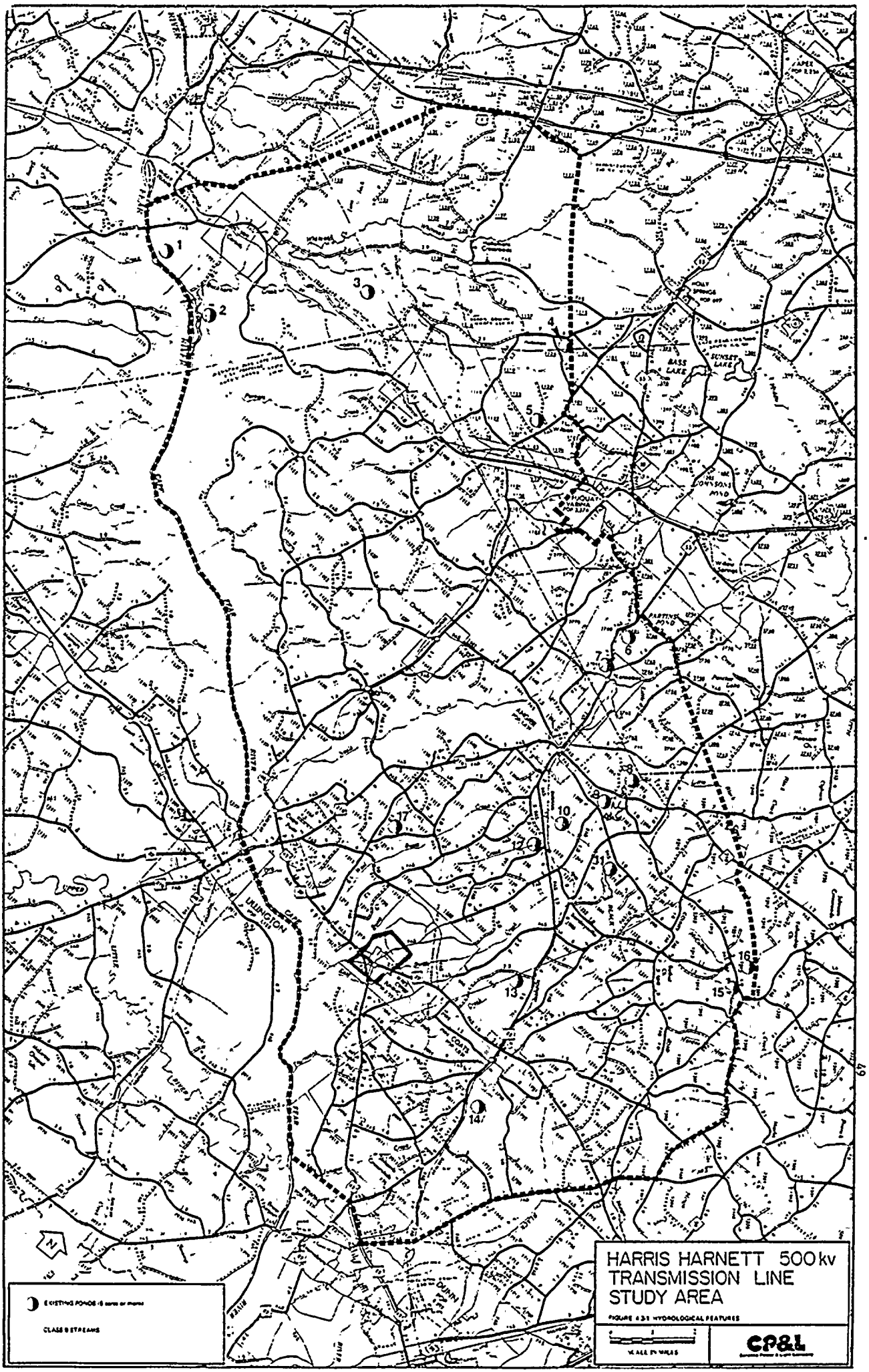
**See Figure 4.4-1.

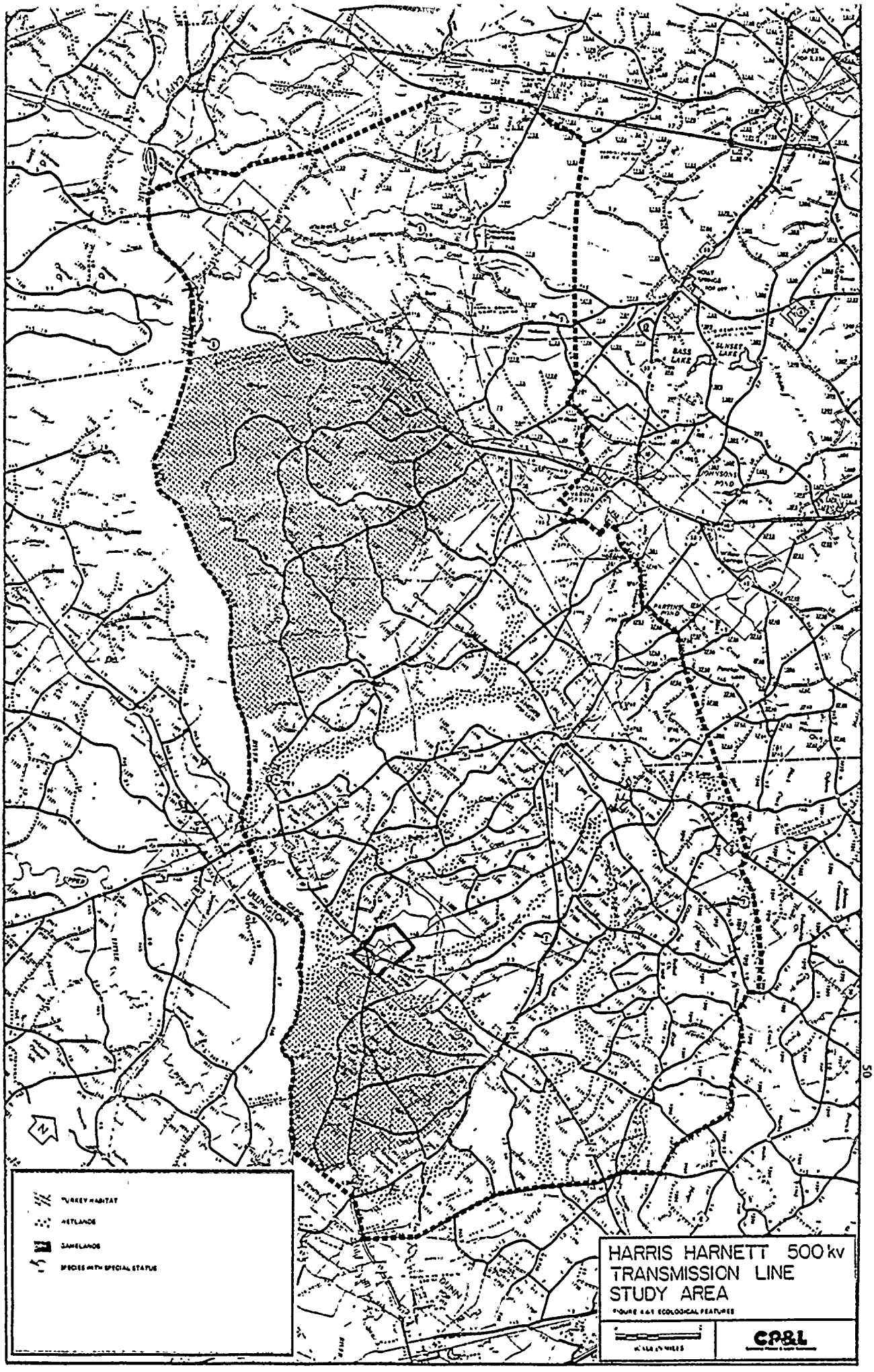

HARRIS HARNETT 500 kv
TRANSMISSION LINE
STUDY AREA
FIGURE 2.3.1 PRESENT AND FUTURE LAND USE FEATURES
CP&L
SCALE IN MILES
OIL PIPELINE
SUBDIVISIONS
RADIO OR TELEPHONE TOWER
FUTURE URBAN
FUTURE INDUSTRIAL
SCHOOLS
CEMETERIES
AIRPORTS
DEVELOPING AREA
RAILROADS
GOLF COURSES
PUBLIC WATER LINE
PROPOSED AIRPORT
RAVEN ROCK STATE PARK
PROPOSED ACQUISITION TO RAVEN ROCK STATE PARK
GAS LINES
PROPOSED ROADS
CHURCHES
INDUSTRIAL SITES
COMMERCIAL
COMMUNITY
TRANSITION
CAMPBELL COLLEGE
BASS LAKE
SUNSET LAKE
LOWNSDYS POND
ULLINGTON
CITY
COUNTY
DUNN


HARRIS HARNETT 500 kv
TRANSMISSION LINE
STUDY AREA
FIGURE 3.5-1 CULTURAL RESOURCES
CP&L
HISTORICAL SITES
ARCHAEOLOGICAL SITES
BASS LAKE
SUNSET LAKE
LILLINGTON


HARRIS HARNETT 500 kv
TRANSMISSION LINE
STUDY AREA
CP&L
BASS LAKE
WHITE STORE CREEDMOOR
WATTOBA-GRANVILLE
CECIL APPLING
MAGNA-NORFOLK
NORFOLK-ORANGEBURG
SUB-CHERAW


PERCENT SLOPE
MINERALS
MARINE ESCARPMENT
BASS LAKE
SUNSET LAKE
JOHNSONS POND
ULLINGTON
HARRIS HARNETT 500 kv
TRANSMISSION LINE
STUDY AREA
FIGURE 4.2.1 TOPOGRAPHIC FEATURES AND MINERAL RESOURCES
CP&L


HARRIS HARNETT 500kv
TRANSMISSION LINE
STUDY AREA
FIGURE 4.3.1 HYDROLOGICAL FEATURES
CP&L
EXISTING PONDS (5 acres or more)
CLASS B STREAMS
N
LILLINGTON
BASS LAKE
SUNSET LAKE
COHN
DUNN
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17


TURKEY HABITAT
WETLANDS
SAMELANDS
SPECIES WITH SPECIAL STATUS
HARRIS HARNETT 500 kv
TRANSMISSION LINE
STUDY AREA
FIGURE 4-6 ECOLOGICAL FEATURES
CP&L
BASS LAKE
SUNSET LAKE
ULLINGTON
QUINN

Appendix A Correspondence

County of Johnston
Post Office Box 1052
Smithfield, North Carolina 27577

Office of County Planner
Telephone (919) 934-5720
~~(919) 934-3102~~

April 9, 1979

Mr. Bobby Ward
Carolina Power & Light Co.
P. O. Box 1551
Raleigh, North Carolina 27602

Dear Mr. Ward:

I have enclosed a copy of the map you provided to Johnston County on the proposed location of the 500 KV transmission line. On the map, I have indicated the approximate number and location of houses, churches, businesses, cemetaries, etc. This information could be used to update the information previously provided to your office.

The "Sketch Land Use and Development Plan" characterized the Pleasant Grove Township as rural, and I would expect it to continue to develop in that manner. The county is not now proposing to extend public water and sanitary sewer to this area so that no urban density development will take place.

The residential development presently taking place is along the existing state secondary road system with few small subdivisions being planned. The state does not indicate any future new highways in the area; the only project for the immediate future is the upgrading of State Highway 210.

There are no present or proposed schools, water supply impoundments, public landfills, hospitals, or airports. The industrial sites are noted on the map. There are only a few industrial uses within the study area.

If you have any questions about this information or if you need further information, please let me know.

Sincerely,

Rick Cannity

Rick Cannity
Johnston County Planner

RC:kj

Enclosure

North Carolina State Museum of Natural History
P. O. Box 27647, Raleigh, North Carolina 27611
(919) 733-7450

Dr. John Funderburg, Director

Research and Collections Section
Dr. John E. Cooper, Director

April 18, 1979

Dr. Bobby J. Ward
Terrestrial-Analytical Unit
Carolina Power and Light Company
411 Fayetteville Street
P.O. Box 1551
Raleigh, NC 27602

Dear Dr. Ward:

Your request for information concerning non-avian fauna of the Harris-Harnett 500 kv line study area was received on April 13, 1979, and has been circulated among staff research personnel for comment. The best source of information on the plants is Dr. Hardin at State University.

1. William M. Palmer, Chief Curator of Lower Vertebrates, and Alvin L. Braswell, Curator of Lower Vertebrates, indicate that there are no definite records of the listed fishes, amphibians and reptiles from the study area. Ambloplites cavifrons and Micrurus fulvius are doubtful, and Hyla andersoni and Necturus lewisi questionable.

2. Rowland M. Shelley, Chief Curator of Invertebrates, says that both Fusconaia masoni and Alasmidonta varicosa are "probables" in the area, based on their known (actually, little known) distribution in the Cape Fear, but we have no new information to add. We also have nothing recent on Limulodes paradoxus, and the single Wake County record mentioned by Dr. Cornell in our 1977 book is probably still its only known occurrence in the state.

3. My crustacean records indicate that Procambarus lepidodactylus is limited in North Carolina to Lake Waccamaw and environs. Although we have made additional collections of the animal since the 1977 book appeared, all have been from the Waccamaw River. The possibility of its occurrence in the study area is very remote. However, since our initial deliberations, we have come to appreciate that several other apparently uncommon members of the genus may warrant some concern (see pp. 198-199). One of these, P. medialis, appears to

be a Neuse-Tar endemic and doubtless occurs in or very close to the eastern edge of the study area. Another, P. pearsei, is recorded from west-central tributaries of the Neuse and several localities in the Cape Fear, and very likely inhabits the study area.

An undescribed species of crayfish of the genus Orconectes, a North Carolina endemic of great biogeographical interest (see p. 199), is now known from one locality in the Tar and eleven in the Neuse. Three of the latter are sites in Middle Creek just outside the study area. This animal is currently under study here at the museum. As an endemic and very interesting species it should be taken into consideration in planning any modifications of aquatic habitats in at least the eastern sectors of the area involved. We do not know at this time whether it ranges into the Cape Fear drainage, but suspect that it does not.

We would like to emphasize that the only way a realistic appraisal of the fauna of this, or any other, study area can be made is through on-site sampling in at least several seasons. All else is just an approximation.

We would appreciate copies of any documents, or pertinent parts of such documents, in which information supplied by us appears.

Sincerely yours,

John E. Cooper

John E. Cooper, Ph.D.
Director of Research
and Collections

JEC:mp

cc: Dr. J. B. Funderburg

State of North Carolina
Wildlife Resources Commission

RALEIGH, N. C. 27611

March 22, 1979

Dr. Bobby Ward
Carolina Power and Light Co.
411 Fayetteville Street
P. O. Box 1551
Raleigh, N. C. 27602

Dear Dr. Ward:

This is in response to your letter of March 19, 1979 concerning CP&L's study in Chatham, Wake, Harnett and Johnston counties, being conducted for the purpose of locating an environmentally suitable corridor for the construction of a 500 kV transmission line from the Harris Nuclear Facility to the Erwin substation.

It is noted from the study area map that an existing 230 kV line now connects Harris to Erwin. It is our recommendation that this right-of-way be utilized in order to avoid additional forest clearing and fragmentation of wildlife habitat.

We particularly want to emphasis that no new corridors be established that would result in clearing within floodplain hardwoods, swamps, or other wetlands, as occur along the Cape Fear River and its major tributaries to the east.

Our records also show that the red-cockaded woodpecker (endangered) and the pine barrens treefrog occur in some of the counties involved, however we cannot state with certainty that these species are present within the study area.

There are no state-administered game lands in the study area.

Your map is returned herewith.

Sincerely,

T. Stuart Critcher, Assistant Chief
Interagency Wildlife Coordination Section

TSC/dlp

Enclosure

NORTH CAROLINA DEPARTMENT OF CULTURAL RESOURCES

Raleigh, North Carolina 27611

Division of Archives and History
Larry E. Tise, Director

Sam W. Hodgkins, Secretary
James B. Hunt, Jr., Governor

April 6, 1979

Mr. Bobby J. Ward, Ph.D.
Principal Scientist
Terrestrial - Analytical Unit
Carolina Power and Light Company
P. O. Box 1551
Raleigh, N.C. 27602

Re: Proposed Transmission Study Area; Johnson, Harnett, Wake and Chatham counties

Dear Mr. Ward:

Enclosed is a map and a listing of the known recorded archaeological sites located within your proposed study area. However, this area has never been systematically surveyed in order to determine the location and significance of archaeological resources. As you will note from the number of sites listed, very little archaeological investigation has been conducted in the area. It is expected, based on our present knowledge of this vicinity, that several other archaeological sites would be discovered if the area were investigated and that some of these sites may be eligible for inclusion in the National Register of Historic Places. To date, the sites depicted have not been evaluated in terms of their eligibility for inclusion in the National Register, and none of these are currently listed in the Register.

We recommend that as soon as your plans are more specific as to which routes are likely to be selected, these proposed routes be forwarded to this office in order that we may complete a more detailed evaluation of the potential effects of the transmission line on archaeological resources. In addition, your investigations of our structures files should be considered in planning the project.

Our comments should be considered a portion of your responsibilities for compliance with Section 106 of the National Historic Preservation Act of 1966, Executive Order 11593 "Protection and Enhancement of the Cultural Environment," and of the Advisory Council on Historic Preservation's Procedures for Compliance, codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning this comment, please contact Ms. F. Langdon Edmunds, Environmental Review Coordinator, at 919/733-4763.

Sincerely,

Brent D. Glass, Deputy State
Historic Preservation Officer

BG:slw

Enclosure

The cultural affiliation of the known archeological sites located within the four-county transmission line corridor study area is as follows:

Chatham County
Prehistoric period (exact cultural affiliation unknown):
31 Ch 334, Ch 335, Ch 336, Ch 337, Ch 340, Ch 341, Ch 342, Ch 344, Ch 345, Ch 346, Ch 347, Ch 348, Ch 349, Ch 350, Ch 353, Ch 354, and Ch 355.

Archaic period (ca. 7000 BC to ca. 1000 BC):
31 Ch 332, Ch 338, Ch 339, Ch 343, Ch 351, and Ch 352.

Archaic and Woodland (ca. 1000 BC to European Contact) periods:
31 Ch 333.

Harnett County
Prehistoric period:
31 Ht 4, Ht 6, Ht 18, Ht 22, Ht 23, Ht 26, Ht 27, and Ht 29.

Archaic period:
31 Ht 19, Ht 20, Ht 21, Ht 28, Ht 30.

Prehistoric and historic periods:
31 Ht 24.

Johnston County
No known sites are located within the study area.

Wake County
Prehistoric period:
31 Wa 184, Wa 186, Wa 187, Wa 188, Wa 191, Wa 192, Wa 193, Wa 194, Wa 195.

Archaic period:
31 Wa 185, Wa 196, Wa 197.

Woodland period:
31 Wa 190.

Historic period:
31 Wa 56, Wa 189.

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

SOUTHERN REGION
P. O. BOX 20636
ATLANTA, GEORGIA 30320

April 19, 1979

Mr. L. J. Spaanbroek
Senior Utilities Coordinator
Carolina Power and Light Company
P. O. Box 1551
Raleigh, North Carolina 27611

Dear Mr. Spaanbroek:

We have reviewed the area you described as a study area for your proposed Harris-Harnett Line. Our study revealed the following radar and airports:

Radar - Benson, N. C., lat. 35°30'45" N., long. 78°33'02" W.

Airport	Latitude	Longitude
Erwin	35°19'00" N.	78°41'30" W.
Harnett County	35°22'37" N.	78°44'10" W.
Stewart	35°22'54" N.	78°42'33" W.
Tirzah	35°24'32" N.	78°50'37" W.
McLamb	35°24'52" N.	78°32'01" W.
Fuquay-Angier	35°32'37" N.	78°45'00" W.
Shelba	35°38'00" N.	78°51'30" W.

If we may be of further assistance, please call on us.

Sincerely,

WILLIAM F. HERRING
Airspace Specialist
Airspace and Procedures Branch

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
P.O. BOX 25201
RALEIGH 27611

JAMES B. HUNT, JR.
GOVERNOR

THOMAS W. BRADSHAW, JR.
SECRETARY

DIVISION OF AERONAUTICS
(919) 733-2491

April 9, 1979

Mr. L.J. Spaanbroek
Senior Utilities Coordinator
Carolina Power & Light Company
Post Office Box 1551
Raleigh, North Carolina 27602

Ref: Harris-Harnett 500 KV Transmission Line

Dear Leo:

We have shown the location of each known airport in the study area on the attached map. With the exception of the new Harnett County Airport, all are privately owned. We suggest keeping several miles from the Harnett County Airport, if possible, since it will be a heavily used facility.

Please let me know if I can provide any further assistance or information.

Sincerely,

Bruce

Bruce E. Matthews
Airport Development Specialist

BEM:mp
attachment

COUNTY OF WAKE

RALEIGH, NORTH CAROLINA

June 27, 1978

Mr. David G. Roberts, Scientist
Transmission Location, C P & L
P. O. Box 1551
Raleigh, N. C. 27602

Dear Mr. Roberts:

In response to your letter of June 1, 1978, requesting information on the Wake-Harris Study Area for use in locating a 500 kv transmission line; the following data are enclosed:

1) A map showing the general location of airports, schools, industrial sites, landfills, subdivisions, parks, natural areas, and historic sites.

2) A map showing the general location of existing gas pipelines, proposed highway rights-of-way, proposed water supply impoundment (The C P & L lake is omitted for obvious reasons), and areas expected to become urban in the future.

3) Legends and reference materials.

Comments on the first map are not really necessary. Those are existing sites which may have some bearing on the location of a 500 kv transmission line. The colored circles are for locational purposes and are not intended to show scale.

The second map deserves more elaboration. (1) Since it is impossible to project where individual private investments will be made in the future, we have chosen to show those areas where public investments are expected to stimulate growth. The "Transition" areas on the map were projected from EPA's 201 Wastewater Plans and represents areas which should urbanize within the next 20 years. The "Future Urban" areas on the map were projected from the County's Water and Wastewater Study of 1972, and represents areas which are now undergoing sporadic development and which should assume urban character within the next 20-70 years. The uncolored areas on this map will be far from rural in the future, but they are not now expected to receive public water and sewer services. (2) The proposed I-40 expressway location shown on this map is the most recent corridor approved by the N. C. Board of Transportation, and should have a right-of-way width in excess of 400 feet. Do not confuse this with the older and now incorrect corridor proposal printed on the base map.

(3) The Middle Creek impoundment is proposed to supply 20 MGP in future watersupply. It is located generally here since a dam site or elevation have not been engineered for this potential facility. To supply this volume of water the impoundment would probably have a surface area in excess of 1,000 acres.

In our last telephone conversation we discussed the possibility of aligning the transmission rights-of-way along the edge of floodway fringes within the county. Thereby providing protection from development along one side of the transmission line. This continues to be a possibility and if you choose to pursue it, this department will be happy to work with your staff on our detailed Flood Hazard Boundary Maps. Another possibility you may wish to consider is the use of the abandoned railroad right-of-way running northwest/southeast through Burt.

If this department can be of any further assistance to you on this or any other project, then we will be happy to participate.

Sincerely,

John G. Scott
Director of Planning

JGS/ejw

Enclosure:

TO: Miss Carolyn Anderson, Scientist, CPL

FROM: Trawick Ward, Archaeologist, RLA

SUBJECT: A Preliminary appraisal of the Archaeological Resources in the Proposed Transmission Study Area at Shearon Harris

DATE: April 11, 1979

The Chatham and Wake County sites were recorded during the course of the archaeological survey of the Shearon Harris facilities site. All have been evaluated in terms of National Register criteria and found to be ineligible for consideration. Almost all the Harnett County sites have also been evaluated relative to National Register criteria with the same results. It should be noted that this evaluation was carried out not only by the Research Labs but also by the Archaeology Branch as part of the A-95 review process.

The remaining sites are considered, in my opinion, not to be eligible also. It should be noted, however, that "significance" is a very fluid and elusive quality reflecting a multiplicity of diffuse, and many times, inscrutable factors. But given even the most liberal interpretation of the term, I feel that it is highly unlikely that any sites would be encountered that could not be mitigated. This assessment increases in validity in direct proportion to the distance between the proposed transmission corridor and the Cape Fear River.

Appendix B

Direct Testimony of Dr. Robert M. Reed Before
the Atomic Safety and Licensing Board (NRC)

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION 9/16/77

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	Docket Nos. 50-400
CAROLINA POWER AND LIGHT COMPANY	)	50-401
	)	50-402
(Shearon Harris Nuclear Power Plant,	)	50-403
Units 1, 2, 3 and 4)	)	

DIRECT TESTIMONY OF ROBERT M. REED
REGARDING TRANSMISSION LINES

State of Tennessee)
) ss.
County of Roane)

Name: Robert M. Reed

Date of Birth: 29 June 1941 Place of Birth: Berea, Ohio

Education: 1963 - B.A. Duke University, Durham, N.C.; Botany major
1969 - Ph.D. Washington State University, Pullman, Wash. Plant Ecology; Soils minor

Employment: 1963-65 Officer, USNR, assigned as First Lieutenant to USS SHELDRAKE (AGS-19), Brooklyn, N.Y.

1965-69 Graduate Teaching Assistant, Department of Botany, Washington State University, Pullman, Washington.

Graduate Research Assistant under the supervision of Dr. Rexford Daubenmire; research on the forest communities of the Wind River Mountains, Wyoming supported by the U.S. Forest Service.

1969-77 Assistant Professor, University of Ottawa, Department of Biology; teaching undergraduate and graduate courses in general ecology, plant ecology and botany.

July, 1977- Terrestrial ecologist in the Ecological Analyses and Applications Program, Oak Ridge National Laboratory, Oak Ridge, Tennessee

Publications:

Reed, R.M. 1969. Forest habitat types of the Wind River Mountains, Wyoming. Ph.D. Dissertation, Washington State University, Pullman, Washington.

Reed, R.M. 1971. Aspen Forests of the Wind River Mountains, Wyoming. Amer. Midl. Natur. 86:327-343.

Reed, R.M. 1976. Coniferous Forest Habitat Types of the Wind River Mountains, Wyoming. Amer. Midl. Natur. 95: 159-173.

Reed, R.M. Editor and Supervisor 1974. An Ecological Assessment of the Mer Bleue Peat Bog Near Ottawa, Ontario. Report to the Ontario Ministry of the Environment SWEEP Program.

Reed, R.M. Editor and Supervisor 1975. An Ecological Study of Conservation-Recreation Areas in the Regional Municipality of Ottawa-Carleton. Report to the Planning Department of the Regional Municipality of Ottawa-Carleton, Ottawa, Ontario.

Reed, R.M., C. Billington and D. Johannsen. 1976. Ecological Studies of Conservation-Recreation Areas in the Regional Municipality of Ottawa-Carleton; Second Report. Report to the Planning Dept., Regional Municipality of Ottawa-Carleton, Ottawa, Ontario.

Introduction

The Environmental Report (ER) for the Construction Permit of the Shearon Harris Nuclear Power Plant (hereafter referred to as the Harris Plant) proposed that a 500KV transmission line connect the plant directly to the Richmond Substation, a distance of approximately 137 km (85 miles) (Fig. 1, original 500 KV route). The Harris Plant would also be connected to the Wake Substation by a 500KV line, and six 230KV lines would connect the plant to other substations in the region. All of these lines are shown as Alternate Plan III in Figure 8.7-3 of the original ER which served as the basis for the analysis done on transmission lines in the Revised Final Environmental Statement dated March, 1974.

Amendment 64 to the ER states that the 500KV line connecting the Richmond and Wake Substations must be built by 1985 (ER, Amendment 64, p. 8.7-3). This line will be routed by the Fayetteville and Erwin load areas and is required even if the Harris Plant is not built. The Amendment proposes that this 500KV Wake-Richmond line be routed via the Harris Plant (Fig. 1, proposed 500KV route), thus eliminating the need for the originally proposed Harris-Richmond 500KV line. All other lines emanating from the Harris Plant would remain essentially unchanged from the original plan (Fig. 8.7-3, Amendment 64).

The purpose of the following analysis is to describe the Harris-Erwin 500KV line which was not considered in the Revised FES, and to evaluate the environmental impact of the construction and operation of this line. The Richmond-Erwin line will not be considered here since it will be constructed even if the Harris Plant is not built.

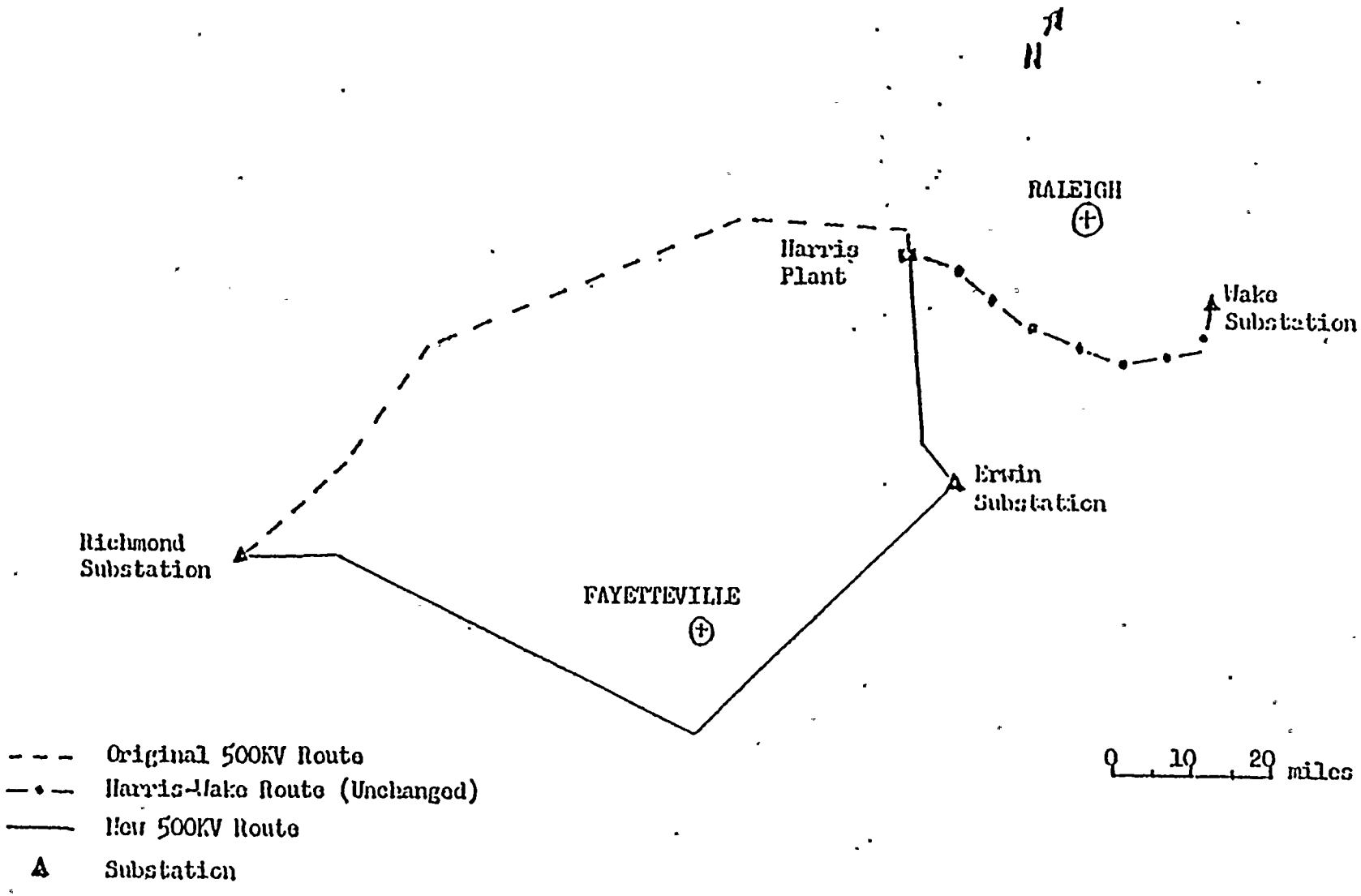


FIGURE 1 - Original and Proposed 500KV Transmission Line Routes
Modified from Fig. 8.7-3 of the ER and Amendment 64 to the ER

Table 1 - Significant Natural Features of the Harris-Erwin Corridor[1]

Feature	Comment
Becker Sand & Gravel Quarry	Approximately 6.4 km (4 miles) SE of Lillington; contains a significant mineral site and a variety of fossils.
Wild Turkey Habitat	Critical wild turkey habitat centered approximately 9.7 km (6 miles) E of Lillington, and a second area centered approximately 19.3 km (12 miles) SE of Merry Oaks.
Cape Fear River	Andromous fish route; striped bass, alewife and blueback herring, american shad.
Merry Oaks Game Land	Occupies 1129 ha (2789 acres) in Wake and Chatham Counties; owned by Albemarle Paper Co.
Eupatorium resinosum	Rare species endemic to N.C.; reported in bogs and pocosins, Wake and Harnett Counties.
Tachopteryx thoreyi (Hagen)	Rare insect occurring in spring-fed, woodland streams.
Coelioxys hunteri (Crawford)	Rare bee in N.C.; has only been collected twice in the past 50 years.
Hyla andersoni	Pine barrens frog; disjunct populations in N.C.; occurs in shrub thickets, bogs and pocosins.
Micrurus fulvius	Coral snake; rare in N.C.

[1] Department of the Army 1973. U.S. Army Corps of Engineers Environmental Reconnaissance Inventory of the State of North Carolina. Prepared for the Dept. of the Army by the Engineer Agency for Resources Inventories.

Description of the Harris-Erwin 500KV Transmission Line

The Harris-Erwin transmission line will be built along a 55 m (180 ft) right-of-way extending in a southeasterly direction from the Harris Plant to a new substation east of the town of Erwin, a distance of approximately 44 km (27.5 miles). The exact route has not yet been determined, but a corridor approximately 44 km long and having a maximum width of 13 km (8 miles) is under study (Fig. 3.11-11, Amendment 64). An unspecified number of galvanized steel lattice towers are to be used for this line (FES, p. 3-29).

A detailed description of the area under study is not given in the ER, but a description of the region indicates that the route traverses rural landscape ranging from 75 to 140 m (250 to 450 ft) in elevation in the uplands to approximately 25 m (80 ft) in some of the lowland areas adjacent to the Cape Fear River and associated streams. The upland areas are approximately 40% agricultural land and 60% wooded. Agricultural areas are generally in close proximity to roads. Soils are relatively infertile and range from clays to sandy loams. Second growth forests of various admixtures of pines and hardwoods are common on the uplands, while on the lowlands willows, alders, birch and sycamore gradually develop into forests of elms, ash and red maple. Table 1 gives a brief description of significant natural features along the Harris-Erwin corridor and indicates several rare species which may occur in that area. In addition, the range of the endangered species the Red Cockaded Woodpecker includes this area. However, no observations of this latter species are reported in the ER and the habitat is unlikely to be present.

The applicant has committed himself to a number of special considerations to minimize the impact of constructing the right-of-way, which are summarized in the Revised FES (Section 3.7).

Impact of the Transmission Line

If routed in a straight line from the Harris Plant to the Erwin Substation, the right-of-way would cover an area of approximately 243 ha (600 acres). Since the applicant is committed to minimizing visual and environmental impact of the transmission lines (FES, Section 3.7), the final route will undoubtedly cover a significantly greater area. Forty six meters (150 ft) of the right-of-way will be completely cleared during construction, with the remaining 4.5 m (15 ft) on the edge of each side being selectively cut to reduce visual impact. Herbicides will not be used during the construction and maintenance of the right-of-way.

Table 1 shows significant natural features present in or near the corridor being considered for the routing of the 500KV line. The staff recommends that the final route avoid the following: (1) critical habitat for rare species as listed in Table 1; (2) the significant mineral and fossil site near Lillington; and (3) unnecessary crossing of the Cape Fear River in the southwestern part of the corridor as shown in Figure 3.11-11. A map showing the location of these significant features can be found in Department of the Army (1973). The staff feels that the impact of the Harris-Erwin 500KV transmission line right-of-way will be acceptable if the natural features noted above are preserved and the route selection criteria specified by the applicant (Amemdment 64, p. 3.11-3) are strictly observed. The staff recommends that when routing within the

corridor is finalized, the applicant[6] submit descriptions of the route and immediate environs to the staff and obtain staff approval on the proposed route prior to initiation of construction of the Harris-Erwin segment.

Robert M. Reed

Robert M. Reed
September 16, 1977

Subscribed and sworn to before
me this 16TH day of September, 1977.

Betty Jane Cochran
NOTARY PUBLIC

My Commission Expires:

3-29-78

50-400
401
402
403

WAKE-RICHMOND 500 kV LINE
HARRIS-HARNETT SECTION
ALTERNATIVE ROUTE EVALUATION REPORT

Prepared by
Environmental Technology Section
Technical Services Department

Submitted to
Transmission Line Engineering & Construction Section
Transmission System Engineering & Construction Department

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CHANGE: L E
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September 1979

TABLE OF CONTENTS

INTRODUCTION

This report discusses the rationale and methodology used in determining the optimum route for the Harris-Harnett section of the Wake-Richmond 500 kV transmission line. Criteria for selecting the optimum route were derived from the line location objectives described on the following page.

By comparing the effect of each alternative route on each of these criteria and the sum of the effects on the criteria for each alternative route, the optimum route for the line was selected.

OBJECTIVES

The optimum route for the Harris-Harnett 500 kV line is the route that best meets the following objectives:

1. Minimum cost of constructing, operating, and maintaining the line should be a criteria important in the selection of the best route.

2. Minimum environmental effects as a result of locating, constructing, operating, and maintaining of the line.

3. Minimum difficulty for both planned and emergency maintenance activities consistent with the Company's obligation of providing electric service to its customers with a minimum of interruptions.

4. Consistent with future development of the system in the study area.

5. Least amount of detrimental impact to present and future land use possible.

CRITERIA

To satisfy the stated objectives, the following criteria were examined for each of the alternative routes:

1. Land Use
2. Ecology
3. Physiography
4. Cultural Resources
5. Visibility
6. Construction
7. Maintenance
8. Reliability
9. Economics
10. Electrostatics

Because no PERMITS were required for any of the alternatives and because all alternatives were equal with regard to SYSTEM DEVELOPMENT, these two criteria were not evaluated.

ALTERNATIVE ROUTE ESTABLISHMENT

Various factors were pertinent to the establishment and evaluation of alternative routes within the Harris-Harnett 500 kV study area. These included physical, environmental, cultural, and economic factors. A detailed inventory of the study area was conducted and was used as a basis for selecting 10 alternative routes for the Harris-Harnett 500 kV line. A report entitled "Environmental Analysis for Harris-Harnett 500 kV Transmission Line Route Selection" discusses in detail the factors that affect these alternatives and is on file in the Transmission Line Engineering & Construction Section of the Transmission System Engineering & Construction Department of Carolina Power & Light Company.

The Harris-Harnett 500 kV study area is largely rural in nature and is composed of a mosaic of agricultural land and wooded areas. The northern one-quarter of the study area lies in the Piedmont physiographic region of North Carolina, while the southern three-quarters lies in the Coastal Plain region. Within the study area are two incorporated towns (Angier and Coats) and several unincorporated communities. Adjacent to the study area are the incorporated towns of Fuquay-Varina, Lillington, and Erwin. Major highways traversing the study area are US 401, NC 42, NC 27, NC 55, and NC 210.

The Piedmont portion of the area is characterized by second and third growth pine and pine-hardwood forests on gentle to moderate slopes. The southern portion is characterized by flat to gentle slopes, with alternating bands of agricultural land occupying the upland areas and low flat bottomlands along the stream basins. The bottomlands are mostly dominated by hardwood forests that reflect various stages of disturbance.

The southwestern border of the study area is the Cape Fear River, into which most of the streams of the area drain. The largest stream within the study area is the upper portion of the Black River and its tributaries. The most extensive bottomland forests in the study area occur along this stream. The highest elevations in the study area are about

350 feet above mean sea level, occurring in the northern area. The lowest elevation is approximately 70 feet above mean sea level occurring at the Cape Fear River in the extreme southern corner.

Scattered throughout the study area are 55 known archaeological sites and 23 structures of architectural and/or historical interest. Mineral resources include four potential sites for quarrying sand or clay for brick and tile. There are 17 ponds and lakes larger than five acres.

A number of other species of scientific interest are known to occur within the four counties in which the study area is located. These include 18 species of plants, 9 of invertebrates, and 8 of vertebrates. Seven species of plants and animals with special status, as determined by the Symposium on Endangered and Threatened Biota of North Carolina (November 7-8, 1975), are known to occur within the study area.

ALTERNATIVES

Ten alternative routes were established within the study area (Figure 1). These routes were located in such a way as to minimize the impact on the cultural, physical, biological, aesthetic, and agricultural resources of the area. Each alternative shares segments with other alternatives so that there is some degree of duplication in the description of each alternative. These segments will be noted in the following discussion.

Alternative Route Number 1

Alternative 1 originates at the Harris 500 kV switchyard and parallels the Harris-Erwin North 230 kV line toward the town of Fuquay-Varina. The route turns southeastward about two miles east of the town, passes east of the community of Duncan and north of the community of Chalybeate. The route then turns east at Point I (Figure 1), passes south of Angier and Popes Lake, and continues along the west side of the flood plain of the headwaters of the Black River. After crossing NC Highway 27 east of Coats, the route turns southward and ends at the site of the Harnett 500 kV substation.

This alternative is the most northeasterly of all the alternatives, passing south of the populated areas around Fuquay-Varina and Angier and east of Coats. One of the major advantages of this route is the maximum possible length of parallel routing with an existing transmission line. The major disadvantages are the potential impact to wetlands along the Black River and the longer length of this route.

Alternative Route Number 2

Alternative 2 follows much of the same route as Alternative 1, except for the segment that runs from southwest of Angier to northwest of Coats, between Points B and E (Figure 1).

Along this segment, Alternative 2 departs from the Black River watershed, passing instead over agricultural land and crossing several minor streams. This segment avoids the potentially sensitive wetland areas and makes the route shorter than Alternative 1.

Alternative Route Number 3

Alternative 3 follows the same route as Alternative 2 except for the last segment which runs from Point D, northwest of Coats, to the Harnett 500 kV substation site (Figure 1). This segment passes west of Coats, then swings southeast to the terminus.

The character of the landscape over which this route passes is essentially the same as Alternative 2. However, the major disadvantages with Alternative 3 are a potential conflict with the Harnett County landfill, located immediately northwest of the Harnett 500 kV substation site, and the addition of another transmission corridor to the numerous lines that already tie into the Erwin 230 kV substation.

Alternative Route Number 4

Alternative 4 utilizes the same route as Alternative 3 as it leaves the Harris 500 kV switchyard and passes over the Harris Reservoir. However, at Point A, about 1/2 mile south of Holleman's Crossroads, Alternative 4 turns southward, passing west of Duncan (Figure 1). Approximately one mile southwest of Duncan, at Point C, the route turns eastward and passes through the southern edge of Chalybeate. From there the alternative continues eastward until it rejoins Alternative 1 at Point I.

The primary advantage of this alternative is that it passes further from the community of Duncan thereby avoiding potential visual impacts. However, the crossing of US Highway 401 is more visible to vehicular traffic than it would be on Alternate 3.

Alternative Route Number 5

Alternative 5 follows the route of Alternative 4 until it reaches Point F (Figure 1). At this point, Alternative 5 then follows the same route as Alternative 2.

The impacts associated with this alternative are the same as those impacts already stated for Alternatives 2 and 4.

Alternative Route Number 6

Alternative 6 follows Alternative Number 4 to Point D (Figure 1) and then follows Alternative 3 to the site of the Harnett 500 kV substation. Consequently, the advantages and disadvantages of this route are the same as those of Alternatives 3 and 4.

Alternative Route Number 7

Alternative 7 originates at the Harris 500 kV switchyard, passes between the reactor buildings and the main body of the Harris Reservoir, and then continues southward toward the community of Corinth. At Point G (Figure 1), approximately one mile east of Corinth, the route turns eastward and proceeds to Point C. From this point, Alternative 7 becomes the same as Alternative 4.

The primary advantage of Alternative 7 is that it passes further away from the community of Duncan than previous routes, thereby reducing visual impacts and potential conflicts with land use in that area. A possible drawback to this alternative is that the segment from the Harris 500 kV switchyard to Point G passes near several known archaeological sites. However, these sites are considered unimportant and many will be inundated by the construction of the Harris Reservoir. A major disadvantage of Alternative 7 is that it is the longest of all routes investigated, thereby making it the most expensive.

Alternative Route Number 8

Alternative 8 follows the same route as Alternative 7 from the Harris 500 kV switchyard to Point F (Figure 1). From this point, Alternative 8 turns southeastward, following the same corridor as Alternative 2.

The primary advantages and disadvantages with this route are the same as those associated with Alternatives 2 and 7. In addition, the route is almost as long as Alternative 7 and would be the next to the most expensive to build.

Alternative Route Number 9

Alternative 9 is the same as Alternative 8 from the Harris 500 kV switchyard to Point D (Figure 1). At Point D, Alternative 9 turns southward and follows the same corridor as Alternative 3. The advantages and disadvantages of this alternative have been included in the discussion of Alternatives 3 and 8.

Alternative Route Number 10

Alternative 10 is the same as Alternative 9 from the Harris 500 kV switchyard to Point G (Figure 1). At Point G, Alternative 10 runs southeastward until it reaches Point H. At Point H, the route rejoins Alternative 3. The G-H segment of this alternative is separate from all other routes, primarily passing through woodlands along the north side of the Cape Fear River.

There are several significant disadvantages associated with Alternative 10. Much of the route passes through valuable wild turkey habitat. The use of this alternative could visually impact portions of Raven Rock State Park. Another disadvantage is that this alternative would add to the number of transmission lines already present near the Erwin 230 kV substation.

DISCUSSION OF ALTERNATIVE ROUTES

1.0 ALTERNATIVE ROUTE NUMBER 1 (Harris-A-B-I-E-Harnett)

1.1 Land Use

1.1.1 Present Land Use

Alternative 1 passes close to the eastern edge of the community of Duncan, but presents no conflicts with occupied dwellings. In four instances, this alternative passes slightly closer than 300 feet from a home. There are about 10.4 miles of non-woodland traversed, but most of this is agricultural land that could continue to be farmed.

1.1.2 Future Land Use

This route does not conflict with any future land use plans as identified in the inventory of the study area. This inventory included discussions with county planners and various state agencies.

1.2 Construction

Portions of Alternative 1 are located adjacent to the lowlands along the upper reaches of the Black River. There is a potential for crossing about 6200 feet of low, wet areas thus creating the possibility of difficulties in building adequate structure foundations and in moving equipment through these areas. Access for this alternative is good, with slightly less than two access roads per mile. The total length of the alternative is 28.9 miles, about 3.2 miles greater than the straight line distance from the Harris 500 kV switchyard to the Harnett 500 kV substation. There are about 18.2 miles of woodlands that would require clearing.

1.3 Reliability

Total line exposure of this alternative is about 28.9 miles, about 3.2 miles greater than the straightline distance. About 5.5 miles (at the northern end) of the line would parallel the Harris-Erwin North 230 kV line. Should both the 230 kV line and the 500 kV line be removed from service, electrical power to the Dunn-Erwin-Clinton area would be continued through the Harris-Erwin South 230 kV line. Also, as the purpose of the Harris-Harnett 500 kV line is to supply bulk power to areas further south and west of the Dunn-Erwin area, potential problems of parallel routing are not considered to be a factor.

1.4 Maintenance

1.4.1 Line Maintenance

This route has slightly less than 2 access roads per mile of transmission line, and the total length of the line is about 28.9 miles.

1.4.2 Corridor Maintenance

This corridor crosses approximately 18.2 miles of woodlands which would require either mowing or handcutting on a regular basis. About 6200 feet of these woodlands are along stream bottoms which may require more expensive handcutting. Access to the corridor is good.

1.5 Physiography

1.5.1 Soil Erosion

Without adequate erosion control measures, construction of the Harris-Harnett 500 kV line along Alternative 1 could result in the loss of about 3846 tons of soil per year through surface erosion, calculated by U.S. Soil

Conservation Service formulae. This value is 25% greater than the loss of 3009 tons calculated for Alternative 2 (the minimum value of all alternatives investigated) and far less than 10,644 tons for Alternative 10 (the largest soil loss of all alternatives).

1.5.2 Stream Crossings

A total of twelve minor streams would be crossed by this route. This is twice as many streams as Alternative 2 crosses, and eight less than the crossings involved with Alternative 4. The values are the maximum and minimum numbers of crossings.

1.6 Ecology

1.6.1 Woodland Wildlife Habitat

This alternative would traverse 18.2 miles of woodlands, which would involve the loss of about 331 acres of woodland habitat. Although the edge effect of these cleared segments of the corridor would be considered excellent habitat for some species, the loss of the woodlands would result in the loss or reduction of other species whose existence is dependent upon that habitat.

1.6.2 Ecologically Sensitive Areas

Approximately 6200 feet of wetlands could be affected to some degree by the construction along this route. The majority of these are located along the upper reaches of the Black River. There are no known threatened or endangered species that would be affected.

1.7 Visibility

As is the case for all alternatives, four state and one federal

highways will be crossed. Of these five crossings, three can be fully screened. This includes the crossing of US 401, the highway with the largest value for average daily traffic.

1.8 Cultural Resources

1.8.1 Historic Sites

There are no sites of historic or architectural interest within 3/4 mile of this alternative.

1.8.2 Archaeological Sites

There are no known archaeological sites located near this route. However, the experience of archaeologists has shown that areas near streams and rivers have a higher potential for sites. Therefore, the segments that are located near the wetlands of the Black River present a greater possibility of impact. This alternative involves the greatest length of all routes, about 11 miles, located within 1000 feet of a stream or river.

1.8.3 Scenic and Recreational Areas

There are no scenic or recreational areas affected by this alternative.

1.9 Electrostatics

This route passes slightly closer than 300 feet from four houses. One of these is a small tenant house that is near the projected location of the centerline, and it would be necessary to purchase and dismantle or move it. In addition, there is one mobile home that is located slightly less than 300 feet from the proposed centerline. An additional 28

barns, sheds, hog shelters, and chicken houses are located within 300 feet of the proposed centerline and those with metal roofs may require some type of action to eliminate induced currents.

1.10 Economics

The estimated cost, in 1979 dollars, to located the Harris-Harnett 500 kV line along the route of Alternative 1 is $11,385,204. This value includes surveying, right-of-way acquisition, materials, labor, engineering, and overhead costs. A detailed breakdown of the cost associated with this alternative is presented in Table 1.

2.0 ALTERNATIVE ROUTE NUMBER 2 (Harris-A-B-F-D-E-Harnett)

2

2.1 Land Use

2.1.1 Present Land Use

Alternative 2, like Alternatives 1 and 3, would pass close to the eastern edge of Duncan; but presents no conflicts with occupied dwellings. There are four houses situated less than 300 feet from the projected centerline. One of these is a small tenant house which would require being either relocated or dismantled. About 10.4 miles of non-woodland distance is traversed, but most of this could continue to be farmed.

2.1.2 Future Land Use

There are no known conflicts between the location of Alternative 2 and future land use plans.

2.2 Construction

Approximately 2500 feet of this alternative passes through low, wet areas adjacent to streams. This could present some minor problems in constructing adequate foundations for support structures and for moving equipment through these areas. Access for this alternative is good, with more than 2.1 access points per mile of transmission line. This is higher than any other alternative investigated. The total length of this alternative is 27.8 miles, with about 17.4 miles of this in woodlands.

2.3 Reliability

Total line exposure of this route is approximately 27.8 miles, which is approximately 2.1 miles greater than the minimum possible distance (straight line distance from the Harris 500 kV switchyard to the Harnett 500 kV substation). As with Alternative 1, the northern 5.5 miles of the route parallels the Harris-Erwin North 230 kV line. The potential problems of parallel routing in this segment have been discussed in Section 1.3.

2.4 Maintenance

2.4.1 Line Maintenance

This route has more than 2 access roads per mile of line and the total length is approximately 27.8 miles. Only about 2500 feet of the route are located in potentially inaccessable areas.

2.4.2 Corridor Maintenance

This alternative crosses approximately 17.4 miles of woodlands which would require either mowing or hand-

cutting on a regular basis. About 2500 feet are located in areas which may require more expensive handcutting. Access to this route is the best of any route investigated.

2.5 Physiography

2.5.1 Soil Erosion

Erosion along Alternative 2, without adequate control measures, could result in the calculated loss of approximately 3008 tons of soil per year. This is equal to Alternative 3, which is the smallest amount of any alternative investigated.

2.5.2 Stream Crossings

Six minor streams would be crossed by this route. This is the smallest number of crossings of the ten alternatives investigated. Coupled with the small amount of soil erosion, this route offers the least potential for sedimentation and siltation.

2.6 Ecology

2.6.1 Woodland Wildlife Habitat

Alternative 2 would cross approximately 17.2 miles of woodlands, involving the loss of about 313 acres of woodland habitat. The effects of this loss have been discussed in Section 1.6.1.

2.6.2 Ecologically Sensitive Areas

Approximately 2500 feet of wetlands could be affected by the construction and operation of this route.

There are no known threatened or endangered species that would be affected.

2.7 Visibility

Of the five crossings of state and federal highways, seven of the ten potential vistas can be screened. This includes screening both sides of US 401 at that crossing.

2.8 Cultural Resources

2.8.1 Historic Sites

There are no known sites of historic or architectural interest located within one mile of this route.

2.8.2 Archaeological Sites

There are no known archaeological sites that would be impacted by this alternative. Approximately 4 miles of this route are located within 1000' of minor streams. This is the least amount of distance within 1000 feet of water for any alternative investigated. The relationship of archaeological sites to streams has been discussed in Section 1.8.2.

2.8.3 Scenic and Recreational Areas

No scenic or recreational areas would be affected by this alternative.

2.9 Electrostatics

Alternative 2 passes slightly closer than 300 feet to three occupied houses, one mobile home and one tenant house. The tenant house is the same one that was discussed in Section

1.9. An additional 25 barns, sheds, and various other buildings are also located closer than 300 feet to the projected centerline. Some of these may require some type of grounding.

2.10 Economics

In 1979 dollars, the estimated cost of building Alternative 2 is $11,341,307. This value includes all costs associated with the construction of this alternative. Table 1 gives a detailed breakdown of costs.

3.0 ALTERNATIVE ROUTE NUMBER 3 (Harris-A-B-F-D-H-Harnett)

3.1 Land Use

3.1.1 Present Land Use

Like Alternatives 1 and 2, Alternative 3 passes close to the community of Duncan, but presents no conflicts with owner-occupied dwellings. There are four dwellings that are less than 300 feet from the centerline of this route. One of these is the small tenant house described in Section 1.1. Approximately 10.9 miles of non-woodlands are traversed, but most of this land could continue to be farmed.

3.1.2 Future Land Use

The Harnett County landfill, located immediately northwest of the Harnett 500 kV substation, would be crossed by this alternative. A small change in the alignment of the centerline of this alternative would skirt the edge of the landfill, but may prevent its planned expansion in future years.

3.2 Construction

No portion of Alternative 3 passes through terrain that would offer potential problems for foundation construction or equipment mobility. Access to all portions of this route is good, with over 2 access points per mile. This is the shortest of all alternatives (27.2 miles), and it passes through the least amount of woodland (16.2 miles).

3.3 Reliability

This is the shortest of all alternatives and therefore offers the least amount of line exposure. The northern 5.5 miles of this route parallels the Harris-Erwin North 230 kV line. Potential problems of this parallel routing are discussed in Section 1.3.

3.4 Maintenance

3.4.1 Line Maintenance

This route is the shortest of all alternatives, crosses no inaccessable areas, and has good access throughout its length. Line maintenance would present no problems on this route.

3.4.2 Corridor Maintenance

This alternative crosses 16.2 miles of woodlands, which would require periodic mowing. This is the least distance of any alternative investigated. No segments are located in inaccessable terrain.

3.5 Physiography

3.5.1 Soil Erosion

Erosion along Alternative 3, without adequate control measures, would result in the calculated loss of approximately 3008 tons of soil per year. This is equal to Alternative 2 and is the least amount of potential erosion of the ten alternatives investigated.

3.5.2 Stream Crossings

A total of ten minor streams would be crossed with the construction of this alternative. This is one-half of the maximum number of crossings by Alternative 4. Coupled with the low erosion potential of this route, the number of stream crossings by Alternative 3 is not considered to be a problem.

3.6 Ecology

3.6.1 Woodland Wildlife Habitat

This route would cross approximately 16.2 miles of forests, involving about 351 acres. The effects of the loss of this habitat have been discussed in Section 1.6.1.

3.6.2 Ecologically Sensitive Areas

Alternative 3 does not cross any ecologically sensitive areas. However, one plant species of interest, *Nestronia umbellula*, was collected in 1934 about 1/4 mile east of the proposed centerline at its crossing of SR 2004. Although that reported location would not be impacted by Alternative 3, the potential exists for impacting

remaining, outlying individuals or populations of Nestronia.

3.7 Visibility

Of the five crossings of state and federal highways, seven of the potential views of the transmission corridor could be screened. This includes full screening at the crossing of US 401.

3.8 Cultural Resources

3.8.1 Historic Sites

No known sites of historic or architectural interest are located within a mile of this route.

3.8.2 Archaeological Sites

There are no known archaeological sites that would be impacted by this alternative. Approximately 5 miles of this route are located within 1000 feet of minor streams. The relationship of archaeological sites to streams has been discussed in Section 1.8.2.

3.8.3 Scenic and Recreational Areas

No scenic or recreational areas would be affected by this alternative.

3.9 Electrostatics

Alternative 3 passes slightly closer than 300 feet to three occupied houses, one mobile home, and one tenant house. The tenant house is the same one that was discussed in Section 1.9. An additional 29 barns, sheds, and various other

buildings are also located closer than 300 feet to the proposed centerline of this alternative. Some of these may require grounding.

3.10 Economics

In 1979 dollars, the estimated cost of building Alternative 3 is $11,040,447. This is the least expensive of all routes investigated. A more detailed breakdown of costs is given in Table 1.

4.0 ALTERNATIVE ROUTE NUMBER 4 (Harris-A-C-F-I-E-Harnett)

4.1 Land Use

4.1.1 Present Land Use

Alternative 4 passes to the west of Duncan, avoiding the conflict with the small tenent house described in Sections 1.1 and 1.9. Three other houses are located within 300 feet of the proposed centerline. Approximately 10.9 miles of non-woodland are crossed by this route, although most of this land could still be farmed after construction was completed.

4.1.2 Future Land Use

There are no conflicts with any known future land use plans.

4.2 Construction

Alternative 4 passes through approximately 6200 feet of low, wet areas, primarily along the upper reaches of the Black River. These areas could present potential problems for tower foundations and for equipment mobility. Access to

this alternative is good, with just under 2 access points per mile. This is one of the longer routes investigated and is approximately 3.2 miles longer than shortest alternative. It traverses approximately 18.8 miles of woodlands.

4.3 Reliability

This route is one of the longest investigated and offers a greater amount of exposure. The northern 2.1 miles parallel the existing Harris-Erwin North 230 kV line. Potential problems of this parallel routing are discussed in Section 1.3.

4.4 Maintenance

4.4.1 Line Maintenance

Although this is one of the longer alternatives investigated, it is only 4.8 miles longer than the straight line distance. Also, access points are numerous and line maintenance on this alternative is not considered to be a problem.

4.4.2 Corridor Maintenance

Alternative 4 crosses 18.8 miles of woodlands, requiring mowing and cutting. Approximately 6200 feet of this is situated in low, wet areas which may require handcutting if mechanical cutting is not feasible.

4.5 Physiography

4.5.1 Soil Erosion

Erosion along Alternative 4, without adequate control measures, would result in the calculated loss of approxi-

mately 4764 tons of soil per year. This is higher than the mean value of all alternatives investigated.

4.5.2 Stream Crossings

This alternative crosses 20 minor streams. This is the highest number of crossings by any alternative. The moderately high soil erosion potential of this route, coupled with this high number of stream crossings, offers a significant potential for impact through sedimentation and siltation.

4.6 Ecology

4.6.1 Woodland Wildlife Habitat

This alternative crosses approximately 18.8 miles of woodlands, involving about 410 acres. Included in this figure is about 115 acres of important wild turkey habitat, which occurs south of Duncan. Although the actual loss of 115 acres of this habitat would be only a small fraction of the total, the impact would be over a much larger area because of the effect of breaking up large, undisturbed tracts of woodlands into smaller ones.

4.6.2 Ecologically Sensitive Areas

Approximately 6200 feet of wetlands could be affected to some degree by the construction along this route. The majority of these areas are located along the upper portions of the Black River. No known threatened or endangered species would be impacted by this route.

4.7 Visibility

Of the five crossings of state and federal highways, only one could be completely screened from view. That is due to the lack of existing forests at the proposed road crossings. The crossing of US 401 immediately south of Chalybeate would be unscreened.

4.8 Cultural Resources

4.8.1 Historic Sites

No known sites of historic or architectural interest would be impacted by this route.

4.8.2 Archaeological Sites

No known archaeological sites would be impacted by this alternative. However, approximately 13.4 miles of this route are located within 1000 feet of minor streams, which is the greatest length of any alternative investigated. The relationship of archaeological sites to water has been discussed in Section 1.8.2.

4.8.3 Scenic and Recreational Areas

No scenic or recreational areas would be affected by this alternative.

4.9 Electrostatics

This alternative passes slightly closer than 300 feet from three houses and one mobile home. Thirty-four other buildings, including barns, sheds, and chicken houses, are also located within 300 feet of the centerline of this route. Some of these may require grounding.

4.10 Economics

In 1979 dollars, the estimated cost of building Alternative 4 is $12,017,960. A detailed breakdown of costs is given in Table 1.

5.0 ALTERNATIVE ROUTE NUMBER 5 (Harris-A-C-F-D-E-Harnett)

5.1 Land Use

5.1.1 Present Land Use

Alternative 5 passes west of Duncan and avoids conflicting with any dwellings in that area. At other points along the route, three houses and one mobile home are located within 300 feet of the proposed centerline. Approximately 10.6 miles of non-woodland are crossed by this route. Most of this land would still be available for agricultural use after construction was completed.

5.1.2 Future Land Use

There are no conflicts with any known future land use plans along this route.

5.2 Construction

Alternative 5 passes through approximately 2500 feet of low, wet areas along minor streams. These areas would offer potential problems for tower foundations and equipment mobility. Access to this alternative is the best of any, with over 2.1 access points per mile. The total length of this route is approximately 28.9 miles.

5.3 Reliability

This is one of the shorter routes, which reduces total line exposure. The northern 2.1 miles parallels the existing Harris-Erwin North 230 kV line. Potential problems of this parallel routing are discussed in Section 1.3.

5.4 Maintenance

5.4.1 Line Maintenance

Because Alternative 5 is one of the shorter routes and has the highest number of access points, line maintenance on this route is not considered to be a problem.

5.4.2 Corridor Maintenance

Alternative 5 crosses approximately 18 miles of woodlands, which would require mowing and cutting. Approximately 2500 feet of this is situated in low, wet areas which may require handcutting if mechanical cutting is not feasible.

5.5 Physiography

5.5.1 Soil Erosion

Erosion along Alternative 5, without adequate control measures, would result in the calculated loss of approximately 3809 tons of soil per year. This is near the mean value for alternatives investigated.

5.5.2 Stream Crossings

This route crosses 14 minor streams. which is about average for all alternatives investigated. Coupled

with the moderate degree of soil erosion potential, this route offers only moderate potential for sedimentation and siltation.

5.6 Ecology

5.6.1 Woodland Wildlife Habitat

This alternative crosses approximately 18.0 miles of woodlands or about 393 acres. Included in this figure is the same 115 acres of wild turkey habitat discussed in Section 4.6.1.

5.6.2 Ecologically Sensitive Areas

Approximately 2500 feet of wetlands could be affected to some degree by the construction of this alternative. No known threatened or endangered species would be impacted.

5.7 Visibility

Of the five crossings of state and federal highways, only one complete screen and a portion of another could be implemented. The crossing of US 401 would be unscreened.

5.8 Cultural Resources

5.8.1 Historic Sites

No known historic or architectually interesting sites would be impacted.

5.8.2 Archaeological Sites

No known archaeological sites would be impacted by this alternative. However, approximately 6.1 miles of the route are located within 1000 feet of minor streams. The relationship of archaeological sites to streams has been discussed in Section 1.8.2.

5.9 Electrostatics

This alternative passes slightly closer than 300 feet from three houses and one mobile home. Twenty-eight other buildings, including barns, sheds, and chicken houses, are also located within 300 feet of the proposed centerline. Some may require grounding.

5.10 Economics

In 1979 dollars, the estimated cost of building Alternative 5 is $12,047,464. A detailed breakdown is given in Table 1.

6.0 ALTERNATIVE ROUTE NUMBER 6 (Harris-A-C-F-D-H-Harnett)

6.1 Land Use

6.1.1 Present Land Use

Alternative 6 does not directly impact any occupied dwellings; however, three houses are located slightly less than 300 feet from the centerline of this proposed route. Approximately 11.2 miles of non-woodlands are crossed by route, although most of this land would be available for agricultural use after construction was completed.

6.1.2 Future Land Use

There are no conflicts with any known future land use plans except for the potential impact on the Harnett County landfill (see Section 3.1.2).

6.2 Construction

Alternative 6 traverses no areas that would offer problems in constructing support foundations or in equipment mobility. Access to this route is good, with over 2 access points per mile. Approximately 16.8 miles of woodland would require clearing along this route.

6.3 Reliability

This alternative is approximately 28.2 miles long, which is 2.5 miles longer than the straight line distance. This makes Alternative 6 one of the shorter alternatives investigated, with concurrent low total line exposure. The northern 2.1 miles of the route parallel the Harris-Erwin North 230 kV line. This parallel routing is discussed in Section 1.3.

6.4 Maintenance

6.4.1 Line Maintenance

Since this alternative is one of the shorter routes and has good access, line maintenance is not expected to be a problem.

6.4.2 Corridor Maintenance

This alternative crosses approximately 16.8 miles of woodlands which would require periodic mowing. None of this is located in an area that would require hand-cutting.

6.5 Physiography

6.5.1 Soil Erosion

Erosion along Alternative 6, without adequate control measures, would result in the calculated loss of approximately 4788 tons of soil per year. This is higher than all other alternatives investigated except for Alternative 10.

6.5.2 Stream Crossings

This route crosses 18 minor streams, two less than the maximum number crossed by any alternative. The large quantity of potential soil erosion and the large number of stream crossings offer moderate to severe potential for sedimentation and siltation.

6.6 Ecology

6.6.1 Woodland Wildlife Habitat

Alternate 6 crosses approximately 16.9 miles of woodlands, involving approximately 367 acres of woodland wildlife habitat. Included in this value are about 125 acres of important wild turkey habitat. The potential impacts to this habitat have been discussed in Section 4.6.1.

6.6.2 Ecologically Sensitive Areas

This route does not impact any ecologically sensitive areas. However, it passes about 1/4 mile from a known location of *Nestronia umbellula*, as discussed in Section 3.6.2.

6.7 Visibility

Of the five state and federal highways crossed, only one full and one partial visual screen could be utilized. The crossing of US 401 would be unscreened.

6.8 Cultural Resources

6.8.1 Historic Sites

No known historic or architectually interesting sites would be impacted by this alternative.

6.8.2 Archaeological Sites

No known archaeological sites would be impacted. However, approximately 7.3 miles of the route are located within 1000 feet of a stream. This is approximately twice the distance of the route with the minimum distance within 1000 feet of a stream. The relationship of archaeological sites to water has been discussed in Section 1.8.2.

6.8.3 Scenic and Recreational Areas

No scenic or recreational areas would be impacted by this alternative.

6.9 Electrostatics

This alternative passes slightly less than 300 feet from three houses and one mobile home. A total of 34 other buildings are also located less than 300 feet from the centerline of this alternate. Some of these may require grounding.

6.10 Economics

The total cost of this alternate, in 1979 dollars, is $11,679,893. A detailed breakdown of costs is given in Table 1.

7.0 ALTERNATIVE ROUTE NUMBER 7 (Harris-G-C-F-I-E-Harnett)

7.1 Land Use

7.1.1 Present Land Use

Alternative 7 passes more than a mile from all towns and communities in the study area, except for the southern edge of Chalybeate. Four houses and one mobile home are located within 300 feet of the centerline of this route. Approximately 11.7 miles of non-woodlands would be crossed by this route, but most of this land could remain in agricultural use.

7.1.2 Future Land Use

This route does not conflict with any known future land use plans.

7.2 Construction

Alternative 7 could present severe problems in its construction. It is the longest of any route investigated (34.0 miles), crosses the greatest amount of woodlands that would require clearing (21.8 miles), has the least number of access points per mile (1.6), and crosses the greatest length of low, wet areas (6700 feet). All these factors would make this route the most difficult of all to construct.

7.3 Reliability

Total line exposure of Alternative 7 is 34.0 miles, the greatest of any route investigated. There is only 3/4 mile of parallel routing with another transmission line, the Harris-Cape Fear 230 kV line. Because the proposed Harris-Harnett 500 kV line and the Harris-Cape Fear 230 kV line serve two distinctly different purposes, system reliability would not be affected by this parallel routing.

7.4 Maintenance

7.4.1 Line Maintenance

The combination of being the longest route and having the least number of access points per mile would make line maintenance the most difficult of any route.

7.4.2 Corridor Maintenance

This route crosses approximately 21.8 miles of woodlands that would require mowing on a regular basis. Approximately 6700 feet of these woodlands are located along stream bottoms, which may require more expensive hand-cutting. Access to this route is the worst of any investigated (1.6 access points per mile).

7.5 Physiography

7.5.1 Soil Erosion

Without adequate erosion control measures, the construction of Alternative 7 would result in the calculated loss of about 4788 tons of soil per year. This value is second only to the 10,644 tons that could be lost on Alternative 10.

7.5.2 Stream Crossings

A total of 16 minor streams would be crossed by this alternative, the third highest number of crossings by any route investigated. Added to the relatively high potential for soil erosion, a significant potential for stream siltation and sedimentation would exist.

7.6 Ecology

7.6.1 Woodland Wildlife Habitat

This alternative would traverse 21.8 miles of woodland, involving approximately 476 acres. Included in this value are approximately 125 acres of important wild turkey habitat. The loss of this habitat has been discussed in Section 5.6.1.

7.6.2 Ecologically Sensitive Areas

Approximately 6700 feet of wetlands could be affected by the construction along this route. The majority of these wetlands are located along the upper reaches of the Black River. There are no known locations of threatened or endangered species that would be affected by this route.

7.7 Visibility

Alternative 7 crosses five state and federal highways, but crosses NC 42 two additional times because of a large loop in that road. There are, therefore, seven crossings of major roads. Of these seven, four can be fully screened, and one can be partially screened. The crossing of US 401 cannot be screened.

7.8 Cultural Resources

7.8.1 Historic Sites

There are no sites of historic or architectural interest that would be impacted by this route.

7.8.2 Archaeological Sites

Two known archaeological sites lie very close to the corridor between the Harris Plant and Point G on this alternative. However, these two sites are not considered important and will be inundated by the filling of the Harris reservoir. About 12.3 miles of Alternative 7 are located within 1000 feet of water, which is the second greatest distance of any route investigated. The relationship of archaeological sites to streams has been discussed in Section 1.8.2.

7.8.3 Scenic and Recreational Sites

There are no scenic or recreational sites affected by this alternative.

7.9 Electrostatics

This route passes slightly closer than 300 feet from four houses and one mobile home. An additional 30 barns, sheds, and other buildings are located less than 300 feet from the proposed centerline. Some of these may require grounding.

7.10 Economics

The estimated cost, in 1979 dollars, to construct Alternative 7 is $13,492,910. A detailed cost breakdown is given in Table 1.

8.0 ALTERNATIVE ROUTE NUMBER 8 (Harris-G-C-F-D-E-Harnett)

3

8.1 Land Use

8.1.1 Present Land Use

Alternative 8 passes more than a mile from all towns and communities in the study area, except for the southern edge of Chalybeate. Four houses and one mobile home are located within 300 feet of the centerline of this route. Approximately 11.4 miles of non-woodlands are crossed by this alternative, but most of the land could remain in agricultural use.

8.1.2 Future Land Use

This route does not conflict with any known future land use plans.

8.2 Construction

Alternative 8 is one of the longer routes investigated (32.3 miles long) and cross approximately 21.0 miles of woodlands which would have to be cleared. Access to this route is fair when compared to the other alternatives, with 1.8 access points per mile. Only 2000 feet of the route crosses areas which may limit or impede construction and mobility. Overall, construction of Alternative 8 would be moderately difficult.

8.3 Reliability

Total line exposure of this alternative is 32.4 miles, which is next to the longest of any route investigated. Only 3/4 mile is parallel to another line. This segment and its effects have been discussed in Section 7.3.

8.4 Maintenance

8.4.1 Line Maintenance

Because this is one of the longer routes and has a lower number of access points, line maintenance on Alternative 8 would be more difficult than most other alternatives.

8.4.2 Corridor Maintenance

This route crosses approximately 21.0 miles of woodlands, which would require regular mowing. About 2000 feet of these woodlands are situated along stream bottoms, which may require more expensive handcutting. Access to this route is among the lowest of the alternates investigated.

8.5 Physiography

8.5.1 Soil Erosion

Without adequate erosion control measures, the construction of Alternate 8 would result in the calculated loss of approximately 3834 tons of soil per year.

8.5.2 Stream Crossings

This alternative crosses a total of 10 minor streams, the second fewest number of crossings by any of the alternatives. With a fairly low erosion potential, sedimentation and siltation along this route does not pose a serious impact.

8.6 Ecology

8.6.1 Woodland Wildlife Habitat

This alternative would cross 21.0 miles of woodlands, involving approximately 458 acres. Included in this value are about 125 acres of important wild turkey habitat. The loss of this habitat has been discussed in Section 5.6.1.

8.6.2 Ecologically Sensitive Areas

Approximately 2000 feet of wetlands could be impacted by the construction of this alternative. There are no known threatened or endangered species that would be impacted.

8.7 Visibility

Alternative 8 crosses five state and federal highways, but crosses NC 42 two additional times because of a large loop in that road. Therefore, there are seven major road crossings involved on this route. Of these seven, four complete and one partial screens could be implemented by utilizing vegetation along the sides of the roads. The crossing of US 401 cannot be screened.

8.8 Cultural Resources

8.8.1 Historic Sites

There are no known sites of historical or architectural interest that would be affected by this route.

8.8.2 Archaeological Sites

The same two sites discussed in Section 7.8.2 would be near this route. Approximately 5.1 miles of this alternate are located within 1000 feet of a stream. The relationship of archaeological sites to streams has been discussed in Section 1.8.2.

8.8.3 Scenic and Recreational Areas

No scenic or recreational sites would be affected by this route.

8.9 Electrostatics

Four houses and one mobile home are slightly less than 300 feet from the centerline of this alternative. An additional 28 barns, sheds, and other buildings are located within 300 feet of the proposed centerline. Some may require grounding.

8.10 Economics

The estimated cost, in 1979 dollars, to construct this alternative is $12,916,219. A detailed cost breakdown is given in Table 1.

9.0 ALTERNATIVE ROUTE NUMBER 9 (Harris-G-C-F-D-H-Harris)

9.1 Land Use

9.1.1 Present Land Use

Alternative 9 passes far from all towns and communities in the study area except Chalybeate. Four houses and one mobile home are located within 300 feet of the

proposed centerline of this route. Approximately 11.7 miles of non-woodlands are crossed by this route, but most of this could remain in agricultural use.

9.1.2 Future Land Use

This route does not conflict with any known future land use plans except for the possible conflict with the Harnett County landfill (see Section 3.1.2).

9.2 Construction

Alternative 9 is 31.8 miles long making it one of the longer routes investigated. Approximately 19.8 miles of woodland would have to be cleared. Access to this route is fair, with approximately 1.7 access points per mile. There are no known areas that would present problems with respect to foundation problems or equipment mobility.

9.3 Reliability

Total line exposure of this alternative is 31.8 miles, of which 3/4 mile is routed parallel to the Harris-Cape Fear 230 kV line. This segment and its impacts have been discussed in Section 7.3.

9.4 Maintenance

9.4.1 Line Maintenance

This route is one of the longer routes and has fewer access points per mile than most others. Therefore, maintenance of this line is expected to be more difficult than most other routes investigated.

9.4.2 Corridor Maintenance

This route crosses approximately 19.8 miles of woodlands, which would require regular mowing. Because equipment mobility should not be a problem, none of these areas would require handcutting.

9.5 Physiography

9.5.1 Soil Erosion

Without adequate erosion control measures, the construction of Alternative 9 would result in the calculated loss of approximately 3884 tons of soil per year.

9.5.2 Stream Crossings

This alternative crosses a total of 14 minor streams, which is equal to the average number of crossings of all routes. Sedimentation and siltation in these streams would present a moderate impact.

9.6 Ecology

9.6.1 Woodland Wildlife Habitat

This route crosses 19.9 miles of woodlands which is approximately 434 acres. Included in this area are 125 acres of important wild turkey habitat. The potential loss of this habitat has been discussed in Section 5.6.1.

9.6.2 Ecologically Sensitive Areas

There are no ecologically sensitive areas, such as wetlands, impacted by this alternative. The route

passes about 1/4 mile from one plant species of concern, Nestronia umbellula. This has been discussed in Section 3.6.2.

9.7 Visibility

Alternative 9 crosses five state and federal highways, but crosses NC 42 two additional times because of a large loop in that road. Therefore, there are seven major road crossings involved on this route. Of these seven, four complete and one partial screen could be implemented by using vegetation along the sides of the roads. The crossing of US 401 cannot be screened.

9.8 Cultural Resources

9.8.1 Historic Sites

No historical or architectually interesting sites would be impacted by this route.

9.8.2 Archaeological Sites

The same two sites discussed in Section 7.8.2 would be near this route. Approximately 6.2 miles of this route are located within 1000 feet of water. The relationship of archaeological sites to water has been discussed in Section 1.8.2.

9.8.3 Scenic and Recreational Sites

No scenic or recreational sites would be affected.

9.9 Electrostatics

Four houses and one mobile home are slightly less than 300

feet from the centerline of this route. An additional 29 barns, sheds, and other buildings are located within 300 feet of the proposed centerline. Some of these may require grounding.

9.10 Economics

The total cost, in 1979 dollars, to construct this route is estimated to be $12,351,857. A detailed cost breakdown is given in Table 1.

10.0 ALTERNATIVE ROUTE NUMBER 10 (Harris-G-H-Harnett) #4

10.1 Land Use

10.1.1 Present Land Use

Alternative 10 passes far from all towns and communities within the study area. Three houses and one mobile home are located within 300 feet of the centerline of this route. Approximately 12.4 miles of non-woodlands, the greatest of any route, would be traversed by this route. Most of this would be available for agricultural use after construction activities are complete.

10.1.2 Future Land Use

Alternative 10 potentially conflicts with the Harnett County landfill, as discussed in Section 3.1.2.

10.5 Physiography

10.5.1 Soil Erosion

Without adequate erosion control measures, the construction of Alternative 10 would result in the calculated loss of approximately 10644 tons of soil per year. This is more than twice the amount of any other alternative.

10.5.2 Stream Crossings

This route crosses 14 minor streams, which is approximately equal to the average number of crossings by all other routes. However, due to the great potential for erosion, problems of sedimentation and siltation along this route could be severe.

10.6 Ecology

10.6.1 Woodland Wildlife Habitat

This route crosses approximately 18.4 miles or 401 acres of woodlands. Includes in this figure is approximately 175 acres of important wild turkey habitat. This is the greatest amount of potential turkey habitat impact of any alternative investigated. The impact of the loss of this habitat has been discussed in Section 5.6.1.

10.6.2 Ecologically Sensitive Areas

Approximately 1400 feet of this route is located in wetlands along streams and could be impacted. There are no known impacts to threatened or endangered species.

10.2 Construction

This alternative is approximately 30.9 miles long, which is longer than most other routes. Of this distance, approximately 18.4 miles are located in forested areas that would require clearing. Access to the corridor is the least of any route (equal to Alternative 7) with slightly over 1.6 access points per mile. Approximately 1400 feet of the route is situated in low, wet areas that could present problems in foundation construction and equipment mobility.

10.3 Reliability

Total line exposure of this route is 30.9 miles, which is somewhat greater than most other routes. Approximately 3/4 mile of this route is routed parallel to the Harris-Cape Fear 230 kV line, which has been discussed in Section 7.3.

10.4 Maintenance

10.4.1 Line Maintenance

This is one of the longer routes and has the least number of access points. Therefore, maintenance of this line would be more difficult than on most other alternatives.

10.4.2 Corridor Maintenance

Approximately 18.4 miles of woodlands are traversed by this alternative. These portions which would require periodic maintenance. Approximately 1400 feet of this route is situated in low, wet areas that may require expensive handcutting.

10.7 Visibility

Like Alternatives 7-9, this route crosses seven state and federal highways. Only three complete and one partial screen could be implemented by using vegetation along the sides of the roads. Only a partial screen would be possible at the crossing of US 401.

10.8 Cultural Resources

10.8.1 Historic Sites

The G-H segment passes approximately 1/4 mile from a pre-Civil war cabin known as the Green House. This is a one story log house built by the grandfather of playwright Paul Green. Although the house is presently in a state of disrepair, the potential visual impact of the transmission could seriously impair any future plans to restore this site.

10.8.2 Archaeological Sites

The same two sites discussed in Section 7.8.2 would be near this route. Approximately 7.4 miles of this route are located within 1000 feet of a stream. The relationship of archaeological sites to water has been discussed in Section 1.8.2.

10.8.3 Scenic and Recreational Areas

Although this route would not pass through the park, the G-H segment of Alternative 10 potentially could be seen from Raven Rock State Park.

10.9 Electrostatics

One house and two mobile homes are located within 300 feet of the proposed centerline of this alternative. An additional 31 barns, sheds, and other buildings are also located within 300 feet of the route. Some of these may require grounding.

10.10 Economics

The total cost, in 1979 dollars, to construct this alternative is $12,464,967. A detailed cost breakdown is in Table 1.

QUANTITATIVE ANALYSIS

In order to evaluate the ten alternatives in an objective manner, a quantitative analysis was utilized. This system was designed to provide an accurate numerical comparison of the routes in order to determine the most favored route.

Each of the criteria in the evaluation was assigned 100 points, to be distributed among the ten alternative routes. The most favorable route in each criterion was assigned the greatest number of points, with the less favorable ones receiving a proportionally smaller score. This method of assigning a value to each alternative illustrates its degree of preference.

Each criterion was then weighted to reflect its importance, relative to other criteria. Five different systems, using various weights, were utilized in order to test the rankings of the ten alternatives. The points were then summed. Use of the different systems was designed to determine the most favorable route when some criteria were given more importance than others.

The result of this analysis indicated that Alternative Number 2 was the preferred route in every weighting system. Results of the five evaluation systems are given in Tables 2-6. A summary of these evaluations is given in Table 7.

QUALITATIVE EVALUATION OF THE PREFERRED ROUTE - ALTERNATIVE 2

Land Use

There are no major constraints associated with Alternative 2. Only one house is within the proposed right-of-way. This house is a small tenant house and it will be necessary to purchase and demolish or move it. Also, a few barns and other small sheds may require relocation. This alternative crosses the least amount of fields. Most of the proposed route passes through rural areas, and the impact of the line through these areas is considered acceptable.

Construction

Alternative 2 is the next to shortest route and and has good accessibility. Approximately 2500 feet of the line is located in areas that offer potential problems for equipment mobility and foundation bases. It is possible that these areas could be minimized by careful placement of tower structures and slight adjustments to the centerline location.

Reliability

Alternative 2 is only 0.6 miles longer than the shortest route, which reduces total line exposure to a minimum. Although the northern 5.5 miles of the alternative parallels the existing Harris-Erwin North 230 kV line, this is not expected to present problems in reliability. This is due to the different purposes of these two lines. Should the Harris-Erwin North line be severed, service to the Dunn-Erwin-Clinton area would continue through the Harris-Erwin South 230 kV line. The purpose of the Harris-Harnett 500 kV line is to carry bulk power to points south and west of the Harnett County area.

Maintenance

Alternative 2 is one of the shortest routes investigated and has the greatest number of access points per mile. Maintenance is not expected to be a problem.

Economics

The cost of this alternative is the second least expensive.

SUMMARY

After examination of all the criteria and evaluation of the alternative routes, it was clear that Alternative 2 was the preferred route. With five different weighting systems applied to each of the criteria, Alternative 2 proved to be the best route in all cases. Although the preferred route does have some disadvantages, these may be reduced somewhat in the fine tuning stage. As a result of these advantages, Alternative 2 has been chosen as the best route.

Table 1. Estimated Costs (in 1979 Dollars) of Harris-Harnett 500 KV Alternate Routes

Alternate 1

ACTIVITY	LABOR COSTS	ACTIVITY	MATERIALS COSTS
Surveying	$ 57,740		
ROW Acquisition	$ 630,000		
ROW Clearing	$ 397,095		
Foundations	$ 992,235		
Structures	$ 843,675	Structures	$ 1,349,880
Conductor & OHGW	$ 548,530	Conductor & OHGW	$ 2,074,309
Total	$3,469,275	Total	$ 3,424,189
33% Overhead	x 1.33	8% Stores & 4% Tax	x 1.1232
		Material Total	$ 3,846,049
Labor Total	$4,614,136		$ 4,614,136
		ROW Easements	$ 1,890,000
		Subtotal	$10,350,185
		10% Engineering Cost	$ x 1.10
		ESTIMATED TOTAL COST	$11,385,204

Alternate 2

ACTIVITY	LABOR COSTS	ACTIVITY	MATERIALS COSTS
Surveying	$ 55,580		
ROW Acquisition	$ 606,000		
ROW Clearing	$ 379,460		
Foundations	$ 976,700		
Structures	$ 818,875	Structures	$ 1,310,200
Conductor & OHGW	$ 528,010	Conductor & OHGW	$ 1,996,711
Total	$3,364,625	Total	$ 3,306,911
33% Overhead	x 1.33	8% Stores & 4% Tax	x 1.1232
		Material Total	$ 3,714,322
Labor Total	$4,474,951		$ 4,474,951
		ROW Easements	$ 2,121,000
		Subtotal	$10,310,273
		10% Engineering Cost	x 1.10
		ESTIMATED TOTAL COST	$11,341,300

Table 1 (cont'd)

Alternate 3

ACTIVITY	LABOR COSTS	ACTIVITY	MATERIALS COSTS
Surveying	$ 54,300		
ROW Acquisition	$ 592,000		
ROW Clearing	$ 352,822		
Foundations	$ 936,125		
Structures	$ 784,925	Structures	$ 1,255,880
Conductor & OHGW	$ 515,850	Conductor & OHGW	$ 1,950,727
Total	$3,236,022	Total	$ 3,206,607
33% Overhead	x 1.33	8% Stores & 4% Tax	x 1.1232
		Material Total	$ 3,601,661
Labor Total	$4,303,909		$ 4,303,909
		ROW Easements	$ 2,131,200
		Subtotal	$10,036,770
		10% Engineering Cost	x 1.10
		ESTIMATED TOTAL COST	$11,040,447

Alternate 4

ACTIVITY	LABOR COSTS	ACTIVITY	MATERIALS COSTS
Surveying	$ 60,920		
ROW Acquisition	$ 665,000		
ROW Clearing	$ 410,229		
Foundations	$1,071,450		
Structures	$ 884,650	Structures	$ 1,415,440
Conductor & OHGW	$ 578,740	Conductor & OHGW	$ 2,188,551
Total	$3,670,989	Total	$ 3,603,991
33% Overhead	x 1.33	8% Stores & 4% Tax	x 1.1232
		Material Total	$ 4,048,003
Labor Total	$4,882,415		$ 4,882,415
		ROW Easements	$ 1,995,000
		Subtotal	$10,925,418
		10% Engineering Cost	x 1.10
		ESTIMATED TOTAL COST	$12,017,960

Table 1 (cont'd)

Alternate 5

ACTIVITY	LABOR COSTS	ACTIVITY	MATERIALS COSTS
Surveying	$ 57,760		
ROW Acquisition	$ 630,000		
ROW Clearing	$ 392,536		
Foundations	$1,060,700		
Structures	$ 867,650	Structures	$ 1,388,240
Conductor & OHGW	$ 548,720	Conductor & OHGW	$ 2,075,028
Total	$3,557,366	Total	$ 3,463,268
33% Overhead	x 1.33	8% Stores & 4% Tax	x 1.1232
		Material Total	$ 3,889,943
Labor Total	$4,731,297		$ 4,731,297
		ROW Easements	$ 2,331,000
		Subtotal	$10,952,240
		10% Engineering Cost	x 1.10
		ESTIMATED TOTAL COST	$12,047,464

Alternate 6

ACTIVITY	LABOR COSTS	ACTIVITY	MATERIALS COSTS
Surveying	$ 56,480		
ROW Acquisition	$ 616,000		
ROW Clearing	$ 367,012		
Foundations	$1,020,025		
Structures	$ 833,700	Structures	$ 1,333,920
Conductor & OHGW	$ 536,560	Conductor & OHGW	$ 2,029,044
Total	$3,429,777	Total	$ 3,362,964
33% Overhead	x 1.33	8% Stores & 4% Tax	x 1.1232
		Material Total	$ 3,777,281
Labor Total	$4,561,603		$ 4,561,603
		ROW Easements	$ 2,279,200
		Subtotal	$10,618,084
		10% Engineering Cost	x 1.10
		ESTIMATED TOTAL COST	$11,679,893

Table 1 (cont'd)

Alternate 7

ACTIVITY	LABOR COSTS	ACTIVITY	MATERIALS COSTS
Surveying	$ 67,980		
ROW Acquisition	$ 742,000		
ROW Clearing	$ 475,491		
Foundations	$1,215,950		
Structures	$ 994,975	Structures	$ 1,591,960
Conductor & OHGW	$ 645,810	Conductor & OHGW	$ 2,442,182
Total	$4,142,206	Total	$ 4,034,142
33% Overhead	x 1.33	8% Stores & 4% Tax	x 1.1232
		Material Total	$ 4,531,148
Labor Total	$5,509,134		$ 5,509,134
		ROW Easements	$ 2,226,000
		Subtotal	$12,266,282
		10% Engineering Cost	x 1.10
		ESTIMATED TOTAL COST	$13,492,910

Alternate 8

ACTIVITY	LABOR COSTS	ACTIVITY	MATERIALS COSTS
Surveying	$ 64,840		
ROW Acquisition	$ 707,000		
ROW Clearing	$ 457,798		
Foundations	$1,205,475		
Structures	$ 978,225	Structures	$ 1,565,160
Conductor & OHGW	$ 615,980	Conductor & OHGW	$ 2,229,377
Total	$4,029,318	Total	$ 3,794,537
33% Overhead	x 1.33	8% Stores & 4% Tax	x 1.1232
		Material Total	$ 4,262,024
Labor Total	$5,358,993		$ 5,358,993
		ROW Easements	$ 2,121,000
		Subtotal	$11,742,017
		10% Engineering Cost	x 1.1232
		ESTIMATED TOTAL COST	$12,916,219

Table 1 (cont'd)

Alternate 9

ACTIVITY	LABOR COSTS	ACTIVITY	MATERIALS COSTS
Surveying	$ 63,580		
ROW Acquisition	$ 694,000		
ROW Clearing	$ 432,275		
Foundations	$ 568,544		
Structures	$ 944,525	Structures	$ 1,511,240
Conductor & OHGW	$ 604,010	Conductor & OHGW	$ 2,284,112
Total	$3,306,934	Total	$ 3,795,352
33% Overhead	x 1.33	8% Stores & 4% Tax	x 1.1232
		Material Total	$ 4,262,939
Labor Total	$4,398,222		$ 4,398,222
		ROW Easements	$ 2,567,800
		Subtotal	$11,228,961
		10% Engineering Cost	x 1.10
		ESTIMATED TOTAL COST	$12,351,857

Alternate 10

ACTIVITY	LABOR COSTS	ACTIVITY	MATERIALS COSTS
Surveying	$ 61,740		
ROW Acquisition	$ 674,000		
ROW Clearing	$ 401,275		
Foundations	$1,106,350		
Structures	$ 912,200	Structures	$ 1,459,520
Conductor & OHGW	$ 586,530	Conductor & OHGW	$ 2,218,010
Total	$3,742,095	Total	$ 3,677,530
33% Overhead	x 1.33	8% Stores & 4% Tax	x 1.1232
		Material Total	$ 4,130,602
Labor Total	$4,976,986		$ 4,976,986
		ROW Easements	$ 2,224,200
		Subtotal	$11,331,788
		10% Engineering Cost	x 1.10
		ESTIMATED TOTAL COST	$12,464,967

Table 2

Project: Harris-Harnett 500 kV Line
Evaluation: #1 Basis: Unity

Criteria	Weight	Alternative Route Point Spread 1 Points	2 Points	3 Points	4 Points	5 Points	6 Points	7 Points	8 Points	9 Points	10 Points
Present Land Use	1	9.87	10.66	10.39	8.60	9.19	8.96	8.70	9.44	9.17	15.03
Construction	1	9.76	10.63	11.60	9.43	10.37	11.27	8.25	9.21	9.96	9.52
Reliability	1	7.49	7.90	7.75	9.33	9.77	8.90	14.52	14.89	10.63	8.82
Line Maintenance	1	10.31	11.05	10.98	10.01	10.79	10.66	8.68	9.32	9.17	9.03
Physiography	1	10.20	16.70	12.70	7.20	9.60	8.60	8.00	11.20	9.50	6.30
Ecology	1	10.95	12.59	11.59	8.58	9.82	9.11	8.30	9.98	8.89	10.19
Visibility	1	10.60	11.03	11.03	9.51	9.99	9.81	9.25	9.62	9.62	9.53
Cultural Resources	1	11.16	12.37	12.23	9.96	10.66	10.73	8.26	9.10	9.03	6.50
Electrostatics	1	9.78	11.03	9.78	8.99	10.01	8.99	10.01	11.38	10.01	10.01
Corridor Maintenance	1	9.74	10.59	11.67	9.42	10.32	11.31	8.21	9.14	9.97	9.63
Economics	1	10.58	10.61	10.90	10.02	9.99	10.30	8.92	9.32	9.75	9.66
Future Land Use	0	0	0	0	0	0	0	0	0	0	0
Permitting	0	0	0	0	0	0	0	0	0	0	0
System Development	0	0	0	0	0	0	0	0	0	0	0
Total Points		110.44	125.16	120.62	101.05	110.51	108.64	101.10	112.60	105.70	104.22
Rank		5	1	2	10	4	6	9	3	7	8
% Diff. from Base		13.3	0.0	3.8	23.9	13.3	15.2	23.8	11.1	18.4	20.1

Table 3

Project: Harris-Harnett 500 kV Line
Evaluation: #2 Basis: Subunit Recommended Weights

Criteria	Weight	Alternative Route Point Spread 1 Points	2 Points	3 Points	4 Points	5 Points	6 Points	7 Points	8 Points	9 Points	10 Points
Project Land Use	7	69.09	74.62	72.73	60.20	64.33	62.72	60.90	66.08	64.19	105.21
Construction	3	29.28	31.89	34.80	28.29	31.11	33.81	24.75	27.63	29.88	28.56
Reliability	3	22.47	23.70	23.25	27.99	29.31	26.70	43.56	44.67	31.89	26.46
Line Maintenance	2	20.62	22.10	21.95	20.02	21.58	21.32	17.36	18.64	18.34	18.06
Physiography	6	61.20	100.20	76.20	43.20	57.60	51.60	48.00	67.20	57.00	37.80
Ecology	7	76.65	88.13	81.13	60.06	68.74	63.77	58.10	69.86	62.23	71.33
Visibility	3	31.80	33.09	33.09	28.53	29.97	29.43	27.75	28.86	28.86	28.59
Cultural Resources	3	33.48	37.11	36.69	29.88	31.98	32.19	24.78	27.30	27.09	19.50
Electrostatics	2	19.56	22.06	19.56	17.98	20.02	17.98	20.02	22.76	20.02	20.02
Corridor Maintenance	2	19.48	21.18	23.34	18.84	20.64	22.62	16.42	18.28	19.94	19.26
Economics	10	105.80	106.10	109.00	100.20	99.90	103.00	89.20	93.20	97.50	96.60
Future Land Use	0	0	0	0	0	0	0	0	0	0	0
Permitting	0	0	0	0	0	0	0	0	0	0	0
System Development	0	0	0	0	0	0	0	0	0	0	0
Total Points		489.43	559.73	531.74	435.19	475.18	465.14	430.84	484.48	456.94	471.39
Rank		3	1	2	9	5	7	10	4	8	6
% Diff. from Base		14.4	0.0	5.3	28.6	17.8	20.3	29.9	15.5	22.5	18.7

Table 4

Project: Harris-Harnett 500 kV Line
Evaluation: #3 Basis: Access & Cost Most Important

Criteria	Weight	Alternative Route Point Spread 1 Points	2 Points	3 Points	4 Points	5 Points	6 Points	7 Points	8 Points	9 Points	10 Points
Present Land Use	5	49.35	53.30	51.95	43.00	45.95	44.80	43.50	47.20	45.85	75.15
Construction	10	97.60	106.30	116.00	94.30	103.70	112.70	82.50	92.10	99.60	95.20
Reliability	3	22.47	23.70	23.25	27.99	29.31	26.70	43.56	44.67	31.89	26.46
Line Maintenance	10	103.10	110.50	109.80	100.10	107.90	106.60	85.80	93.20	91.70	90.30
Physiography	4	40.80	66.80	50.80	28.80	38.40	34.40	32.00	44.80	38.00	25.20
Ecology	5	54.75	62.95	57.95	42.90	49.10	45.55	41.50	49.90	44.45	50.95
Visibility	2	21.20	22.06	22.06	19.02	19.98	19.62	18.50	19.24	19.24	19.06
Cultural Resources	3	33.48	37.11	36.69	29.88	31.98	32.19	24.78	27.30	27.09	19.50
Electrostatics	2	19.56	22.06	19.56	17.98	20.02	17.98	20.02	22.76	20.02	20.02
Corridor Maintenance	10	97.40	105.00	116.70	94.20	103.20	113.10	82.10	91.40	99.70	96.30
Economics	10	105.60	106.10	109.00	100.20	99.90	103.00	89.20	93.20	97.50	96.60
Future Land Use	0	0	0	0	0	0	0	0	0	0	0
Permitting	0	0	0	0	0	0	0	0	0	0	0
System Development	0	0	0	0	0	0	0	0	0	0	0
Total Points		645.51	716.78	713.76	598.37	649.44	656.64	564.46	625.77	615.04	614.74
Rank		5	1	2	9	4	3	10	6	7	8
% Diff. from Base		11.0	0.0	0.42	19.8	10.4	9.2	27.0	14.5	16.5	16.6

Table 5

Project: Harris-Harnett 500 kV Line
Evaluation: #4 Basis: Cost Most Important

Criteria	Weight	Alternative Route Point Spread 1 Points	2 Points	3 Points	4 Points	5 Points	6 Points	7 Points	8 Points	9 Points	10 Points
Present Land Use	5	49.35	53.30	51.95	43.00	45.95	44.80	43.50	47.20	45.85	75.15
Construction	4	39.04	42.52	46.40	37.72	41.48	45.08	33.00	36.89	39.84	38.08
Reliability	3	22.47	23.70	23.25	27.99	29.31	26.70	43.56	44.67	31.89	26.46
Line Maintenance	3	30.93	33.15	32.94	30.03	32.37	31.98	26.04	27.96	27.51	27.09
Physiography	4	40.80	66.80	50.80	20.80	38.40	34.40	32.00	44.80	38.00	25.20
Ecology	5	54.75	62.95	57.95	42.90	49.10	45.55	41.50	49.90	44.45	50.95
Visibility	2	21.20	22.06	22.06	19.02	19.98	19.62	18.50	19.24	19.24	19.06
Cultural Resources	3	33.48	37.11	36.69	29.88	31.98	32.19	24.78	27.30	27.09	19.50
Electrostatics	2	19.56	22.06	19.56	17.98	20.02	17.98	20.02	22.76	20.02	20.02
Corridor Maintenance	3	29.22	31.77	35.01	28.26	30.96	33.93	24.63	27.42	29.91	28.89
Economics	10	105.80	106.10	109.00	100.20	99.90	103.00	89.20	93.20	97.50	96.60
Future Land Use	0	0	0	0	0	0	0	0	0	0	0
Permitting	0	0	0	0	0	0	0	0	0	0	0
System Development	0	0	0	0	0	0	0	0	0	0	0
Total Points		446.6	501.52	485.61	398.05	439.45	435.53	396.73	441.29	421.30	427.00
Rank		3	1	2	9	5	6	10	4	8	7
% Diff. from Base		12.3	0.0	3.3	26.0	14.1	15.2	26.4	13.6	19.0	17.5

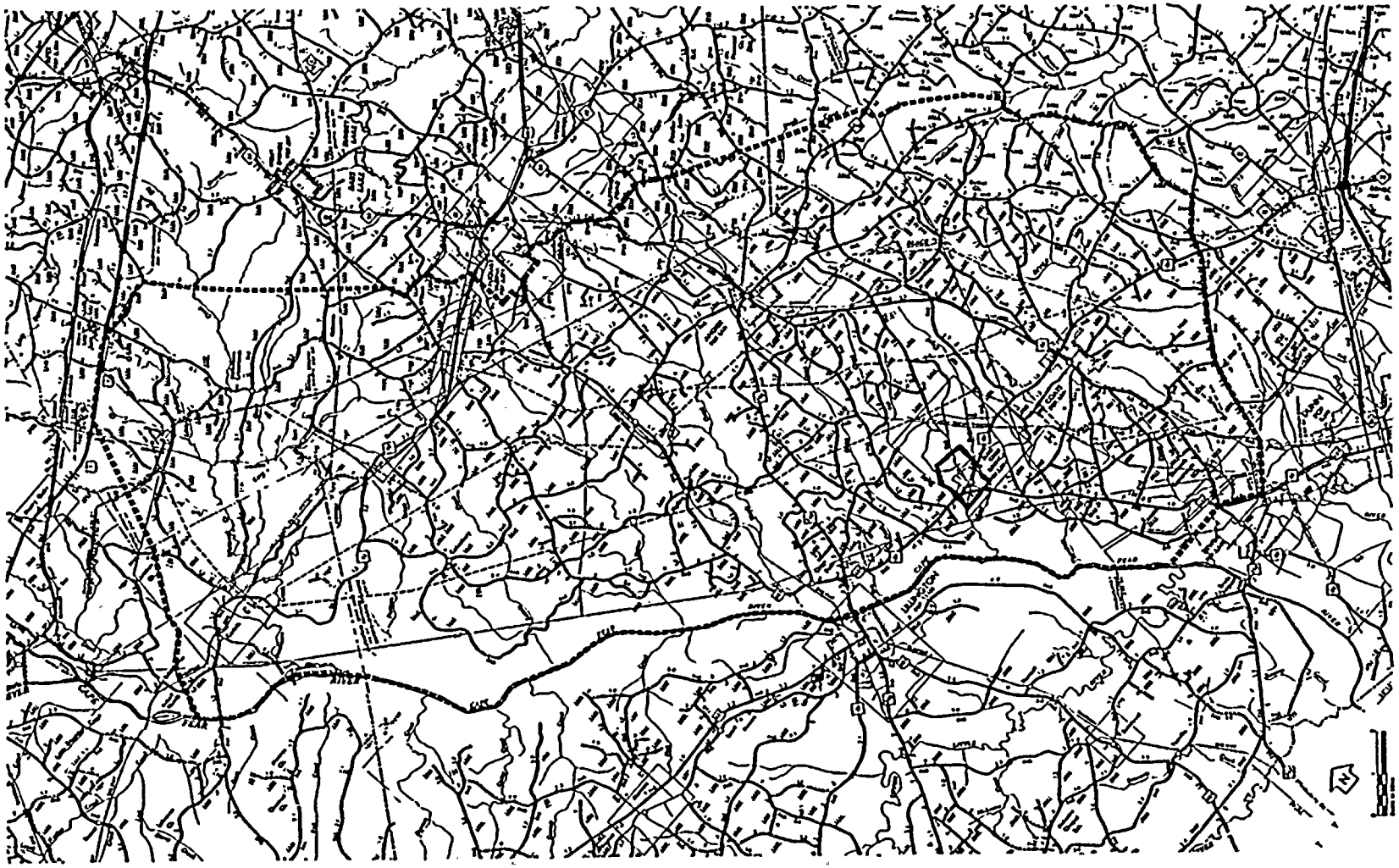
Table 6

Project: Harris-Harnett 500 kV Line
Evaluation: #5 Basis: Ecology, Cultural Resources, and Land Use Most Important

Criteria	Weight	Alternative Route Point Spread									
		1 Points	2 Points	3 Points	4 Points	5 Points	6 Points	7 Points	8 Points	9 Points	10 Points
Present Land Use	10	98.70	106.60	103.90	86.00	91.90	89.60	87.00	94.40	91.70	150.30
Construction	4	39.04	42.52	46.40	37.72	43.08	45.08	33.00	36.84	39.84	38.08
Reliability	3	22.47	23.70	23.25	27.99	29.31	26.70	43.56	44.67	31.89	26.46
Line Maintenance	3	30.93	33.15	32.94	30.03	32.37	31.98	26.04	27.96	27.51	27.09
Physiography	10	102.00	167.00	127.00	72.00	96.00	86.00	80.00	112.00	95.00	63.00
Ecology	10	109.50	125.90	115.90	85.80	98.20	91.10	83.00	99.80	88.90	101.90
Visibility	2	21.20	22.06	22.06	19.02	19.98	19.62	18.50	19.24	19.24	19.06
Cultural Resources	10	111.60	123.70	122.30	99.60	106.60	107.30	82.60	91.00	90.30	65.00
Electrostatics	3	29.34	33.09	29.34	26.97	30.03	26.97	30.03	34.14	30.03	30.03
Corridor Maintenance	3	29.22	31.77	35.01	28.26	30.96	33.93	24.63	27.42	29.91	28.89
Economics	5	52.90	53.05	54.50	50.10	49.95	51.50	44.60	46.60	48.75	48.30
Future Land Use	0	0	0	0	0	0	0	0	0	0	0
Permitting	0	0	0	0	0	0	0	0	0	0	0
System Development	0	0	0	0	0	0	0	0	0	0	0
Total Points		646.90	762.54	712.60	563.49	628.38	609.78	552.96	634.07	593.07	598.11
Rank		3	1	2	9	5	6	10	4	8	7
% of Diff. from Base		17.3	0.0	7.0	35.3	21.4	25.1	37.9	20.3	28.6	27.5

Table 7
Comparison of Rankings

Evaluation No.	Alternative Route 1	2	3	4	5	6	7	8	9	10
1	5	1	2	10	4	6	9	3	7	8
2	3	1	2	9	5	7	10	4	8	6
3	5	1	2	9	4	3	10	6	7	8
4	3	1	2	9	5	6	10	4	8	7
5	3	1	2	9	5	6	10	4	8	7



CAROLINA POWER & LIGHT CO.
RALEIGH, N. C.

HARRIS-HARNETT 500kv
ALTERNATE ROUTES

Figure 1