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August 3, 2017

VIA ELECTRONIC FILING

Ms. M. Lynn Jarvis, Chief Clerk
North Carolina Utilities Commission
4325 Mail Service Center
Raleigh, North Carolina 27699-4300

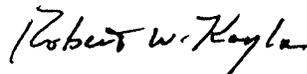
Re: Application of Duke Energy Progress, LLC for a Certificate of Environmental Compatibility and Public Convenience and Necessity to Construct a Transmission Line in Carteret County, North Carolina Docket No. E-2, Sub 1113

Dear Ms. Jarvis:

Pursuant to N.C. Gen. Stat. §§ 62-101 et seq. and Commission Rule R8-62, Duke Energy Progress, LLC (“DEP”) submits for filing its Application for a Certificate of Environmental Compatibility and Public Convenience and Necessity to construct approximately 6.91 miles of new 230kV transmission line in Carteret County, North Carolina, along with a draft public notice and the supporting testimony of Timothy J. Same and Mark Byrd. DEP will serve the parties identified in N.C. Gen. Stat. § 62-102(b) and will publish notice in the appropriate newspapers after the Commission approves the public notice pursuant to N.C. Gen. Stat. § 62-102(c). To meet the ten-day notification requirement, DEP respectfully requests that the Commission approve the public notice or identify any required changes within three (3) business days of the filing of this Application. A check in the amount of \$250 is enclosed for the Application filing fee.

Please let me know if you have any questions.

Sincerely,



Robert W. Kaylor

Enclosures

cc: David Drooz (w/encls.)

OFFICIAL COPY

Aug 03 2017

BEFORE THE NORTH CAROLINA UTILITIES COMMISSION
DOCKET NO. E-2, Sub 1113

In the Matter of)	
)	
Application of Duke Energy Progress, LLC)	DUKE ENERGY PROGRESS, LLC
For a Certificate of Environmental)	APPLICATION FOR A
Compatibility and Public Convenience and)	CERTIFICATE OF
Necessity Pursuant to <u>N.C. Gen. Stat. §§ 62-</u>)	ENVIRONMENTAL
<u>100 et seq.</u> to Construct Approximately)	COMPATIBILITY AND PUBLIC
6.91 Miles of New 230kV Transmission)	CONVENIENCE AND
Line in Carteret County, North Carolina)	NECESSITY

NOW COMES Duke Energy Progress, LLC (“DEP” or the “Company”), pursuant to N.C. Gen. Stat. §§ 62-100 et seq. and Rules R1-5 and R8-62 of the Rules of Practice and Procedure of the North Carolina Utilities Commission (“the Commission”) and files its Application for a Certificate of Environmental Compatibility and Public Convenience and Necessity (“Certificate”) to construct a new 230kV transmission line in Carteret County, North Carolina. The new 230kV line will extend west approximately 6.91 miles between DEP’s existing Havelock–Morehead Wildwood 115kV North line near the Town of Harlowe and the existing Havelock – Morehead Wildwood 230kV line near the Town of Newport, both located in Carteret County, North Carolina. In support thereof, DEP shows the following:

1. The Applicant’s regional headquarters and general offices are located at 410 South Wilmington Street, Raleigh, North Carolina, and its mailing address is:

Duke Energy Progress, LLC
410 S. Wilmington Street
NCRH 20 / P. O. Box 1551
Raleigh, North Carolina 27602

2. The names and addresses of Applicant’s attorneys are:

Lawrence B. Somers, Deputy General Counsel
Duke Energy Progress, LLC
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Raleigh, North Carolina 27609
Tel: (919) 828-5250
bkaylor@rwkaylorlaw.com

Copies of all pleadings, testimony, orders, and correspondence in this proceeding should be served upon the attorneys listed above.

3. Duke Energy Progress is engaged in the generation, transmission, distribution, and sale of electricity at retail in the eastern and western portions of North Carolina, and the northeastern portion of South Carolina. It also sells electricity at wholesale to many municipal, cooperative, and investor-owned electric utilities. The Company is authorized to transact business in the State of North Carolina and is a public utility under the laws of the State of North Carolina. Accordingly, its operations in the State of North Carolina are subject to the jurisdiction of the Commission.

4. DEP is required by the Federal Energy Regulatory Commission (“the FERC”) to comply with the Reliability Standards of the North American Electric Reliability Corporation (“NERC”). NERC may impose stringent penalties for violations of NERC Reliability Standards. In accordance with these standards, DEP plans its transmission system to supply projected demands in a reliable manner at all demand levels over the range of forecast system demand, under contingency conditions. In

compliance with these Reliability Standards, DEP routinely conducts studies of its transmission system to identify required improvements.

5. By summer 2020, an outage of the Havelock terminal of the Havelock – Morehead Wildwood 115kV North line will cause voltages in the Havelock area to fall below planning criteria. The construction of this new line will mitigate the voltage problem and increase electric capacity and service reliability across the Eastern North Carolina region.

6. The new line from the proposed Harlowe 115kV – 230kV Substation located north of State Route (“SR”) 101 in the Town of Harlowe to the proposed Newport 230kV Switching Station along the Havelock – Morehead Wildwood 230kV line near the Town of Newport will increase electric capacity for the immediate area and ensure reliable service in the DEP service area in this region. Maintaining the transmission backbone is critical to ensuring that electricity remains reliable in the future. The new line will provide benefits to the entire region, including Carteret and Craven County residents and businesses, through enhanced reliability. The transmission system serves DEP customers as well as customers of rural electric cooperatives and municipally owned electric utilities.

7. In order to construct the proposed 230kV transmission line, DEP must first obtain a Certificate from the Commission pursuant to N.C. Gen. Stat. § 62-102.

8. The project study area is located in the Eastern Region of North Carolina between the City of Havelock and the Towns of Newport and Harlowe within Carteret and Craven Counties. The study area is generally bound by the Havelock – Morehead Wildwood 115kV line and US 70 to the west, SR 101 and the Marine Corps Air Station

(“MCAS”) Cherry Point to the north, public and private roads to the east, and the Newport River to the south. The Croatan National Forest (“CNF”), managed by the U.S. Forest Service, bisects the central portion of the study area. The study area and regional features are shown in Figure 2-1 of the Routing Study and Environmental Report (“Report”) attached as Exhibit A to this Application.

9. The initial preferred route begins at the proposed Harlowe 230kV – 115kV Substation southeast of the Town of Harlowe and north of SR 101 as shown in Figure 4-5 of the Report. The alignment exits the substation to the west for approximately 0.35 miles and then turns southwest for approximately 0.85 miles, crossing the Harlowe Creek Clubfoot Canal and SR 101. West of SR 101, the route continues along an increasingly western heading for approximately 1.13 miles before it arrives at the eastern boundary of the CNF. The route continues west southwest crossing through the CNF for approximately 1.2 miles. Upon exiting the CNF, the route continues west and parallels the CNF boundary for approximately 3.17 miles until it meets the Havelock – Morehead Wildwood 115kV South Transmission Line northeast of the Town of Newport. From here, the alignment turns north and parallels the existing overhead transmission line for approximately 1.56 miles before arriving at the proposed Newport 230kV Switching Station as shown in Figure 2-2 of the Report.

10. After the selection of the preferred route and preparation of the routing and siting report, DEP found that the site for the proposed Harlowe 230kV – 115kV Substation had been cleared of timber, which revealed that features regulated under the Clean Water Act are prevalent across the entire site. Any configuration of the proposed substation on that site would result in significant fill within jurisdictional areas. Around

this same time, DEP received a letter from Mr. Joel Davis (attached in Appendix A of the Report), a significant land holder in the region and the largest single private property owner impacted by the proposed preferred route, about the possibility of finding a potential substation site on one of his parcels near the preferred route. DEP and Mr. Davis were able to identify a mutually agreeable location that appears to minimize impacts to features regulated under the Clean Water Act and minimize impacts to timber production on Mr. Davis' property, while still continuing to meet the project purpose and need.

Changing the substation location required slightly adjusting the alignment of the preferred route, which shortened the total route length to approximately 6.91 miles, and further minimized impacts to the human and natural environment. No new landowner is impacted with this revision. In addition to shortening the overall length, the newly proposed Harlowe Substation will be located west of SR 101 and eliminate the previously proposed highway crossing as well as the crossing of Harlowe Canal. The new alignment and substation locations are illustrated in Figure 5-1 of the Report, and a summary of the updated route with changes is provided below.

The following is a detailed description of the path taken by the revised preferred route. The revised preferred route begins at the proposed Harlowe 230kV – 115kV Substation near the Town of Harlowe and southwest of SR 101. The alignment exits the Substation heading west for approximately 1.29 miles across private pine plantations before it arrives at the eastern boundary of the CNF. The route then crosses through the CNF for approximately 0.95 miles. Upon exiting the CNF, the route continues west and parallels the CNF boundary for approximately 3.12 miles across active forest plantations, Significant Natural Heritage Areas, and private conservation easements until it meets the

Havelock-Morehead Wildwood 115kV South Transmission Line north of the Town of Newport. In the vicinity of this location, the route crosses an additional 1,310 feet of CNF lands. From here, the alignment turns north and parallels the existing overhead transmission line for approximately 1.55 miles before arriving at the proposed Newport 230kV Switching Station.

The slight modification of the proposed Newport 230kV Switching Station (on the same piece of property) required adjusting the end of the alignment just slightly but did not introduce any new environmental constraints or impacts to the human environment. Relocation of the proposed Harlowe 230kV – 115kV Substation reduced the overall length of the preferred route by 14%, or 1.1 miles. At this location, the revised preferred route now measures 6.91 miles in length and avoids crossings of both SR 101 and the historic Harlowe Canal. Impacts to the natural and human environment are further reduced by this change in alignment. The Right-Of-Way of the preferred route crosses approximately 12.06 fewer acres of wetlands, of which 11.93 acres are forested wetlands, and has fewer residential buildings in proximity.

10. The transmission line routing process, studies, and physical properties are fully described in the Report. The Report satisfies all of the requirements of N.C. Gen. Stat. § 62-102. “Exhibit B” is a draft public notice summarizing the Application that DEP proposes to publish in the newspapers of general circulation serving the portions of Carteret County impacted by the proposed line. DEP will publish this public notice upon Commission approval and will serve the parties identified in N.C. Gen. Stat. § 62-102(b) with a copy of this Application and the public notice stating the date the Application was

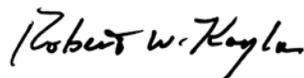
filed, the date by which parties must seek intervention, and the statute and the rule governing intervention.

11. The information and data required to be filed by Commission Rule R8-62 is supported by the testimony of Timothy J. Same and Mark Byrd, being filed simultaneously with this Application and incorporated herein by reference.

WHEREFORE, Duke Energy Progress requests that the Commission grant the Company a Certificate of Environmental Compatibility and Public Convenience and Necessity to construct approximately 6.91 miles of new 230kV transmission line in Carteret County, North Carolina.

Respectfully submitted this 3rd day of August, 2017.

DUKE ENERGY PROGRESS, LLC



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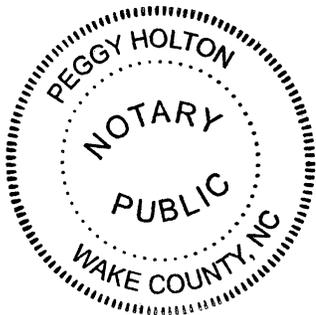
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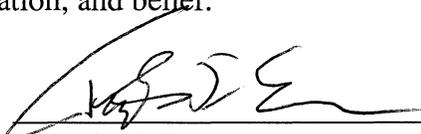
ATTORNEYS FOR DUKE ENERGY
PROGRESS, LLC

VERIFICATION

STATE OF NORTH CAROLINA)
)
COUNTY OF WAKE) DOCKET NO. E-2, SUB 1113

PERSONALLY APPEARED before me, Timothy J. Same, after first being duly sworn, said that he is Lead Transmission Siting Specialist – Siting, Permitting and Engagement for Duke Energy Progress, LLC and as such is authorized to make this verification; that he has read the foregoing *Application for a Certificate of Environmental Compatibility and Public Convenience and Necessity* and knows the contents thereof; and that the same are true and correct to the best of his knowledge, information, and belief.





Timothy J. Same
Lead Transmission Siting Specialist
Siting, Permitting and Engagement
Duke Energy Progress, LLC

Sworn to and subscribed before me this 27th day of July, 2017.

Peggy Holton
Notary Public Peggy Holton

My Commission expires: 12/22/2021

**Routing Study and
Environmental Report**

for the

**Harlowe — Newport 230kV
Transmission Line Project**

July 2017

Prepared for



Prepared by



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ACRONYMS AND ABBREVIATIONS

A&NC	Atlantic and North Carolina Railroad
BGPA	Bald and Golden Eagle Protection Act
C2Env	C2 Environmental, Inc.
CAMA	NC Coastal Area Management Act
CLT	Coastal Land Trust
CNF	Croatan National Forest
DCM	NC Division of Coastal Management
DEP	Duke Energy Progress
E	Endangered Species
FDP	NC Forest Development Program
FSC	Federal Species of Concern
FSW	Future Water Supply
GIS	Geographic Information System
HQW	High Quality Waters
ID	Identification
MCAS	Marine Corps Air Station
NC	North Carolina
NCDEQ	NC Department of Environmental Quality
NCDOT	NC Department of Transportation
NCDWR	NC Division of Water Resources
NCFS	NC Forest Service
NCOSA	NC Office of State Archaeology
NCSHPQ	NC State Historic Preservation Office
NHD	USGS National Hydrology Dataset
NHP	NC Natural Heritage Program
NRCS	National Resource Conservation Service
NRHP	Nation Register of Historic Places
NSW	Nutrient Sensitive Waters
NWI	USFWS National Wetlands Inventory
NWIS	USGS National Water Information System
PEM	Palustrine Emergent
PETS	USDA Protected, Endangered, Threatened and Sensitive Species
PFO	Palustrine Forested
PSS	Palustrine Scrub/Shrub
RCW	Red Cockaded Woodpecker
ROW	Right-of-Way
SC	Special Concern Species
SNHA	Significant Natural Heritage Areas
SPCA	NC Sediment Pollution Control Act
Spp.	Species'
SR	State Route

SR	Significantly Rare Species
Stantec	Stantec Consulting Services, Inc.
T	Threatened Species
T&E	Threatened and Endangered Species
TNC	The Nature Conservancy
U.S.	United States
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

1.0 INTRODUCTION

This report has been prepared in accordance with the requirements of Article 5A, Chapter 62 of the North Carolina General Statutes for the proposed Duke Energy Progress (DEP) Harlowe – Newport 230 kilovolt (kV) Transmission Line project. According to Article 5A, a Certificate of Environmental Compatibility and Public Convenience and Necessity is required for construction of a line designed to carry more than 161kV.

To continue providing reliable electric service to customers in the Eastern North Carolina region, DEP proposes to design, build, and operate a new 230kV transmission line called the Harlowe – Newport 230kV line. The new 230kV line will extend west approximately 8.01 miles between DEP's existing Havelock – Morehead Wildwood 115kV North line near the Town of Harlowe and the existing Havelock – Morehead Wildwood 230kV line near the Town of Newport, both located in Carteret County, North Carolina. A new substation, the Harlowe 230kV – 115kV Substation, will be constructed north of State Route (SR) 101 near the Town of Harlowe to connect the new 230kV line to the existing Havelock – Morehead Wildwood 115kV North line. The project will terminate at the new Newport 230kV Switching Station which will be constructed near Newport to connect the existing Havelock – Morehead Wildwood 230kV line to the proposed 230kV line.

DEP retained Stantec Consulting Services, Inc. (Stantec) and C2 Environmental, Inc. (C2Env) to assist with the line routing and public involvement for the project. Stantec and C2Env also assisted with the selection of routing alternatives and the preparation of this routing study and environmental report. This report contains a summary of the route selection process, public involvement activities, and the potential environmental impacts of the preferred route. The study was completed in support of an application for a Certificate of Environmental Compatibility and Public Convenience and Necessity from the North Carolina Utilities Commission (NCUC).

The following sections include a description of the project, including the need (Chapter 2.0) and a description of the existing environmental and social conditions in the study area (Chapter 3.0). The analysis of routing alternatives is described in Chapter 4.0, environmental impacts of the proposed project are discussed in Chapter 5.0, proposed mitigation measures are described in Chapter 6.0 and a summary of necessary approvals and permits is provided in Chapter 7.0. The project is summarized in Chapter 8.0 and references are included in Chapter 9.0. Appendix A includes copies of agency correspondence and public involvement documentation.

2.0 PROJECT DESCRIPTION

2.1 OVERVIEW

DEP proposes to construct a new 230kV transmission line between the existing Havelock – Morehead Wildwood 115kV North line near the Town of Harlowe and the Havelock – Morehead Wildwood 230kV line near the Town of Newport, both in Carteret County, North Carolina. This proposed addition is needed to meet the growing demand for reliable electric power within the region.

2.2 DESCRIPTION OF THE PROJECT

The project includes the construction, operation and maintenance of a new overhead 230kV line. The new 230kV line will extend west approximately 8.01 miles between DEP's existing Havelock – Morehead Wildwood 115kV North line near the Town of Harlowe and the existing Havelock – Morehead Wildwood 230kV line near the Town of Newport, both located in Carteret County, North Carolina. A new substation, the Harlowe 230kV – 115kV Substation, will be constructed north of SR 101 near the Town of Harlowe to connect the new 230kV line to the existing Havelock – Morehead Wildwood 115kV North line. The project will terminate at the new Newport 230kV Switching Station which will be constructed near Newport to connect the existing Havelock – Morehead Wildwood 230kV line to the proposed 230kV line. The proposed line will be owned and operated by DEP. Alternative routes were identified and evaluated as part of the routing and siting process, and ultimately, a preferred route was identified. The routing and siting process is described further in Chapter 4.0.

2.2.1 Purpose and Necessity

DEP has a state- and federally-mandated responsibility to ensure reliable electric service. The project is needed to ensure a continuous reliable supply of electricity to homes and businesses throughout the region. By summer 2020, an outage of the Havelock terminal of the Havelock – Morehead Wildwood 115 kV North line will cause voltages in the Havelock area to fall below planning criteria. The construction of this new line will mitigate this voltage problem and increase electric capacity and service reliability across the Eastern North Carolina region.

The transmission line will run from the proposed Harlowe 115kV – 230kV Substation located north of SR 101 in the Town of Harlowe to the proposed Newport 230kV Switching Station to be constructed along the Havelock – Morehead Wildwood 230kV line near the Town of Newport. The new line will increase electric capacity for the immediate area and ensure reliable service in the DEP service area in this region. Maintaining the transmission backbone is critical to ensuring that electricity remains reliable in the future.

The new line will provide benefits to the entire region, including Carteret and Craven County residents and businesses, through enhanced reliability. The transmission system serves DEP customers as well as customers of rural electric cooperatives and municipally owned electric utilities.

2.2.2 Location

The project study area is located in Eastern Region of North Carolina between the City of Havelock and Towns of Newport and Harlowe within Carteret and Craven Counties. The study area is generally bound by the Havelock – Morehead Wildwood 115kV line and US 70 to the west, SR 101 and the Marine Corps Air Station (MCAS) Cherry Point to the north, public and private roads to the east, and the Newport River to the south. The Croatan National Forest (CNF), managed by the USFS, bisects the central portion of the study area. The study area and regional features are shown in Figure 2-1.

The preferred route begins at the proposed Harlowe 230kV – 115kV Substation southeast of the Town of Harlowe and north of SR 101 (Figure 2-2). The alignment exits the substation to the west for approximately 0.35 miles and then turns southwest for approximately 0.85 miles, crossing the Harlowe Canal and SR 101. West of SR 101, the route continues along an increasingly western heading for approximately 1.18 miles before it arrives at the eastern boundary of the CNF. The route continues west southwest crossing through the CNF for approximately 0.95 miles. Upon exiting the CNF, the route continues west and parallels the CNF boundary for approximately 3.12 miles until it meets the Havelock – Morehead Wildwood 115kV South Transmission Line northeast of the Town of Newport. From here, the alignment turns north and parallels the existing overhead transmission line for approximately 1.56 miles before arriving at the proposed Newport 230kV Switching Station (Figure 2-2).

2.2.3 Structures

Weathering steel H-frame structures will be used for the new line. In certain situations, depending on environmental factors (e.g., groundwater and soils), galvanized steel poles may be used in lieu of weathering steel poles. Guy wires will be used to anchor the poles and provide structural stability. Figure 2-3 depicts a typical single-circuit tangent H-frame structure and Figure 2-4 shows a typical three-pole structure required for line angles. The single-circuit structures will be designed to support three phases of single 1590 conductor, one optical ground wire and one overhead ground wire. Ground clearance will meet or exceed the National Electrical Safety Code requirements for a 230kV transmission line. Pole heights for the new single-circuit H-frame structures will be approximately 65 to 110 feet above ground, on average. The structures will be spaced approximately 500 to 700 feet apart. Heights and spans may vary depending on the design, terrain, or measures to mitigate potential impacts of the line.

2.2.4 Right-of-Way

The alternatives evaluated for the proposed project will require two right-of-way (ROW) widths, depending upon whether the line will be constructed parallel to an existing line or on new ROW. As detailed further in Section 4.0, there were no feasible opportunities to double-circuit the line with an existing line. As such, this option was not included in the routing analysis.

Where the preferred route will not be parallel with an existing transmission line, the 230kV transmission line will require a new 125-foot wide ROW. The new line will be located in the center of the ROW with 62.5 feet on each side of the transmission line centerline (Figure 2-5). When parallel to existing lines, the new ROW for the preferred route will share some ROW with the existing line such that only approximately 82.5 feet of new ROW is required (Figure 2-6). Other alternatives, which were studied but not selected as the preferred route (see Chapter 4.0), generally required a new 125-foot ROW as well, as there were a number of constraints to paralleling existing infrastructure.

Once a route has been approved by the NCUC, DEP land agents will work with individual property owners to purchase ROW for the new line. DEP pays fair market value for ROWs, and landowners retain ownership of the property with some limitation on the use of the land in the ROW. Under the agreement, property owners could not place any permanent structures within the corridor that will interfere with the conductors or restrict complete access for maintenance of the line or ROW.

2.3 CONSTRUCTION, OPERATION, AND MAINTENANCE

The transmission line will be constructed using both rubber-tired and tracked equipment. The appropriate materials will be delivered to each structure location for assembly. Holes for each pole will be dug with an auger and the poles will be erected using a crane. Excess soil from the holes will be evenly distributed around each pole and the soil stabilized in upland areas. In wetland areas, the method used for the installation of poles will depend on the nature of the sub-surface conditions. Under most circumstances, the poles will be buried directly into the ground. However, if poor sub-surface soil conditions are encountered, steel caissons may be necessary. The steel caissons will be vibrated into the ground and the poles will be set on top of the steel caisson. Conductors will be pulled through each structure using tensioning equipment.

Maintaining the ROWs under transmission lines is essential for the reliable operation of the line and public safety. Operation and maintenance of the line will consist of periodic inspections of the line and

ROW, replacement of hardware as necessary, and periodic cutting of danger trees and tall vegetation within the corridor. Danger trees are trees outside the cleared corridor that are sufficiently tall to potentially impact the transmission line should the trees fall into the ROW. The periodic inspections will occur on a regular basis and utilize both aircraft and walking patrols. Normal operation and maintenance will require only infrequent visits by DEP or their contractors.

DEP will use an Integrated Vegetation Management approach that includes both mechanical and chemical control methods to maintain the ROW. Most maintenance activities consist of mowing or hand-cutting the entire ROW every three to six years and cutting danger trees approximately every five to fifteen years. Herbicides will be used on a very limited basis and are generally applied at low volumes approximately every five years, except on CNF property unless prior approvals are obtained. DEP only uses herbicides approved by the U.S. Environmental Protection Agency for use on power line ROWs. Herbicides cannot be used on U.S. Forest Service (USFS) lands unless prior approvals are obtained.

2.4 PROJECT SCHEDULE

The projected schedule for the Harlowe – Newport 230kV project is described below:

- Route Selection: Mid 2016
- NCUC Review: Mid to Late 2017
- ROW Acquisition: Mid 2016 through Late 2017
- Clearing: Early 2019
- Construction: Mid 2019 through Early 2020
- In-Service Date: March 2020

2.5 PROJECT COST

The total project cost estimated for the new Harlowe – Newport 230kV project is approximately \$32 million. This estimate includes company labor, contract labor, ROW acquisition, materials, clearing, construction, project administration, overhead, and taxes. Actual cost may vary from the estimate depending on final appraised land values, condemnation costs, final engineering plans, construction labor, and environmental permitting.

3.0 DESCRIPTION OF THE PROJECT AREA

The study area encompasses portions of Carteret and Craven counties including the City of Havelock and Towns of Newport and Harlowe within Eastern Region of North Carolina (Figure 2-1). The study area is generally bound by the Newport River to the south, the existing DEP Havelock - Morehead Wildwood 115kV South Transmission Line and US 70 to the west, the MCAS Cherry Point and SR 101 to the north, and a series of public and private roads to the east. The CNF bisects the central portion of the study area.

3.1 NATURAL RESOURCES

The following is a description of natural resources in the study area that could be affected by the construction and operation of the proposed project. These resources include physiography, hydrology, vegetation, wetlands, and wildlife. The potential impacts of this project upon these resources are described in Chapter 5.0.

3.1.1 Topography

North Carolina is characterized by three major physiographic provinces: Mountains, Piedmont and Coastal Plain. The study area is situated entirely within the Coastal Plain physiographic province. The province is generally divided into two regions, the Outer Coastal Plain and the Inner Coastal Plain. The Outer Coastal Plain includes the Outer Banks, a series of barrier islands, and the Tidewater areas. The Tidewater is the area along the coast with elevations ranging between sea level and 25 feet above mean sea level. The Tidewater area includes seven sounds, many low-lying areas and wetlands, and portions of the Great Dismal Swamp. The Inner Coastal Plain is characterized by higher elevations ranging from 1,000 feet to 25 feet above mean sea level and begins west of the Tidewater (DPI 2016). The rich, sandy soil in this region provides some of the state's best farmland. The majority of the study area is located in the Tidewater with a small western portion of the study area extending into the Inner Coastal Plain.

3.1.2 Soils

Land use patterns in the study area are influenced by the suitability and limitations of soil properties for development. The U.S. Department of Agriculture (USDA), Natural Resource Conservation Service (NRCS) has surveyed and mapped the soil units in each of the counties based on the physical properties and composition of the soil and the amount of slope and drainage where the soil is located. These soil maps are helpful in planning future land use and development.

Specific soil classifications are called soil map units. Soil map units describe the soil characteristics in a specific geographic area. The study area consists of a diverse assemblage of soil types with the greatest diversity occurring around the developed regions of the study area (NRCS 2015). The study area is dominated by Torhunta mucky fine loamy sand (To) and Deloss fine sandy loam (De) with additional large areas of Tomotely fine sandy loam (Tm), Pantego fine sandy loam (Pa), Rains fine sandy loam (0 to 2 percent slopes), Atlantic Coast Flatwoods (Ra). Additional soil groups comprising very minor portions (<10 percent total) of the study area include Croatan muck (CT), Altavista loamy fine sand (0 to 2 percent slopes) (AaA), Masontown mucky loam (frequently flooded) (MA), and Ponzer muck (PO).

The Torhunta, Croatan, and Pantego soil units are largely associated with the CNF, with Pantego soils being located to the north of the forest within the study area and Torhunta and Croatan soils being located in the central and southern portions of the forest. Deloss soils are generally located around the Harlowe area, and the Masontown soils are associated with Mill Creek Pond. The remaining portions of the study area are a mixture of numerous soil types. Table 3-1 provides a more detailed description of the dominant soil associations within the study area (NRCS 1992a, 1992b).

**Table 3-1
Soil Associations within the Study Area**

Soil Association	Characteristics
Torhunta Mucky Fine Sandy Loam (To)	<ul style="list-style-type: none"> ▪ Nearly level, poorly drained loamy soils on broad upland flats ▪ Largely associated with CNF ▪ Seasonal high water table is at or near the surface ▪ Used mainly as woodland but in some areas also for crops or pastureland ▪ Restrictive feature: high water table
Deloss Fine Sandy Loam (De)	<ul style="list-style-type: none"> ▪ Nearly level, poorly drained on broad flats and in depressions on low marine and stream terraces ▪ Associated with Harlowe community area ▪ Seasonal high water table at or near the surface ▪ Used mainly as woodland and also crops and pastureland in some areas ▪ Restrictive feature: wetness, ponding and rare flooding
Tomotely Fine Sandy Loam (Tm)	<ul style="list-style-type: none"> ▪ Nearly level and poorly drained on broad flats and in depressions on low marine and stream terraces ▪ Largely associated with CNF ▪ Seasonal high water table at or near the surface ▪ Used mainly as woodland and also crops and pastureland in some areas ▪ Restrictive feature: wetness and rare flooding of low-lying areas

Soil Association	Characteristics
Croatan Muck (CT)	<ul style="list-style-type: none"> ▪ Nearly level and very poorly drained on broad flats and depressions known as pocosins ▪ Largely associated with uplands in the CNF ▪ Water table is at or near the surface ▪ Used mainly as native woodland ▪ Restrictive features: extreme wetness, low fertility, possible ground fires after artificial drainage, subsidence, reactivity
Pantego Fine Sandy Loam (Pa)	<ul style="list-style-type: none"> ▪ Nearly level and very poorly drained on broad flats and upland depressions ▪ Largest areas are in CNF ▪ Seasonal high water table is at or near the surface ▪ Used mainly as woodland and also crops and pastureland in a few areas ▪ Restrictive features: seasonal wetness and ponding in depressions
Rains Fine Sandy Loam (Ra)	<ul style="list-style-type: none"> ▪ Nearly level and poorly drained on broad flats and upland depressions ▪ Seasonal high water table is at or near the surface ▪ Used mainly as woodland and also crops and pastureland in a few areas ▪ Restrictive features: seasonal wetness

Table provided includes only those dominant soils that individually comprise more than 10 percent of the study area.

3.1.3 Hydrology

According to the State Climate Office of North Carolina (North Carolina Department of Environment Quality [NCDEQ, 2001]), North Carolina receives an average of 48 inches of rain per year. The study area is drained by the White Oak River Basin as well as the Neuse River Basin (North Carolina State University 2016). The Neuse River Basin runs to the Pamlico Sound near New Bern, and the White Oak River Basin runs to the Atlantic Ocean. The White Oak River Basin is divided into four sub-basins: New River, White Oak River, Newport River and North River. The rivers in this basin flow southeast into the estuaries of the Back, Core and Bogue Sounds. While none of these major rivers cross the study area, the Newport River is a prominent water feature running to the south of the study area. The river runs through the Town of Newport to the west of the study area boundary and drains to the Bogue Sound between Morehead City and Beaufort.

The majority of the public water supply within the area is derived from groundwater withdrawals. According to the U.S. Geological Survey's (USGS) National Water Information System (NWIS), of the 66,469 people within Carteret County, a total of 46,528 people are served by groundwater (USGS 2012). Likewise, of the 103,505 residents of Craven County, the public supply population served by groundwater is 72,454 (USGS 2012). The per capita use for Carteret County is 149 gallons per person per day with 3.26 million gallons per day (MGD) being delivered to domestic end-users. Craven County is documented to have a per capita use of 195 gallons per person per day with 5.07 MGD being delivered to

domestic end-users. Additional public self-supplied groundwater withdrawals account for 6.91 MGD and 14.15 MGD in Carteret and Craven Counties, respectively.

Surface water in North Carolina is assigned a primary classification by the NCDEQ (2016). Primary classifications are used to define the best uses (swimming, fishing, drinking water supply) to be protected within each waterbody. All waters must at least meet the standards for Class C (fishable / swimmable) waters. The other primary classifications provide additional levels of protection for primary water contact recreation (Class B) and drinking water (Water Supply Classes I through V). Nine of the streams in the study area have a primary classification of Class C including Little Deep Creek (21-11), Sandy Branch (21-13), Black Creek (21-16), Mill Pond (21-16), Billys Branch (21-16-3), Money Island Swamp (21-16-2), Ghouls Fork (21-16-1), Caps Branch (27-112-2-2), and Main Prong (21-16-1), each listed with stream index number. An ‘S’ added to a primary classification indicates that the waterbody is a tidal saltwater waterbody. Five systems, Shop Branch (27-115-3), Deep Branch (27-115-2), Hancock Creek (27-115), Mocoeks Branch (27-115-1), Cahoogue Creek (27-115-7), all carry a classification of “SC.” Nine systems, Little Creek Swamp (21-18), Mill Creek (21-19), Big Creek (21-20), Little Creek (21-21), Alligator Creek (21-22-2), Harlowe Creek (21-22), Harlowe Canal (21-22-1), West Prong Mortons Mill Pond (27-123-2-1), East Prong Mortons Mill Pond (27-123-2-2) and Mortons Mill Pond (27-123-2), all carry a classification of “SA” for market shellfishing, saltwater (NCDEQ 2016).

Supplemental classifications are sometimes added to the primary classifications to provide extra protection to waters with special uses. For example, Future Water Supply (FWS) is a supplemental classification for waters intended as a future source of drinking, culinary or food processing purposes. High Quality Waters (HQW) is a supplemental classification intended to protect waters which are rated excellent based on physical and chemical characteristics and nursery areas designated by the Marine Fisheries Commission. Nutrient Sensitive Waters (NSW) are those waters which require additional nutrient management due to being subject to excessive growth of microscopic or macroscopic vegetation. Little Creek Swamp, Mill Creek, Big Creek, Little Creek, Alligator Creek, Harlowe Canal, and Harlowe Creek, which all drain to the Newport River, carry the HQW supplemental designation. West Prong Mortens Mill Pond, East Prong Mortons Mill Pond, and Mortons Mill Pond, all of which drain to Clubfoot Creek and the Neuse River, are also designated HQW by the NCDEQ (NCDEQ 2016). Caps Branch, Shop Branch, Deep Branch, Hancock Creek, Mocoeks Branch, Cahoogue Creek, the East and West Prongs of Mortons Mill Pond, Mortons Mill Pond, Harlowe Canal, and Harlowe Creek all carry the NSW designation. There are no wild or scenic rivers within the study area.

3.1.4 Vegetation

The study area lies within the Outer Coastal Plain Mixed Forest Ecological Province in the Atlantic Coastal Flatwoods section, which is dominated by mosaics of pine and hardwood stands. Longleaf pine (*Pinus palustris*)-slash pine (*P. elliotii*) forests and loblolly pine (*P. taeda*)-shortleaf (*P. echinata*) pine forests are interspersed with oak-gum-cypress hardwood stands. Common tree species within the Atlantic Coastal Flatwoods include: longleaf pine, slash pine, loblolly pine, shortleaf pine, sweetgum (*Liquidambar styraciflua*), black gum (*Nyssa sylvatica*), red maple (*Acer rubrum*), red bay (*Persea borbonia*), sweetbay (*Magnolia virginiana*), and winged elm (*Ulmus alata*). Various species of oaks and hickories are also present in this Ecological Province, including white oak (*Quercus alba*), red oak (*Q. rubra*), post oak (*Q. stellata*), black oak (*Q. velutina*), chinquapin oak (*Q. muehlenbergii*), mockernut hickory (*Carya alba*), red hickory (*C. ovalis*), pignut hickory (*C. glabra*), and Carolina shagbark hickory (*C. carolinae-septentrionalis*). Dogwood (*Cornus spp*), viburnum (*Viburnum spp*), blueberry (*Vaccinium spp*), American beautyberry (*Callicarpa americana*), holly (*Ilex spp*), and many other woody shrubs and vines are common to the Outer Coastal Plain Mixed Forest Ecological Province. Common grasses that may occur within the study area include bluestems (*Andropogon spp*), panicums (*Dicanthelium spp*), and wiregrasses (*Aristida spp*) (USDA, 2005; Rudis, 1999).

Natural communities within the study area include tidal swamps (Cypress-Gum subtype), low pocosins (Titi subtype), Coastal Plain Semipermanent Impoundment (Open Water subtype), high pocosin (Evergreen subtype), pond pine woodlands (Typic subtype), mesic pine savanna (Coastal Plain subtype) and Coastal Plain semipermanent impoundment (Cypress-Gum subtype).

3.1.5 Protected and Rare Plant Species

The North Carolina Natural Heritage Program (NHP 2016a) and the U.S. Fish and Wildlife Service (USFWS 2016) websites were reviewed for records of known federally threatened and endangered plant species within the study area (see Table 3-2). The search results indicated the potential presence of the federally and state endangered rough-leaved loosestrife (*Lysimachia asperulaefolia*), the federally and state threatened seabeach amaranth (*Amaranthus pumilus*) and federally threatened sensitive joint-vetch (*Aeschynomene virginica*). Three state-listed threatened plants and one state-listed endangered plant were identified as potentially occurring. The bog bluestem (*Andropogon mohrii*), branched gerardia (*Agalinis virgata*), and comfortroot (*Hibiscus aculeatus*) are all state-listed threatened, and the viviparous spikerush (*Eleocharis vivipara*) is state-listed as endangered. Two federal species of concern, the spring-flowering goldenrod (*Solidago verna*) and spoonflower (*Peltandra sagittifolia*), were also identified. These two species also carry a state significantly rare designation. Three additional state-designated

significantly rare plant species were also noted as potentially occurring within the study area. These include the short-bristled beaksedge (*Rhynchospora galeana*) and two liverworts (*Lejeunea bermudiana*, *Frullania donellii*). Hooker’s milkwort (*Polygala hookeri*) and Leconte’s thistle (*Cirsium lecontei*), both state species of concern, were also noted. A number of the plant species identified as known to occur within the quadrangle search areas were also on the USFS 2010 Protected, Endangered, Threatened, and Sensitive (PETS) species list for the CNF (NCDOT 2011). Their USFS designations are included in Table 3-2 below.

**Table 3-2
Protected and Rare Plants Potentially Occurring Within the Study Area**

Common Name	Scientific Name	State Status	Federal Status	USFS Status
Bog bluestem	<i>Andropogon mohrii</i>	T		LR
Branched gerardia	<i>Agalinis virgata</i>	T		LR
Comfortroot	<i>Hibiscus aculeatus</i>	T		LR
Hooker’s milkwort	<i>Polygala hookeri</i>	SC – V		S
Leconte’s thistle	<i>Cirsium lecontei</i>	SC – V		LR
A Liverwort	<i>Frullania donnelli</i>	SR – T		
A Liverwort	<i>Lejeunea bermudiana</i>	SR - P		
Rough-leaved loosestrife	<i>Lysimachia asperulaefolia</i>	E	E	E
Seabeach amaranth	<i>Amaranthus pumilus</i>	T	T	
Sensitive joint-vetch	<i>Aeschynomene virginica</i>		T	T
Short-bristled beaksedge	<i>Rhynchospora galeana</i>	SR – P		
Spoonflower	<i>Peltandra sagittifolia</i>	SR – P		
Spring-flowering goldenrod	<i>Solidago verna</i>	SR - O	FSC	S
Viviparous spikerush	<i>Eleocharis vivipara</i>	E		

Note: T denotes Threatened; E denotes Endangered; SC denotes Special Concern; SR denotes Significantly Rare; FSC denotes Federal Species of Concern; LR denotes Locally Rare and S denotes Sensitive. Sources: USFWS 2016; NHP 2016a; NCDOT 2011.

3.1.6 Wetlands

Wetlands are areas inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and under normal circumstances do support, vegetation adapted for life in saturated soil conditions. Wetlands filter sediments and contaminants, reduce flood damage, provide breeding grounds for fish and wildlife, including endangered species and migratory birds, and protect shorelines from erosion. Reducing and preventing loss and damage to wetlands is a primary goal of the Clean Water Act.

Approximately 95 percent of North Carolina’s wetlands are located in the Coastal Plain. Wetlands within the study area were approximated using both National Wetlands Inventory (NWI) data from the USFWS and coastal wetlands data from the North Carolina Department of Coastal Management (DCM). The

majority of the wetlands found within the study area are categorized as palustrine, which are non-tidal, vegetated wetlands defined by dominant plant species, such as trees, shrubs, and emergents (herbaceous plants) (Cowardin et al. 1979). The study area contains three main groups of palustrine wetlands: emergent (PEM), forested (PFO), and scrub-shrub (PSS). Most of the wetlands within the study area are pine flat and managed pinelands (DCM 2016, NWI 2014).

3.1.7 Wildlife

Wildlife species commonly found within the CNF may be present within the study area. Species common to the CNF as well as the Outer Coastal Plain Mixed Forest Ecological Province that may occur within the study area are described below (USDA 2005). Mammal species common to the area include: black bear (*Ursus americanus*), white-tailed deer (*Odocoileus virginianus*), eastern gray squirrel (*Sciurus carolinensis*), eastern fox squirrel (*Sciurus niger*), common gray fox (*Urocyon cinereoargenteus*), common raccoon (*Procyon lotor*), common opossum (*Didelphis virginiana*), beaver (*Castor canadensis*), bobcat (*Felis rufus*), eastern cottontail (*Sylvilagus floridanus*), and a number of small rodents and shrews.

Included among the list of bird species found in the region and CNF are the federally endangered red cockaded woodpecker (RCW) (*Picoides borealis*) and federally protected bald eagle (*Haliaeetus leucocephalus*). Additional species include the red-shouldered hawk (*Buteo lineatus*), red-tailed hawk (*B. jamaicensis*), mourning dove (*Zenaida macroura*), great horned owl (*Bubo virginianus*), wild turkey (*Meleagris gallopavo*), pine warbler (*Dendroica dominica*), cardinal (*Cardinalis cardinalis*), Carolina wren (*Thryothorus ludovicianus*), hooded warbler (*Setophaga citrina*), and a variety of waterfowl and shorebirds including mallard (*Anas rubripes*), wood duck (*Aix sponsa*), Canada goose (*Branta canadensis*), hooded merganser (*Lophodytes cucullatus*), great blue heron (*Ardea herodias*), and great egret (*A. alba*).

Reptiles and amphibians observed in the study area and surrounding region include the following (Davidson College Herpetology Lab 2016):

American alligator (<i>Alligator mississippiensis</i>)	Eastern box turtle (<i>Terrapene carolina</i>)
Corn snake (<i>Elaphe guttata</i>)	Slider (<i>Trachemys scripta</i>)
Rat snake (<i>Elaphe obsoleta</i>)	Southern leopard frog (<i>Rana sphenoccephala</i>)
Cottonmouth (<i>Agkistrodon piscivorus</i>)	Eastern narrowmouth toad (<i>Gastrophryne carolinensis</i>)
Copperhead (<i>Agkistrodon contortrix</i>)	Oak toad (<i>Bufo quercicus</i>)
Timber rattlesnake (<i>Crotalus horridus</i>)	Southern toad (<i>Bufo terrestris</i>)

Eastern king snake (<i>Lampropeltis getula</i>)	Cope’s gray treefrog (<i>Hyla chrysoscelis</i>)
Pine woods snake (<i>Rhadinaea flavilata</i>)	Green treefrog (<i>Hyla cinerea</i>)
Pigmy rattlesnake (<i>Sistrurus miliarius</i>)	Barking treefrog (<i>Hyla gratiosa</i>)
Brown snake (<i>Storeria dekayi</i>)	Carolina gopher frog (<i>Rana capito</i>)
Common garter snake (<i>Thamnophis sirtalis</i>)	Eastern spadefoot (<i>Scaphiopus holbrookii</i>)
Rough earth snake (<i>Virginia striatula</i>)	Green anole (<i>Anolis carolinensis</i>)
Redbelly watersnake (<i>Nerodia erythrogaster</i>)	Six-lined racerunner (<i>Aspidoscelis sexlineatus</i>)
Banded watersnake (<i>Nerodia fasciata</i>)	Five-lined skink (<i>Eumeces fasciatus</i>)
Snapping turtle (<i>Chelydra serpentina</i>)	Southeastern five-lined skink (<i>Eumeces inexpectatus</i>)
Spotted turtle (<i>Clemmys guttata</i>)	
Chicken turtle (<i>Deirochelys reticularia</i>)	Broadhead skink (<i>Eumeces laticeps</i>)
Striped mud turtle (<i>Kinosternon baurii</i>)	Eastern glass lizard (<i>Ophisaurus ventralis</i>)
Eastern mud turtle (<i>Kinosternon subrubrum</i>)	Texas horned lizard (<i>Phrynosoma cornutum</i>)
Diamond back terrapin (<i>Malaclemys terrapin</i>)	Ground skink (<i>Scincella lateralis</i>)

3.1.8 Protected and Rare Animal Species

The USFWS (2016) and NHP (2016a) databases were searched to identify potential occurrences of federally and state threatened and endangered animal species within the study area. The results of these searches are provided below in Table 3-3.

According to USFWS, there are 12 listed threatened or endangered species known to occur within the vicinity of the study area. Federally endangered species include RCW (*Picoides borealis*), roseate tern (*Sterna dougallii dougallii*), Atlantic sturgeon (*Acipenser oxyrinchus*), shortnose sturgeon (*Acipenser brevirostrum*), West Indian manatee (*Trichechus manatus*), hawksbill sea turtle (*Eretmochelys imbricata*), Kemp’s Ridley sea turtle (*Lepidochelys kempii*), and leatherback sea turtle (*Dermochelys coriacea*). The RCW, West Indian manatee, Kemp’s Ridley sea turtle and leatherback sea turtle are all state-listed endangered. Federally threatened species include piping plover (*Charadrius melodus*), red knot (*Calidris canutus rufa*), loggerhead sea turtle (*Caretta caretta*), and American alligator (*Alligator mississippiensis*) which is listed due to similarity of appearance. The American alligator and piping plover are also listed as state threatened while the roseate tern is state-listed endangered. The bald eagle (*Haliaeetus leucocephalus*) which is protected by the Bald and Golden Eagle Protection Act is also noted.

The NHP identified seven additional federal species of concern that may potentially occur within the study area. These are Carter’s noctuid moth (*Photedes carterae*), southern hognose snake (*Heterodon*

simus), black-throated green warbler – Coastal Plain population (*Setophaga virens waynei*), venus flytrap cutworm moth (*Hemipachnobia subporphyrea*), annointed sallow moth (*Pyreferra ceromatica*), eastern painted bunting (*Passerina ciris ciris*), and eastern diamondback rattlesnake (*Crotalus adamanteus*). The eastern diamondback rattlesnake is also state-listed endangered. The southern hognose snake and the eastern painted bunting are both state-listed species of concern, and the remaining species all carry a state significantly rare designation. In addition to these species, the state significantly rare Cypress daggermoth (*Arconicta perblanda*), Dismal Swamp green stinkbug (*Chlorochroa dismalia*), Franclemont’s cane moth (*Franclemontia interrogans*), oak toad (*Anaxyrus quercicus*), regal darner (*Coryphaeschna ingens*), phantom darner (*Tricanthagyna trifida*), and Georgia satyr (*Neonympha areolatus*) were all identified by NHP as potentially occurring within the study area.

3.1.9 Environmentally Sensitive and Managed Lands

This section contains information on federally- and state-owned and managed lands as well as environmentally sensitive lands within the study area. The lands include mitigation areas, conservation easements, natural heritage areas, and other sensitive lands in the study area.

Croatan National Forest

The CNF, managed by the USFS, is located within the study area. The CNF is the only true coastal forest in eastern North Carolina. The forest consists of 160,000 acres and includes pine forests, saltwater estuaries, bogs, and pocosins. The forest is bordered on three sides by tidal rivers and the Bogue Sound. The proximity to water provides a variety of recreational opportunities as well as diversity of wildlife. Canoeing and fishing are popular on blackwater creeks and saltwater marshes. The CNF is managed in accordance with the Croatan National Forest Land and Resource Management Plan (USFS 2002).

Croatan Game Lands

A portion of the Croatan Game Lands, concurrent with the boundaries of the CNF, are located within the central portion of the study area. These lands are located in both Carteret and Craven Counties. They are managed by the USFS under the Croatan National Forest Land and Resource Management Plan (USFS 2002). The plan’s objectives are to manage the lands to protect and preserve biodiversity, recreation, allocation of lands, silviculture and forestry activities, fire management, access, and interaction with the local communities.

State Parks

There are no state parks within the study area (North Carolina State Parks 2016). Hammocks Beach and Fort Macon State Parks are both located to the south and outside of the study area. Hammocks Beach

State Park is a barrier island with pristine beaches providing nesting habitat to loggerhead turtles. Fort Macon State Park is located on Emerald Isle and is an historic Civil War era military fort from 1843.

**Table 3-3
Protected and Rare Animals Potentially Occurring Within the Study Area**

Common Name	Scientific Name	State Status	Federal Status
American alligator	<i>Alligator mississippiensis</i>	T	T(S/A)
Annointed sallow moth	<i>Pyreferra ceromatica</i>	SR	FSC
Atlantic sturgeon	<i>Acipenser oxyrinchus</i>	SC	E
Bald eagle	<i>Haliaeetus leucocephalus</i>	T	BGPA
Black-throated green warbler – Coastal Plain population	<i>Setophaga virens waynei</i>	SR	FSC
Carter's noctuid moth	<i>Photodes carterae</i>	SR	FSC
Cypress daggermoth	<i>Arconicta perblanda</i>	SR	
Dismal Swamp green stinkbug	<i>Chlorochroa dismalia</i>	SR	
Eastern diamondback rattlesnake	<i>Crotalus adamanteus</i>	E	FSC
Eastern painted bunting	<i>Passerina ciris ciris</i>	SC	FSC
Franclemont's cane moth	<i>Franclemontia iterrogans</i>	SR	
Georgia satyr	<i>Neonympha areolatus</i>	SR	
Hawksbill sea turtle	<i>Eretmochelys imbricate</i>		E
Leatherback sea turtle	<i>Dermochelys coriacea</i>	E	E
Loggerhead sea turtle	<i>Caretta caretta</i>	T	T
Kemp's Ridley sea turtle	<i>Lepidochelys kempii</i>	E	E
Oak toad	<i>Anaxyrus quercicus</i>	SR	
Phantom darner	<i>Tricanthagnya trifida</i>	SR	
Piping plover	<i>Charadrius melodus</i>	T	T
Red-cockaded woodpecker	<i>Picoides borealis</i>	E	E
Red knot	<i>Calidris canutus rufa</i>		T
Regal darner	<i>Coryphaeschna ingens</i>	SR	
Roseate tern	<i>Sterna dougalii dougalii</i>	E	E
Shortnose sturgeon	<i>Acipenser brevirostrum</i>	E	E
Southern hognose snake	<i>Heterodon simus</i>	SC	FSC
Venus flytrap cutworm moth	<i>Hemipachnobia subporphyrea</i>	SR	FSC
West Indian manatee	<i>Trichechus manatus</i>	E	E

Note: T denotes Threatened, E denotes Endangered; T(S/A) denotes Threatened due to similarity of appearance; FSC denotes Federal Species of Concern; SC denotes state Special Concern; SR denotes state Significantly Rare; BGPA denotes protected under Bald and Golden Eagle Protection Act. Sources: USFWS 2016; NHP 2016a

Mitigation Lands

Mitigation lands are lands that have been purchased and managed to mitigate environmental impacts for another construction project. These areas are lands that often include wetlands that have been restored, created, enhanced or preserved as required by the U.S. Army Corps of Engineers (USACE) as a condition of a Section 404 or 401 permit under the Clean Water Act. Construction of a transmission line within these types of lands are considered infeasible. There are no known mitigation lands within the study area (NCDEQ 2012).

Significant Natural Heritage Areas

The NHP maintains a list of natural areas throughout the state of North Carolina. Natural areas are evaluated on the basis of the occurrences of rare plant and animal species, rare or high quality natural communities, and special animal habitats, collectively termed the “Elements” of natural diversity. They are given priority ranks that indicate the degree of their importance for conservation. The list includes protected and unprotected areas, and inclusion of an area on the NHP list does not directly confer protection to a natural area. The areas are given a Collective Value Rating as well as a Representational Rating. The Collective Value Ratings (C1 – C5) are based on the number and rarity of the elements it contains. The Representational Ratings (R1 – R5) are based on the importance of protecting the best occurrences of individual elements. Ratings with lower numbers indicate more exceptional areas, while ratings with higher numbers indicate more moderate or general areas (NHP 2016b).

The NHP has designated areas within the CNF and surrounding Mill Pond as Significant Natural Heritage Areas (SNHA). SNHAs are areas regarded as important for the conservation of the state’s biodiversity. Typically, these areas contain high-quality or rare natural communities, rare species, and/or special animal habitats. There are four different significance levels for SNHAs: national, state, regional, and county. National significance denotes sites which contain one of the best occurrences of a rare or high-quality element of natural diversity known to exist anywhere within its range. State-significant areas contain one of the best element occurrences within the state that are not already considered of national significance. Regional significance denotes areas with the best occurrences within a given Priority Region that are not already considered of national or state significance. Priority Regions have been assigned by the NHP to create regions with similar environmental conditions that are roughly the same size. County significance denotes sites that are biological resources within a particular county but are not regionally significant.

The Walkers Mill Pond and Black Creek Natural Heritage Area includes a total of 767 acres of land and extends north to south from the edge of the CNF in the central portion of the study area. This SNHA has a representational ranking of R5 (General) and collective ranking of C5 (General). A second SNHA, Union Point Pocosin, is a 5,747-acre area, a portion of which is generally located within the limits of the CNF in the study area. This SNHA has a representational ranking of R4 (Moderate) and collective ranking of C4 (Moderate). Both of these areas are crossed by several alternative routes as well as the preferred route.

Conservation Easements

Four conservation easements owned by the Coastal Land Trust (CLT) are located within the study area. Two of the easements flank Mill Pond in the central portion of the study area which includes lands that are considered to be a regionally significant natural heritage site and represents a rare wetland community type. These easements begin at the edge of the CNF property to the north and extend along Ghouls Fork, Main Prong, and Mill Pond, terminating at SR 1154. Together these easements total approximately 416 acres. A third CLT easement begins at the same point along SR 1154 and continues south along Black Creek towards the Newport River, totaling approximately 664 acres.

The fourth CLT easement was recently purchased in May of 2016 (CLT 2016). The easement includes 302 acres of forested land along Mill Creek. The property is surrounded on two sides by the CNF and has 2,400 feet of frontage along Mill Creek, a tributary to the Newport River. The property includes habitat such as longleaf pine forest, pocosin, and brackish marsh wetlands. The property was purchased from private land owners and was funded by the Department of the Navy and the North Carolina Clean Water Management Trust Fund.

The Nature Conservancy Lands

The Nature Conservancy (TNC) purchases (or receives) environmentally sensitive lands and typically transfers management responsibilities to different agencies. There are no TNC lands located within the study area.

Forest Development Program Lands

The Forest Development Program (FDP) is a reforestation, afforestation and forest stand improvement cost-sharing program run by the North Carolina Forest Service (NCFS). The goals of the program include timber production and the creation of the benefits associated with active forest management (NCFS 2016). The program provides cost-sharing money for site preparation, planting, seedling release, and other work required to establish a new forest or improve an existing forest. To qualify for the FDP, the

landowner must have a forest management plan approved by the NCFS. There are two parcels of privately owned lands along Segment 10 within the study area known to be participating in this program (Figure 4-2).

3.2 HUMAN RESOURCES

Following is a description of the human resources in the study area that could be impacted by the construction or operation of the proposed project. Topics addressed include patterns of land use and socioeconomic, cultural resources, and visual character.

3.2.1 Land Use and Development Patterns

This section contains information on general land use patterns, agriculture, residential areas, recreation areas, transportation, and utilities within the study area.

The study area includes the City of Havelock within Craven County and the Towns of Newport and Harlowe within Carteret County. The county border between Craven and Carteret Counties runs west to east through the northern section of the study area. Havelock is located in the northwest corner of the study area and is home to the MCAS Cherry Point, the 2nd Marine Aircraft Wing and the Fleet Readiness Center – East. The majority of the lands within the study area lie within the limits of the CNF. Remaining areas are generally used for timber production and agriculture with localized areas of dense urban development around Newport and Havelock. Residential development is generally found within the vicinity of Havelock, Newport, Harlowe, and state roads throughout the project area.

Agriculture

According to the U.S. Department of Agriculture and Consumer Services (USDA), 24.3 percent of North Carolina (8.3 million acres) is farmland with a total value of agricultural products sold of \$12.6 billion statewide (USDA 2012). Craven County has approximately 14 percent of its lands in farms. Farms include livestock, poultry, corn, soybean, hay and wheat and had a total gross income of \$707,000 (NCDACS 2014b). Carteret County has only 7.3 percent of its lands in farms. Crop and livestock production is similar as that for Carteret County with major crops being corn, soybeans, hay and wheat. The total gross income from farm-related sources in Carteret County is \$2.1 million (NCDACS 2014a).

According to 2012 data compiled by the USFS, Forest Inventory and Analysis Data, Timber Products Output Survey, and Timber Mart-South, 53 percent of the land in the state of North Carolina is unreserved forestland, or timberland (North Carolina Cooperative Extension 2015). Only 14 percent of

timberlands in the state are owned by non-private entities (e.g., National Forests, federal, state or county/municipality). Forestry, logging and wood manufacturing contributed \$10.9 billion to North Carolina's economy in 2008 (NC Cooperative Extension 2015). Thirty-eight percent of the lands in Carteret County (161,533 acres) are timberland. These areas have a delivered value of \$4.6 million. Craven County has 254,742 acres of timberlands accounting for 55 percent of land within the county. The delivered value of Craven County timber resources is \$21 million, ranking fifth in the state.

Urban and Residential Areas

The population density for North Carolina was 196.1 persons per square mile in 2010. Carteret County had a population density of 51.3 persons per square mile in 2015, and a housing unit density of 36.1 units per square mile (U.S. Census Bureau 2015). Craven County had a population density of 133.6 persons per square mile in 2015, and a housing unit density of 61.9 units per square mile (U.S. Census Bureau 2015). Of the 4,327,528 housing units in North Carolina, 20.7 percent were built between 2000 and 2010. There has been a 3.7 percent increase in the number of housing units across the state between 2010 and 2015. The number of housing units in Craven County has increased by 2.3 percent between 2010 and 2015, and the number of housing units in Carteret County has increased by 1.7 percent in the same period (U.S. Census Bureau 2015).

Carteret County has one public school district with ten elementary and primary schools, six middle schools and four high schools (Carteret 2016c). Craven County has one public school district with fifteen elementary and primary schools, five middle schools and five high schools (Craven County 2016). Two elementary, one middle, and one high school are located within the study area. The schools are associated with the City of Havelock.

Recreation Areas

Recreational opportunities can be found throughout the study area. Community and regional parks, ball fields, recreation centers, hiking trails, and other recreation-type activities are available in the municipalities within the study area. Specific recreational opportunities in and near the study area are outlined below.

There are a number of trails and outdoor recreational opportunities within Carteret and Craven Counties as well as within the CNF (Carteret County 2016b). Regional trails associated with the CNF include the Weetock Trail, Cedar Point Tideland Trail, Flanners Beach and Fishers Landing, and the Neusiok Trail. Additional trails within the region include Western Park, Emerald Isle Woods Park Trail, Emerald Isle

Multi-Use Path, Patsy Pond Nature Trail, OWLS Nature Trail, Fort Benjamin Park, Morehead Alternative Transportation System Trail, NC Aquarium at Pine Knoll Shores Roosevelt Trail and Hoffman Trail, Calico Creek Boardwalk, Promise Land Heritage Walk, Hoop Pole Creek Nature Trail, Willow Pond Trail, Eastern Park, and Cedar Island National Wildlife Refuge.

The Neusiok Trail is a 20.4-mile recreational trail that begins at Pine Cliff, a sandy beach on the Neuse River, and ends at Oyster Point, a salt marsh on the Newport River. Within the study area, the trail is largely maintained by the CNF as it passes through their boundaries. It is part of the larger Mountains-to-Seas Trail, described in further detail below. The Neusiok trail crosses cypress swamps, hardwood ridges, longleaf pine savannah, and pocosin. Pitcher plants can be found along the trail in wet areas.

The Mountains-to-Sea Trail is a 900-mile trail that extends from the Great Smoky Mountains National Park in the Appalachian Mountains to Jockey Ridge State Park at the Atlantic Ocean. This state trail of North Carolina passes through 37 counties, three national parks, three national forests, two national wildlife refuges and connects to seven state parks. The trail was added to the state park system in 2000. The trail includes hardwood forests, swamps, fading tobacco crossroads, reviving urban centers, courthouse square towns, rugged gorges, remote lighthouses, and mountain overlooks.

Transportation and Utilities

The study area is traversed by U.S., state and county highways, and local streets. US 70 and SR 1247 run predominantly north to south along the western edge of the study area while SR 101 runs generally northwest to southeast and forms the northern border of the study area. SR 1154 (Mill Creek Road) runs west to east generally through the central portion of the study area, and SR 1155 (Old Wineberry Rd) runs generally southwest to northeast in the eastern portion of the study area. The central portion of the study area is characterized by the presence of unpaved logging roads associated with timberland properties.

The North Carolina Department of Transportation (NCDOT) is currently developing a number of projects along US 70 to improve traffic and freight movement along the corridor between Raleigh and the Morehead City Port. One such project is the Havelock Bypass near the City of Havelock to the northwest of the study area. The Havelock Bypass will be a four-lane divided highway that will provide an alternative route to US 70 that currently runs through Havelock. The bypass will begin north of the Havelock City limits and will extend south for approximately 10 miles to just north of the Craven – Carteret county line (NCDOT 2016). Acquisition of ROW for the project is expected to begin late 2016, and construction is expected to begin in 2018.

The North Carolina Railroad Company (NCR) owns and operates a single main track that runs from the City of Havelock in Craven County to the Morehead City Port Terminal (North Carolina Railroad Company 2016). The line segment is at the eastern end of the Atlantic and North Carolina Railroad (A&NC) which was completed in 1858 and ran from Goldsboro to Beaufort Harbor. The A&NC was merged into the North Carolina Railroad in 1989 and is currently leased by Norfolk Southern Railway. The line is a single track that is operated without train control signals. The maximum speed of the line is 35 miles per hour. Rail traffic concentrated at Havelock and Morehead City is principally associated with transport to and from MCAS Cherry Point.

Several airports and airstrips are located near the study area. The major airfield in the vicinity of the study area is MCAS Cherry Point. The air station and its associated support locations occupy approximately 29,000 acres and include a four-point runway system to provide multiple approach and departure advantages (U.S. Marine Corps 2016). The air station served in the past as an emergency landing site for the National Aeronautics and Space Administration during the operation of the space shuttle program. MCAS Cherry Point maintains a system of auxiliary landing fields for additional training exercises. MCAS Cherry Point is home to Marine Transport Squadron 1, which operated HH-46E search and rescue helicopters until September 2015. The squadron continues to operate the McDonnell Douglas C-9 Skytrain and the Cessna UC-35 Citation II in support of worldwide transport for the Department of Defense.

The Coastal Carolina Regional Airport is a regional passenger airfield located to the north of the study area in New Bern, North Carolina. The airport serves as the main connection to destinations within Craven County, Pamlico County, Carteret County and Jones County such as MCAS Cherry Point, Atlantic Beach, and Emerald Isle, North Carolina.

The Michael J. Smith airfield is a public airport located one-mile north of the central business district of Beaufort and northeast of Morehead City in Carteret County, North Carolina. The airfield is owned by the Beaufort-Morehead City Airport Authority.

The study area is generally bound by existing transmission lines currently owned and operated by DEP. The existing 15.31-mile Havelock – Morehead Wildwood 230kV transmission line runs north to south along the western portion of the study area. To the west of this line, the 14.83-mile Havelock – Morehead Wildwood 115kV South line also runs north to south. The Havelock – Morehead Wildwood 115kV North

line runs approximately 38.83 miles generally northwest to southeast along the northern boundary of the study area. Several substations owned and operated by DEP are also in the vicinity of the study area. These include the North River, Morehead, Morehead Wildwood, Newport, and Cherry Point #2 substations. In addition, the Harlowe substation, owned and operated by the Carteret-Craven Electric Cooperative, is located in the eastern portion of the study area near the terminus of the proposed line.

3.2.2 Socioeconomic Patterns

This section contains data on population and employment in Carteret and Craven Counties.

Population

According to the North Carolina Office of State Budget and Management (2014), the population of North Carolina has increased over 77 percent since 1976. Since 2000, North Carolina's population has grown more than 18.5 percent. Carteret and Craven Counties have both experienced growths at a slower rate than the state, with Carteret's population increasing by 11.9 percent and Craven's population increasing by 13.2 percent. However, the Town of Harlowe and the Town of Newport have seen population increases of 23.4 percent and 19.8 percent in this time period, respectively. The City of Havelock experienced negative growth of 8.2 percent (U.S. Census Bureau 2012).

**Table 3-4
Population Data**

County/City	Population		
	2000	Percent Change (2000-2010)	2010
North Carolina	8,046,485	18.5	9,535,483
Carteret County	59,383	11.9	66,469
Harlowe Township	1,272	23.4	1,570
Newport Township	8,326	19.8	9,974
Craven County	91,436	13.2	103,505
City of Havelock	22,442	-8.2	20,735

Source: U.S. Census Bureau (2012)

Employment and Income

Between 2000 and 2010, North Carolina experienced 12 percent growth in its labor force, more than the national rate of 9.5 percent. During this same period, Carteret County experienced a 4.2 percent increase in the labor force. With 32,845 in the labor force in 2014, the County had an unemployment rate of 7.5 percent, more than the state unemployment of 6.9 percent and more than the national unemployment of 7.0 percent (North Carolina Department of Commerce 2016, Carteret County 2016a). Craven County

experienced a 4.8 percent increase in the labor force between 2000 and 2014. There were 41,645 in the labor force in Craven County in 2014, resulting in an unemployment rate of 7.7 percent.

More than 53,000 people make up the total MCAS Cherry Point-related population, including active duty and retired Marines, the civilian workforce, and their families. Nearly 14,000 Marines, Sailors and civilian employees earn an annual payroll of more than \$1.2 billion. These salaries, in addition to retiree benefits and local expenditures for supplies and capital improvements, come to more than \$2 billion in annual economic impact to the state (U.S. Marine Corps 2016).

3.2.3 Cultural Resources

A records search at the North Carolina State Historic Preservation Office (NCSHPO) and the North Carolina Office of State Archaeology (NCOSA) was conducted in March of 2016. A total of 56 archaeological sites, landmarks, and historical sites and structures were identified within the study area. Of these, one resource has been determined eligible for the National Register of Historic Places (NRHP), but carries a designation of “determined eligible but gone,” indicating the resource is no longer extant. Four resources are noted as being on the North Carolina Study List and will likely be eligible for the NRHP (NCSHPO 2016). All of the remaining sites are listed as surveyed only, surveyed only gone, unevaluated or determined not eligible.

The Truss Bridge #101-16-10 (ID# CR0643) has been determined eligible for the NRHP but is noted as being gone. The bridge was constructed in 1924 and is located on SR 101 crossing the Harlowe Canal. The original bridge is no longer extant as it has been replaced by a modern concrete span bridge. The resources identified on the Study List include two portions of Harlowe Canal (Clubfoot and Harlowes Creek Canal, ID#s CR0565 and CV1338), the William Nash Bell House (ID# CR1208), and the Rufus Bell House (ID# CR0555).

3.2.4 Visual Character

The visual character of an area is a function of the terrain, land cover, and land use. The study area is a mixture of natural areas, timber production lands, residential areas, commercial development, and military activities due to the proximity of MCAS Cherry Point. The study area is dominated by the CNF which is characterized by large, contiguous forested lands throughout the northern and central portion of the study area. Areas surrounding the CNF consist of large pine timber plantations, farmlands and other wooded areas. Residential and commercial development is generally limited to the state- and locally-maintained roadways.

4.0 ANALYSIS OF ALTERNATIVES

DEP retained Stantec and C2Env to assist in the route selection, public involvement, and documentation for the Harlowe – Newport 230kV Transmission Line project. This section presents the rationale behind the route identification and evaluation process used for the project, which ultimately resulted in the selection of a preferred route.

4.1 OVERVIEW OF THE ROUTING PROCESS

The following is an overview of the steps involved in the identification of the alternative routes and the selection of a preferred route for the project.

A study area was established based on the locations of DEPs proposed Newport 230kV Switching Station and proposed Harlowe 230kV – 115kV Substation as the end points. The limits of the study area were identified based on a preliminary review of possible large scale constraints within the region. The study area is large enough to encompass a set of reasonable and geographically distinct alternative routes between the endpoints while avoiding circuitry to minimize unnecessary impacts to the natural and human environment. The study area, which encompasses approximately 63.6 square miles in both Carteret and Craven Counties, North Carolina, is shown in Figure 2-1.

The study area is bound by the Newport River to the south, the existing Havelock - Morehead Wildwood 115kV South Transmission Line and US 70 to the west, MCAS Cherry Point and SR 101 to the north, and a series of public and private roads to the east. The study area includes portions of the Towns of Newport and Harlowe, the City of Havelock, and a portion of CNF. The western boundary of the study area was identified to exclude the more populated areas in the Town of Newport and parallel the existing DEP transmission line east of Newport. The northwestern and northern boundaries use major roads to limit the study area and exclude more heavily constrained areas within the City of Havelock and MCAS Cherry Point. Upon entering the Town of Harlowe, the study area uses the Carteret-Craven county boundary and existing roads as practical eastern extents to identify feasible routes to the proposed Harlowe 230kV – 115kV Substation. The southern boundary of the study area is generally constrained by the Newport River.

Upon establishing the study area, publically available GIS data was collected to develop a GIS model for the project. The data was then reviewed to characterize the study area and identify opportunities and constraints to transmission line routing and siting. The siting team further characterized the opportunities

and constraints with regards to sensitivity to transmission line construction and operation. The data was then weighted 0-100, with more sensitive constraints receiving higher scores. The weighted data was then used to create a raster-based suitability surface to aid in identifying potential areas of low constraint where there would be less sensitivity to transmission line routing and siting. With all of the opportunity and constraint data overlain in the project geographic information system (GIS), the suitability value of each constraint within a given raster cell was added to arrive at a cumulative suitability score for that cell. The same process was applied to every grid cell in the study area, the end result being a color coded 'heat map' showing areas suitable to transmission line routing and siting (Figure 4-1). This analysis effectively considers the entire study area, and helps focus attention on those areas that are more favorable for the project.

With a significant portion of the study area being located within the CNF, the initial suitability analysis resulted in a bimodal data distribution which overpowered the remaining study area. The analysis was run again excluding the CNF, allowing for a more unimodal data distribution to show greater contrast between suitable and non-suitable areas (Figure 4-1). Several factors were noted based upon this analysis. First, routing a line through the northern regions of the study area in the vicinity of Havelock would be more impactful than the placement of a line through the southern region. This is due to the extent of USFS property in the north; the overlap of flight paths, air installation compatible use zones, and federal properties associated with MCAS Cherry Point; and significant residential and commercial development. An area of poor suitability was also identified in the southwestern corner of the study area due to the presence of coastal wetlands and associated buffers, a recreational area, and other county-owned facilities. The analysis also helped to highlight areas where crossings of sensitive lands (CNF, SNHAs, and conservation easements) may be minimized.

After conducting the suitability analysis, potential route segments were identified with the primary objective of establishing a network of segments connecting the proposed substation sites that avoided or minimized impacts to human and natural resources. Co-location opportunities with existing linear infrastructure such as electric lines and roads were investigated during the development of the route segments. Two alternatives were identified as co-location opportunities with regards to existing transmission lines, paralleling the existing line and double circuiting the existing line. However, it was determined that the ability to double circuit any existing transmission lines in the study area would be limited to a distance of approximately one mile as any greater distance could impact the reliability of the transmission system in the area. Three existing overhead transmission lines are located within the study area, including the Havelock-Morehead Wildwood 115kV South Transmission Line which runs in a

north-south direction along the western boundary of the study area, the Havelock-Morehead Wildwood 115kV North Transmission Line which runs in a northwest-southeast direction along the northern and eastern boundaries of the study area, and the Havelock-Morehead Wildwood 230kV Transmission Line which runs in a north-south direction across the western side of the study area (Figure 2-2). Co-location opportunities were identified along the Havelock-Morehead Wildwood 230kV Transmission Line, to the north and south of the proposed Newport 230kV Switching Station site. The Havelock-Morehead Wildwood 115kV North Transmission Line was effectively excluded as a co-location opportunity since the line would have to be double circuited for greater than one mile, and paralleling the existing ROW is not feasible due to the presence of homes and businesses crossed by and abutting the existing ROW.

Several roads, including US 70 along the western boundary of the study area, SR 101 along the northern and eastern boundary, SR 1154 across the southern portion of the study area, and SR 1155 along the eastern portion of the study area were reviewed for potential co-location opportunities, as well as several minor and un-named roads. Co-location along SR 1154 was evaluated as there is an existing distribution line along the north side of the roadway. As SR 1154 runs generally east-west across the very southern portion of the study area, the length of co-location would be limited. While there may be an opportunity to overbuild the existing distribution line, clearing trees for expansion of the ROW where SR 1154 crosses Mill Pond would drastically change the visual character of the crossing and potentially undermine the earthen dam supporting the roadway. As such, co-location of the proposed line with SR 1154 was determined to not be advantageous. Co-location along portions of SR 1155 is generally constrained by the presence of residential structures along the road and was not considered. No railroad or pipeline corridors were identified within the study area that could serve as potential co-location opportunities. As a result of the sensitivity analysis, the inability to co-locate with the Havelock-Morehead Wildwood 115kV North Transmission Line as well as the inability to expand the existing ROW along SR 101, the northern portion of the project area in the vicinity of Havelock and along SR 101 was removed from further consideration.

Public and stakeholder engagement was achieved through a variety of means as further detailed in Section 4.3. With a portion of the CNF bisecting the study area, avoiding a crossing of this property would not be possible. As such, the impact to the CNF was considered when identifying route segments and evaluating route alternatives. Members of the DEP team corresponded and met with USFS officials to gather data on the portion of the CNF within the study area and seek input on the proposed route segments and route alternatives. Additional federal, state, and local officials were contacted to obtain information on resources of particular concern to them that were relevant to the routing process.

The potential route segments were provided to the public via mailings, a project website, and an open house. Comments received from the public and various stakeholders were incorporated into the evaluation of route segments and the segments were revised as necessary. Following the public engagement process, the route segments were combined to form all possible route alternatives between the project endpoints. Quantitative and qualitative data, public input, and engineering factors were used to evaluate each of the alternatives and select a preferred route for the proposed transmission line. Activities leading to the selection of the preferred route are described in more detail in the following sections.

4.2 IDENTIFICATION OF ALTERNATIVE ROUTES

The objective of the routing analysis was to identify an economically feasible route that offered the most benefits in terms of providing reliable electric power but that also minimized adverse impacts to the human and natural environment. This effort included the five main components listed below:

- Review of USGS topographic maps and recent aerial photography;
- Review of local planning and zoning documents and available GIS opportunities and constraints data;
- Field reconnaissance of the study area via windshield survey;
- Suitability analysis of study area; and
- Public and stakeholder engagement.

Based upon the information gathered, a network of route segments was identified connecting the two endpoints. The major objectives for routing and siting the line were to:

- Maximize the distance of the project from existing residences and other occupied buildings, schools, parks, and churches;
- Minimize the impact to the CNF;
- Minimize impacts to wetlands, streams, forested areas, threatened and endangered species, floodplains, and other managed sensitive lands;
- Maintain reliable electric service by developing routes that are realistic and feasible to construct and operate, which involved limiting the amount of proposed double-circuit construction, number of transmission line turn angles, overall route length, and the length of overbuilding non-DEP ROW;
- Minimize overall impacts by maximizing the use of existing ROWs, including transmission lines, highways, roads, and railroads;
- Minimize impacts to known cemeteries, cultural resources, and historic properties; and

- Avoid impacts to existing airports and private airstrips in the region.

After completion of the sensitivity analysis and initial data collection, preliminary route segments were identified and numbered. All segments identified were mutually exclusive and could be combined to form a variety of possible route alternatives between the proposed project endpoints. The segments were evaluated by the siting team, and a windshield survey was conducted from publicly accessible areas to field verify and evaluate the preliminary route segments. Based upon this survey and further siting and engineering evaluations prior to publically sharing the proposed route segments, the following revisions were incorporated:

- Eliminated all segments in the northern portion of the study area which entered the proposed Newport 230kV Switching Station from the north and required co-location with the Havelock-Morehead Wildwood 115kV North Transmission Line along SR 101 through the City of Havelock due to the aforementioned constraints;
- Segment 1 revised to share ROW with existing easement rather than abut existing ROW;
- Segments 5 and 12 revised to further offset from the CNF to account for danger tree removal;
- Segment 3 revised to be a more direct route, lessen the degree of turn angle, and provide a better interconnection with Segments 10 and 11 that is further from occupied residences;
- Segment 10 revised to cross Mill Creek south of SR 1154 to avoid overbuilding a Carteret-Craven Cooperative overhead distribution line parallel to SR 1154. ROW expansion at the Mill Creek dam along SR 1154 is a concern and would drastically change the visual character of the crossing;
- Segments 4, 9, 13, 16, 17, 18, 19 and 21 revised for minor engineering changes to reduce impacts, decrease angle structures, and improve route design;
- Removed segment co-located with SR 1155 between Segments 18 and 19 due to proximity to occupied residences and constraints between road ROW and water tower;
- Segments 20 and 22 added to provide alternative alignment exiting the proposed Harlowe 230kV – 115kV Substation;
- Segment 23 revised to reduce proximity to occupied residences; and
- Segment 24 added as alternative to Segment 23 to further reduce proximity to occupied residences and be less impactful to agricultural land.

The results of this effort identified 24 final route segments to present to the public and stakeholders (Figure 4-2). Since all segments to the north of the study area were eliminated due to environmental and engineering constraints, the remaining segments in the southern half of the study area were sited to

minimize the crossing length of the CNF, sensitive lands, and avoid proximity to existing residences. Segment 1 is co-located along an existing transmission line easement before entering the proposed Newport 230kV Switching Station and is a common segment to all route alternatives. No additional segments were identified into the proposed Newport 230kV Switching Station because any alternative to Segment 1 would result in greater impacts and be unnecessarily closer in proximity to a greater number of occupied residences.

4.3 PUBLIC INVOLVEMENT ACTIVITIES

To determine community priorities relative to the proposed project, the route selection process included multiple forms of public input. These included a scoping meeting with federal and state agencies, correspondence with county officials and local stakeholders, mailings to affected landowners, a public open house held by DEP, and a publically accessible project website with interactive mapping allowing the public to view and comment on route segments. All input was used to assess the priorities and attitudes of the residents and public officials regarding the project, thereby enabling the siting team to identify the most appropriate factors to evaluate the segments and to develop route alternatives that minimized impacts to resources of primary concern to both the environmental agencies and residents. In addition to the following public and agency involvement efforts sponsored by DEP, DEP staff also attended other meetings with private landowners having large land holdings within the study area (> 1,000 acres) and the CLT.

4.3.1 Federal & State Agency Contact

A scoping team meeting was held on December 14, 2015 with the representatives identified below to discuss the proposed project and preliminary route segments:

- U.S. Army Corps of Engineers
- U.S. Coast Guard
- U.S. Fish and Wildlife Service
- U.S. Forest Service
- NC Division of Water Resources
- NC Division of Coastal Management
- NC Wildlife Resources Commission
- NC Natural Heritage Program
- NC Department of Energy, Mineral and Land Resources, Land Quality Section

During this meeting, aerial photographs and USGS topographic maps of the study area were reviewed and the agency representatives were asked to provide input on issues of concern and potential permitting constraints. Environmentally sensitive lands and rare species occurrences were obtained using digital data available from the NHP and a search of the records of known historic resources maintained by the NCSHPO and NCOSA was also conducted. Comments were received from the US Coast Guard only, which indicated no potential issues with crossing the Harlowe Canal (Appendix A). On March 7, 2016, DEP provided the centerline and proposed ROW for the routes digitally to the same agency representatives to enable a preliminary assessment of the proposed route segments. Comments were received from the USACE only. These comments were general without regard to a specific route segment (Appendix A).

DEP siting and permitting personnel also held two meetings with representatives from the USFS. The first meeting, to gather information on the overall study area, was held on October 16, 2015. Points of contact were made at this meeting and it was established that a crossing of the Forest would require the preparation of a document for compliance with the National Environmental Policy Act (NEPA). Representatives indicated the shortest crossing of the CNF would likely be the least impactful to the CNF and therefore, would likely be the most preferential route. Therefore, the routing and siting team tried to identify segments which avoided crossing CNF, such as Segment 19, or identify segments which crossed at the narrowest points within the study area, including locations along Segments 1, 2, 6, 10, and 13. The representatives also confirmed the presence of RCW colonies within the study area and verified that the siting team was able to obtain these locations from the NHP for avoidance during routing and siting.

The second meeting was held on May 10, 2016, at which time DEP personnel and USFS representatives reviewed the proposed crossings of the CNF. During this meeting, it was determined that any of the proposed crossings would require the preparation of an Environmental Assessment with a Finding of No Significant Impact for compliance under NEPA. Representatives also provided the 2002 Croatan National Forest Land and Resource Management Plan, which indicated that Segments 3, 4, 6, 10, 16, and 18 pass adjacent to areas managed for RCW habitat, while Segments 1-5 and 13-17 pass through areas managed for black bear habitat. While no comments were received regarding wildlife or botany, representatives relayed that all segments crossing the CNF had previously been surveyed for archaeological resources, with the exception of Segment 13, and no significant sites had been found.

On June 22, 2016, DEP personnel solicited comments from the NHP as the route requires crossed two SNHAs. The NHP queried their database for listed and rare species occurrences, important natural

communities, SNHAs, and conservation easements crossed by the preferred route and provided the results by letter dated June 23, 2016 (Appendix A). It was noted that no federally-listed species were identified. No further project-specific comments were provided.

4.3.2 Regional Stakeholders

DEP identified 22 officials from Craven County and 20 Officials from Carteret County to notify about the project and solicit input on the route evaluation. E-mails were sent to these individuals on February 9, 2016 which contained a project description, details on the upcoming public open house, and contact information for requesting additional information or submitting comments on the project. A copy of this correspondence is enclosed in Appendix A. While no comments were received from these officials as a result of this particular solicitation, county officials were present at the open house, detailed below, at which time they engaged in discussion with DEP personnel.

DEP siting and permitting personnel met with Ms. Janice Allen, Deputy Director at the CLT on May 9, 2016 to discuss the privately held conservation easements crossed by the proposed segments. At this meeting, Ms. Allen confirmed that these areas are in fact donated, private easements that are not under the purview of any state or federal regulatory authority. The acquisition of ROW across the easements would require a judicial process for condemnation, but the process would likely be uncontested.

4.3.3 Public Outreach

A public comment period was established from February 10, 2016 to March 15, 2016 to allow the community and other stakeholders adequate time to submit comments regarding the project. A public open house was held on February 10, 2016 to kick off the comment period. The purpose of the open house was to gather input on the route segments (Figure 4-2) and allow affected landowners to voice concerns about the proposed project. The event also provided an opportunity to discuss with community members and other stakeholders the purpose and need for the project and describe the decision-making process used to select a preferred route. The open house was held at the J. Fort Benjamin Park Recreational Center in Newport, North Carolina from 4pm-7pm. Thirty people signed into the open house at the registration table.

Letters describing the project and advertising the open house were mailed to all property owners within 500 feet of the route segments and proposed substation locations on January 25, 2016. The public was also notified of the project open house through a news release and newspaper ad which appeared in the Carteret Craven News Times, both online and in print, on February 9, 2016. A project web page was

established which advertised the open house and public comment period, and provided information on the project's purpose and need and construction time, as well as general information on electric and magnetic fields; ROW acquisition, zones, and restrictions; transmission line construction; route selection; and contact information to request additional information. The webpage also featured an interactive map where the public could view the study area and route segments. During the public comment period, the public was able to leave comments directly on the interactive map. Copies of the property owner letter, news release, and newspaper ad are included in Appendix A.

The open house included displays with information on project need, engineering, route alternatives, environmental management, and ROW requirements. Representatives from DEP, Stantec and C2Env were present to address the public's questions and take comments. A system map of the transmission lines and substations presently serving the study area and an iterative computer program illustrating future power expectations were provided to help demonstrate the need for the project. Potential route segments for the proposed transmission line were depicted on large format aerial photographs and two GIS workstations were provided. The workstations allowed attendees to review the study area and route segments in relation to their property or other areas of interest and leave comments. No preferred route had been selected at the time of the workshops. Photographs and drawings showing the types of structures that would be used for the project were displayed. DEP staff were also present to discuss ROW acquisition and maintenance, and electric and magnetic fields associated with transmission lines.

Participants at the open house received a written questionnaire to communicate their opinions on the routing criteria, the segment locations, preferred route locations, and issues of concern regarding the project. The public was asked to return questionnaires either at the workshops or by mail within two to three weeks after the event. Appendix B contains a sample questionnaire and a summary of the responses received to the questionnaire. The results from the questionnaire are discussed below.

4.3.4 Summary of Concerns

During the public comment period, feedback from the community and other stakeholders was received by way of the open house, letters, e-mails, and from the interactive map on the project website. A total of 10 questionnaires and 19 comments on the GIS workstation were received as a result of the open house. Five e-mails were also received directly by DEP staff, and 11 comments were recorded on the interactive map. DEP, Stantec and C2Env staff reviewed all of the public input and made adjustments to route segments where appropriate before evaluating route alternatives, as further detailed in Section 4.3.5.

Questionnaire Results

The questionnaire consisted of 6 questions with space for additional comments, designed to help DEP understand the public's priorities and concerns such that the project team could incorporate these into the route planning and selection. Fifty percent of the respondents indicated they understood the need for the new transmission line while 10 percent were uncertain and 40 percent did not believe the need for the project had been explained adequately (Question 3). The fourth item on the questionnaire asked respondents to rate the importance of 13 common routing considerations between 1 and 5 with 1 being of the lowest concern and 5 being of the highest concern. Although the sample size was low (10), the responses were tabulated and summarized for use in evaluating the route alternatives. The results were tabulated by routing consideration and determined by multiplying the assigned rating (1-5) by the number of respondents that selected that rating. For example, all 10 respondents gave proximity to residential homes a rating of 5, giving this route consideration an overall score of 50. The tabulated results are shown below in Table 4-1.

Question 6 solicited respondent's specific concerns for particular route segments. Segment 19 was the only route segment to receive specific comments. Eight of the 10 questionnaires listed negative comments on Segment 19 with three of those providing further comments in the additional comments section. These comments are described further in the section below and were considered in the overall routing evaluation. These questionnaire results show proximity to residential homes resulting in decreased property value and diminished viewshed were the most frequent concerns of respondents, occurring as the primary subject or component of 24 of 49 total comments. Impacts to streams, wetlands, sensitive lands, and forested area were found to be of least concern.

Summary of Comments

A number of comments and questions were received in addition to the questionnaires, as well as the identification of additional constraints not yet known to the project team. Many of the comments received via the project website duplicated remarks submitted on questionnaires at the open house. The following is a summary of all comments and questions received during the public comment period.

- About half of the comments received were from homeowners in the Chadwick Shores Plantation development in reference to Segment 19. Respondents expressed concerns over the proximity of the segment to residences and the resulting potential for reduced property value and a diminished

**Table 4-1
Public Ranking of Routing Considerations**

Routing Considerations	Score	Public Rank
Proximity to residential homes	50	1
View from residences	49	2
Minimize total length of line (reducing the total cost)	42	3
Proximity to public amenities (schools, parks, churches)	40	4
Minimize new corridor impact by placing new facilities alongside existing linear infrastructure (e.g. utility lines, roads, railways)	38	5
View from roadways	37	6
Impact to historic and archaeological resources	36	7
Maintain reliable electric service	36	7
Impact to cropland or specialty crops (including blueberry farms, vineyards, organic farms, etc.)	32	9
Impact to commercial/industrial properties	28	10
Impact to streams and wetlands	25	11
Impact to federal and state lands and other environmentally sensitive areas	19	12
Impact to forested area (non-state/federal lands)	19	12

viewshed or aesthetic concerns. Additional concerns included construction noise, noise from operation of the transmission line, and elector-magnetic field (EMF) hazards. Three respondents commented that a more direct path would be better, with one indicating a preference for Segments 17 and 13 over Segment 19. In total 23, comments were received in opposition to Segment 19.

- One comment identified Segments 10, 16, and 18 as being in close proximity to RCW clusters within the CNF. Habitat in the vicinity of these segments has been set aside for future recovery of the species in the 2002 Croatan National Forest Land and Resource Management Plan.
- One comment suggested that a ROW through the heavily forested regions of the study area would serve as a maintained fire barrier.
- A representative of the NCDOT provided comments at the open house regarding the relocation of US 70 from Havelock to Morehead City.

- The CLT identified a conservation easement around Mill Pond and Black Creek, crossed by Segments 5-8, 10, and 11, as well as a parcel under state easement, trust fund easement, and military restrictive easement crossed by Segment 10.
- Three comments were received at the open house by landowners in the vicinity of Segments 3, 23, and 24 with no opposition to the project.
- A representative from Weyerhaeuser Timber Company relayed potential safety concerns regarding land use compatibility between operating and maintaining an overhead transmission line and active forestry operations. Concerns were also expressed regarding loss of tree growing acreage due to ROW restrictions, and the potential for the transmission line ROW to open a corridor for trespassing onto forestry lands. The latter was identified as a safety concern given the operation of heavy equipment on the site and because the site is leased for recreational hunting. Of the route alternatives, Weyerhaeuser identified the most northern alignment (Segments 5 and 12 across their property) as potentially having the least impact on planned forestry activities.
- One comment expressed concern over residence in proximity to Segment 24.
- Four comments were provided by individual property owners which identified preferences for crossing their property, such as preserving existing road frontage, paralleling existing access roads, reducing impacts to agricultural or silvicultural lands, and following property lines.
- One comment identified a newly constructed horse barn and pasture area crossed by Segments 10 and 18.
- Two comments indicated plans to construct a home in close proximity to Segment 19 and just northwest of proposed Newport 230kV Switching Station.
- One comment identified Segment 13 as preferred crossing of the CNF because it would be the least impactful.
- One comment expressed viewshed and safety concerns over Segment 11 crossing Mill Pond.
- Two comments identified old gravesites in the vicinity of Segments 17 and 21.
- Two comments identified parcels enrolled in a state-sponsored forestry program crossed by Segment 10.
- General questions or requests for additional information included:
 - Are the route options etched in stone or can they be tweaked once a route has been chosen?
 - How is the appraisal process for the easement handled?
 - A request for PDF versions of the maps presented at the Open House
 - What happens with the existing standing timber on the easement?

- o A request for more information on how landowners will be compensated for losses in property value.

The public input was used in the evaluation through the weighting of the routing criteria and in making the final selection of the preferred route.

4.3.5 Segment Adjustments and Additions

As a result of information gathered during the public involvement activities, several segments were adjusted to further minimize impacts. Segments 9, 14, 15, 17, and 23 were revised primarily to improve line design and to further reduce impacts to individual property owners. Given the rural nature of the area crossed by these segments, these revisions were considered reasonable because they did not cause a proposed segment to be closer to another person's home. These refinements also remained on the same properties so no additional notifications of the public were required. Minor alignment adjustments may be made once the NCUC approves a route and easement negotiations are initiated with landowners along the selected route.

Although public involvement activities identified some segments that caused relatively greater concern (primarily due to proximity to residences), all segments were left in for route evaluation. The routing and siting team felt that since the route evaluation incorporated the public's priorities with regards to routing and siting considerations, routes with these segments would ultimately score accordingly in the route evaluation.

4.4 IDENTIFICATION OF THE PREFERRED ROUTE

The segments were combined to form all possible route alternatives between the proposed end points. The alternatives were then evaluated based on ecological, land use, cultural, and technical (engineering) criteria groups. Data for each of these groups were quantified and a weighted analysis was performed to capture the route consideration priorities identified through the public involvement activities. The following is a detailed description of the process that resulted in the selection of a preferred route.

4.4.1 Quantitative Routing Considerations

The evaluation of the proposed alternatives began by identifying and grouping the opportunities and constraint data with which to evaluate the proposed routes. Breaking out the opportunities and constraints data into three tiers, Criteria Group, Criteria, and Sub-Criteria, allowed the data to be weighted in a way that captured the route consideration priorities identified by the public involvement activities, as further

detailed in the next section. Table 4-2 shows the criteria groups, criteria, and sub-criteria groups used in the weighted analysis.

**Table 4-2
Criteria Groups, Criteria, and Sub-Criteria**

Criteria Group & Weight		Criteria & Weight		Sub-Criteria & Weight	
Ecology	20%	Wetlands	20%	Acres of Forested Wetlands in ROW	30%
				Acres of Potential CAMA Wetlands in ROW	25%
				Acres of 75' Buffer of CAMA Wetlands in ROW	25%
				Acres of PSS/PEM Wetlands in ROW	20%
		Streams	15%	Number of Stream Crossings along Centerline	60%
				Acres of Stream Buffer within ROW	40%
		Land Cover	15%	Acres of Hardwood Forest within ROW	30%
				Acres of Urban/Built-up Area within ROW	25%
				Acres of Mixed Forest within ROW	20%
				Acres of Pine Forest within ROW	15%
				Acres of Scrub/Shrub/Cut-Over within ROW	5%
				Acres of Grassland/Herbaceous within ROW	3%
				Acres of Cultivated Crop/Pasture/Hay within ROW	2%
		Protected & Rare Species	40%	Count of Federal T&E within 500' of ROW	40%
				Count of Federal Species of Concern within 100' of ROW	25%
				Count of State T&E within 500' of ROW	20%
Count of State Species of Concern within 100' of ROW	15%				
Floodplain	10%	Acres of Floodway in ROW	80%		
		Acres of 100-Year Floodplain in ROW	15%		
		Acres of 500-Year Floodplain in ROW	5%		
Land Use	50%	Residential Buildings	35%	Number of Residential Buildings within ROW	45%
				Number of Residential Buildings within 100' of ROW	40%
				Number of Residential Buildings within 100-500' of ROW	10%
				Number of Residential Buildings within 500-1000' of ROW	5%
		Non-Residential Buildings	10%	Number of Non-Residential Buildings within ROW	60%
				Number of Non-Residential Buildings within 100' of ROW	25%
				Number of Non-Residential Buildings within 100-200' of ROW	15%
		Prime Farmland	5%	Acres of Prime Farmland within ROW	30%
				Acres of Farmland of Unique Importance within ROW	30%
				Acres of Farmland of Statewide Importance within ROW	30%
Acres of Prime Farmland if Drained within ROW	10%				

Table 4-2 Continued

Land Use	50%	Properties Crossed	10%	Number of Properties Crossed by ROW	60%		
				Number of Property Owners Crossed by ROW	40%		
		Institutional Land Use	20%			Acres of Institutional land Use Crossed by ROW	60%
						Number of Institutional Land Use within 100' of ROW	25%
						Number of Institutional Land Use within 100-500' of ROW	10%
						Number of institutional Land Use within 500-1000' of ROW	5%
		Sensitive Land Use	15%			Acres of Sensitive Land Use within ROW	60%
						Acres of Sensitive Land Use within 100' of ROW	25%
						Acres of Sensitive Land Use within 100-500' of ROW	10%
						Acres of Sensitive Land Use within 500-1000' of ROW	5%
		Proposed Land Use	5%			Acres of Proposed Institutional Land Use within ROW	50%
						Acres of Proposed Residential/Commercial Land Use within ROW	50%
Cultural	10%	Historic Site/Structure	35%		Number of Historic Sites/Structures within ROW	60%	
					Number of Historic Sites/Structures within 100' of ROW	25%	
					Number of Historic Sites/Structures within 100-500' of ROW	10%	
					Number of Historic Sites/Structures within 500-1000' of ROW	5%	
		Archaeological Sites	25%			Number of Archaeological Sites within the ROW	67%
						Number of Archaeological Sites within 50' of ROW	33%
		Cemetery	40%			Number of cemeteries within ROW	67%
						Number of Cemeteries within 100' of ROW	33%
Technical	20%	Road Crossings	10%		Number of Centerline Road Crossings	100%	
		Railroad Crossings	10%		Number of Centerline Railroad Crossings	100%	
		Route Length	35%		Length of Route in Miles	100%	
		Angles	10%			Number of Angles Less than 30°	33%
						Number of Angles Greater than or Equal to 30°	67%
		Paralleling Linear Infrastructure	35%			Length of Route Paralleling Existing DEP Electric Transmission ROW	40%
						Length of Route Paralleling Existing non-DEP Electric Transmission	30%
						Length of Route Paralleling existing Pipeline or Overbuilding non-DEP Electric Distribution ROW	15%
Length of Route Paralleling Road or Active Railroad ROW	15%						

CAMA denotes Coastal Area Management Act, PEM denotes Palustrine Emergent Wetland, PSS denotes Palustrine Scrub/Shrub Wetland, T&E denotes Threatened and Endangered Species. Wetland types based on Cowardin classification (Cowardin et al. 1979).

Digital data, such as roads, parcels, sensitive and protected lands, locations of rare and protected species, cultural and historic resources, and approximated wetland and stream information, were acquired from

various agencies. Additional information about the study area was obtained from 2010 aerial imagery and USGS topographic maps. This data was then supplemented and verified by field reconnaissance from publically accessible portions of the study area. Some of the criteria were quantified using GIS software; others were calculated by measuring information directly from the aerial photography. Where sub-criteria were calculated based on a specified distance within and from the proposed ROW, all sub-criteria within that criteria group are mutually exclusive. Following is a description of each of the routing considerations used in the weighted analysis.

Ecology Criteria Group

Wetlands within the study area were approximated using both NWI data from the USFWS and coastal wetlands data from the DCM (NWI 2014 and DCM 2016). The NWI dataset was created by analyzing aerial images and classified according to the Cowardin system (Cowardin et al. 1979). The coastal wetlands data was developed by using an overlay analysis between NWI wetland, county soil surveys, and 30- meter Thematic Mapper satellite imagery, and are also classified according to the Cowardin system. Any overlap between these datasets was removed to avoid double counting. Categories evaluated in the analysis include acres of palustrine forested (PFO) wetland, palustrine scrub/shrub and emergent (PSS/PEM) wetlands, and potential coastal wetlands (estuarine), including estuarine and marine deepwater, estuarine, and marine wetland. Wetlands were included in the analysis to compare the potential level of effort for federal and state permitting under the Clean Water Act and Coastal Area Management Act (CAMA) and capture potential increased costs for construction associated with structure foundation type and construction access. The analysis quantified the acres of forested wetlands, potential CAMA wetlands, and PSS/PEM wetlands within the ROW. A 75' buffer was applied to the potential CAMA wetlands as these areas are regulated under CAMA and were quantified in the analysis as acres of buffer within the ROW.

Streams within the study area were approximated using flowlines from the USGS National Hydrography Dataset (NHD 2014). The categories stream/river, artificial path, and canal/ditch from this dataset were combined for the analysis. Sub-criteria were quantified in the analysis as the total number of streams crossed by the ROW and acres of stream buffer within the ROW were calculated by placing a 100 foot buffer on all flowlines. Streams and stream buffers were included in the analysis to compare the potential level of effort for federal and state permitting under the Clean Water Act and Rivers and Harbors Act, as well as capture potential engineering constraints for increased span length and minimum vertical clearance requirements. None of the streams crossed were listed on the National Rivers Inventory or designated as a state or national scenic river.

Land Cover was included in the analysis to capture the potential loss or impact to certain cover types. Land cover within the study area was approximated using the 2011 Multi-Resolution Land Characteristics (MRLC) Consortium National Land Cover Database (NLCD), which was derived from remote sensing techniques using Landsat satellite imagery (MRLC 2011). Categories within this dataset used for the analysis included developed (open space, low, medium, and high intensity), forest (deciduous, evergreen, and mixed), shrubland (shrub/scrub), herbaceous (grassland/herbaceous), and planted/cultivated (pasture/hay and cultivated crops). Water, wetlands, and barren lands data were not used and all sub-criteria were calculated as acres crossed by the ROW.

Protected and Rare Species occurrences within the study area were included in the analysis to compare the level of effort needed to construct a route compliant with the Threatened and Endangered Species Act. Occurrences were obtained from the NHP (NHP 2015). This dataset is based upon known current and historic observations of the species. Specific locations of the observations are not depicted, rather, large general locations are provided to prevent poaching. The analysis quantified the number of occurrences of federal and state listed species and species of concern within a specified distance of the ROW. State species of concern included those with the significantly rare designation. No federally-listed threatened species were identified in the analysis. The analysis also looked for USFS PETS species and species protected under the Bald and Golden Eagle Protection Act crossed by the proposed routes and none were identified (NHP 2015 and DEP 2015).

Floodplain data was obtained from the Federal Emergency management Agency's (FEMA) National Flood Hazard Layer (FEMA 2015). Categories within the dataset used for the analysis included the floodway, 100- year floodplain, and 500- year floodplain. These sub-criteria were calculated as acres within the ROW to measure potential impacts to the floodplain by a proposed route. No floodway was identified by the analysis.

Land Use Criteria Group

Residential Buildings within the study area were included in the analysis to compare potential impacts to residences based on the proximity to the proposed route. Residential buildings were identified using building footprints obtained from the NC Department of Public Safety, Emergency Management (NCEM) (NCEM 2015). This data was supplemented and verified using existing land use data from the locality GIS, aerial imagery, and field reconnaissance (Carteret County 2016d, Craven County 2015, and Microsoft 2016). Residential buildings were considered to be any apparent, primary residential structure.

Garages, sheds, and other outbuildings associated with the residence were not included. Sub-criteria were calculated using the number of buildings within a specified distance of the ROW. Although multi-family residences were located within the study area, none were captured by the analysis.

Non-Residential Buildings within the study area were included in the analysis to compare potential impacts to non-residences based on the proximity to the proposed route. Non-residential buildings within the study area were identified using building footprints obtained from the NCEM (NCEM 2015). This data was supplemented and verified using existing land use data from the locality GIS, aerial imagery, and field reconnaissance (Carteret County 2016d, Craven County 2015, and Microsoft 2016). Non-Residential buildings were considered to be any outbuildings not included above, businesses, and any other non-residential or non-institutional buildings. Buildings such as schools, churches, or hospitals, were considered institutional and were included elsewhere. Sub-criteria were calculated using the number of buildings within a specified distance of the ROW.

Prime Farmland within the study area was approximated using data obtained from the NRCS Web Soil Survey (NRCS 2015). Categories within the dataset used for the analysis include those soils identified as prime farmland, farmland of unique importance, farmland of statewide importance, and prime farmland if drained. Sub-criteria were calculated as acres within the ROW.

Properties within the study area were identified using parcel data obtained from the locality GIS (Carteret County 2016d and Craven County 2015). The sub-criteria Properties Crossed was calculated as the raw number of parcels crossed by the ROW and Property Owners Crossed was calculated as the number of individual property owners crossed by the ROW. As no routes are located in Craven County, only those parcels in Carteret County were identified in the analysis.

Institutional Land Use within the study area was identified using building footprints obtained from the NCEM. This data was supplemented and verified using existing land use data from the locality GIS, with aerial imagery, and field reconnaissance (Carteret County 2016d, Craven County 2015, and Microsoft 2016). Sub-criteria were to be calculated using the number of buildings within a specified distance of the ROW; however, no institutional land use was identified by the analysis.

Sensitive Land Use within the study area was identified using multiple data sources, including NC One Map, NHP, and locality GIS (NC OneMap 2008, NHP 2015, Carteret County 2015, and Craven County 2015). Sensitive land use was defined to include SHNAs and managed areas (open space, safe harbor

agreements, and public conservation easements), the CNF, the Mountain-to-Sea Trail network, private conservation easements (both within and outside of regulatory agency purview), as well as parks and other recreational areas. Through the public involvement activities, parcels participating in the North Carolina FDP were identified and included. Sub-criteria were calculated as acres of sensitive land use within a specified distance of the ROW. No safe harbor agreement properties or dedicated nature preserves were identified by the analysis.

Proposed Land Use within the study area was identified to include proposed commercial, residential, and institutional developments in the permitting phase. No such land uses were identified in available GIS datasets or discovered as a result of the public involvement activities. Information was provided with regards to the construction of the US 70 Bypass project but the location was not in the vicinity of any of the proposed segments. Information was also provided for the community of Chadwick Shores which was found to be partially constructed and as such was not included.

Historic Sites/Structures within the study area were obtained from the NCSHPO (NCSHPO 2016). Categories in this dataset evaluated in the analysis include study list, determination of eligibility, eligible, and national register listed sites and historic districts. Sub-criteria in this group were calculated as the number of historic sites within a specified distance of the ROW. The analysis did identify properties on the study list and one property determined eligible but gone, but none of the other categories were identified by the analysis.

Archaeological Sites within the study area were obtained from the NCOSA and by reviewing USGS topographic maps (NCOSA 2015 and USGS 2013). Categories in this dataset evaluated in the analysis include surveyed only, study list, determination of eligibility, and national register listed sites. Sub-criteria in this group were calculated as the number of archaeological sites within a specified distance of the ROW. No archaeological sites were identified by the analysis.

Cemeteries within the study area were obtained from locality GIS data and USGS topographic maps, and were then supplemented and verified with field reconnaissance (Carteret County 2015, Craven County 2015, and USGS 2013). Sub-criteria were calculated as the number of cemeteries within a specified distance of the ROW. No cemeteries were identified by the analysis.

Technical Criteria Group

Road Crossings were measured using road centerlines obtained from NCDOT (NCDOT 2014). Road crossings included state and/or locality maintained roads to capture potential permitting requirements and did not include private drives, parking lots or farm/forestry roads as these crossings would likely not require any permitting. This sub-criterion was calculated as the number of times a proposed route centerline crossed a road centerline.

Railroad Crossings within the study area were identified using data obtained from NC One Map and USGS topographic maps and verified by field reconnaissance (NC OneMap 2008 and USGS 2013). These sub-criteria were to be calculated as the number of times a proposed route centerline crossed a railroad centerline; however, no railroad crossings were identified in the analysis.

Route Length was measured and compared because it is an indicator of relative cost and impact of a project. Generally, the longer the proposed route, the greater the potential number of affected landowners and the greater the potential overall environmental impact.

Turn Angles along the proposed routes were measured as angles of deviation less than 30 degrees and angles 30 degrees and greater. Turns 30 degrees and greater require dead-end structures that are designed to carry more load and as such, are more visible and have a greater cost of construction. Sub-criteria were calculated as counts per route.

Paralleling Linear Infrastructure was measured as the length a route paralleling infrastructure such as existing transmission lines, pipelines, railroads, and roads. In the case of existing transmission lines, paralleling these features is generally considered a favorable opportunity as it typically results in less visual and environmental impact, particularly when ROW can be shared. The length of a route paralleling other linear infrastructure such as pipelines, railroads, and roads was calculated as coordination and permitting with entity operating the infrastructure may be required. Linear infrastructure within the study area was identified using the same data sets obtained from road and railroad crossings, with data provided by DEP, and by reviewing USGS topographic maps and aerial imagery (DEP 2011, USGS 2013, and Microsoft 2016). No pipelines, railroads, roads or non-DEP transmission lines were identified to be paralleled by any of the proposed routes. All routes have Segment 1 in common, which parallels an existing DEP transmission line ROW.

4.4.2 Weighting the Opportunities and Constraints

After identifying the opportunities and constraint described above, the next step in the weighted analysis was to weight the data in a way that captured the route consideration priorities identified by the public involvement activities. The routing and siting team assigned weights to the criteria groups, criteria, and sub-criteria based on the input from the public involvement activities, but also, due to the low number of respondents, factored in input from the public on similar projects in the region, input from DEP engineers, and experience with similar transmission line projects across the country. The weights associated with each routing consideration are also presented in Table 4-2.

4.4.3 Weighted Analysis Method

As a result of the segments modifications and deletions described in Section 4.2, 24 segments were identified interconnecting the proposed Harlowe 230kV – 115kV Substation and proposed Newport 230kV Switching Station. The segments were combined to form all possible routes between the endpoints, resulting in 17 routes to be carried forward in the weighted analysis. The segments composing each route and the sub-criteria calculations for the analysis are shown in Table 4-3 and Table 4-4, respectively.

Each sub-criteria was calculated by route, and the raw data were normalized so that the data could be directly compared. The following formula was used for the normalization:

$$\text{Normalized Value for Sub-Criteria} = \frac{(\text{value of sub-criteria for Route X} - \text{min value among all routes})}{\text{range of values for all routes}} * 100.$$

An example is provided below.

$$\text{Number of Stream Crossings for Route Z} = [(5 - 1) / 6] * 100$$

Whereas: 5 is the number of streams crossed by Route Z

1 is the minimum number of streams crossed among all routes

6 is the range of streams crossed for all routes

A weighted multiplier was then applied to the normalized value to arrive at a score for that particular sub-criterion. The weighted multipliers for each sub-criterion were established by multiplying the criteria group, criteria, and sub criteria weights together. For example, the weighted multiplier for the Number of Stream Crossings sub-criteria was found to be 0.018, whereby the sub-criteria weight of 60 percent was

multiplied by Streams criteria weight of 15 percent and the Ecology criteria group weight of 20 percent. The sub-criteria scores for a particular route were then added together to arrive at an overall score for that route.

4.4.4 Weighted Analysis Results

Once an overall score was established for each of the 17 possible routes, the routes were ranked with the lowest score being the top-ranked route. The scores are not considered a definitive comparison of routes; rather they provide a useful index of the relative overall impact associated with the alternatives. The ultimate goal is to identify the least overall impacting route, using both the weighted analysis and “intangible” or unquantifiable features of the routes as identified through public involvement activities. The results of the weighted analysis and ranks are shown in Table 4-4 and a summary of the results is provided below.

- Every route exiting the proposed Harlowe 230kV – 115kV Substation to the east ranked in the bottom half of all routes, 10th-17th, including Routes J, K, L, N, O, P, and Q. These routes had scores ranging from 28.7 to 45.86, which were more than twice as high as all other routes except one. Each of these routes was comprised in some fashion of Segments 10, 16, 18, 19, or 21-24, which were not components of any of the other, better scoring routes. In general, these routes scored poorly due to:
 - Their proximity to residential and non-residential buildings associated with Segments 19, 23 and 24;
 - Acres of potential CAMA wetlands and acres of floodplain associated with Harlowe Creek in vicinity of Segments 21 and 23;
 - Proximity to T&E species associated with Segment 16;
 - Acres of sensitive land use associated with Segments 10 and 16; and an
 - Overall greater route length contributing to a higher number of properties, landowners, and roads crossed, as well as a greater number of heavy angles.
- The top five routes exited the proposed Harlowe 230kV – 115kV Substation to the west and had scores ranging from 8.64-12.25, including Routes F, D, B, G and E, respectively.
 - The top 3 routes (F, D, and B) had Segment 13 in common, which was the second shortest crossing of the CNF, following Segment 10. The only difference between these routes was in the crossing of Mill Pond, where the private conservation easements and SNHAs are located. Route F featured the shortest crossing of these areas, along Segment 8; followed by Route D with the second shortest crossing along Segment 6; and Route B with the longest crossing along Segment 5. These routes were among the highest scoring

routes in the Cultural criteria group given their proximity to properties identified as being on the NCSHPO Study List.

- Routes G and E, ranked 4th and 5th, had Segments 14 and 17 in common which also provided a relatively short crossing of the CNF relative to other segments. Route G had the shorter crossing of Mill Pond along Segment 8, followed by Route E along Segment 6.
- In general, the top five routes scored well because there were no residential buildings, non-residential buildings, institutional land use within the ROW or within 100' of the ROW, and were generally among the shortest routes considered. These routes also minimized the crossings of sensitive lands and were further away from occurrences of threatened and endangered species.
- Routes H, C, M, and A ranked in the middle at 6th-9th place, respectively, with scores ranging from 12.53-17.50.

4.4.5 Preferred Route Selection

During the routing and siting process, DEP considered impacts to the human and natural environments by repeatedly engaging project stakeholders. The challenge was to balance public and stakeholder concerns and identify a low impact but feasible route. In total, 17 route alternatives were evaluated in selecting the preferred route.

Upon completion of the weighted analysis and result evaluation, only the top five scoring route alternatives, Routes F, D, B, G, and E, were further evaluated for selection of the preferred route. Key project stakeholders impacted by these alternatives were further engaged to ensure that each had ample opportunity to provide input on final route selection. These key stakeholders were identified as the USFS, CLT, and those individual property owners with large land holdings (>1,000 acres) crossed by the alternatives, including Mr. Joel H. Davis and Weyerhaeuser Timber Company. The USFS and CLT did not provide any additional information with which to evaluate the top five route alternatives and the USFS reiterated their preference for the shortest crossing of the CNF. The preferences of Weyerhaeuser Timber Company and Mr. Joel H. Davis included minimizing loss of tree growing acreage and minimizing the potential for land use conflicts between operating the transmission line and active forestry operations. Based upon this feedback, Route B was identified as the preferred route. Route B is comprised of Segments 1, 5, 12, 13, and 20.

**Table 4-3
Route Data**

Route	Segments Comprising Route	Ecology																			
		Wetlands								Streams				Land Cover							
		Acres of Forested Wetlands in ROW		Acres of Potential CAMA Wetlands in ROW		Acres of 75' Buffer of CAMA Wetlands in ROW		Acres of PSS/PEM Wetlands in ROW		Number of Stream Crossings along Centerline		Acres of Stream Buffer within ROW		Acres of Hardwood Forest within ROW		Acres of Urban/Built-up within ROW		Acres of Mixed Forest within ROW		Acres of Pine Forest	
Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized		
A	1-5-9-20	86.82	5.63	0.20	4.19	0.61	31.83	10.33	100	6	40	4.09	14.72	0	N/A	1.46	0.83	0	N/A	31.55	0
B	1-5-12-13-20	84.68	0	0.00	0.07	0.28	14.86	6.60	62.93	5	20	3.19	0.59	0	N/A	1.34	0	0	N/A	40.13	29.82
C	1-5-12-14-17-20	95.91	29.51	0	0	0	0	0.26	0	6	40	3.87	11.26	0	N/A	4.55	21.26	0	N/A	40.54	31.24
D	1-2-6-13-20	91.08	16.81	0.00	0.07	0.28	14.86	6.60	62.93	5	20	5.03	29.53	0	N/A	1.34	0	0	N/A	38.29	23.42
E	1-2-6-14-17-20	102.31	46.32	0	0	0	0	0.26	0	6	40	5.72	40.20	0	N/A	2.74	9.30	0	N/A	38.70	24.84
F	1-2-4-8-13-20	95.35	28.03	0.00	0.07	0.28	14.86	6.60	62.93	4	0	3.15	0	0	N/A	1.89	3.68	0	N/A	42.61	38.41
G	1-2-4-8-14-17-20	106.57	57.53	0	0	0	0	0.26	0	5	20	3.83	10.67	0	N/A	3.30	12.98	0	N/A	43.02	39.83
H	1-2-4-7-15-17-20	97.67	34.14	0	0	0	0	6.29	59.93	7	60	5.21	32.28	0	N/A	5.74	29.12	0	N/A	33.19	5.72
I	1-2-4-7-16-21-23-22	99.96	40.15	4.82	100	1.91	100	0.87	6.09	7	60	5.19	32.03	0	N/A	16.45	100	0	N/A	40.59	31.40
J	1-2-4-7-16-21-24-22	107.55	60.10	4.02	83.41	1.47	76.79	0.87	6.09	7	60	5.15	31.28	0	N/A	16.17	98.18	0	N/A	42.91	39.46
K	1-3-11-16-21-23-22	104.08	50.99	4.82	100	1.91	100	0.94	6.71	7	60	5.28	33.35	0	N/A	15.64	94.64	0	N/A	50.42	65.56
L	1-3-11-16-21-24-22	111.67	70.93	4.02	83.41	1.47	76.79	0.94	6.71	7	60	5.23	32.60	0	N/A	15.36	92.82	0	N/A	52.75	73.62
M	1-3-11-15-17-20	101.80	44.98	0	0	0	0	6.36	60.55	7	60	5.29	33.60	0	N/A	4.93	23.76	0	N/A	43.03	39.87
N	1-3-10-18-21-23-22	115.15	80.05	4.82	100	1.91	100	4.26	39.74	9	100	9.53	100	0	N/A	5.10	24.90	0	N/A	58.02	91.94
O	1-3-10-19-21-24-22	122.10	98.34	4.02	83.41	1.47	76.79	5.21	49.20	9	100	9.27	95.90	0	N/A	4.83	23.11	0	N/A	57.87	91.42
P	1-3-10-18-21-24-22	122.74	100	4.02	83.41	1.47	76.79	4.26	39.74	9	100	9.49	99.25	0	N/A	4.83	23.08	0	N/A	60.34	100
Q	1-3-10-19-21-23-22	114.51	78.39	4.82	100	1.91	100	5.21	49.21	9	100	9.32	96.65	0	N/A	5.11	24.93	0	N/A	55.55	83.36
	<i>Minimum</i>	84.68		0		0		0.26		4		3.15		0		1.34		0		31.55	
	<i>Maximum</i>	122.74		4.82		1.91		10.33		9		9.53		0		16.45		0		60.34	
	<i>Range</i>	38.06		4.82		1.91		10.07		5		6.39		0		15.11		0		28.79	

**Table 4-3
Route Data Continued**

Route	Segments Comprising Route	Ecology Con't																			
		Land Cover Con't						Threatened and Endangered Species								Floodplain					
		Acres of Scrub/Shrub/Cut-Over within ROW		Acres of Grassland/Herbaceous within ROW		Acres of Cultivated Crop/Pasture/Hay within ROW		Count of Federal T&E within 500' of ROW		Count of Federal Species of Concern within 100' of ROW		Count of State T&E within 500' of ROW		Count of State Species of Concern within 100' of ROW		Acres of Floodway within ROW		Acres of 100- Year Floodplain in ROW		Acres of 500-Year Floodplain in ROW	
		Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized
A	1-5-9-20	9.59	0	5.88	17.15	9.87	30.77	0	0	1	100	0	0	4	0	0	N/A	1.89	0	4.86	5.04
B	1-5-12-13-20	11.54	10.40	5.81	16.25	11.37	42.79	0	0	1	100	0	0	4	0	0	N/A	3.44	10.25	4.45	0
C	1-5-12-14-17-20	15.11	29.37	4.55	0	6.03	0	0	0	1	100	0	0	4	0	0	N/A	4.08	14.49	5.52	13.09
D	1-2-6-13-20	15.40	30.91	6.10	20.03	14.49	67.80	0	0	1	100	0	0	4	0	0	N/A	3.56	11.06	4.45	0
E	1-2-6-14-17-20	18.96	49.88	4.84	3.78	9.15	25.01	0	0	1	100	0	0	4	0	0	N/A	4.20	15.29	5.52	13.09
F	1-2-4-8-13-20	18.05	45.00	6.75	28.31	12.77	54.03	0	0	1	100	0	0	4	0	0	N/A	3.52	10.80	4.62	2.05
G	1-2-4-8-14-17-20	21.61	63.97	5.48	12.06	7.43	11.24	0	0	1	100	0	0	4	0	0	N/A	4.16	15.03	5.69	15.13
H	1-2-4-7-15-17-20	18.50	47.39	6.13	20.37	7.41	11.07	0	0	0	0	0	0	4	0	0	N/A	7.75	38.72	6.36	23.37
I	1-2-4-7-16-21-23-22	18.29	46.30	9.05	58.06	13.35	58.70	1	100	0	0	1	100	4	0	0	N/A	17.01	100	7.23	34.06
J	1-2-4-7-16-21-24-22	20.37	57.34	6.97	31.18	12.99	55.80	1	100	0	0	1	100	4	0	0	N/A	15.79	91.94	12.62	100
K	1-3-11-16-21-23-22	24.26	78.04	8.53	51.35	13.03	56.14	1	100	0	0	1	100	4	0	0	N/A	14.06	80.51	6.87	29.62
L	1-3-11-16-21-24-22	26.33	89.09	6.45	24.47	12.67	53.24	1	100	0	0	1	100	4	0	0	N/A	12.85	72.46	12.26	95.55
M	1-3-11-15-17-20	24.46	79.14	5.61	13.67	7.09	8.51	0	0	0	0	0	0	4	0	0	N/A	4.80	19.24	6.00	18.92
N	1-3-10-18-21-23-22	25.91	86.81	10.96	82.63	14.98	71.76	0	0	0	0	0	0	4	0	0	N/A	15.48	89.89	6.40	23.78
O	1-3-10-19-21-24-22	28.39	100	10.22	73.12	18.14	97.10	0	0	0	0	0	0	4	0	0	N/A	14.61	84.13	11.78	89.72
P	1-3-10-18-21-24-22	27.98	97.85	8.87	55.75	14.62	68.85	0	0	0	0	0	0	4	0	0	N/A	14.26	81.83	11.78	89.72
Q	1-3-10-19-21-23-22	26.31	88.96	12.31	100	18.50	100	0	0	0	0	0	0	4	0	0	N/A	15.83	92.19	6.40	23.78
	<i>Minimum</i>	9.59		4.55		6.03		0		0		0		4		0	N/A	1.89		4.45	
	<i>Maximum</i>	28.39		12.31		18.50		1		1		1		4		0		17.01		12.62	
	<i>Range</i>	18.8005		7.76		12.47		1		1		1		0		0		15.12		8.17	

**Table 4-3
Route Data Continued**

Route	Segments Comprising Route	Land Use																			
		Residential Buildings								Non-Residential Buildings						Prime Farmland					
		Number of Residential Buildings within ROW		Number of Residential Buildings within 100' of ROW		Number of Residential Buildings within 100-500' of ROW		Number of Residential Buildings within 500-1000' of ROW		Number of Non-Residential Buildings within ROW		Number of Non-Residential Buildings within 100' of ROW		Number of Non-Residential Buildings within 100-200' of ROW		Acres of Prime Farmland within ROW		Acres of Farmland of Unique Importance within ROW		Acres of Farmland of Statewide Importance within ROW	
		Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized
A	1-5-9-20	0	0	0	0	6	10.53	17	12.50	0	N/A	0	0	0	0	0	0	7.92	0	6.00	23.39
B	1-5-12-13-20	0	0	0	0	4	0	14	6.25	0	N/A	0	0	0	0	0	0	7.92	0	5.20	20.28
C	1-5-12-14-17-20	0	0	0	0	5	5.26	11	0	0	N/A	0	0	0	0	2.66	10.37	8.60	8.55	3.05	11.90
D	1-2-6-13-20	0	0	0	0	4	0	14	6.25	0	N/A	0	0	0	0	0.04	0.17	7.92	0	5.20	20.28
E	1-2-6-14-17-20	0	0	0	0	5	5.26	11	0	0	N/A	0	0	0	0	2.70	10.54	8.60	8.55	3.05	11.90
F	1-2-4-8-13-20	0	0	0	0	4	0	14	6.25	0	N/A	0	0	0	0	4.73	18.43	7.92	0	5.20	20.28
G	1-2-4-8-14-17-20	0	0	0	0	5	5.26	11	0	0	N/A	0	0	0	0	7.39	28.80	8.60	8.55	3.05	11.90
H	1-2-4-7-15-17-20	0	0	0	0	5	5.26	11	0	0	N/A	0	0	0	0	13.41	52.28	9.84	24.23	3.05	0
I	1-2-4-7-16-21-23-22	0	0	2	40	19	78.95	52	85.42	0	N/A	0	0	2	100	25.64	100	13.09	65.36	4.71	18.35
J	1-2-4-7-16-21-24-22	0	0	1	20	12	42.11	34	47.92	0	N/A	0	0	0	0	17.57	68.50	13.09	65.36	4.63	18.06
K	1-3-11-16-21-23-22	0	0	2	40	19	78.95	52	85.42	0	N/A	0	0	2	100	16.54	64.51	13.09	65.36	10.00	38.99
L	1-3-11-16-21-24-22	0	0	1	20	12	42.11	34	47.92	0	N/A	0	0	0	0	8.47	33.02	13.09	65.36	9.93	38.71
M	1-3-11-15-17-20	0	0	0	0	5	5.26	11	0	0	N/A	0	0	0	0	4.31	16.79	9.84	24.23	8.35	32.55
N	1-3-10-18-21-23-22	0	0	2	40	18	73.68	59	100	0	N/A	1	100	2	100	23.07	89.95	15.84	100	4.71	18.35
O	1-3-10-19-21-24-22	1	100	4	80	16	63.16	40	60.42	0	N/A	1	100	0	0	16.00	62.40	15.84	100	4.63	18.06
P	1-3-10-18-21-24-22	0	0	1	20	11	36.84	41	62.5	0	N/A	1	100	0	0	14.99	58.46	15.84	100	4.63	18.06
Q	1-3-10-19-21-23-22	1	100	5	100	23	100	58	97.92	0	N/A	1	100	2	100	24.08	93.90	15.84	100	4.71	18.35
	<i>Minimum</i>	0		0		4		11		0		0		0		0		7.92		3.05	
	<i>Maximum</i>	1		5		23		59		0		1		2		25.64		15.84		10.00	
	<i>Range</i>	1		5		19		48		0		1		2		25.64		7.91		6.95	

**Table 4-3
Route Data Continued**

Route	Segments Comprising Route	Land Use Con't																			
		Prime Farmland Con't		Properties Crossed				Institutional Land Use								Sensitive Land Use					
		Acres of Prime Farmland if Drained within ROW		Number of Properties Crossed by ROW		Number of Property Owners Crossed by ROW		Acres of Institutional land Use Crossed by ROW		Number of Institutional Land Use within 100' of ROW		Number of Institutional Land Use within 100-500' of ROW		Number of Institutional Land Use within 500-1000' of ROW		Acres of Sensitive Land Use within ROW		Acres of Sensitive Land Use within 100' of ROW		Acres of Sensitive Land Use within 100-500' or ROW	
		Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized
A	1-5-9-20	96.54	20.64	24	15.15	21	16	0	N/A	0	N/A	0	N/A	0	N/A	45.95	85.72	72.55	93.96	312.75	100
B	1-5-12-13-20	92.25	10.90	19	0	17	0	0	N/A	0	N/A	0	N/A	0	N/A	29.71	39.53	50.74	51.17	253.80	72.02
C	1-5-12-14-17-20	100.76	30.22	20	3.03	18	4	0	N/A	0	N/A	0	N/A	0	N/A	36.58	59.07	61.45	72.18	293.16	90.70
D	1-2-6-13-20	93.28	13.23	20	3.03	18	4	0	N/A	0	N/A	0	N/A	0	N/A	23.86	22.90	34.33	18.97	148.95	22.26
E	1-2-6-14-17-20	101.79	32.55	21	6.06	18	4	0	N/A	0	N/A	0	N/A	0	N/A	30.73	42.43	45.03	39.96	188.27	40.92
F	1-2-4-8-13-20	96.44	20.41	21	6.06	18	4	0	N/A	0	N/A	0	N/A	0	N/A	15.81	0.00	24.66	0	102.06	0
G	1-2-4-8-14-17-20	104.95	39.73	22	9.09	19	8	0	N/A	0	N/A	0	N/A	0	N/A	22.68	19.54	35.35	20.97	141.20	18.58
H	1-2-4-7-15-17-20	87.45	0	22	9.09	19	8	0	N/A	0	N/A	0	N/A	0	N/A	35.86	57.03	51.29	52.25	191.76	42.57
I	1-2-4-7-16-21-23-22	94.55	16.11	29	30.30	25	32	0	N/A	0	N/A	0	N/A	0	N/A	50.97	100.00	75.63	100	278.46	83.72
J	1-2-4-7-16-21-24-22	107.56	45.66	26	21.21	24	28	0	N/A	0	N/A	0	N/A	0	N/A	50.97	100.00	75.63	100	278.46	83.72
K	1-3-11-16-21-23-22	110.80	53.02	30	33.33	25	32	0	N/A	0	N/A	0	N/A	0	N/A	44.64	82.00	69.29	87.56	276.42	82.76
L	1-3-11-16-21-24-22	123.82	82.57	27	24.24	24	28	0	N/A	0	N/A	0	N/A	0	N/A	44.64	82.00	69.29	87.56	276.42	82.76
M	1-3-11-15-17-20	103.71	36.92	23	12.12	19	8	0	N/A	0	N/A	0	N/A	0	N/A	29.54	39.05	44.97	39.85	190.01	41.74
N	1-3-10-18-21-23-22	116.57	66.11	41	66.67	36	76	0	N/A	0	N/A	0	N/A	0	N/A	32.94	48.72	50.93	51.54	198.12	45.59
O	1-3-10-19-21-24-22	131.49	100	45	78.79	41	96	0	N/A	0	N/A	0	N/A	0	N/A	27.16	32.28	41.73	33.49	180.27	37.12
P	1-3-10-18-21-24-22	129.58	95.66	38	57.58	35	72	0	N/A	0	N/A	0	N/A	0	N/A	32.94	48.72	50.93	51.54	198.12	45.59
Q	1-3-10-19-21-23-22	118.48	70.45	52	100	42	100	0	N/A	0	N/A	0	N/A	0	N/A	27.16	32.28	41.73	33.49	180.27	37.12
	<i>Minimum</i>	87.45		19		17		0		0		0		0		15.81		24.66		102.06	
	<i>Maximum</i>	131.49		52		42		0		0		0		0		50.97		75.63		312.75	
	<i>Range</i>	44.04		33		25		0		0		0		0		35.16		50.97		210.69	

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**Table 4-3
Route Data Continued**

Route	Segments Comprising Route	Land Use Con't						Cultural													
		Sensitive Land Use Con't		Proposed Land Use				Historic Site/Structure								Archaeological Sites				Cemetery	
		Acres of Sensitive Land Use within 500-1000' of ROW		Acres of Proposed Institutional Land Use within ROW		Acres of Proposed Residential/Commercial Land Use within ROW		Number of Historic Sites/Structures within ROW		Number of Historic Sites/Structures within 100' of ROW		Number of Historic Sites/Structures within 100-500' of ROW		Number of Historic Sites/Structures within 500-1000' of ROW		Number of Archaeological Sites within ROW		Number of Archaeological Sites within 50' of ROW		Number of Cemeteries within ROW	
		Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized
A	1-5-9-20	361.25	100	0	N/A	0	N/A	1	100	1	100	2	100	2	100	0	N/A	0	N/A	0	N/A
B	1-5-12-13-20	273.90	63.45	0	N/A	0	N/A	1	100	1	100	1	50	2	100	0	N/A	0	N/A	0	N/A
C	1-5-12-14-17-20	308.53	77.94	0	N/A	0	N/A	1	100	1	100	1	50	1	50	0	N/A	0	N/A	0	N/A
D	1-2-6-13-20	153.72	13.17	0	N/A	0	N/A	1	100	1	100	1	50	2	100	0	N/A	0	N/A	0	N/A
E	1-2-6-14-17-20	188.20	27.60	0	N/A	0	N/A	1	100	1	100	1	50	1	50	0	N/A	0	N/A	0	N/A
F	1-2-4-8-13-20	122.24	0	0	N/A	0	N/A	1	100	1	100	1	50	2	100	0	N/A	0	N/A	0	N/A
G	1-2-4-8-14-17-20	156.06	14.15	0	N/A	0	N/A	1	100	1	100	1	50	1	50	0	N/A	0	N/A	0	N/A
H	1-2-4-7-15-17-20	210.51	36.93	0	N/A	0	N/A	1	100	1	100	1	50	1	50	0	N/A	0	N/A	0	N/A
I	1-2-4-7-16-21-23-22	269.97	61.81	0	N/A	0	N/A	0	0	0	0	0	0	0	0	0	N/A	0	N/A	0	N/A
J	1-2-4-7-16-21-24-22	269.97	61.81	0	N/A	0	N/A	0	0	0	0	0	0	0	0	0	N/A	0	N/A	0	N/A
K	1-3-11-16-21-23-22	313.80	80.15	0	N/A	0	N/A	0	0	0	0	0	0	0	0	0	N/A	0	N/A	0	N/A
L	1-3-11-16-21-24-22	313.80	80.15	0	N/A	0	N/A	0	0	0	0	0	0	0	0	0	N/A	0	N/A	0	N/A
M	1-3-11-15-17-20	255.38	55.70	0	N/A	0	N/A	1	100	1	100	1	50	1	50	0	N/A	0	N/A	0	N/A
N	1-3-10-18-21-23-22	227.32	43.96	0	N/A	0	N/A	0	0	0	0	0	0	0	0	0	N/A	0	N/A	0	N/A
O	1-3-10-19-21-24-22	228.37	44.40	0	N/A	2.94	N/A	0	0	0	0	0	0	0	0	0	N/A	0	N/A	0	N/A
P	1-3-10-18-21-24-22	227.32	43.96	0	N/A	0	N/A	0	0	0	0	0	0	0	0	0	N/A	0	N/A	0	N/A
Q	1-3-10-19-21-23-22	228.37	44.40	0	N/A	2.94	N/A	0	0	0	0	0	0	0	0	0	N/A	0	N/A	0	N/A
	<i>Minimum</i>	122.24		0		0		0		0		0		0		0		0		0	
	<i>Maximum</i>	361.25		0		2.94		1		1		2		2		0		0		0	
	<i>Range</i>	239.01		0		2.94		1		1		2		2		0		0		0	

**Table 4-3
Route Data Continued**

Route	Segments Comprising Route	Cultural Con't		Technical																	
		Cemetery Con't		Road Crossings		Railroad Crossings		Route Length		Angles				Paralleling Linear Infrastructure							
		Number of Cemeteries within 100' of ROW		Number of Centerline Road Crossings		Number of Centerline Railroad Crossings		Length of Route in Miles		Number of Angles Less than 30°		Number of Angles Greater than or Equal to 30 Degrees°		Length of Route Paralleling Existing DEP Electric Transmission ROW		Length of Route Paralleling Existing non-DEP Electric Transmission ROW		Length of Route Paralleling existing Pipeline or Overbuilding non-DEP Electric		Length of Route Paralleling Road or Active Railroad ROW	
		Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized	Total	Normalized
A	1-5-9-20	0	N/A	1	0	0	N/A	8.49	13.35	6	55.56	4	33.33	1.57	N/A	0	N/A	0	N/A	0	N/A
B	1-5-12-13-20	0	N/A	1	0	0	N/A	7.96	0	6	55.56	2	11.11	1.57	N/A	0	N/A	0	N/A	0	N/A
C	1-5-12-14-17-20	0	N/A	1	0	0	N/A	8.19	5.79	3	22.22	2	11.11	1.57	N/A	0	N/A	0	N/A	0	N/A
D	1-2-6-13-20	0	N/A	1	0	0	N/A	8.08	3.02	10	100	1	0	1.57	N/A	0	N/A	0	N/A	0	N/A
E	1-2-6-14-17-20	0	N/A	1	0	0	N/A	8.30	8.56	7	66.67	2	11.11	1.57	N/A	0	N/A	0	N/A	0	N/A
F	1-2-4-8-13-20	0	N/A	1	0	0	N/A	8.37	10.33	9	88.89	1	0	1.57	N/A	0	N/A	0	N/A	0	N/A
G	1-2-4-8-14-17-20	0	N/A	1	0	0	N/A	8.60	16.12	6	55.56	3	22.22	1.57	N/A	0	N/A	0	N/A	0	N/A
H	1-2-4-7-15-17-20	0	N/A	1	0	0	N/A	8.56	15.11	5	44.44	1	0	1.57	N/A	0	N/A	0	N/A	0	N/A
I	1-2-4-7-16-21-23-22	0	N/A	3	33.33	0	N/A	10.04	52.39	9	88.89	4	33.33	1.57	N/A	0	N/A	0	N/A	0	N/A
J	1-2-4-7-16-21-24-22	0	N/A	4	50	0	N/A	10.33	59.70	7	66.67	2	11.11	1.57	N/A	0	N/A	0	N/A	0	N/A
K	1-3-11-16-21-23-22	0	N/A	3	33.33	0	N/A	10.76	70.53	5	44.44	7	66.67	1.57	N/A	0	N/A	0	N/A	0	N/A
L	1-3-11-16-21-24-22	0	N/A	4	50	0	N/A	11.05	77.83	4	33.33	5	44.44	1.57	N/A	0	N/A	0	N/A	0	N/A
M	1-3-11-15-17-20	0	N/A	1	0	0	N/A	9.27	33.00	2	11.11	2	11.11	1.57	N/A	0	N/A	0	N/A	0	N/A
N	1-3-10-18-21-23-22	0	N/A	5	66.67	0	N/A	11.45	87.91	4	33.33	6	55.56	1.57	N/A	0	N/A	0	N/A	0	N/A
O	1-3-10-19-21-24-22	0	N/A	7	100	0	N/A	11.93	100	1	0	8	77.78	1.57	N/A	0	N/A	0	N/A	0	N/A
P	1-3-10-18-21-24-22	0	N/A	6	83.33	0	N/A	11.73	94.96	2	11.11	4	33.33	1.57	N/A	0	N/A	0	N/A	0	N/A
Q	1-3-10-19-21-23-22	0	N/A	6	83.33	0	N/A	11.64	92.70	3	22.22	10	100	1.57	N/A	0	N/A	0	N/A	0	N/A
	<i>Minimum</i>	0		1		0		7.96		1		1		1.57		0		0		0	
	<i>Maximum</i>	0		7		0		11.93		10		10		1.57		0		0		0	
	<i>Range</i>	0		6		0		3.97		9		9		0		0		0		0	

Table 4-4
Results of Weighted Analysis

Route	Segments Comprising Route	Ecology Score	Ecology Rank	Land Use Score	Land Use Rank	Cultural Score	Cultural Rank	Technical Score	Technical Rank	Total Score	Overall Rank
A	1-5-9-20	4.17	9	8.04	9	3.50	17	1.79	7	17.50	9
B	1-5-12-13-20	3.24	3	3.75	5	3.33	14	0.52	1	10.83	3
C	1-5-12-14-17-20	3.61	5	5.55	8	3.24	9	0.70	2	13.10	7
D	1-2-6-13-20	3.81	7	2.01	2	3.33	14	0.87	3	10.02	2
E	1-2-6-14-17-20	4.09	8	3.74	4	3.24	9	1.19	4	12.25	5
F	1-2-4-8-13-20	3.35	4	0.66	1	3.33	14	1.31	5	8.64	1
G	1-2-4-8-14-17-20	3.63	6	2.46	3	3.24	9	1.79	8	11.12	4
H	1-2-4-7-15-17-20	2.84	1	5.10	7	3.24	9	1.35	6	12.53	6
I	1-2-4-7-16-21-23-22	10.18	15	15.88	15	0.00	1	5.37	10	31.43	13
J	1-2-4-7-16-21-24-22	10.06	14	12.24	12	0.00	1	5.77	11	28.07	10
K	1-3-11-16-21-23-22	10.42	17	14.97	13	0.00	1	6.79	12	32.18	15
L	1-3-11-16-21-24-22	10.31	16	11.33	10	0.00	1	7.26	13	28.90	12
M	1-3-11-15-17-20	3.08	2	4.29	6	3.24	9	2.53	9	13.13	8
N	1-3-10-18-21-23-22	7.42	12	15.88	14	0.00	1	8.45	14	31.75	14
O	1-3-10-19-21-24-22	7.33	11	24.77	16	0.00	1	10.04	17	42.14	16
P	1-3-10-18-21-24-22	7.31	10	12.24	11	0.00	1	8.83	15	28.38	11
Q	1-3-10-19-21-23-22	7.44	13	28.78	17	0.00	1	9.64	16	45.86	17

See Table 5-1 for a summary of results for the Preferred Route with revised Segment 13.

Subsequent to the selection of Route B, Segment 13 was revised to be located further south on the property of Mr. Joel H. Davis between SR 101 and the CNF. The purpose of the revision was to minimize impacts to agricultural and silvicultural operations on Mr. Davis's property. As such, the alignment of Segment 13 as it crosses the CNF was adjusted to maintain a more direct path between Segment 5 and the revised location of the route on Mr. Davis's property. This resulted in a minor increase in the length of the crossing through the CNF. DEP investigated the possibility of maintaining the shorter CNF crossing for Segment 13. To do so, hard angle structures with non-standard engineering designs would need to be installed along the route east of the CNF prior to the crossing. The increase in number of hard angles in such a short distance could compromise the reliability of the line. As such, the preferred route maintains a direct path for Segment 13 across Mr. Davis's property and through the CNF to its junction with Segment 5 (Figure 4-4). DEP coordinated with the USFS and NHP regarding this proposed revision to Segment 13. Neither the USFS nor the NHP identified any new constraints within the vicinity of the revised alignment.

Overall, Route B ranked 3rd with a score of 10.83. The route was among the top five routes with regards to the overall Ecology, Land Use and Technical criteria group scores. Route B ranked 14th in the overall Cultural criteria group, along with Routes F and D. Route B was scored behind Routes F and D primarily due to longer crossings of the SNHAs and private conservation easements. Revised Route B still provides a shorter crossing of the CNF compared to Routes G and E while taking into account preferences of Weyerhaeuser Timber Company and Mr. Joel H. Davis. As Segments 1, 5, and 13 cross the CNF, an Environmental Assessment will have to be prepared for compliance with NEPA. Additionally, the acquisition of ROW across the private conservation easements along Segment 5 will require going through the judicial process for condemnation.

The following is a detailed description of the path taken by the preferred route, prior to the request received from Mr. Joel H. Davis to move the Harlowe 230kV Substation to his property southwest of SR 101, as detailed in Chapter 5. The preferred route begins at the proposed Harlowe 230kV – 115kV Substation, southeast of the Town of Harlowe and north of SR 101 (Figure 4-4). The alignment exits the Substation to the west for approximately 0.35 miles and then turns southwest for approximately 0.85 miles, crossing the Harlowe Canal and SR 101. West of SR 101, the route continues along an increasingly western heading for approximately 1.18 miles across private pine plantations before it arrives at the eastern boundary of CNF. The route then continues west southwest crossing through the CNF for approximately 0.95 miles. Upon exiting the CNF, the route continues west and parallels the CNF boundary for approximately 3.12 miles across active forest plantations, SNHAs, and private conservation easements until it meets the Havelock-Morehead Wildwood 115kV South Transmission Line northeast of

the Town of Newport. In the vicinity of this location, the route crosses an additional 1,310 feet of CNF lands. From here, the alignment turns north and parallels the existing overhead transmission line for approximately 1.56 miles before arriving at the proposed Newport 230kV Switching Station (Figure 4-4).

5.0 ENVIRONMENTAL IMPACTS OF THE PROPOSED PROJECT

This section contains a description of the potential environmental effects that could result from the construction, operation, and maintenance of the proposed 230kV transmission line between the Harlowe 115kV – 230kV Substation and the Newport 230kV Switching Station. Potential impacts to both natural and human resources located in the study area are considered. The evaluation of alternatives resulted in the selection of a preferred route by DEP. The preferred route was identified as a result of the route evaluation study presented in Chapter 4.0. Figure 4-4 shows the preferred route described in the following sections.

5.1 Preferred Route

Route B, composed of Segments 1, 5, 12, 13, and 20, was selected by DEP as the preferred route connecting the proposed Harlowe 230kV – 115kV Substation and the proposed Newport 230kV Switching Station. As discussed in Chapter 4.0, after selection of Route B as the preferred route, Segment 13 was revised to avoid impacts to private agricultural and silviculture operations and avoid engineering constraints. Preferred Route B measures approximately 8.01 miles in length and the preferred route data presented in this section, including Table 5-1, account for the revisions to Segment 13.

The following is a description of the path taken by the preferred route summarized from that provided in Section 4.0. The preferred route exits the proposed Harlowe 230kV – 115kV Substation to the west for approximately 0.35 miles and then turns southwest for approximately 0.85 miles, crossing the Harlowe Canal and SR 101. West of SR 101, the route continues along an increasingly western heading for approximately 1.18 miles before it arrives at the eastern boundary of CNF. The route then continues west southwest and crosses CNF for approximately 0.95 miles. Upon exiting the CNF, the route continues west and parallels the CNF boundary for approximately 3.12 miles until it meets the Havelock-Morehead Wildwood 115kV South Transmission Line northeast of the Town of Newport. From here, the alignment turns north and parallels the existing overhead transmission line for approximately 1.56 miles before arriving at the proposed Newport 230kV Switching Station (Figure 4-4).

5.1.1 Preferred Route Data

Route B was identified as the preferred route ranking 1st in Technical, 3rd in Ecology, 5th in Land Use, and 14th in Cultural criteria groups. While Route B ranked third overall, the remaining top two routes shared a number of segments with Route B. The main difference between the top three ranked routes was the

location at which the route crossed a privately held conservation easement and SHNAs surrounding Mill Pond. As previously described in Chapter 4.0 and mentioned above, Route B was revised after the weighted analysis to further avoid impacts to private agricultural and silvicultural operations and avoid engineering constraints east of the CNF.

A summary of the quantitative scoring factors contributing to the selection of the preferred route are discussed below:

- Ecology Group Criteria:
 - Below average acreage of forested wetlands impacted when compared to all routes;
 - Low number of NHD streams crossed and acres of NHD stream buffer within ROW;
 - Low scoring in Land Cover sub-criteria categories;
 - No federal or state listed species within 500 feet of the ROW;
 - Low acreage of 100-year floodplain in the ROW.
- Land Use Group Criteria:
 - Scored the best or near best in all Residential and Non-Residential buildings sub-criteria;
 - Low impact to Prime Farmlands of Unique Importance and Farmland of Statewide Importance;
 - No impacts to Institutional Land Uses sub-criteria;
 - Average to above average scores in Sensitive Land Use sub-criteria;
 - Best scores in all Proposed Land Use sub-criteria.
- Cultural Criteria:
 - Highest scores for Historic Sites and Structures sub-criteria;
 - No impacts to known archaeological resources;
 - No impacts to cemeteries;
- Technical Criteria:
 - Scored best in Road Crossings, Railroad Crossings, Length, and Length Paralleling Existing DEP Electric Transmission ROW;
 - Below average scores for Number of Angles and Number of Hard Angles sub-criteria.

The preferred route scored among the poorest in the Cultural Resources criteria group ranking fourteenth along with Routes D and E due to the proximity of documented historic sites in the proximity of the proposed line and a historic canal crossing. As discussed further in Section 5.4.3 below, the route is located in an area with existing transmission infrastructure and is not expected to impact these resources.

Table 5-1 contains a cumulative summary of the data for the preferred route, as well as the range of values for all the other routes compared.

**Table 5-1
Preferred Route Summary Data**

Criteria Group	Criteria	Sub-Criteria	Preferred Route (Route B)*	Range of Values
Ecology	Wetlands	Acres of Forested Wetlands in ROW	90.07	86.82 – 122.74
		Acres of Potential CAMA Wetlands in ROW	0	0 – 4.82
		Acres of 75' Buffer of CAMA Wetlands in ROW	0	0 – 1.91
		Acres of PSS/PEM Wetlands in ROW	3.92	0.26 – 10.33
	Streams	Number of Stream Crossings along Centerline	5	4 - 9
		Acres of Stream Buffer within ROW	3.12	3.15 – 9.53
	Land Cover	Acres of Hardwood Forest within ROW	0	0
		Acres of Urban/Built-up Area within ROW	2.75	1.34 – 16.45
		Acres of Mixed Forest within ROW	0.23	0 – 0.58
		Acres of Pine Forest within ROW	41.83	31.55 – 60.34
		Acres of Scrub/Shrub/Cut-Over within ROW	18.66	9.56 – 28.39
		Acres of Grassland/Herbaceous within ROW	4.56	4.55 – 12.31
		Acres of Cultivated Crop/Pasture/Hay within ROW	6.43	6.03 – 18.5
	Protected & Rare Species	Count of Federal T&E within 500' of ROW	0	0 - 1
		Count of Federal Species of Concern within 100' of ROW	0	0 - 1
		Count of State T&E within 500' of ROW	0	0 - 1
		Count of State Species of Concern within 100' of ROW	5	4 - 5
	Floodplain	Acres of Floodway in ROW	0	0
		Acres of 100- Year Floodplain in ROW	3.7	1.89 – 17.01
		Acres of 500-Year Floodplain in ROW	4.79	4.45 – 12.62
Land Use	Residential Buildings	Number of Residential Buildings within ROW	0	0 - 1
		Number of Residential Buildings within 100' of ROW	0	0 - 5
		Number of Residential Buildings within 100-500' of ROW	5	4 - 23
		Number of Residential Buildings within 500-1000' of ROW	10	10 - 59
	Non-Residential Buildings	Number of Non-Residential Buildings within ROW	0	0
		Number of Non-Residential Buildings within 100' of ROW	0	0 - 1
		Number of Non-Residential Buildings within 100-200' of ROW	0	0 - 2
	Prime Farmland	Acres of Prime Farmland within ROW	2.58	0 – 25.64
		Acres of Farmland of Unique Importance within ROW	7.92	7.92 – 15.84
		Acres of Farmland of Statewide Importance within ROW	3.19	3.05 – 10.00
Acres of Prime Farmland if Drained within ROW		94.83	87.45 – 131.49	

Table 5-1 Continued

Land Use	Properties Crossed	Number of Properties Crossed by ROW	19	19 - 52
		Number of Property Owners Crossed by ROW	16	16 - 42
	Institutional Land Use	Acres of Institutional Land Use Crossed by ROW	0	0
		Number of Institutional Land Use within 100' of ROW	0	0
		Number of Institutional Land Use within 100-500' of ROW	0	0
		Number of institutional Land Use within 500-1000' of ROW	0	0
	Sensitive Land Use	Acres of Sensitive Land Use within ROW	30.40	15.81 – 50.97
		Acres of Sensitive Land Use within 100' of ROW	49.33	24.66 – 75.63
		Acres of Sensitive Land Use within 100-500' of ROW	276.97	102.06 – 312.75
		Acres of Sensitive Land Use within 500-1000' of ROW	363.20	122.24 – 361.25
Proposed Land Use	Acres of Proposed Institutional Land Use within ROW	0	0	
	Acres of Proposed Residential/Commercial Land Use within ROW	0	0 – 2.94	
Cultural	Historic Site/Structure	Number of Historic Sites/Structures within ROW	1	0 - 1
		Number of Historic Sites/Structures within 100' of ROW	1	0 - 1
		Number of Historic Sites/Structures within 100-500' of ROW	1	0 - 2
		Number of Historic Sites/Structures within 500-1000' of ROW	1	0 - 2
	Archaeological Sites	Number of Archaeological Sites within the ROW	0	0
		Number of Archaeological Sites within 50' of ROW	0	0
	Cemetery	Number of cemeteries within ROW	0	0
		Number of Cemeteries within 100' of ROW	0	0
Technical	Road Crossings	Number of Centerline Road Crossings	1	1 - 7
	Railroad Crossings	Number of Centerline Railroad Crossings	0	0
	Route Length	Length of Route in Miles	8.01	8.01 – 11.93
	Angles	Number of Angles Less than 30°	3	1 - 10
		Number of Angles Greater than or Equal to 30°	2	1 - 10
	Paralleling Linear Infrastructure	Length of Route Paralleling Existing DEP Electric Transmission ROW	1.57	1.57
		Length of Route Paralleling Existing non-DEP Electric Transmission	0	0
		Length of Route Paralleling Existing Pipeline or Overbuilding non-DEP Electric Distribution ROW	0	0
Length of Route Paralleling Road or Active Railroad ROW		0	0	

*Route B data presented includes the revision to Segment 13 but does not account for the alignment changes due to relocation of the project termini presented in Section 5.5.

5.2 IMPACTS ON NATURAL RESOURCES

Following is a description of potential impacts to natural resources in the study area from the construction and operation of the proposed project.

5.2.1 Topography and Soils

Construction and operation of the proposed project will not significantly change the existing topography. The project will generally follow the existing contour of the land. Extensive grading or earthwork will not be necessary. Land clearing will consist of tree and shrub removal. Impacts, if any, to topography from the use of heavy equipment will be localized, minimal, and temporary in nature.

Impacts to soils from construction of the project will be minor and temporary regardless of the route selected. DEP's ROW clearing practices involve cutting vegetation within 4 inches of the ground surface. Stumps, low-growing vegetation and root mats are left in place to minimize soil disturbance. No grubbing or grading activities are anticipated as part of the ROW clearing activities. DEP also requires that wetlands be hand cleared and matted. However, some soil disturbance will result from the use of heavy construction equipment and the excavation of soils required for installing the poles. Construction activities, which are temporary in nature, can cause soil compaction, ruts, or tracks from vehicular movement and mixing of the soil profile. Alongside ROW clearing practices, DEP uses specific construction practices to minimize disturbance as much as possible. For instance, DEP calls for composite mats to be used in wetland areas, in order to avoid rutting and changes in water flow

During construction of the proposed transmission line, soil erosion will be managed and minimized through preparation of a Stormwater Pollution Prevention Plan in compliance with the North Carolina Sedimentation Pollution Control Act (SPCA). Mitigation measures are provided in more detail in Chapter 6.0. DEP will obtain an approved Erosion and Sediment Control/Clearing Plan and install appropriate erosion control measure to minimize erosion and prevent the migration of sediment from the construction site to sensitive areas, adjacent lands, and roadways.

5.2.2 Hydrology

Construction and operation of the project will not significantly impact surface water features along the transmission line route. Based on U.S. Geological Survey (USGS) 1:24,000 scale topographic maps, the preferred route will cross Harlowe Canal which is mapped as a perennial system (USGS 2013). The canal is listed as having a primary classification of Class SA and is classified as HQW and NSW (NCDEQ 2016). The preferred route avoids the numerous HQW designated waters in the southeastern portion of the study area.

The transmission line will be designed in attempt to span all rivers, creeks, and streams to minimize the need to place structures within waterways. All streams and other surface water features along the route

appear to be narrow enough that they can typically be spanned with normal structure spacing (500 to 700 feet) and heights (65 to 110 feet). Similarly, the construction and maintenance of the line will not disturb any surface waters. Each structure will be buried to a depth of approximately ten percent of the actual pole height plus 1.5 – 3 feet based upon the soil conditions except for self-supporting engineered structures, which will be mounted on concrete caisson foundations of varying depths. Most of the structures will be buried at depths insufficient to encounter subsurface aquifers, if present.

DEP, as indicated above, intends to fully comply with the SPCA as well as other applicable laws such as the Clean Water Act. This compliance, coupled with DEP's low-impact ROW clearing and construction practices, is intended to prevent off-site sedimentation, including impacts to streams and wetlands. Mitigation measures proposed in Chapter 6.0 will further minimize potential water quality impacts associated with stream crossings.

5.2.3 Vegetation

Construction and maintenance of the proposed transmission line will result in the loss of tall vegetation within the transmission line ROW due to shrub and tree clearing. Herbaceous vegetation will not be removed but could be damaged by construction equipment and vehicular movement. Disturbed areas will be re-seeded following the disturbance, as described in DEP's erosion control plan, which will be submitted to the NCDEQ's Land Quality Section for approval. Most tree clearing activity will occur where the line crosses undeveloped forestland. The preferred route will require clearing approximately 132.13 acres of forested land, which is comparable to the top five routes considered.

Less vegetation will need to be cleared where the transmission line is partially co-located with an existing utility corridor. The preferred route will share a ROW with another transmission line for approximately 19 percent of its length. In addition to the clearing of the actual transmission line ROW, danger trees that could fall into the new transmission line and cause an outage will also be removed outside the maintained corridor. The line has been located to ensure that danger tree removal will not impact the CNF where the line is adjacent to these lands.

The majority of the woody vegetation that will be impacted consists of pine and deciduous hardwood stands. Mature trees occurring in or immediately adjacent to the transmission line ROW will have to be cleared to protect the integrity and safe operation of the line. On-going maintenance of the ROW during operation of the line (Section 2.3) through mowing and/or herbicide application will encourage the proliferation of lower-growing types of vegetation, which will ensure the stabilization of the soils. Some

cropland may also be impacted along the preferred route by the placement of structures. Impacts to crops are discussed in Section 5.3.1.

5.2.4 Protected and Rare Plant Species

The USFWS and NHP identified three federally-listed and four additional state-listed plant species as potentially occurring within the project study area. An additional seven plant species identified as state species of concern or state significantly rare were also noted. Of the identified plants potentially occurring within the study area, eight are also included on the USFS PETS list. Based on the NHP and USFWS records, there are no known occurrences of any federally-listed plant species located within the vicinity of the preferred route. The federally-listed and state-listed threatened seabeach amaranth is found on open, sandy beaches between the high tide line and toe of primary sand dunes. No such habitat is present within the study area. Sensitive joint vetch, which is federally-listed threatened, typically grows in intertidal zones of coastal marshes at elevations near the upper limits of tidal inundation. Habitat for this species may be present in portions of the study area, but no potential habitat is present along any of the routes analyzed.

Habitat for the federally-listed and state-listed endangered rough-leaved loosestrife may occur within the study area. This species is generally found in edge habitat between longleaf pine uplands and pond pine pocosins on seasonally saturated sands and shallow organic soils overlaying sand. Example habitats may be roadside, and in power line ROWs where regular maintenance keeps vegetation shorter exposing low-growing herbaceous species to sunlight. Rough-leaved loosestrife communities are generally found adjacent to fire-maintained plant communities, which results in increased shrub density and height, which in turn can eliminate open edge areas required by the rough-leaved loosestrife to thrive. While there are no known occurrences of this species within the study area, the project may ultimately provide additional edge habitat suitable for this species.

Habitat for the additional state designated significantly rare and state species of concern may also occur within the study area. Based on the NHP data, only Leconte's thistle, a state species of concern and PETS locally rare species, and two state significantly rare liverwort species may potentially occur within the limits of the preferred route. Leconte's thistle is a facultative wet species that is generally found in mostly wet grassy pine savannas, pine barrens, bogs, and roadside ditches. Liverworts are non-vascular, spore-producing plant species found worldwide. Those species identified as potentially occurring within the study area are those that are limited to southern regions and the Coastal Plain, with their northern extent of occurrence being in southeastern North Carolina.

DEP has a working relationship with NHP to manage federally protected plant species occurring within its ROWs. DEP will coordinate with USFWS and NHP to avoid, minimize and/or manage impacts to federally protected species that may be encountered along the preferred route. Additional surveys for PETS species will be completed on the CNF property prior to construction to determine the potential presence of these species within the project limits.

5.2.5 Wetlands

The majority of the DCM and NWI wetlands in the project area are forested riparian areas located along streams, creeks, and pocosins. The ROW for the preferred route will cross approximately 94 acres of NWI defined wetlands. The wetlands crossed by the preferred route are mostly forested wetlands, 90.07 acres, along the various perennial creeks and streams crossed by the route, many of which will be spanned. An additional 3.92 acres in the preferred route ROW are PSS and PEM wetlands (NWI 2014 and DCM 2016).

Construction and operation of the project is not expected to result in jurisdictional discharges to water or wetlands, and thus, no Clean Water Act Section 404 permit will likely be required. Some conversion of forested wetlands to scrub/shrub or emergent wetlands will occur. DEP's ROW clearing practices include hand-cutting in jurisdictional wetlands to avoid regulated discharges. Composite mats will also be utilized to avoid impacts to wetlands, in accordance with DEP's construction standards. Similarly, DEP can typically avoid placing structures in streams or smaller wetlands by spanning such areas. DEP will utilize existing U.S. and state highways, local roads, and cleared transmission corridors to minimize the need to construct new access roads. Erosion control measures described previously and in Chapter 6.0 will further prevent sediment from entering waterways or impacting wetlands.

DEP notifies the USACE and the NCDEQ Division of Water Resources (DWR) on its proposed transmission construction projects, seeking confirmation that the project design is exempt from Section 404 and Section 401 permitting requirements. Should a project require unavoidable impacts to waters or wetlands, DEP will obtain the required approvals, normally under the USACE Nationwide Permit 12.

5.2.6 Wildlife

Construction and maintenance of the preferred route could result in some adverse impacts to wildlife. The removal of forested vegetation within or near the proposed ROW may impact foraging, shelter, or nesting habitat for some species and will fragment forested lands. However, transmission line and other linear

corridors also create edge habitat which is beneficial to some species. Impacts to most species will be temporary and short-term during construction and will consist primarily of displacement and disturbance. Some less mobile species occurring in the construction corridor could be directly impacted, and movements between segmented habitats could be temporarily impeded due to noise and human presence. Additional temporary disturbance could occur during future maintenance of the line. No impacts are expected to fish or aquatic invertebrate species, as waterways will be spanned or avoided and erosion control techniques will be used to minimize sedimentation of waterways. Generally, impacts to wildlife are minimized where existing transmission lines or highways are followed.

5.2.7 Protected and Rare Animal Species

Three federally protected species, RCW, American alligator and bald eagle, may occur within the study area. The bald eagle and American alligator are also listed as state threatened, and the RCW is listed as state endangered. The remaining federally protected species, West Indian manatee and Atlantic sturgeon are marine species and no suitable habitat is present within the study area. Animals with a federal species of concern designation that may be found along the preferred route will be monitored to ensure a change in listing does not occur prior to project construction. If a species' listing is elevated to threatened or endangered, USFWS will be contacted and efforts will be made to minimize impacts to these species.

The federally-listed endangered and state-listed endangered RCW is known to occur within the study area within the limits of the CNF. Nesting and roosting habitat consists of stands of pine containing trees 60 years old and older. RCWs require live, large, older pines (i.e. longleaf pines) to excavate cavities. Roosting cavities are excavated in living pines infected with a fungus producing what is known as red-heart disease (i.e. heart rot). Cavities in active use typically have numerous small resin wells that exude sap. RCWs keep sap flowing to defend against rat snakes and other predators. The aggregation of active and inactive cavity trees within an area is called a cluster. Half-mile foraging circles (partitions) have been assigned to the center of each cluster to protect the foraging habitat. Protection of the foraging habitat for the RCW has been important for the conservation and recovery of the species (USFWS, 2003). The known location of RCW clusters is located in the southern portion of the study area. Several segments analyzed were in the vicinity of this cluster, resulting in lower scores for routes containing those segments. The preferred route does not cross any 0.5 mile foraging partitions or known RCW clusters. DEP conducted aerial RCW surveys within an half mile buffer of the proposed route, and no nests were observed.

An occurrence of federally-listed threatened (for similarity of appearance) and state-listed threatened American alligator is also documented within the study area near the southern extent of Mill Pond. American alligator is found throughout the eastern portion of the United States, from the Great Dismal Swamp in Virginia and North Carolina to the Florida Everglades. American alligators may be found in swamps, streams, rivers, ponds, and lakes. Females and juveniles may also be found in seasonal wetlands. Alligators generally prefer fresh water but may also be found in brackish waters. The preferred route crosses well north of the documented occurrence and does not include large areas of open water.

The federally protected and state-listed threatened bald eagle is found throughout North America near large bodies of water and old-growth trees for food sources and nesting sites. The bald eagle was on the brink of extinction in the later twentieth century and was placed on the Endangered Species List. The species was subsequently removed from the Endangered Species List and listed as federally threatened in 1995 after conservation measures had been enacted. On June 28, 2007, the bald eagle was delisted from the federal Threatened Species list, but remained state-listed in many states and retains federal protection under the Bald and Golden Eagle Protection Act. One of the major threats to bald eagles is the removal of old-growth nesting trees and disturbance during nesting season from noise or other land disturbing activities. As such, time of year restrictions and management buffer areas have been established for activities that may disturb bald eagles. A nest has been documented along the shoreline of the Newport River located to the south of the study area. The preferred route is located well outside of the management buffer zones and will not disturb this bald eagle nest. DEP conducted aerial bald eagle surveys within a 600 foot buffer of the proposed route, and no nests were observed.

The federal species of concern and state significantly rare black-throated green warbler may be found in the vicinity of the preferred route. The phantom darter and regal darter, both state species of concern, may also be found along the preferred route. None of the other identified federal species of concern, state species of concern or state significantly rare species were noted as potentially occurring along the proposed route.

Despite care taken to avoid protected animal species during the routing process, potential habitat for some species may occur along the preferred route. DEP has conducted surveys along the preferred route to determine the presence or absence of potential habitat for federally protected animal species, including RCW and bald eagle. DEP has completed surveys of potentially suitable habitat, for presence/absence of each species along the preferred route. Upon completion of the surveys, DEP did not identify occurrences of either species. Construction activities will be coordinated with environmental personnel at the USFS

and USFWS to ensure impacts to protected species are minimized to the extent practicable. DEP will coordinate with USFS and USFWS and recommended mitigation measures will be implemented to ensure full compliance with the Endangered Species Act.

5.2.8 Environmentally Sensitive and Managed Lands

Sensitive Land uses include parks, SHNAs, NHP Program Managed Areas, Croatan Game Lands and CNF, recreation areas, wildlife reserves, conservation areas, airports, and golf courses. The preferred route crosses 26.80 acres of environmentally sensitive lands which include SNHAs, private conservation areas, and the CNF. Impacts to these areas will be minimized through DEPs construction methods and implementation of erosion and sedimentation control measures during construction.

The proposed route across the CNF is one of the shortest practicable routes while minimizing overall impacts of the line. Shorter crossings to the north (original Segment 13) and south (Segment 10) were identified. The routes to the south utilizing Segment 10 would significantly impact residential areas and were in the vicinity of known RCW locations. The route with revised Segment 13 requires a slightly longer crossing of the CNF than the originally proposed Segment 13, but avoids the significant impacts associated with the southern routes and minimizes overall impacts to natural and human resources along the route.

The top three routes all required crossings of the Walkers Mill Pond and Black Creek Natural Heritage Areas south of the CNF property. These SNHAs overlap with private conservation easements held by the CLT. Route F, which ranked first overall in the routing analysis, crossed these sensitive areas at the narrowest point and resulted in the least amount of acreage impacted (Segment 8, Figure 4-3). The crossing here would have been required to span an approximately 500-foot wide portion of Main Prong which drains into Mill Pond. Aerial imagery depicts a large amount of mature vegetation within Main Prong that would be required to be cleared for construction of the line. In addition, the length of the span required for this crossing could result in the need for taller structures to span the entire creek width or the potential need for structures to be located in or directly adjacent to the waterway.

Route D, which scored second in the routing analysis, crossed the sensitive areas north of Route F where Ghouls Fork branches off of Main Prong. While the CLT conservation easements are limited to a buffer on either side of the stream channels, the SNHAs include all areas in between the forked channels. Route D follows an existing access road between Ghouls Fork and Main Prong (Segment 6, Figure 4-3). The road provides access through managed timber lands. The crossing of Main Prong would still require a span of approximately 500 feet for Route D, and an additional crossing of Ghouls Fork.

Route B, which ranked third overall in the routing analysis, crosses the sensitive areas just south of the CNF property boundary (Segments 5 and 12, Figure 4-3). The area of the CLT conservation easements crossed by Route B is less than that crossed by Route D. However, as Ghouls Fork and Main Prong continue to diverge to the north, the acreage of the SNHA crossed by Route B exceeds that of Route D and Route F. The crossing of Main Prong is narrower than that for Routes D and F, and the crossing of Ghouls Fork is narrower than that for Route D. Based on the existing land use and position of environmental features, Route B appeared to be less impactful to these sensitive areas than Routes D or F. DEP coordinated directly with the CLT and Weyerhaeuser Timber Company to review the top five routes. The CLT had no objections to Route B. As documented in Section 4.0, Weyerhaeuser preferred Route B which minimized safety and operational concerns in actively timbered areas. DEP subsequently chose Route B with revised Segment 13 as their preferred route.

5.3 IMPACTS ON HUMAN RESOURCES

This section contains a discussion of the potential impacts of the project on the human resources in the area, including land use, socioeconomics, and cultural resources.

5.3.1 Land Use and Development Patterns

The following paragraphs provide information on potential impacts to agriculture, urban and residential areas, recreational areas, and transportation and utility corridors. In general, the proposed route will have only minimal impacts on the existing land uses in the area. DEP will work with individual landowners as much as possible to reach agreeable solutions for land use conflicts that may arise.

Agriculture and Other Land Uses

Construction and operation of the preferred route may result in some minor impacts to agricultural land within the proposed ROW. The preferred route will cross approximately 6.43 acres of cropland, pasture land, and hay fields. The majority of the land in the ROW is classified as either pine forest, cropland and pasture land, or scrub/shrub. Grassland/Herbaceous, mixed forest, and urban areas are scattered in small tracts throughout the ROW (MRLC 2011).

The impact on pasture and other open lands will be negligible because the line will not significantly interfere with grazing or other uses. The impact to cropland will be slightly greater because poles placed in croplands remove some of the land from production and may create obstacles for large farm machinery. Some pole and minor alignment adjustments may be made during future consultations with landowners to further minimize impacts. Temporary disturbance from heavy equipment within the ROW

may result in the loss of some crops during construction. The only land that will be unavailable for agricultural use following construction will be the area occupied by poles or guy wires. Other cropland within the ROW can continue to be farmed.

The proposed route (or any other route in the vicinity) will remove some land from the production of timber. Trees will be cleared from the ROW, and the ROW will be periodically managed to keep it treeless. Landowners may be allowed to clear and sell timber from their land that will conflict with the transmission ROW, or DEP's contractors could clear the timber for landowners. Landowners will be compensated for any timber cleared by DEP's contractors for the transmission line and for the use of their land according to the negotiated acquisition agreement.

Urban and Residential Areas

The majority of the study area is rural and consists of private timber farms, croplands, and the CNF. Urbanization is centered around the Town of Newport, City of Havelock and Town of Harlowe. Additional residential development is found along state routes throughout the study area. The preferred route avoids the majority of the residential and urban areas thereby avoiding impacts to commercial and residential areas. The preferred route ROW will be constructed within 500 feet of only 5 residential buildings. There are no non-residential buildings within 200 feet of the ROW. Two of the residential buildings are located near the terminus of the line at the Newport 230kV Substation. The preferred route will parallel an existing transmission line near both of these residences. The remaining residential buildings are located at the eastern end of the preferred route near its start at the proposed Harlowe 115kv-230kV Switching Station. No residential buildings are located within 100 feet of the ROW.

The preferred route ROW will likely not impact residential and non-residential structures. DEP will work with affected residents during the final placement of poles to identify a location suitable to both the landowner and DEP to the maximum extent practicable.

Recreation Areas

The preferred route crosses five NHD streams. The primary recreational activities that occur on these streams are likely boating, canoeing, and fishing, none of which will be affected by the new line. DEP will work to ensure impacts to the streams are minimized and that the project complies with federal and state law.

CNF is an environmentally sensitive land crossed by the preferred route and is reserved for recreational and institutional use. Impacts to the CNF are discussed in Section 5.2.8. Portions of the Neusiok Trail and the Mountain-to-Sea Trail are also located within the study area. The preferred route will cross the Neusiok Trail at the junction of Segments 5 and 12 just outside of the CNF boundary. The line will span the trail to avoid direct impacts at this location. Minor visual impacts may occur as the new ROW will be required to be cleared, and the line will introduce an overhead crossing in an otherwise undisturbed area. The trail passes through varying landscapes including being co-located with timber roads and crossings of state maintained roads. The addition of the line is not expected to adversely impact the trail user experience.

Transportation and Utilities

Construction of the line may result in some brief disruption of traffic during line pulling activities and hauling of material to the job site. Most of the roads within the study area are considered state routes, maintained by the NCDOT, though some are considered primary roads such as state highways. The preferred route crosses only one state route (SR 101). Construction of the preferred route will not impact railroads or known public or private air strips. DEP will adhere to all county, state and federal regulations for road crossings.

Approximately 19 percent of the preferred route will be constructed parallel to an existing transmission line. Upon approaching the Newport 230kV Switching Station, the preferred route will be constructed parallel to the Havelock – Morehead Wildwood 230kV line. The new line will share approximately 12.5 feet of its ROW with the existing line. The preferred route also crosses the existing Havelock – Morehead Wildwood 115kV North line which runs parallel to SR 101. Operation of the new 230kV line will result in an overall increased reliability of electrical service both in and out of the study area.

5.3.2 Socioeconomic Patterns

This section addresses the potential impacts of the proposed route on the socioeconomic patterns in the study area.

Population

Construction and operation of the preferred route will not directly result in a change in the population in the study area. The project will, however, help to meet the electrical needs of an overall growing population (see Table 3-4), as well as local businesses and industries, and increase reliability of the electrical system in the region. Reliable electric service (as identified during the public workshops) is

important to residents and a significant factor in the location of many industries. The preferred route avoids the incorporated portions of cities within the study area.

Employment and Income

Construction and operation of the new line is unlikely to affect employment in the study area. The construction work force will be small and temporary. Some of the workers for the project may already reside in the study area. Workers from outside the study area will likely commute on a daily or weekly basis. The presence of additional workers may result in a slight increase in retail sales in the study area due to purchases of food, fuel, and other merchandise. No additional staff will be expected for operations. By meeting the need for additional power in the area, industries and businesses may be attracted to the area in the future, thereby increasing the potential for employment in and around the study area. The project will also increase the tax base in the study area counties.

5.3.3 Cultural Resources

The route identification process included avoidance to the extent practicable of known historical and archaeological resources based on a records search of the study area conducted at the NCSHPO and the NCOSA. This search indicated that there are no known archaeological sites that are crossed by the preferred route. The preferred route does, however, cross the historic boundary portion of the Harlowe Canal (Clubfoot and Harlowe Creek Canal). There are no other historic sites or structures within 1000 feet of the preferred route ROW. In addition, the route does not cross or come within 100 feet of any known cemeteries.

The Harlowe Canal (Clubfoot and Harlowe Creek Canal) was authorized by an Act passed by the North Carolina General Assembly circa 1815 that allowed for the construction of canals for the purpose of improving navigation and trade. The Harlowe Canal (Clubfoot and Harlowe Creek Canal) was constructed to connect the Newport River with Beaufort. The canal was chartered in 1855 and became part of the inland waterway transportation system within the state. With the construction of railroads and interstate highways, the canal's significance in transportation has subsided and the waterway is now mainly used for recreational purposes. The transmission line will span the canal at the crossing to avoid direct impacts to this location. Clearing of trees along the edges of the canal will be required for construction and safe operation of the line. As the canal is used largely for recreational purposes and the crossing is located in the same proximity as an adjacent transmission line and State Highway crossing, the proposed line is not expected to adversely affect this resource.

Additional cultural resource issues may arise once consultation with NCSHPO is initiated prior to project construction, as much of the study area has not yet been surveyed. The NCSHPO, as well as the USFS, may require an archaeological and/or architectural survey of all or portions of the proposed line route. If required, DEP will retain a consultant to perform the survey and submit the results to the NCSHPO and USFS, as appropriate, and any required mitigation will be coordinated with them. Pole placement generally can be adjusted to avoid most archaeological sites.

5.3.4 Visual Character

The visual character of an area is a function of the viewer's perception, terrain, land cover, and land use. Construction and operation of the transmission line will affect the existing aesthetics of the study area through which the line passes, primarily because of the clearing of trees and the introduction of a new linear facility.

The transmission line may create some visual contrast with the surrounding environment, except where the line is proposed to parallel an existing transmission line. Following existing utility corridors minimizes the visual impact by minimizing the tree clearing needed for the new line and by reducing the visual contrast to residents who are accustomed to viewing a transmission line nearby. The preferred route parallels an existing transmission line for 19 percent of its length. In addition, the majority of the preferred route is located in non-residential areas, so the visual impact to local residents is also minimized as much as practicable.

Where present, surrounding forest vegetation and terrain help provide visual screening. Approximately 90 percent of the land use along the preferred route consists of forestland, and many trees throughout the study area are as tall as or possibly taller than the structures proposed for this project, so much of the preferred route will be screened (MRLC 2011, NWI 2014, and DCM 2016). Crossing cleared land can make the line more visible from viewpoints with a long perspective. The preferred route crosses an average amount of cleared land compared to the other route alternatives. However, the study area is fairly level which further increases the visual impact of the preferred route, or any other transmission line in the area.

The line will be seen at road crossings. However, visibility from the roads will be temporary and fleeting due to the speed of traffic and traffic volume along SR 101. The view of transmission lines along highways is generally considered more acceptable than along other roads or new ROWs, as the highway and development that generally occurs along highways have already affected the visual landscape in these

areas. The visual impact for the preferred route is about the same as that for the other top routes as they all largely bypass the urban and suburban portions of the study area. The total length of a route is also a factor in the overall visual character: the longer the route, the more opportunity for a visual impact. Preferred Route B is of average length when compared to the top five alternate routes.

5.4 SUMMARY

The construction, maintenance, and operation of the proposed Harlowe - Newport 230kV Transmission Line Project will have minimal impacts on natural and human resources in the study area. Following is a brief summary of the impacts of the preferred route for the proposed project.

Ecological impacts are low when comparing the preferred route to other route options. The preferred route scored among the best in many of the ecological group criteria. The preferred route does cross more environmentally sensitive lands when compared to the remaining top two routes. Route F minimized the crossing of the conservation easement and SNHA lands, and ultimately ranked the best out of all routes considered. However, the location of this crossing had a significant impact on the ranking in the routing analysis, making Routes F, D and B viable options for consideration. The crossing location of Routes F and D appeared to pose potential construction challenges that may have resulted in greater impacts to Walkers Mill Pond than the preferred route, Route B. Discussions with the CLT, USFS and land owners ultimately supported Route B as the preferred route.

From a land use perspective, the preferred route offers very minimal disturbance to residential and non-residential buildings, and properties and property owners crossed when compared to other routes. The preferred route ranks among the best in all Sensitive, Proposed, Prime Farmland and Institutional Land Use sub-criteria. Though the route does pass through the CNF, the crossing distance has been minimized and located to avoid known RCW cluster areas.

Known cultural impacts are minor. The preferred route ROW ranked the same as the other top routes for proximity to known historic sites and cemeteries located within 100 feet of the ROW, and no known archaeological sites were identified within 50 feet of the ROW. The route crosses the historic boundaries of the Harlowe Canal (Clubfoot Harlowe Creek Canal). However, the crossing is located near an adjacent transmission line and bridge crossing. The line will span the canal to avoid direct impacts to the resource.

From an engineering/technical perspective, the preferred route scored the best or among the best in the Technical criteria group. The preferred route parallels an existing DEP transmission line for

approximately 1.56 miles, minimizing new visual, agricultural, forestland, and wetland impacts along this portion. From a reliability standpoint, only 19 percent of the preferred route is paralleling existing electric transmission lines and only one crossing of an existing line is required, which minimizes potential reliability concerns. For the above reasons, Route B was determined to be the preferred route for the Harlowe – Newport 230kV Transmission Line.

5.5 SUBSTATION RELOCATION AND PREFERRED ROUTE REVISION

After the selection of the preferred route and preparation of this routing and siting report, DEP found that the site for the proposed Harlowe 230kV – 115kV Substation had been cleared of timber, which revealed that features regulated under the Clean Water Act are prevalent across the entire site. Any configuration of the proposed substation on that site would result in significant fill within jurisdictional areas. Around this same time, DEP received a letter from Mr. Joel Davis, a significant land holder in the region and the largest single private property owner impacted by the proposed preferred route, about the possibility of finding a potential substation site on one of his parcels near the preferred route (Appendix A). DEP and Mr. Davis were able to come to a mutually agreeable location that appears to minimize impacts to features regulated under the Clean Water Act and minimize impacts to timber production on Mr. Davis' property, while still continuing to meet the project purpose and need. The new location for the proposed Harlowe 230kV – 115kV Substation is now southwest of SR 101, approximately 1 mile southwest of its original location (Figure 5-1).

Changing the substation location required slightly adjusting the alignment of the preferred route, which shortened the total route length to 6.91 miles and further minimized impacts to the human and natural environment. In addition to shortening the overall length, the newly proposed location eliminates the previously proposed crossing of SR 101 as well as the crossing of Harlowe Canal. The new alignment and substation locations are illustrated in Figure 5-1, Revised Preferred Route Constraints and Opportunities, and a summary of the updated route with changes is provided below.

The following is a detailed description of the path taken by the preferred route. The preferred route exits the proposed Harlowe 230kV – 115kV Substation and heads west for approximately 1.29 miles across private pine plantations before it arrives at the eastern boundary of CNF. The route then crosses through the CNF for approximately 0.95 miles. Upon exiting the CNF, the route continues west and parallels the CNF boundary for approximately 3.12 miles across active forest plantations, SNHAs, and private conservation easements until it meets the Havelock-Morehead Wildwood 115kV South Transmission Line north of the Town of Newport. In the vicinity of this location, the route crosses an additional 1,310

feet of CNF lands. From here, the alignment turns north and parallels the existing overhead transmission line for approximately 1.55 miles before arriving at the proposed Newport 230kV Switching Station (Figure 5-1).

A slight modification of the proposed Newport 230kV Switching Station (on the same piece of property) required adjusting the end of the alignment just slightly but did not introduce any new environmental constraints or impacts to the human environment. Relocation of the proposed Harlowe 230kV – 115kV Substation reduced the overall length of the preferred route by 14%, or 1.1 miles. At this location, the preferred route now measures 6.91 miles in length and avoids crossings of both SR 101 and the historic Harlowe Canal. Impacts to the natural and human environment are further reduced by this change in alignment. The ROW of the preferred route crosses approximately 12.06 fewer acres of wetlands, of which 11.93 acres are forested wetland, and has fewer residential buildings in proximity.

6.0 MITIGATION MEASURES

Mitigation measures are those steps undertaken to reduce the potential impact of the construction or operation of a project on natural and human resources. The primary forms of mitigation are avoidance of potential negative impacts, which typically occurs during the initial route development, and minimization, such as co-locating new lines adjacent to existing lines to reduce the required ROW width and the overall impacts. By paralleling existing transmission lines for approximately 22 percent of the length of the route, the potential for adverse impacts resulting from construction and operation of the project have been reduced. This approach minimizes the amount of clearing required, limits the impacts to residences located in the affected area, and reduces the visual impacts of the line as compared to construction within entirely new ROW.

This section includes a discussion of the steps taken to avoid negative impacts through the routing and design of the proposed transmission line. For those impacts that could not be avoided, recommended measures for reducing impacts are described. If impacts cannot be avoided or minimized to the extent that no adverse effect is expected, additional compensatory mitigation may be required by the agencies in charge of the resource affected.

6.1 MITIGATION OF NATURAL RESOURCE IMPACTS

A total of 6.91 miles of new transmission line will be built between the Harlowe 115kV – 230kV Substation and the Newport 230kV Switching Station, once the project is approved by the NCUC. The primary issues discussed in Chapter 5.0 regarding natural resources were soil and erosion control, water resources and wetlands, threatened and endangered species, and sensitive areas. Measures to avoid or eliminate potential negative impacts to these resources are described below.

6.1.1 Soil and Erosion Control

DEP typically submits an erosion and sediment control plan to NCDEQ's Land Quality Section for approval prior to project construction. Under an agreement with the Land Quality Section, DEP is allowed to file simplified plans since ROW clearing typically only involves cutting of vegetation above-ground, with no blading, grubbing, or other typical land-disturbing activities. As appropriate, DEP also minimizes impacts to stream buffer areas, wetlands, and other sensitive areas. In these areas, DEP requires that composite mats be laid to avoid permanent impacts and disturbance.

Holes for each pole will be dug with an auger and the structures will be erected using a crane. Most poles will be buried directly in the ground. Excess soil from the pole excavations will be evenly distributed around each pole and the soil stabilized. When heavy equipment must traverse the ROW, access routes will be selected to minimize impacts by avoiding streams and wetlands, and by following existing ground contours. If unavoidable, streams will be bridged and wetlands will be matted for access. Areas disturbed by construction activities will be restored by establishing an appropriate ground cover to prevent erosion of the soil.

Where possible, contractors will use existing access roads along the parallel ROW. If new access roads are required, they will be routed, where practicable, to follow present land contours and minimize clearing and surface changes.

6.1.2 Protection of Water Resources and Wetlands

DEP will survey the preferred route for jurisdictional waters and wetlands. DEP's standard transmission ROW clearing and line construction practices call for avoiding impacts to waters and wetlands to the extent practicable. All vegetation is cut to near-ground level and ROWs within wetlands are hand-cut. Vegetative buffers adjacent to streams are left as appropriate (only low-growing vegetation can be left). No blading or grubbing of stumps is allowed, and remaining root mats typically sprout and quickly re-vegetate ROWs with native species. Remaining stumps help ensure stream bank stabilization. Heavy equipment is kept out of waters and wetlands to the extent possible. Where streams or wetlands must be crossed, matting and bridging or low ground pressure equipment is used to avoid rutting or damage to stream banks or bottoms and wetlands.

There will be no change in contours or redirection of water flow and the amount of spoilage from the installation of structures will be minimal. Excess spoilage will be placed on matting, transported to upland areas and stabilized. Trees outside of the ROW corridor tall enough to endanger the line if they fell ("danger trees") will be selectively cut.

DEP representatives will work closely with the USACE and NCDEQ to ensure compliance with the applicable regulations and permit conditions. Additional mitigation measures may be implemented following consultation with the USACE for Section 404 compliance.

6.1.3 Threatened and Endangered Species

Communication has been initiated with the USFS, USFWS, and NHP regarding potential impacts concerning state and federally protected species. Further consultation with the USFWS and NHP will be initiated once a route has been approved, to ensure compliance with the Endangered Species Act. DEP will hire a contractor to conduct a review of the preferred route to determine whether potential habitat for threatened and endangered species is likely to be impacted by the route. If habitat is found along the route, surveys to determine the presence or absence of federally protected species along the preferred route may be necessary. Fish and mussel species are not likely to be affected by the construction and maintenance of the preferred route because streams and creeks will be spanned and erosion control methods will be implemented to minimize sedimentation.

Mitigation to avoid damage to protected plant and wildlife species communities or habitat could include strategic pole placement, avoidance, or other USFS and USFWS recommendations. DEP already has in place a memorandum of understanding with the NHP to manage any threatened and endangered species found on existing ROWs.

6.1.4 Sensitive Areas

The project crosses designated SNHAs, private conservation easements and the CNF. The practices outlined above in Sections 6.1.1 – 6.1.3 will also be applied to these sensitive areas thereby minimizing impacts to the extent practicable. The crossing of the CNF has been designed to be the minimum distance practicable while minimizing overall impacts of the line. Acquisition of new ROW through the CNF will be required to comply with NEPA. Based on the estimate of impacts to the forest lands, an environmental assessment appears to be necessary. DEP will coordinate with the USFS to provide the appropriate documentation and environmental studies to ensure that the proposed line will avoid and minimize impacts to the CNF to the maximum extent practicable.

6.2 MITIGATION OF HUMAN RESOURCE IMPACTS

The main issues discussed in Chapter 5.0 related to human resources were land use, cultural resources, and visual character. Measures to avoid or eliminate potential negative impacts to these resources are described below.

6.2.1 Land Use

Routes were initially identified that minimized impacts to residences and other avoidable land uses to the extent possible. The preferred route minimizes its overall social impact by following existing

transmission lines and highways for 22 percent of its length. Following existing utility ROWs minimizes the amount of new ROW required, thereby limiting new impacts to property owners, as well as the visual impact, and impacts to agricultural land, forestland, and wetlands.

The line will be constructed within 500 feet of two residential buildings, which are located near the terminus of the line at the Newport 230kV Switching Station. The preferred route will parallel an existing transmission line near these residences. There are no residential buildings located within 100 feet of the ROW and no non-residential buildings within 200 feet of the ROW.

Impacts to different land uses were minimized by following existing lines as much as possible and by minimizing the overall length of the line. At approximately 6.91 miles, revised Route B is the shortest of the alternative routes. Because the majority of the study area is comprised of woodlands, it was impossible to develop a route that avoided large amounts of clearing.

6.2.2 Cultural Resources

The route identification process included avoidance of known historical and archaeological resources; however, little of the study area has been previously surveyed and a high probability for cultural resources exists within the study area. The NCSHPO may recommend that DEP perform an archaeological survey of the proposed route, especially if the route crosses areas that have the potential to contain archaeological resources possibly eligible for inclusion in the NRHP. If the survey results in the discovery of any sites that are or could be considered eligible for the NRHP, the line or poles could be adjusted to avoid the site, or other actions will be taken as recommended by the NCSHPO. If a survey is required, the findings will be submitted to the NCSHPO, and any proposed mitigation will be coordinated with them.

6.2.3 Visual Character

Most of the land crossed by the preferred route is wooded, which helps to screen the line from view and all roads and trails are crossed nearly perpendicular to one another to further minimize visibility. Additionally, paralleling of existing ROW will minimize the visual impact of the line in these areas as there is already existing transmission infrastructure within the viewshed. The structures proposed for this project will likely consist of weathering steel, which tends to blend in with the adjacent trees, reducing the line's visual impact. The structures for the proposed project will be H-frames, though some three-pole structures will be used for some angles in the transmission. H-frame structures are typically shorter and have longer spans than single-pole structures. Because the H-frame structures are shorter, they will generally not exceed the height of nearby trees, which will help to shield the line from view. Where

practicable, structures will be located to take advantage of any existing vegetation for screening from residences and roadways. Typically, the pole itself creates the most visual contrast for a transmission line, so longer spans will result in fewer overall structures and less overall visual impact compared to other structure designs. The visual impact of the line is further minimized because H-frame structures are better suited for following the contour of the land than single-pole structures. Because angle structures are larger, require more space, and hence are more visible, the preferred route was designed to minimize the number of such structures to the extent practicable, while also avoiding residences and other known constraints.

6.3 CONCLUSION

By following DEP's standard clearing and construction practices, the route selection process described, and the above mitigation techniques, most potential impacts of the selected route will either be avoided or minimized. As a result, the construction and operation of the proposed project will have minimal effects on the natural resources and human resources within the study area.

7.0 NECESSARY APPROVALS AND PERMITS

DEP will construct the project in accordance with all applicable federal, state, and local permit requirements. DEP is responsible for obtaining all permits and approvals required to construct the Project. A comprehensive list of the potentially required permits, approvals, and administering agencies is included in Table 7-1. Consultations for the project are ongoing with federal, state, and local agencies. If desired, further correspondences and agency clearances will be forwarded to the NCUC upon receipt.

Table 7-1

Preliminary List of Potential Permits, Clearances and Approvals

	Administering Agency	Potentially Required Permit/Clearance		
Federal	U.S. Army Corps of Engineers – Wilmington District, Wilmington Regulatory Field Office	Section 404 – Nationwide Permit 12 and Jurisdictional Determination (Clean Water Act)		
	U.S. Fish and Wildlife Service – Southeast Region 4, Raleigh Ecological Field Office	Federally listed threatened and endangered species consultation (Section 7 of the Endangered Species Act)		
	U.S. Forest Service – North Carolina Supervisor’s Office and Croatan National Forest Ranger District	<ul style="list-style-type: none"> ○ National Environmental Policy Act – Environmental Assessment ○ Special Use Permit 		
State	North Carolina Public Utilities Commission	Certificate of Environmental Compatibility and Public Convenience and Necessity		
	North Carolina Division of Coastal Management – Southern District, Moorhead City Office	Coastal Zone Management Act Permit of Consistency Review (Coastal Zone Management Act of 1972)		
	North Carolina Wildlife Resources Commission – District 2 – Coastal Region	State listed Threatened and Endangered Wildlife Species Consultation (North Carolina General Statutes, Article 25)		
	North Carolina Department of Environmental Quality– Wilmington Regional Office	Division of Water Quality	<ul style="list-style-type: none"> ○ Water Quality Certification (Section 401 of the Clean Water Act) ○ National Pollutant Discharge Elimination System Construction General Permit for Stormwater Discharges 	
		Division of Land Resources – Land Quality Section	Erosion and Sediment Control Permit	
		North Carolina Natural Heritage Program	State listed Threatened and Endangered Plant Species Consultation (North Carolina General Statutes, Article 25)	
	North Carolina Office of Archives and History – Department of Cultural Resources	Cultural Resources Consultation Review (Section 106 of the National Historic Preservation Act)		
North Carolina Department of Transportation	<ul style="list-style-type: none"> ○ Encroachment Agreement for Utilities ○ Temporary and Permanent Driveway Access Permits 			
Local	Carteret County Planning Department	<ul style="list-style-type: none"> ○ County Stormwater Permit ○ County Floodplain Permit 		
	Land Owners	ROW Easements		

8.0 SUMMARY

DEP is proposing to construct approximately 6.91 miles of new 230kV transmission line in Carteret County, North Carolina. The proposed line will connect the Harlowe 115kV – 230kV Substation located near the Town of Harlowe, and the Newport 230kV Switching Station located near the Town of Newport (Figure 5-1).

Data was collected from local, state and federal sources, as well as through aerial interpretation and field reconnaissance of the study area to identify potential routes between the two substations. Public workshops were held to provide information about the project and preliminary routes and to acquire public input to be used to help compare the routes. Throughout the course of the project, route segments were added, adjusted, and deleted as meetings were held with federal, state and local agency representatives, environmental stakeholders, and the public. The northern portion of the study area was generally removed from consideration as it was determined by DEP that the new line could not be double-circuited for more than one mile, and expansion of the existing ROW associated with the Havelock – Morehead Wildwood 115kV North line would have significant impacts on a number of residential and commercial areas. Additional residential, threatened and endangered species, and natural resource constraints resulted in unfavorable scores for the most southern routes considered.

The preferred route exits the proposed Harlowe 230kV – 115kV Substation and heads west for approximately 1.29 miles across private pine plantations before it arrives at the eastern boundary of CNF. The route then crosses through the CNF for approximately 0.95 miles. Upon exiting the CNF, the route continues west and parallels the CNF boundary for approximately 3.12 miles across active forest plantations, SNHAs, and private conservation easements until it meets the Havelock-Morehead Wildwood 115kV South Transmission Line north of the Town of Newport. In the vicinity of this location, the route crosses an additional 1,310 feet of CNF lands. From here, the alignment turns north and parallels the existing overhead transmission line for approximately 1.55 miles before arriving at the proposed Newport 230kV Switching Station (Figure 5-1).

The preferred route was selected for the following reasons:

- It minimizes impacts to residential and commercial areas;
- It avoids impacts to the federally endangered RCW;
- It minimizes impacts to sensitive areas;

- It parallels existing ROW for 19 percent of the line length, minimizing visual and environmental impacts in this area; and
- It is one of the shortest alternatives, thereby minimizing overall impacts.

For these reasons, the preferred route was one of the best-scoring of the alternatives in the numerical evaluation performed for the proposed project. While the route did not score the highest based on the quantitative data analysis, further evaluation of the routes and discussions with key stakeholders confirmed that Route B, as revised, was the preferred route as it best met the public interests outlined in Chapter 4.0 while minimizing overall impacts due to construction and operation of the line. By using standard construction procedures and mitigation techniques, and by coordinating the project with state and federal agencies to ensure compliance with necessary regulations, the construction and operation of the proposed project will have minimal effects on the natural and human resources within the study area. DEP will continue to work with the USFS, the environmental stakeholders and agencies, and landowners to minimize the impacts of this proposed project.

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FIGURES

Figure No. **2-2**
 Title **Preferred Route Overview Map**

Client/Project
 Duke Energy Progress
 Harlowe - Newport 230kV Transmission Line

Project Location
 Craven and Carteret Counties, NC

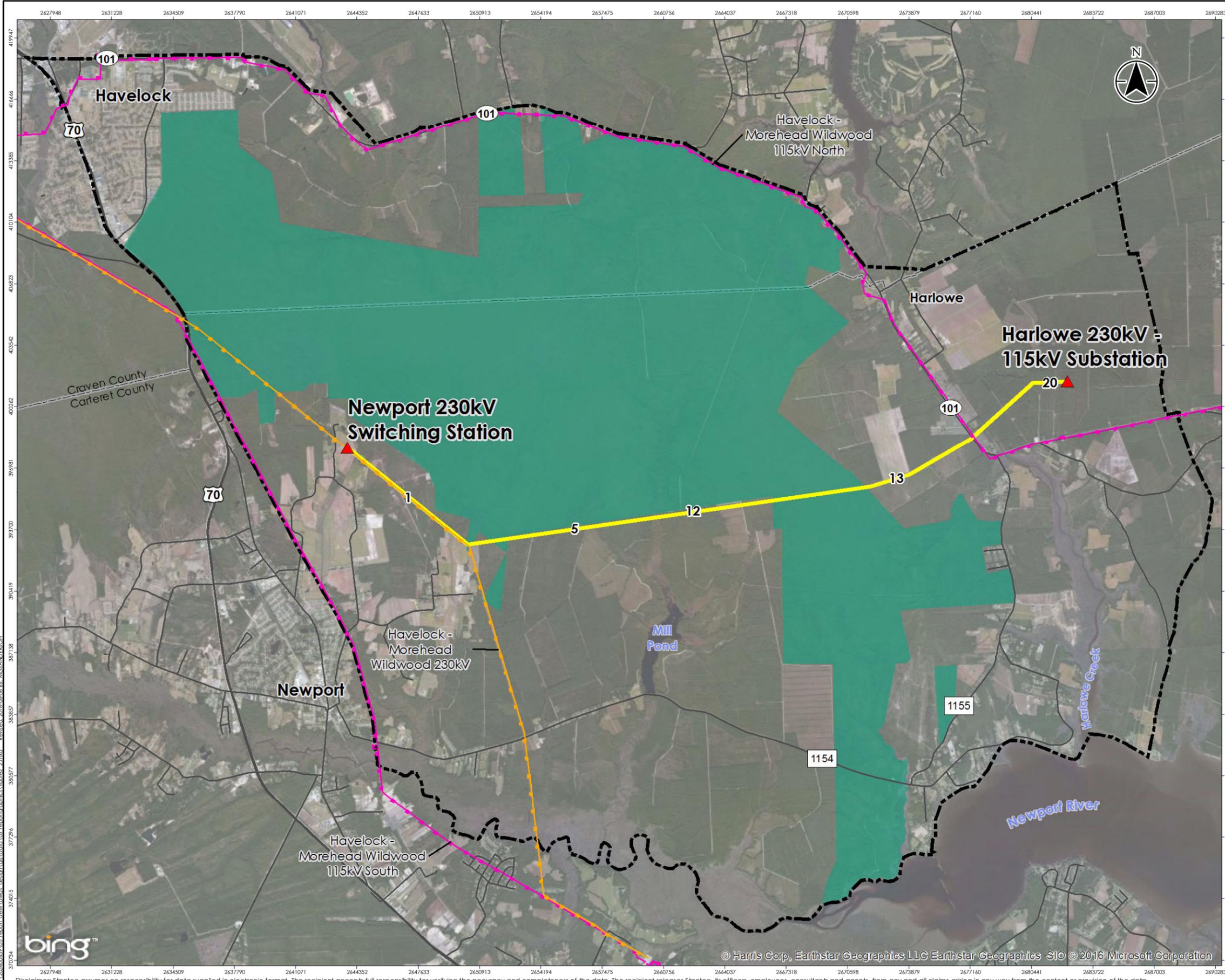
203400439
 Prepared by MGS on 2016-07-08
 Technical Review by TPS on 2016-07-11
 Independent Review by JBJ on 2016-07-11



- Legend
- Proposed Substation / Switching Station
 - Study Area
 - Proposed Route Segment
 - Existing Duke 115kV Transmission Line
 - Existing Duke 230kV Transmission Line
 - Croatan National Forest



- Notes
1. Coordinate System: NAD 1983 StatePlane North Carolina FIPS 3200 Feet
 2. Substation and Switching Station locations provided by Duke Energy Progress
 3. Orthoimagery © Bing Maps
 4. Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation



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Figure 2-3: Typical Steel H-Frame Tangent Structure



Figure 2-4: Typical Three-Pole Structure

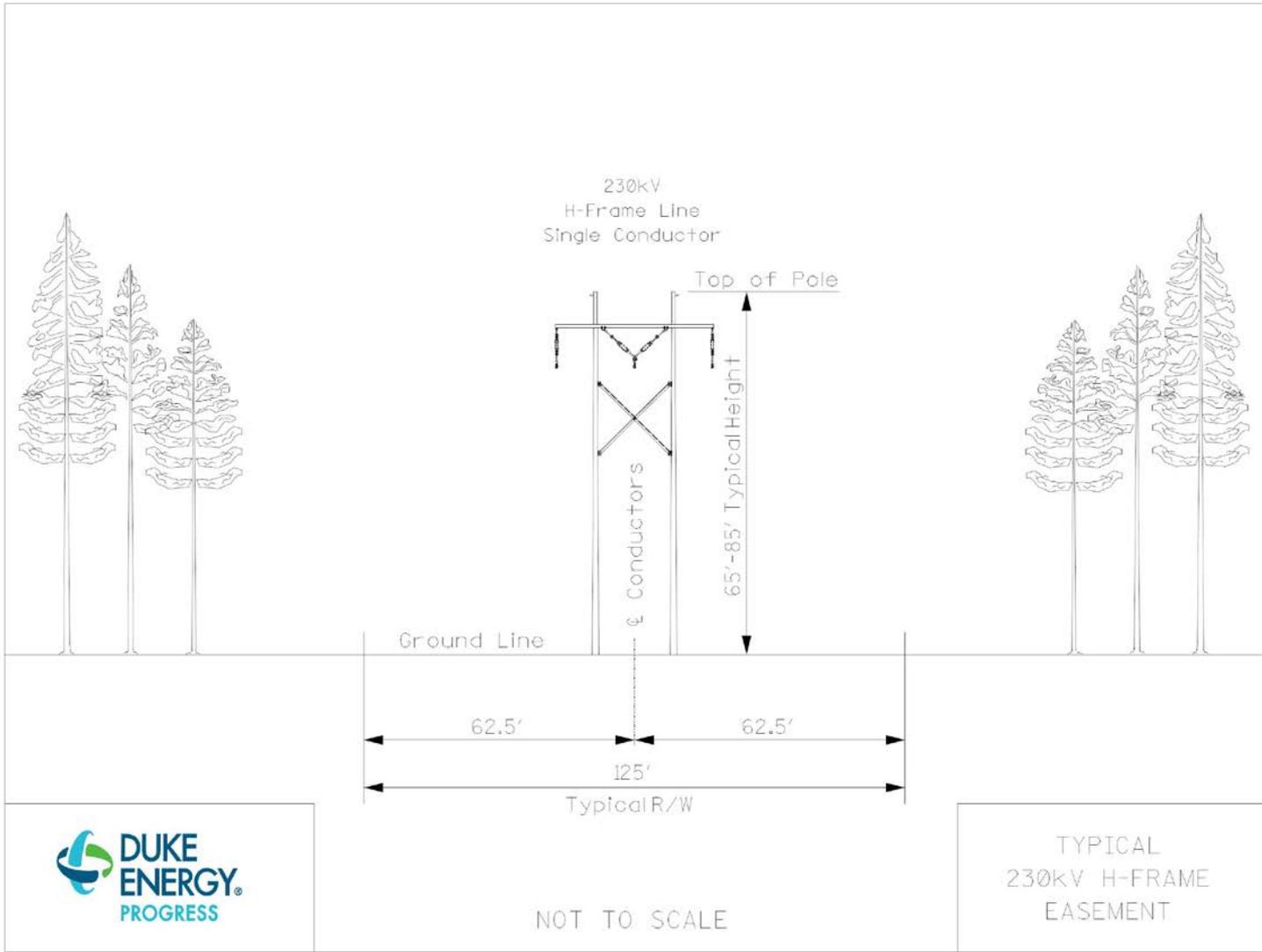


Figure 2-5: Typical 230kV Single Circuit Steel H-Frame Easement

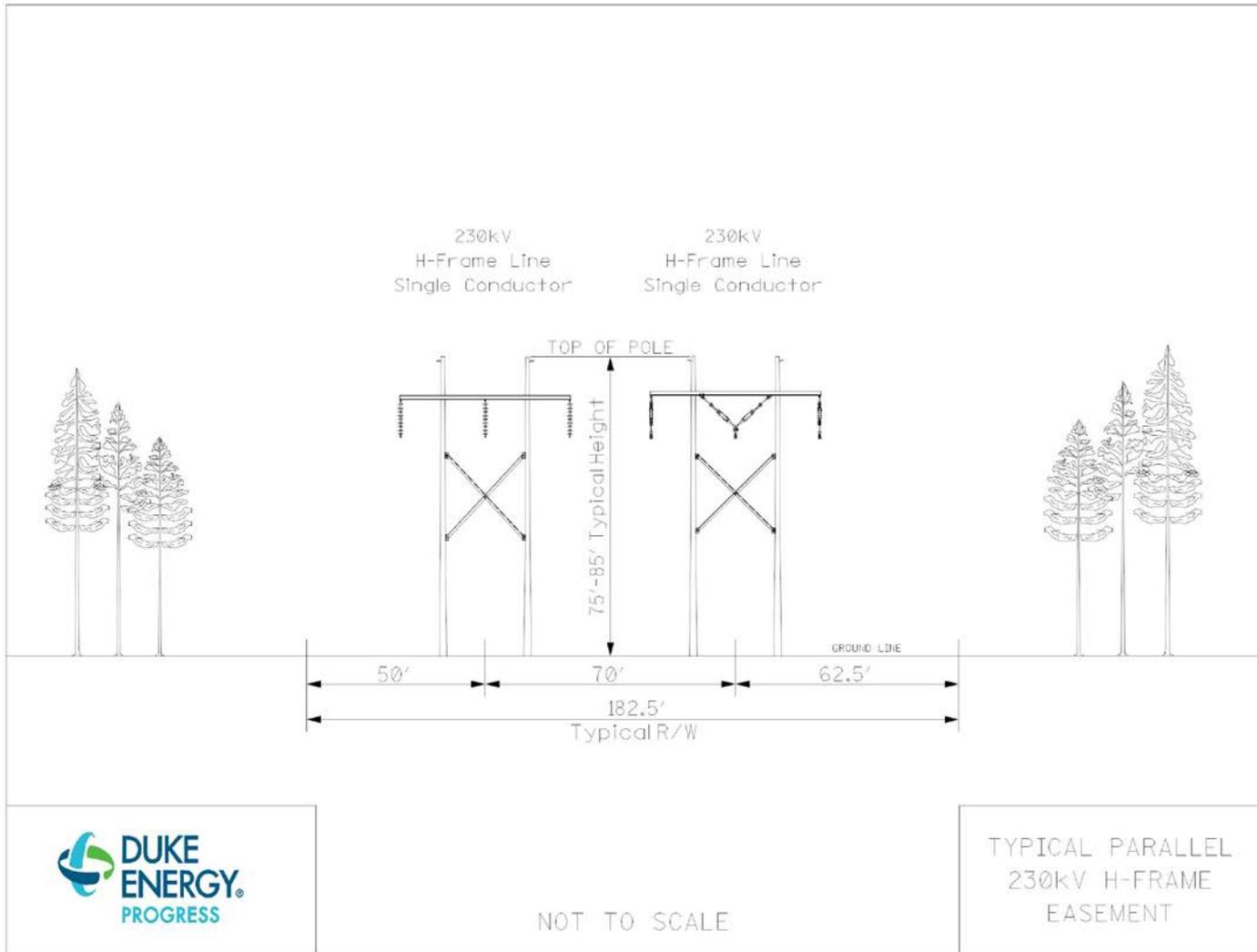


Figure 2-6: Typical 230kV H-Frame Parallel Easement

Figure No. 4-1

Suitability Analysis

Client/Project
Duke Energy Progress
Harlowe - Newport 230kV Transmission Line

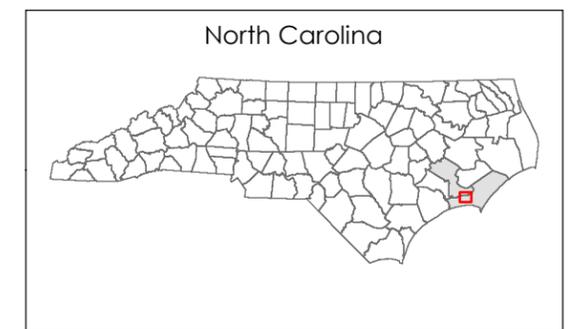
Project Location
Craven and Carteret Counties, NC

203400439
Prepared by MGS on 2016-06-15
Technical Review by TPS on 2016-06-30
Independent Review by JBJ on 2016-06-30



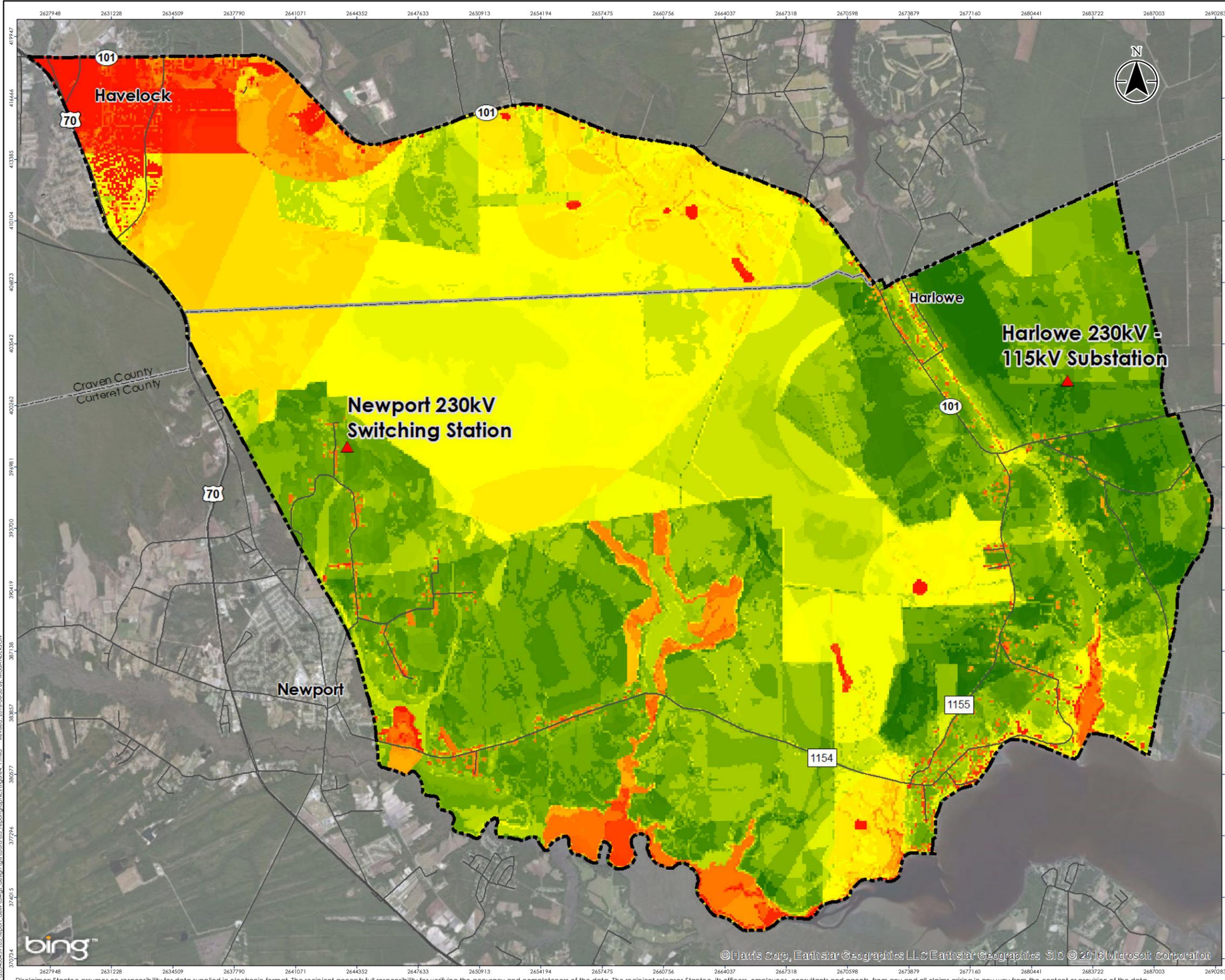
Legend

-  Proposed Substation / Switching Station
 -  Study Area
- Suitability Analysis**
-  Less Suitable
 -  More Suitable



Notes

1. Coordinate System: NAD 1983 StatePlane North Carolina FIPS 3200 Feet
2. Substation and Switching Station locations provided by Duke Energy Progress
3. Data collected from: Duke Energy Progress; Carteret County, Craven County, and City of Havelock GIS; Town of Newport; NCHPO Web GIS; NCDENR NHP; NC One Map; NCDOT; FEMA; USDA NRCS and MRLC; USFWS NWI; USGS Quads, and Gap Analysis Program
4. Orthoimagery © Bing Maps
5. Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation

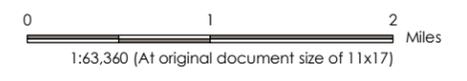


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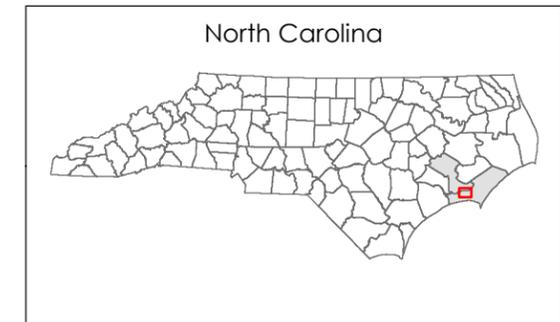
U:\203400439\05_report_data\gis_data\05_report_graphics\figure4_1.mxd Revised: 2016-06-30 By: MGS ANDERSON

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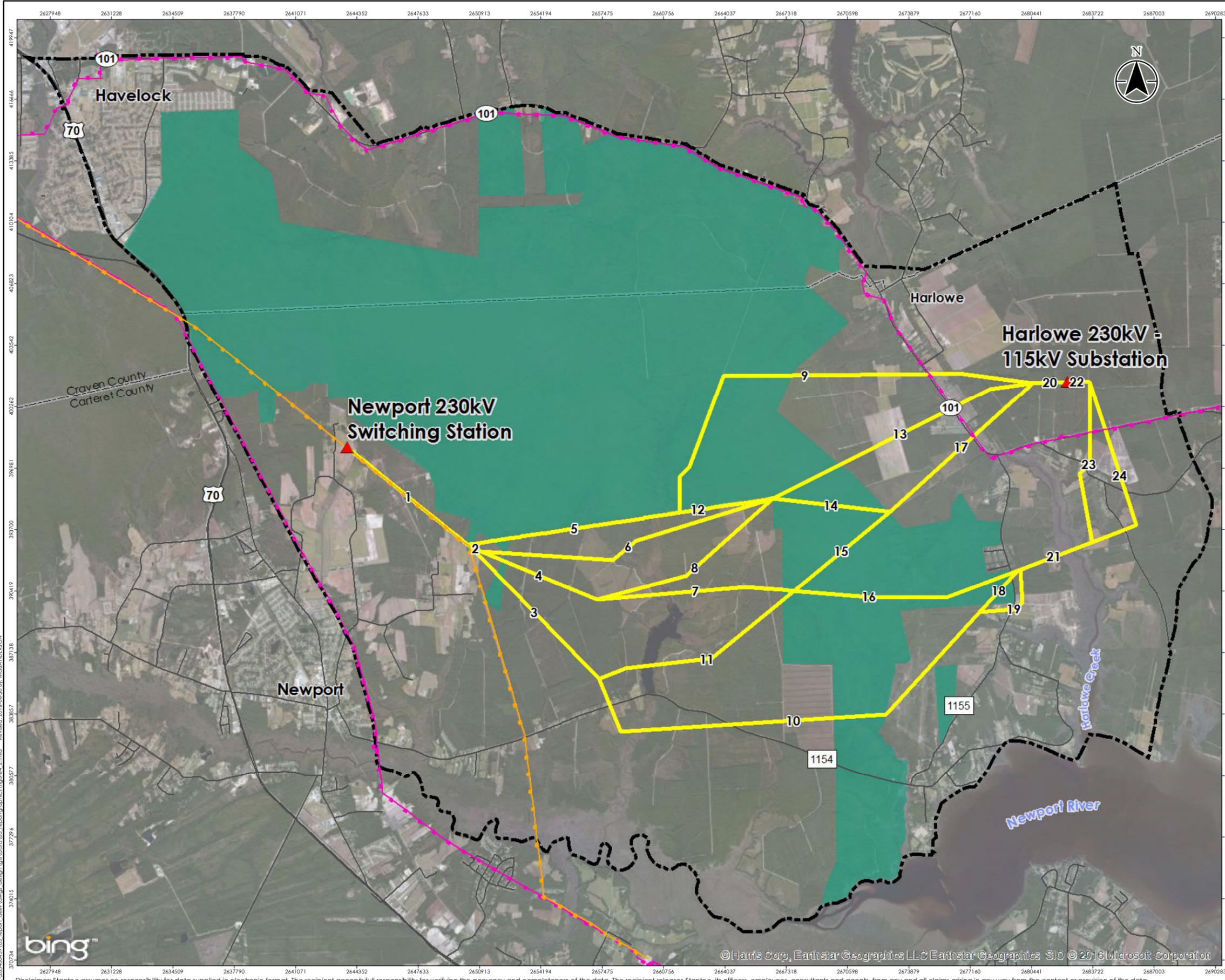
Figure No. **4-2**
 Title **Route Segments Presented at Public Open House**
 Client/Project **Duke Energy Progress Harlowe - Newport 230kV Transmission Line**
 Project Location **Craven and Carteret Counties, NC** 203400439
 Prepared by MGS on 2016-06-15
 Technical Review by TPS on 2016-06-30
 Independent Review by JBJ on 2016-06-30



- Legend**
- Proposed Substation / Switching Station
 - Study Area
 - Proposed Route Segment
 - Existing Duke 115 kV Transmission Line
 - Existing Duke 230 kV Transmission Line
 - Croatan National Forest



- Notes**
1. Coordinate System: NAD 1983 StatePlane North Carolina FIPS 3200 Feet
 2. Substation and Switching Station locations provided by Duke Energy Progress
 3. Orthoimagery © Bing Maps
 4. Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation



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 Revised: 2016-06-30 By: MGS ANDERSON
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Figure No. **4-3**
 Title **Final Route Segments**

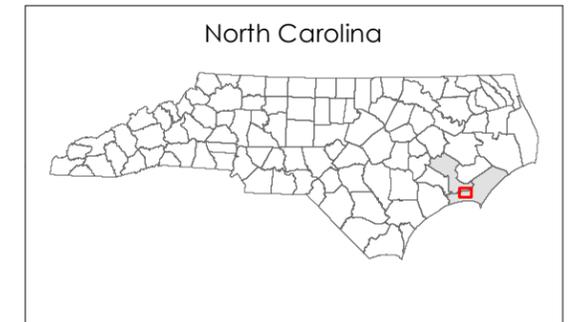
Client/Project
 Duke Energy Progress
 Harlowe - Newport 230kV Transmission Line

Project Location
 Craven and Carteret Counties, NC

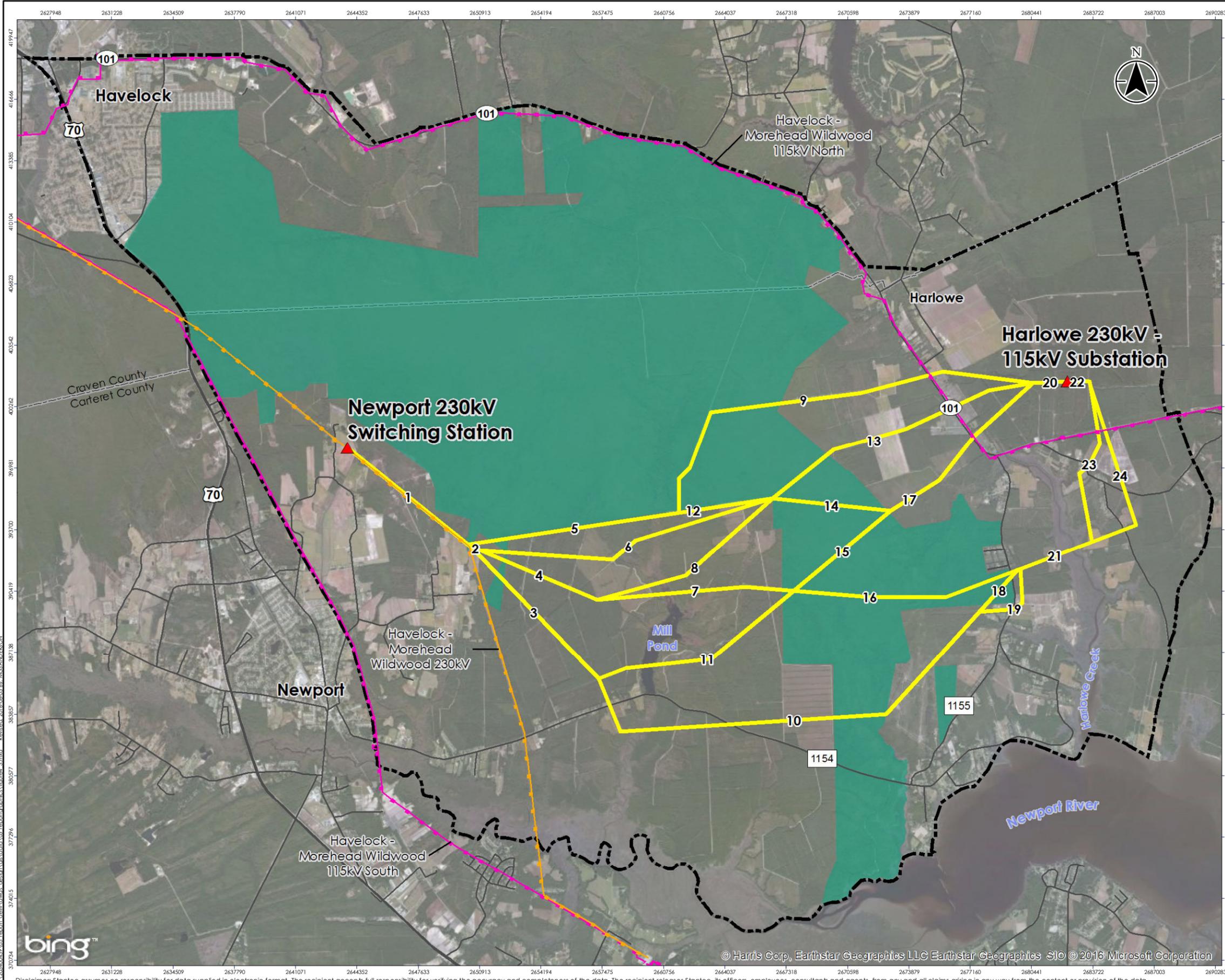
203400439
 Prepared by MGS on 2016-06-23
 Technical Review by TPS on 2016-06-30
 Independent Review by JBJ on 2016-06-30



- Legend
- Proposed Substation / Switching Station
 - Study Area
 - Proposed Route Segment
 - Existing Duke 115kV Transmission Line
 - Existing Duke 230kV Transmission Line
 - Croatan National Forest

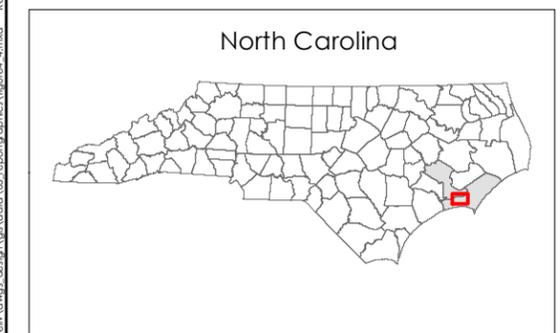
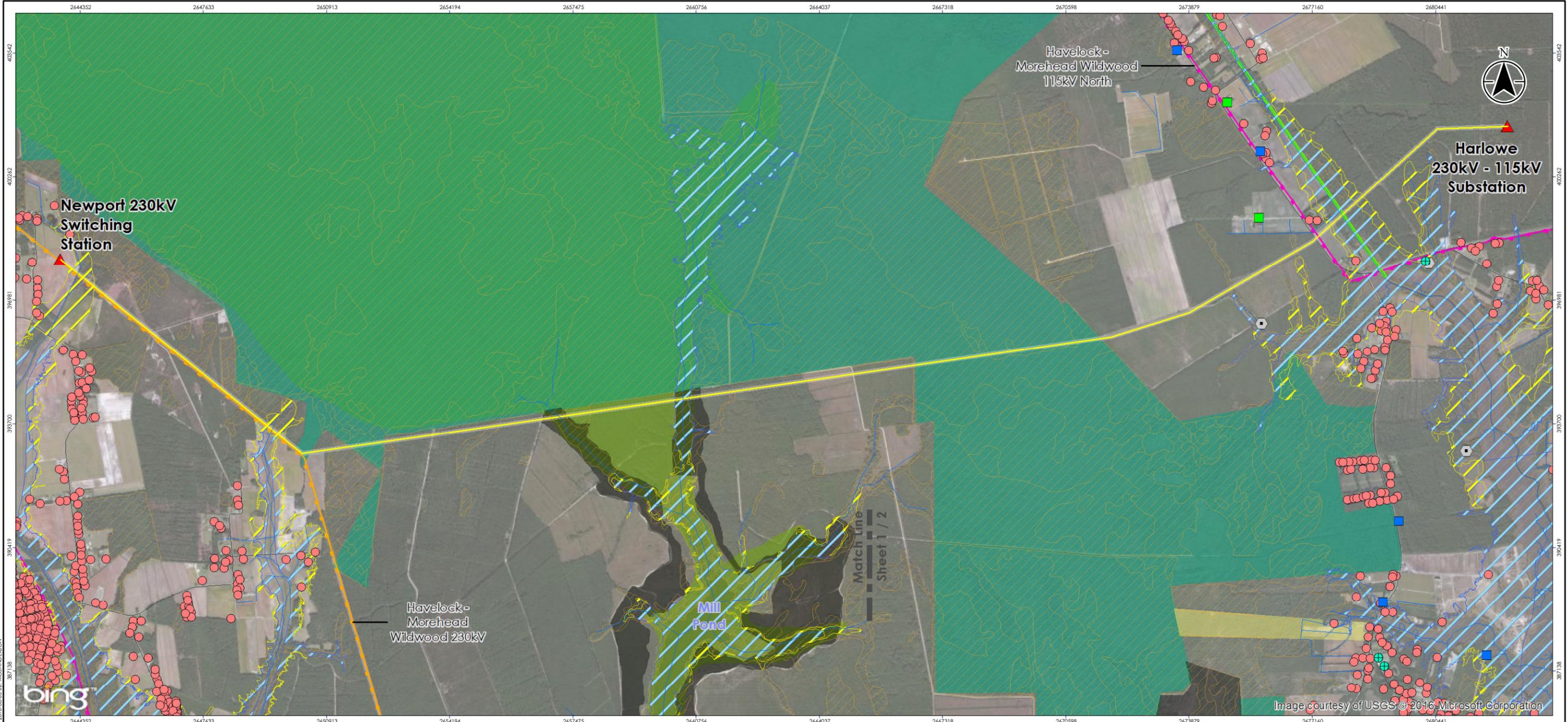


- Notes
1. Coordinate System: NAD 1983 StatePlane North Carolina FIPS 3200 Feet
 2. Substation and Switching Station locations provided by Duke Energy Progress
 3. Orthoimagery © Bing Maps
 4. Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation



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- Legend**
- ▲ Proposed Substation / Switching Station
 - Proposed Route with 125-Foot Right-of-Way
 - Existing Duke 115kV Transmission Line
 - Existing Duke 230kV Transmission Line
 - NC Coastal Land Trust Easement
 - Croatan National Forest
 - Natural Heritage Program Natural Areas
 - Participating in NCFS Forest Development Program
 - Cultural and Historical Resource
 - Mountain to Sea Trail
 - NHD Flowline
 - NWI Wetlands
 - 100-Year Floodzone
 - 500-Year Floodzone
 - Cemetery
 - + Church
 - Commercial
 - Residential
 - Cultural and Historical Resource



Project Location: Craven County and Carteret County, NC
 Prepared by MGS on 2016-06-28
 Technical Review by IPS on 2016-06-30
 Independent Review by JBJ on 2016-06-30

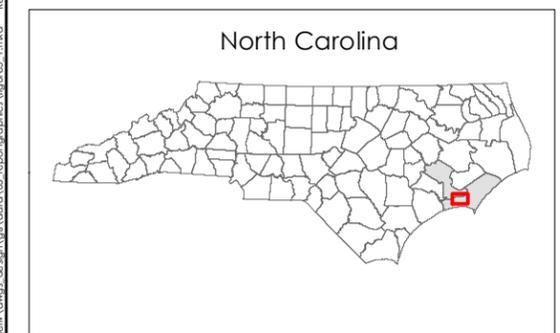
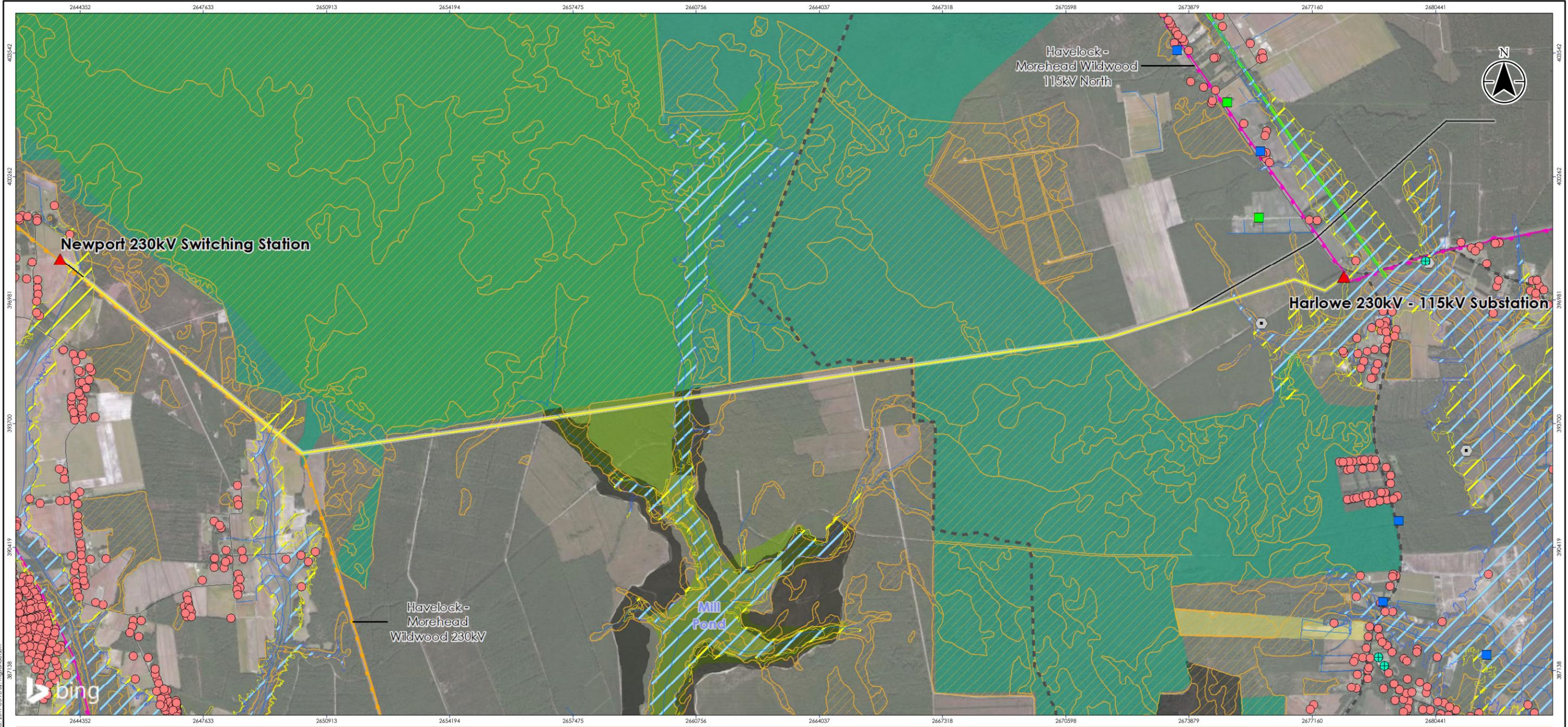
Client/Project: Duke Energy Progress
 Harlowe - Newport 230kV Transmission Line

Figure No.: **4-4**

Title: **Preferred Route Constraints and Opportunities Map**
 Page 01 of 01

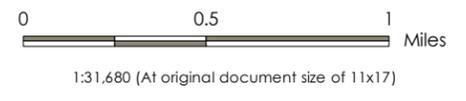
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 Revised: 2016-08-05 By: MCS ANDERSON
 387138

Notes
 1. Coordinate System: NAD 1983 StatePlane North Carolina FIPS 3200 Feet
 2. Data collected from: Duke Energy Progress; NC One Map; NCHPO Web GIS; NCDENR NHP; FEMA; USFWS NWI; USGS NHD; and NCDOT
 3. Orthoimagery © Bing Maps
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Legend

Proposed Substation / Switching Station	NC Coastal Land Trust Easement	Cemetery
Proposed Route with 125-Foot Right-of-Way	Croatan National Forest	Church
Previously Proposed Route with 125-Foot Right-of-Way	Natural Heritage Program Natural Areas	Commercial
Existing Duke 115kV Transmission Line	Participating in NCFS Forest Development Program	Residential
Existing Duke 230kV Transmission Line	Cultural and Historical Resource	Cultural and Historical Resource
NHD Flowline	NWI Wetlands	
Mountain to Sea Trail	100-Year Floodzone	
	500-Year Floodzone	



Project Location: Craven County and Carteret County, NC
 Prepared by MGS on 2017-05-17
 Technical Review by ECL on 2017-05-17
 Independent Review by JBJ on 2017-05-17

Client/Project: Duke Energy Progress
 Harlowe - Newport 230kV Transmission Line

Figure No.: 5-1

Title: Revised Preferred Route Constraints and Opportunities Map

Notes
 1. Coordinate System: NAD 1983 StatePlane North Carolina FIPS 3200 Feet
 2. Data collected from: Duke Energy Progress; NC One Map; NCHPO Web GIS; NCDENR NHP; FEMA; USFWS NWI; USGS NHD; and NCDOT
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APPENDIX A

Johnson, Jennifer

Subject: FW: Harlow Canal

-----Original Message-----

From: Phillips, Ryan A BM1 [<mailto:Ryan.A.Phillips@uscg.mil>]

Sent: Wednesday, December 16, 2015 1:52 PM

To: Tyner, Gail

Subject: Harlow Canal

*** Exercise caution. This is an EXTERNAL email. DO NOT open attachments or click links from unknown senders or unexpected email. ***

Gail,

I did some research on the canal in question. It looks like we won't need anything for it. It's so secluded that we don't see your project being any kind of issue. If you could please let us know about when you the project will start, that would be good. I will put out a small broadcast for it just to cover our bases but that's it. Should be super simple. Please let me know if there is anything else I can do for you.

V/R,

BM1 Ryan Phillips
Sector North Carolina
Waterways Management
721 Medical Center Dr.
Suite 100
Wilmington, NC. 28401
Office: (910)-772-2212

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Aug 03 2017



DEPARTMENT OF THE ARMY
WILMINGTON DISTRICT, CORPS OF ENGINEERS
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403-1343

April 8, 2016

Regulatory Division

Action ID No. SAW-2016-00676

Ms. Gail Tyner
Duke Energy Progress
Environmental Specialist, Siting & Permitting
410 S. Wilmington Street
NC 2
Raleigh, North Carolina 27601

Dear Ms. Tyner:

Reference is made to your email dated March 7, 2016, requesting preliminary agency comments for the proposed Harlowe-Newport 230 kV Transmission Line, in between a proposed substation along its existing Havelock-Morehead Wildwood 230 kV transmission line in Newport, NC to a proposed substation along its Havelock-Morehead Wildwood 115 kV Transmission line in Harlowe, North Carolina, located north of Morehead City, Carteret County, North Carolina.

The information provided in the scoping meeting request package, held on December 14, 2015 identifies multiple proposed alignments of the proposed transmission line, which would measure approximately 8-12 miles in length and would require a new 125-foot right of way. The proposed line would be constructed utilizing typical H-Frame construction. The majority of the land within the proposed alignments are comprised of managed timber lands and US Forest Service property.

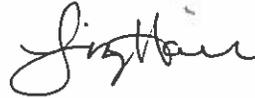
Preliminary review of the information provided is inconclusive as to whether the project will impact jurisdictional wetlands and waters of the U. S. Based on the maps provided, there appear to be a number of jurisdictional features, such as streams and wetlands, including Harlowe Creek, Money Island Swamp, Mill Pond, and Black Creek, which may be impacted by the proposed project.

It is strongly recommended that all areas within the project boundaries be inspected for the presence of jurisdictional waters and wetlands in order for our office to determine the need for Department of the Army authorization. Identified wetlands or waters must be delineated and then verified by our office. By delineating all jurisdictional areas, this will aid in your planning stage for avoiding any unnecessary impacts to waters and wetlands. Issuance of Department of the Army authorization must precede any placement of excavated or fill material within any

wetlands or other waters of the United States within the project boundary. Any unauthorized work in jurisdictional areas may be a violation of Federal law.

Should you have any further questions related to Department of the Army permits for this project, please contact Ms. Liz Hair at 910-251- 4049.

Sincerely,



Liz Hair
Regulatory Project Manager
Wilmington Regulatory Field Office

Electronic copy furnished:

Mr. Ken Riley, NOAA Fisheries
Ms. Joanne Steenhuis, NC DWR
Ms. Courtney Spears, NC DCM

Johnson, Jennifer

Subject: FW: Newport - Harlowe Preferred Route
Attachments: 2016-06-23_LGR_Newport_Harlowe Duke Energy transmission line preferred route.pdf

From: Robinson, Laura [<mailto:Laura.Robinson@ncdcr.gov>]
Sent: Thursday, June 23, 2016 12:06 PM
To: Tyner, Gail
Subject: RE: Newport - Harlowe Preferred Route

***** Exercise caution. This is an EXTERNAL email. DO NOT open attachments or click links from unknown senders or unexpected email. *****

Hi Gail,

I reviewed the project ran it through our Data Explorer, which provides a list of what records are within the project boundaries and what is within a 1 mile radius. You may already have this data compiled for your project, but the attached letter can serve as official input from NHP. I'm happily surprised to see that no element occurrences fall within the proposed route. If you do surveys and find that there are federally listed species there, I can be available to help you coordinate with the relevant agencies to address possible impacts.

Please let me know if you have any questions.

Thanks!

Laura

Laura Robinson, Botanist
Natural Heritage Program
Division of Land and Water Stewardship
North Carolina Department of Natural and Cultural Resources

919.707.8647 office
laura.robinson@ncdcr.gov
www.ncnhp.org

Please note my new email address: laura.robinson@ncdcr.gov

121 West Jones Street
1651 Mail Service Center
Raleigh, North Carolina 27699-1651



Email correspondence to and from this address is subject to the North Carolina Public Records Law and may be disclosed to third parties.

From: Tyner, Gail [<mailto:Gail.Tyner@duke-energy.com>]
Sent: Wednesday, June 22, 2016 11:31 AM
To: Robinson, Laura <Laura.Robinson@ncdcr.gov>
Subject: Newport - Harlowe Preferred Route

Laura

As per our conversation this morning, I'm sending you a KMZ file of the preferred alternative. Please let me know if you have any concerns about the proposed routes. DEP will perform environmental surveys for wetlands/streams, and federally protected species. We will also include surveys for additional PETS species as required by the USFS.

Thanks

Gail Tyner

Duke Energy Progress

Environmental Specialist, Siting & Permitting

410 S. Wilmington Street
NC 2
Raleigh, NC 27601-1551

919.546.2974 (office)
919.630.4079 (cell)
919.546.7175 (fax)
gail.tyner@duke-energy.com

NORTH CAROLINA DEPARTMENT OF NATURAL AND CULTURAL RESOURCES

Pat McCrory
Governor

Bryan Gossage
Executive Director
Clean Water Management Trust Fund

Susan Kluttz
Secretary

NCNHDE-1783

June 23, 2016

Gail Tyner
Duke Energy Progress
140 S. Wilmington Street
Raleigh, NC 27601-1551
laura.robinson@ncdcr.gov

RE: Newport-Harlowe Duke Energy transmission line-preferred route

Dear Gail Tyner:

The North Carolina Natural Heritage Program (NCNHP) appreciates the opportunity to provide information about natural heritage resources from our database that have been compiled for the project referenced above.

A query of the NCNHP database indicates that there are records for rare species, important natural communities, natural areas, or conservation/managed areas within the proposed project boundary submitted with your request for information. These results are presented in the attached 'Documented Occurrences' table and map.

Also attached is a table summarizing rare species and natural communities that have been documented within a one-mile radius of the project boundary. The proximity of these records suggests that these natural heritage elements may potentially be present in the project area if suitable habitat exists and is included for reference. In the event that rare species are found within the project area, please contact the NCNHP so that we may update our records. Tables of natural areas and conservation/managed area within a one-mile radius, if any, are also included in this report.

Please note that natural heritage element data are maintained for the purposes of conservation planning, project review, and scientific research, and are not intended for use as the primary criteria for regulatory decisions. Information provided by the NCNHP database may not be published without prior written notification to the NCNHP, and the NCNHP must be credited as an information source in these publications. Maps of NC Natural Heritage Program data may not be redistributed without permission from the NCNHP.

Also please note that the NC Natural Heritage Program may follow this letter with additional correspondence if a Dedicated Nature Preserve (DNP), Registered Heritage Area (RHA), or an occurrence of a Federally-listed species is documented within or near the project area.

Thank you for your inquiry. If you have questions regarding the information provided in this letter or need additional assistance, please contact Suzanne Mason at suzanne.mason@ncdcr.gov or 919.707.8637.

Sincerely,
NC Natural Heritage Program

**Natural Heritage Element Occurrences, Natural Areas, and Managed Areas Intersecting the Project Area
Newport-Harlowe Duke Energy transmission line-preferred route
June 23, 2016
NCNHDE-1783**

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No Element Occurrences are Documented within the Project Area

There are no documented element occurrences (of medium to very high accuracy) that intersect with the project area. Please note, however, that although the NCNHP database does not show records for rare species within the project area, it does not necessarily mean that they are not present; it may simply mean that the area has not been surveyed. The use of Natural Heritage Program data should not be substituted for actual field surveys if needed, particularly if the project area contains suitable habitat for rare species. If rare species are found, the NCNHP would appreciate receiving this information so that we may update our database.

Natural Areas Documented Within Project Area

Site Name	Representational Rating	Collective Rating
Union Point Pocosin	R4 (Moderate)	C4 (Moderate)
Walkers Millpond and Black Creek	R5 (General)	C5 (General)

Managed Areas Documented Within Project Area *

Managed Area Name	Owner	Owner Type
Croatan National Forest	US Forest Service	Federal
North Carolina Coastal Land Trust Easement	North Carolina Coastal Land Trust	Private
North Carolina Coastal Land Trust Easement	North Carolina Coastal Land Trust	Private
Walkers Millpond/Black Creek RHA	Weyerhaeuser Company	Private
Walkers Millpond/Black Creek RHA	Weyerhaeuser Company	Private

* NOTE: If the proposed project intersects with a conservation/managed area, please contact the landowner directly for additional information. If the project intersects with a Dedicated Nature Preserve (DNP), Registered Natural Heritage Area (RHA), or Federally-listed species, NCNHP staff may provide additional correspondence regarding the project.

Definitions and an explanation of status designations and codes can be found at <https://ncnhde.natureserve.org/content/help>. Data query generated on June 23, 2016; source: NCNHP, Q4 October 2015. Please resubmit your information request if more than one year elapses before project initiation as new information is continually added to the NCNHP database.

Natural Heritage Element Occurrences, Natural Areas, and Managed Areas Within a One-mile Radius of the Project Area
Newport-Harlowe Duke Energy transmission line-preferred route
June 23, 2016
NCNHDE-1783

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Aug 03 2017

Element Occurrences Documented Within a One-mile Radius of the Project Area

Taxonomic Group	EO ID	Scientific Name	Common Name	Last Observation Date	Element Occurrence Status	Accuracy	Federal Status	State Status	Global Rank	State Rank
Bird	15888	Setophaga virens waynei	Black-throated Green Warbler - Coastal Plain population	2015-04-28	Current	1-Very High	Species of Concern	Significantly Rare	G5T3	S2S3B
Dragonfly or Damselfly	32036	Coryphaeschna ingens	Regal Darner	2004-PRE	Historical	5-Very Low	---	Significantly Rare	G5	S2?
Dragonfly or Damselfly	33787	Triacanthagyna trifida	Phantom Darner	2004-PRE	Historical	5-Very Low	---	Significantly Rare	G5	S1?
Liverwort	22157	Frullania donnellii	A Liverwort	1992-PRE	Historical	4-Low	---	Significantly Rare Throughout	G3?	SH
Liverwort	20114	Lejeunea bermudiana	A Liverwort	1953	Historical	4-Low	---	Significantly Rare Peripheral	G3G4	S1
Moth	15767	Franclemontia interrogans	Franclemont's Cane Moth	1992-PRE	Current	3-Medium	---	Significantly Rare	G3G4	S2S3
Moth	18900	Hemipachnobia subporphyrea	Venus Flytrap Cutworm Moth	1974-03-24	Historical	3-Medium	Species of Concern	Significantly Rare	G1	S1?
Moth	619	Photodes carterae	Carter's Noctuid Moth	1972-10-13	Historical	3-Medium	Species of Concern	Significantly Rare	G2G3	S2S3
Natural Community	11461	High Pocosin (Evergreen Subtype)	---	1998	Current	4-Low	---	---	G3	S3S4
Natural Community	6023	Low Pocosin (Titi Subtype)	---	1998	Current	4-Low	---	---	G2G3	S2S3
Natural Community	12511	Pond Pine Woodland (Typic Subtype)	---	1998	Current	4-Low	---	---	G3	S3
Vascular Plant	10462	Cirsium lecontei	Leconte's Thistle	1949-08-04	Historical	5-Very Low	---	Special Concern Vulnerable	G2G3	S2

Natural Areas Documented Within a One-mile Radius of the Project Area

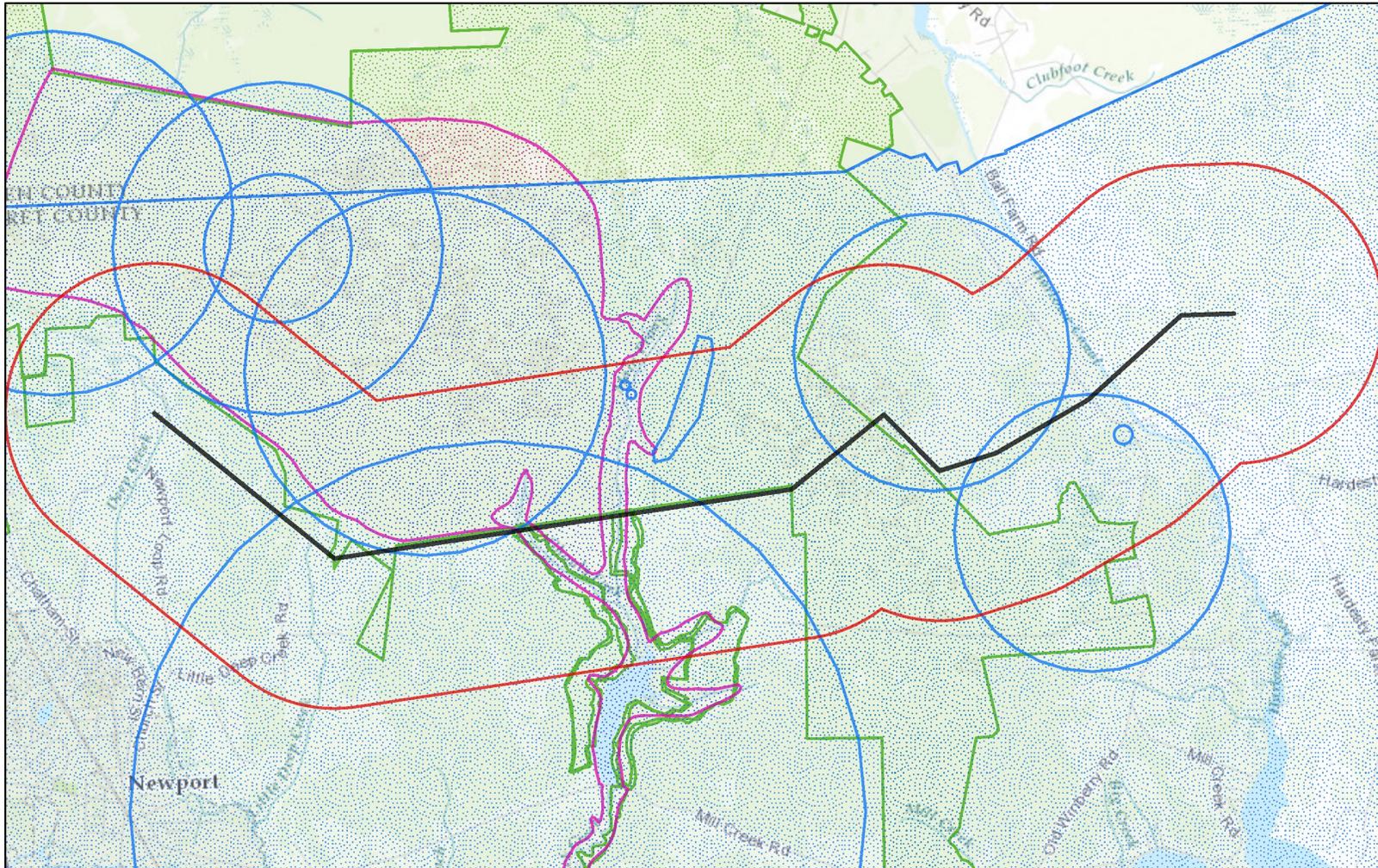
Site Name	Representational Rating	Collective Rating
Union Point Pocosin	R4 (Moderate)	C4 (Moderate)
Walkers Millpond and Black Creek	R5 (General)	C5 (General)

Managed Areas Documented Within a One-mile Radius of the Project Area

Managed Area Name	Owner	Owner Type
Carteret County Open Space	Carteret County: multiple local government	Local Government
Croatan National Forest	US Forest Service	Federal
North Carolina Coastal Land Trust Easement	North Carolina Coastal Land Trust	Private
North Carolina Coastal Land Trust Easement	North Carolina Coastal Land Trust	Private
Walkers Millpond/Black Creek RHA	Weyerhaeuser Company	Private
Walkers Millpond/Black Creek RHA	Weyerhaeuser Company	Private
Walkers Millpond/Black Creek RHA	Weyerhaeuser Company	Private

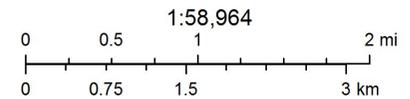
Definitions and an explanation of status designations and codes can be found at <https://ncnhde.natureserve.org/content/help>. Data query generated on June 23, 2016; source: NCNHP, Q4 October 2015. Please resubmit your information request if more than one year elapses before project initiation as new information is continually added to the NCNHP database.

NCNHDE-1783: Newport-Harlowe Duke Energy transmission line-preferred route



June 23, 2016

-  Project Boundary
-  Buffered Project Boundary
-  Natural Heritage Element Occurrence (NHEO)
-  NHP Natural Area (NHNA)
-  Managed Area (MAREA)



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey,

Subject: Proposed Newport-Harlowe 230kV Transmission Line Project

Good Morning:

This communication is being shared with Carteret and Craven County government leaders. Duke Energy Progress is seeking public input for a \$32 million project to increase capacity and enhance electricity service to customers in the Carteret County and Craven County area. The project, an approximately 10-mile, 230-kilovolt (kV) transmission line and two new substations, is part of the company's ongoing commitment to provide reliable service to the region. A community open house is scheduled for Wednesday, February 10 from 4 p.m. to 7 p.m. at the J. Fort Benjamin Park Recreation Center in Newport. "We must invest in the electric system to ensure it continues to meet the needs of this growing region," said Steve Wilson, project manager for the new transmission line. "This new transmission line will provide greater capacity and enhanced service reliability for the Newport and Harlow communities and across Eastern North Carolina."

We are planning for the construction of a new 230-kV transmission line to connect the existing Havelock-Morehead City Wildwood 230-kV line to the existing Havelock-Morehead City Wildwood 115-kV north line. The project also includes the construction of a substation near Newport to connect the existing 230-kV transmission line to the new 230-kV line. Another new substation will be constructed off Highway 101 near Harlowe to connect the new 230-kV transmission line to the existing 115-kV line. Construction is expected to begin in early 2019 and is targeted for completion in mid-2020.

Duke Energy Progress is currently evaluating a number of potential routes for construction of the transmission line, and is seeking input from the public. Property owners along the various alternate routes and near the proposed substations have been notified by letter and provided opportunities for input in this process. The public is also invited to attend a community open house to learn more about the project and provide input on the route selection.

Harlowe-Newport Transmission Line Project Community Open House
Wednesday, Feb. 10, 2016 | 4 - 7 p.m.
J. Fort Benjamin Park Recreation Center
100 McQueen Avenue, Newport, N.C.

During the open house, Duke Energy representatives will be available at stations with information on the project, aerial maps of the proposed route options, and an estimated timeline for the project. Once the public input and review process is complete, a final route will be announced this spring. "Our goal is to minimize impacts to homes and businesses, the environment and cultural resources as we work to determine the final route," said Wilson. "We also want to address the questions and concerns of potentially affected property owners and are committed to communicating with the public throughout the process."

Information on the project is available beginning February 10 at <http://www.duke-energy.com/harlowe-newport> . All information made available at the public meeting may be viewed on the website. In addition, an interactive map where the public's comments may be left can be accessed from the website. Members of the public may also email questions and comments to CETransmissionEnhancements@duke-energy.com or call 833.297.5886.

Please call if you have questions or need additional information.

Millie M. Chalk
Duke Energy Progress - District Manager



January 25, 2016

Carteret County
302 Courthouse Square
Suite 200
Beaufort, NC 28516

Reference:

637802995789000, 637904814489000

Important information about a Duke Energy transmission reliability enhancement project in your community

Dear Property Owner:

Reliability is a responsibility Duke Energy takes very seriously. As part of that commitment, we have determined the need to construct a new transmission line and two new substations in the Carteret/Craven County area. The new line and substations will provide greater capacity and enhanced service reliability for the counties and across eastern North Carolina.

We invite you to attend an informational open house to learn more about this important project:

Wednesday, Feb. 10, 2016 | 4:00 – 7:00 p.m.

J. Fort Benjamin Park Recreation Center | 100 McQueen Ave. | Newport, NC 28570

This \$32 million investment includes construction of a new 10-mile, 230-kilovolt (kV) transmission line between our existing 230-kV Havelock-Morehead City Wildwood line near Newport and the existing 115-kV Havelock-Morehead City line near the Harlowe community. The easement for the new transmission line will be 125 feet wide. The width may be less where we are able to build adjacent to existing transmission lines.

In addition to the transmission line, a new substation will be constructed near Newport to connect the existing 230-kV transmission line to the new 230-kV line. Another new substation will be constructed off Highway 101 near the Harlowe community to connect the new 230-kV transmission line to the existing 115-kV line.

Construction is expected to begin in early 2019 and is targeted for completion in June 2020. Please see the enclosed map for alternate routes under consideration. Only one of these alternate routes will be selected for the new line.

Our goal is to minimize impacts to personal property, homes, businesses, the environment and cultural resources. Public participation is a vital part of this process. That's why we hope you'll attend this meeting and provide your input. You are being invited because your property falls within 500 feet of the centerline of one of the potential routes. The final route will be determined this fall following public input and further study.

The meeting will be set up in an open house format, allowing you to attend as your schedule permits. Instead of a presentation, various information stations will be set up with Duke Energy subject matter experts there to address your questions and provide information. This will include visual displays of the project, an estimated timeline and other materials. If you are unable to attend or if you have additional questions about the project, please contact us at the toll-free number or email address provided below. Information made available at the open house will also be found at our website beginning Feb. 10.

Website: www.duke-energy.com/harlowe-newport

Email: CETransmissionEnhancements@duke-energy.com

Call: 866.297.5886 (toll free)

On behalf of Duke Energy, we look forward to seeing you at the open house. We are committed to communicating with you throughout this process.

Thank you in advance as we move forward with this important project to meet the growing demand for power and to help ensure safe, reliable and affordable electricity in the future for the community.

Sincerely,



Steve Wilson
Project Manager

News Release

Contact: Jennifer Jabon
24-Hour Media Line: 800.559.3853

Feb. 9, 2016

Customer reliability to improve with proposed Duke Energy Progress transmission project

- **Utility to construct new transmission line and substations to add capacity in Carteret and Craven counties**
- **Community open house on the project to be held Feb. 10 in Newport**

NEWPORT, N.C. – Duke Energy Progress is seeking public input for a \$32 million project to increase capacity and enhance electricity service to customers in the Carteret County and Craven County area.

The project, an approximately 10-mile, 230-kilovolt (kV) transmission line and two new substations, is part of the company's ongoing commitment to provide reliable service to the region. A community open house is scheduled for Tuesday, Feb. 2 from 4 p.m. to 7 p.m. at the J. Fort Benjamin Park Recreation Center in Newport.

"We must invest in the electric system to ensure it continues to meet the needs of this growing region," said Steve Wilson, project manager for the new transmission line. "This new transmission line will provide greater capacity and enhanced service reliability for the Newport and Harlow communities and across Eastern North Carolina."

The utility is planning for the construction of a new 230-kV transmission line to connect the existing Havelock-Morehead City Wildwood 230-kV line to the existing Havelock-Morehead City Wildwood 115-kV north line. The project also includes the construction of a substation near Newport to connect the existing 230-kV transmission line to the new 230-kV line. Another new substation will be constructed off Highway 101 near Harlowe to connect the new 230-kV transmission line to the existing 115-kV line.

Construction is expected to begin in early 2019 and is targeted for completion in mid-2020.

Duke Energy Progress is currently evaluating a number of potential routes for construction of the transmission line, and is seeking input from the public. Property owners along the various alternate routes and near the proposed substations have been notified by letter and provided opportunities for input in this process.

The public is also invited to attend a community open house to learn more about the project and provide input on the route selection.

Harlowe-Newport Transmission Line Project Community Open House

Wednesday, Feb. 10, 2016 | 4 - 7 p.m.

J. Fort Benjamin Park Recreation Center
100 McQueen Avenue, Newport, N.C.

During the open house, Duke Energy representatives will be available at stations with information on the project, aerial maps of the proposed route options, and an estimated timeline for the project. Once the public input and review process is complete, a final route will be announced this spring.

“Our goal is to minimize impacts to homes and businesses, the environment and cultural resources as we work to determine the final route,” said Wilson. “We also want to address the questions and concerns of potentially affected property owners and are committed to communicating with the public throughout the process.”

Information on the project is available beginning Feb. 10 at www.duke-energy.com/harlowe-newport. All information made available at the public meeting may be viewed on the website. In addition, an interactive map where the public’s comments may be left can be accessed from the website. Members of the public may also email questions and comments to CETransmissionEnhancements@duke-energy.com or call 833.297.5886.

About Duke Energy Progress

Duke Energy Progress owns nuclear, coal-fired, natural gas and hydroelectric generation. That diverse fuel mix provides about 12,000 megawatts of owned electric capacity to approximately 1.5 million customers in a 32,000-square-mile service area of North Carolina and South Carolina.

Headquartered in Charlotte, N.C., Duke Energy is a Fortune 250 company traded on the New York Stock Exchange under the symbol DUK. More information about the company is available at duke-energy.com.

Follow Duke Energy on [Twitter](#), [LinkedIn](#) and [Facebook](#).

###

PLANS TO IMPROVE YOUR ENERGY

Join us to learn more.

More than 7.3 million people in the Southeast and Midwest count on Duke Energy for electricity, and we're committed to delivering it in a safe, reliable and affordable way. We're continually upgrading our generation and transmission system to meet growing power demand, ensure reliability and reduce our environmental footprint.

We're investing \$32 million in a new transmission line and two substations that will connect the new line to our existing Havelock-Morehead City Wildwood line in the Newport area and to our existing Havelock-Morehead City line located near the Harlowe community.

The new line will provide greater capacity and enhanced reliability for your community, including customers of local cooperatives. Property owners along the proposed route have been sent letters directly. If you'd like to learn more about the proposed transmission line and our plans for meeting the area's future energy needs, please join us at the following open house meeting:

DUKE ENERGY OPEN HOUSE MEETING

**Wednesday, Feb. 10, 2016
4:00 – 7:00 p.m.**

**J. Fort Benjamin Park Recreation Center
100 McQueen Ave.
Newport, NC 28570**

If you have additional questions about the project, please contact us by

Email: CETransmissionEnhancements@duke-energy.com

Phone: **866.297.5886**

Information for the meeting will also be available online starting Feb. 10 at duke-energy.com/harlowe-newport.

We look forward to working with you to meet this area's growing need for power, and to help ensure safe, reliable, affordable and increasingly clean energy now and for future generations.

QUESTIONNAIRE

Harlowe to Newport 230-kV North Transmission Line and Substation Project

Please complete this questionnaire after you have reviewed the information provided at the open house meeting or on our website.

This questionnaire is designed to help identify issues related to a new, approximately 10-mile, 230-kilovolt transmission line, which is to be constructed between our existing Newport, N.C. substation, and the existing 115-kilovolt (kV) line near the Harlowe community. In addition to the transmission line, a new substation will be constructed near Newport to connect the existing 230-kV transmission line to the new 230-kV line.

In addition, another new substation will be constructed off Highway 101 near the Harlowe community to connect the new 230-kV transmission line to the existing 115-kV line.

Your answers will help Duke Energy understand public interests and concerns and will allow the team to incorporate this information into our comprehensive route selection and planning process. Thank you for your input.

1. Which of the following describes your situation (mark all that apply)?

- Homeowner or property owner
- Business owner
- Governmental agency
- Potential line route is near my home/farm/business
- Not affected by any routes
- Other, please specify _____

2. Who is your electrical service provider? _____

PROJECT NEED

3. Do you believe the need for this transmission line has been explained adequately?

- yes no uncertain

LINE ROUTING CONSIDERATIONS

4. The routing of a transmission line involves many considerations. Please circle the number corresponding to the level of importance of that factor to you.

	<u>Rating</u>				
	Not Important	Somewhat Important	3	Very Important	5
a) Proximity to residential homes	1	2	3	4	5
b) Proximity to public amenities (schools, parks, churches)	1	2	3	4	5
c) Minimize new corridor impact by placing new facilities alongside existing linear infrastructure (e.g., utility lines, roads, railways)	1	2	3	4	5
d) View from roadways	1	2	3	4	5
e) View from residences	1	2	3	4	5
f) Impact to federal and state lands and other environmentally sensitive areas	1	2	3	4	5
g) Impact to streams and wetlands	1	2	3	4	5
h) Impact to historic and archaeological resources	1	2	3	4	5
i) Impact to forested area (non-state/federal lands)	1	2	3	4	5
j) Impact to cropland or specialty crops (including blueberry farms, vineyards, organic farms, etc.)	1	2	3	4	5
k) Impact to commercial/industrial properties	1	2	3	4	5
l) Maintain reliable electric service	1	2	3	4	5
m) Minimize total length of line (reducing the total cost)	1	2	3	4	5

5. Do you know of any building, family cemetery, landmark or other concern in the siting study area that could be considered historically important or should be considered in the routing analysis? If so, please describe the area below and any applicable information, such as property address or owner's name. Also, please visit our computer workstations to locate the areas with one of our representatives.

6. If you have a concern with a particular transmission line segment(s) shown on the display of potential routes, please indicate the segment designation (i.e., A-B, I-K, etc.) and describe your concern.

Segment Designation

Concern

<hr/>	<hr/>
<hr/>	<hr/>
<hr/>	<hr/>

CONTACT INFORMATION (optional)

Personal information will be kept confidential.

Name _____ Phone _____

Email _____ Date _____

Address _____

ADDITIONAL COMMENTS (Comments may also be left by voice mail by calling 866.297.5886 (toll-free))

In an effort to inform the public about our project, it is important that we effectively communicate. Do you have any unanswered questions? If so, what suggestions do you have on how to improve our public notification and information process?

If taking the questionnaire with you, please mail completed questionnaire by **March 10, 2016** to:

Duke Energy
EC09Q | 526 South Church Street
Charlotte, NC 28202

DAVID S. HENDERSON

ATTORNEY AT LAW

211 Broad Street

PO Box 4

New Bern, NC 28563

Phone (252) 637-2139

Fax (252) 633-0844

davidshenderson@embarqmail.com

September 12, 2016

Duke Energy
Mr. Phil Williams: Project Manager
NC3: 401 South Wilmington Street
Raleigh, NC 27601

Re: Harlowe – Newport 230 KV Transmission Line

Dear Mr. Williams:

In a meeting on February 5, 2016 with Mr. Steve Wilson and Mr. Steve Banks (Duke Energy), Mr. Joel Henry Davis asked if this transmission line project is the first phase with additional future project(s) to be attached to it. Mr. Wilson's reply was, "not to his knowledge."

After the meeting and after further review of the transmission line location and consequent damage to his forest land, Mr. Davis is now asking why the proposed 230 KV substation is to be located on the East side of the Harlowe Canal, approximately 1.25 miles East of NC Highway 101 and Duke's existing 115 KV Line. (This is assumed to be the connecting line.)

With this in mind, Mr. Davis would instead propose an alternative option for the Harlowe Substation site: to make available 25+ acres on the West side of NC Highway 101, property part of the 1,200 acre tract that lies in the Northwest quadrant of the intersection of NC Highway 101 and Old Winberry Road (NC 1155). At this location the existing Duke 115 KV line makes an approximate 90 degree turn towards Beaufort. Further, the location is off the highway and is shaded or secluded by forest trees.

It is the opinion of Mr. Davis that this alternative proposed site for the Harlowe Substation would result in significant cost savings to Duke Energy as follows:

1. Eliminate construction cost of 1.25 miles of 230 KV transmission line; additional cost of structures for the 230 KV line to cross NC Highway 101 and Duke's 115 KV line and the Harlowe Canal; and additional costs of easement and easement clearing.

2. Dependent upon the location, eliminate the cost to construct the 115 KV line from the Harlowe substation back to the existing 115 KV Line, estimated to be one half mile or more.
3. Eliminate cost to construct access road on the Duke site to the proposed Harlowe substation.

Other advantages of the Davis proposal include:

1. The 230 KV Line would not cross NC Highway 101 and would be shaded by a buffer of forestry trees.
2. The Davis Family Limited Partnership property on the East side of NC Highway 101 and the East side of Harlowe Canal would not be encumbered.
3. The real property owned by Joel Henry Davis and Thelma B. Davis on the East side of NC Highway 101 also would not be involved in the transmission line project.

The site proposed by Mr. Davis is part of a 1,200 acre tract that he has judiciously guarded from intrusion since it has been in his control, it being the home plantation of his great-grandfather, Rufus Bell. The alternative substation proposed site would be in the Southeast corner of the tract, bounded on the East by NC Highway 101, on the South by Old Winberry Road (NC 1155), on the West by a swale, and on the North by a forest road that could jointly serve both the proposed substation site and Davis Family Limited Partnership forestry interests. The proposed site is traversed by the Duke 115 KV Line making a turn to follow NC Highway 101 to Beaufort. There is an easement of 20 feet by 20 feet to the Telephone Company adjacent to Old Winberry Road. The Davis Family Limited Partnership has a "pay as cut" timber contract on that site; however, it is the opinion of Mr. Davis that can be modified to any Duke requirements. There are no other known encumbrances.

It is not the desire of Mr. Davis to have intrusion of the subject Transmission Line or his proposed substation location on his property. However, if his proposal for relocation of the substation site is feasible, there would be considerable savings for Duke Energy and less intrusive loss for Davis property interests.

Sincerely,



David S. Henderson

DSH/c

cc: Mr. Joel Henry Davis



Duke Proposed 230 KV

Paris Proposed 230 KV

Existing 115 KV Line

County Fire District Line

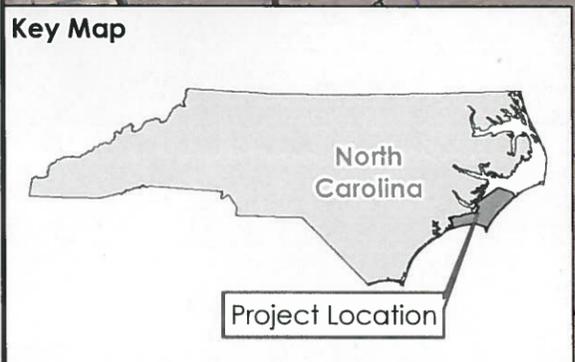
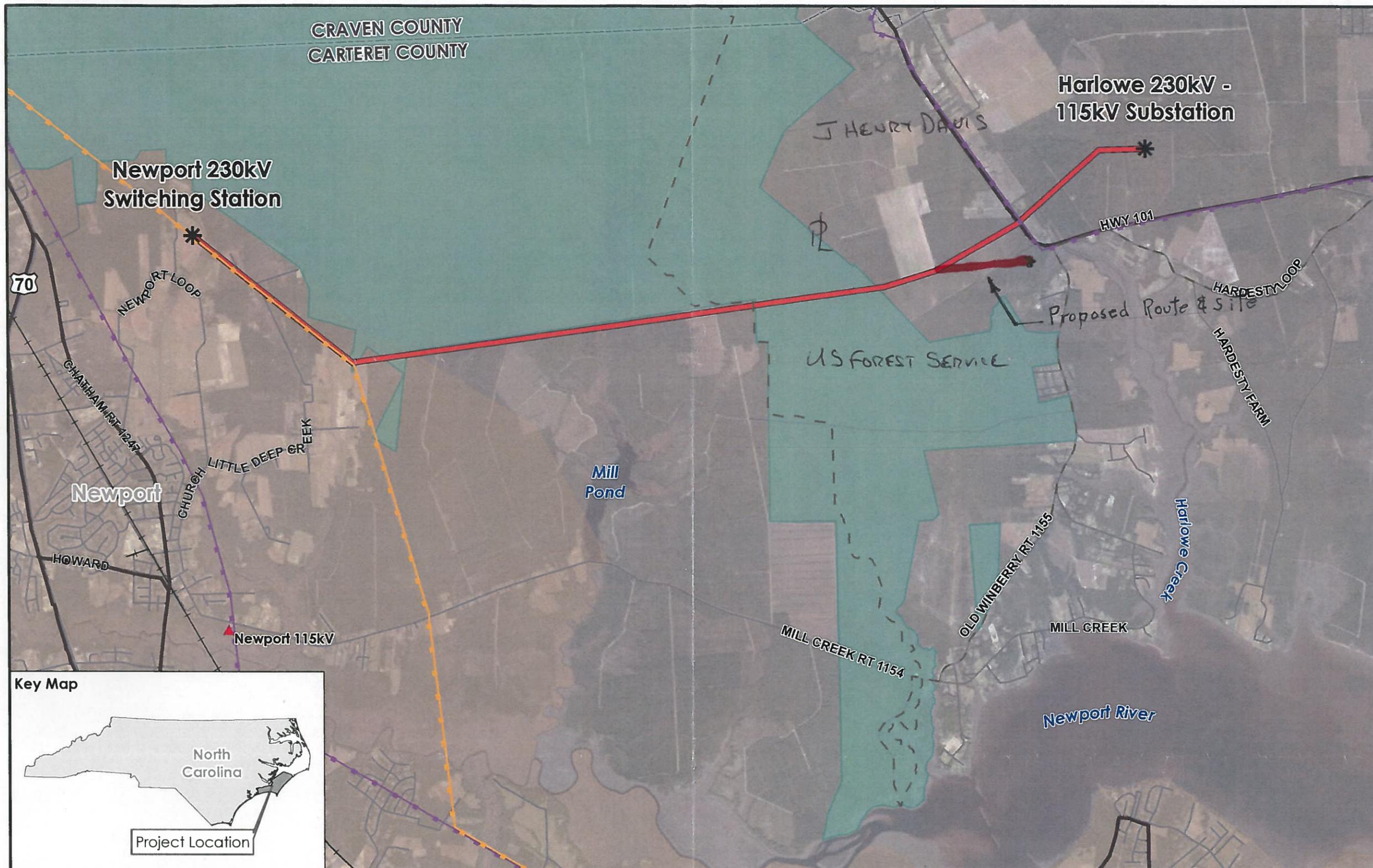
Proposed Substation Site

W. Berry Rd

Aug 03 2017

OFFICIAL COPY

1" = 660'



<ul style="list-style-type: none"> Proposed Substation Proposed New Transmission Line (Route B) Highway Road Railroad 	<p>Existing Transmission Lines</p> <ul style="list-style-type: none"> 115kV 230kV Existing Substation 	<ul style="list-style-type: none"> Mountain to Sea Trail Municipality Croatan National Forest County Boundary
---	--	---

0 0.5 1 Miles



Duke Energy
Reliability Enhancement Project
Harlowe - Newport
230kV Transmission Line
Preferred Route

Source: USGS National Hydrography Dataset (NHD), Carteret County, City of Newport, Bing Maps, ESRI, Duke Energy Progress, Stantec Consulting Services Inc. Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation

Exhibit B

BEFORE THE NORTH CAROLINA UTILITIES COMMISSION

DOCKET NO. E-2, Sub 1113

In the Matter of)
)
 Application of Duke Energy Progress, LLC)
 for a Certificate of Environmental)
 Compatibility and Public Convenience and) **PUBLIC NOTICE**
 Necessity Pursuant to N.C. Gen. Stat. §§ 62-)
 100 et seq. to Construct Approximately 8.01)
 Miles of New 230kV Transmission Line in)
 Carteret County, North Carolina)

NOTICE IS HEREBY GIVEN that on August 3, 2017, Duke Energy Progress, LLC (“DEP” or “Applicant”) filed with the North Carolina Utilities Commission (“Commission”) an application to obtain a certificate of environmental compatibility and public convenience and necessity to construct approximately 6.91 miles of new 230kV transmission line in Carteret County, North Carolina.

The preferred route begins at the proposed Harlowe 230kV – 115kV Substation near the Town of Harlowe and southwest of the State Road 101. The alignment exits the Substation heading west for approximately 1.29 miles across private pine plantations before it arrives at the eastern boundary of Croatan National Forest (“CNF”). The route then crosses through the CNF for approximately 0.95 miles. Upon exiting the CNF, the route continues west and parallels the CNF boundary for approximately 3.12 miles across active forest plantations, Significant Natural Heritage Areas, and private conservation easements until it meets the Havelock-Morehead Wildwood 115kV South Transmission Line north of the Town of Newport. In the vicinity of this location, the route crosses an additional 1,310 feet of CNF lands. From here, the alignment turns north and parallels the existing overhead transmission line for approximately 1.55 miles before arriving at the proposed Newport 230kV Switching Station.

Anyone wishing to view Duke Energy Progress’ certificate application report and/or the detailed maps concerning this project may do so at either the Office of the Chief Clerk of the Commission, Dobbs Building, 430 North Salisbury Street, Raleigh, North Carolina, or at the following Duke Energy Progress location: 270 Arthur Farm Road, NC 28570. Please contact Lori Daniels at (252) 240-8303 prior to the visit. The filing is also available on the Commission’s web site, www.ncuc.net. (Search for Docket No. E-2, Sub 1113).

The Commission has scheduled the application for public hearing at ____ p.m., on _____, _____, in _____,

_____, North Carolina. This hearing may be canceled if no significant protests are received subsequent to public notice.

Persons desiring to intervene as formal parties of record should file a verified petition under Commission Rules R1-5 and R1-64 no later than _____, 2017. Such a petition should be filed with the Chief Clerk, North Carolina Utilities Commission, 4325 Mail Service Center, Raleigh, North Carolina 27699-4300. Intervenors shall also file the direct testimony and exhibits of expert witnesses with the Commission on or before _____, 2017.

Persons desiring to send written statements to inform the Commission of their position in the matter should address their statements to the North Carolina Utilities Commission, 4325 Mail Service Center, Raleigh, North Carolina 27699-4300 and reference Docket no. E-2, Sub 1113. Such written statements will be included in the Commission's official files. If the public hearing is not canceled, however, such written statements cannot be considered competent evidence unless those persons appear at the hearing and testify concerning the information contained in their written statements.

The Public Staff of the Utilities Commission, through its Executive Director, is required by statute to represent the using and consuming public in proceedings before the Commission. Statements to the Executive Director should be addressed to: Mr. Chris Ayers, Executive Director, Public Staff-North Carolina Utilities Commission, 4326 Mail Service Center, Raleigh, North Carolina 27699-4300.

The Attorney General is also authorized to represent the using and consuming public in proceedings before the Commission. Statements to the Attorney General should be addressed to: The Honorable Josh Stein, Attorney General of North Carolina, 9001 Mail Service Center, Raleigh, North Carolina 27699-9001.

ISSUED BY ORDER OF THE COMMISSION.

This the ____ day of _____, 2017.

NORTH CAROLINA UTILITIES COMMISSION
Chief Clerk

(In accordance with N.C. Gen. Stat. § 62-102(c), Duke Energy Progress, LLC will publish this Public Notice, upon approval and instruction from the North Carolina Utilities Commission, in the newspapers of general circulation in the area of the proposed project.)

BEFORE THE NORTH CAROLINA UTILITIES COMMISSION

DOCKET NO. E-2, SUB 1113

In the Matter of)
)
Application of Duke Energy Progress, LLC)
For A Certificate of Environmental)
Compatibility and Public Convenience and)
Necessity Pursuant to N.C. Gen. Stat. § 62-)
100 et seq. to Construct Approximately 6.91)
Miles of New 230kV Transmission Line in)
Carteret County, North Carolina)

**DIRECT TESTIMONY OF
TIMOTHY J. SAME FOR
DUKE ENERGY PROGRESS, LLC**

1 **Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.**

2 A. My name is Timothy J. Same, and my business address is 410 S. Wilmington
3 Street, Raleigh, North Carolina 27601.

4 **Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?**

5 A. I am employed as Lead Transmission Siting Specialist, Transmission Siting,
6 Permitting and Engagement, by Duke Energy Progress, LLC (“DEP”). DEP
7 is a wholly owned, indirect subsidiary of Duke Energy Corporation (“Duke
8 Energy”).

9 **Q. WHAT ARE YOUR RESPONSIBILITIES AS LEAD TRANSMISSION**
10 **SITING SPECIALIST?**

11 A. As Lead Transmission Siting Specialist, I am responsible for both the
12 siting/due diligence of substation sites to be purchased in fee as well as the
13 selection of preferred/least impactful routes for transmission lines which
14 require easement and/or Right-of-Way acquisition for DEP territories.

15 **Q. PLEASE DESCRIBE YOUR EDUCATIONAL AND PROFESSIONAL**
16 **BACKGROUND.**

17 A. I am a registered professional engineer in the state of North Carolina, having
18 received a Bachelor of Science in Civil Engineering from Clarkson
19 University. I began my career in Pennsylvania working as a job engineer in
20 the field for Lane Construction, rebuilding Route 22 through Bethlehem,
21 Pennsylvania. I then began employment with Dunn & Sgromo Engineers in
22 Syracuse, New York, where I worked as an assistant engineer and began
23 designing site work and utilities. In 1999, I began working for Costich

1 Engineering, P.C. where I continued designing site work and utilities for land
2 development projects, and eventually became a Senior Project Manager before
3 leaving in 2006 to begin working for the John R. McAdams Company, Inc. as
4 a Project Manager. While with the John R. McAdams Company, Inc., I
5 handled increasingly more complex land development projects including
6 multi-phase, private sector, and mixed-use development/construction projects.
7 In 2009, I continued my career in Project Management with Greenhorne &
8 O'Mara, where I transitioned into overseeing architects and engineers working
9 on federal projects on military installations in the mid-Atlantic region. In
10 addition, while at Greenhorne & O'Mara, I began designing projects for
11 Progress Energy Carolinas, Inc. (now DEP). In 2013, I began my
12 employment with DEP in the substation engineering unit. In September 2014,
13 I transitioned into my current role as the Lead Siting Specialist for DEP.

14 **Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THE NORTH**
15 **CAROLINA UTILITIES COMMISSION?**

16 A. No, but I have previously submitted pre-filed direct testimony before this
17 Commission in Docket No. E-2, Subs 1102, 1111 and 1150.

18 **Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?**

19 A. The purpose of my testimony in this proceeding is to support DEP's
20 Application for a Certificate of Public Convenience and Necessity to construct
21 6.91 miles of new 230kV transmission line in Carteret County, North Carolina.

22 **Q. WERE YOU INVOLVED IN PREPARING DEP'S APPLICATION IN**
23 **THIS DOCKET?**

1 A. Yes.

2 **Q. TO YOUR KNOWLEDGE, WILL DEP FILE AND PROVIDE ALL**
3 **INFORMATION, BEGIN PUBLIC NOTICE REQUIRED BY THIS**
4 **COMMISSION, AND OBTAIN ALL FEDERAL AND STATE**
5 **LICENSES, PERMITS, AND EXEMPTIONS REQUIRED FOR**
6 **CONSTRUCTION AND OPERATION OF THIS TRANSMISSION**
7 **LINE?**

8 A. Yes.

9 **Q. PLEASE DESCRIBE THE PREFERRED ROUTE OF THE PROPOSED**
10 **TRANSMISSION LINE.**

11 A. The preferred route begins at the proposed Harlowe 230kV – 115kV
12 Substation near the Town of Harlowe and southwest of State Route (“SR”)
13 101 as shown in Figure 5-1 of the Routing Study and Environmental Report
14 attached as Exhibit A to the Application (“Report”). The alignment exits the
15 substation heading west for approximately 1.29 miles across private pine
16 plantations before it arrives at the eastern boundary of the Croatan National
17 Forest (“CNF”). The route then crosses through the CNF for approximately
18 0.95 miles. Upon exiting the CNF, the route continues west and parallels the
19 CNF boundary for approximately 3.12 miles across active forest plantations,
20 Significant Natural Heritage Areas, and private conservation easements until it
21 meets the Havelock – Morehead Wildwood 115kV South Transmission Line
22 north of the Town of Newport. In the vicinity of this location, the route
23 crosses an additional 1,310 feet of CNF lands. From here, the alignment turns

1 north and parallels the existing overhead transmission line for approximately
2 1.55 miles before arriving at the proposed Newport 230kV Switching Station.

3 **Q. HOW MANY LANDOWNERS WILL BE DIRECTLY AFFECTED BY**
4 **THE PROPOSED TRANSMISSION LINE, AND HAS DUKE ENERGY**
5 **CONTACTED THOSE LANDOWNERS?**

6 A. There are 16 landowners that will be directly affected by having at least some
7 portion of the proposed 125' right-of-way on their property. On July 29,
8 2016, Duke Energy sent letters to property owners (18 total landowners) that
9 are within 125 feet of the proposed centerline of the preferred route (250 feet
10 total). These letters included the appropriate reference to NC Gen. Stat. §
11 40A-11 providing the necessary 30-day notice to enter the properties for the
12 purpose of surveying, soil borings, appraisals, and assessments.

13 **Q. DOES THIS CONCLUDE YOUR PRE-FILED DIRECT TESTIMONY?**

14 A. Yes.

BEFORE THE NORTH CAROLINA UTILITIES COMMISSION

DOCKET NO. E-2, SUB 1113

In the Matter of)
)
Application of Duke Energy Progress, LLC)
For A Certificate of Environmental)
Compatibility and Public Convenience and)
Necessity Pursuant to N.C. Gen. Stat. § 62-)
100 et seq. to Construct Approximately 6.91)
Miles of New 230kV Transmission Line in)
Carteret County, North Carolina)

**DIRECT TESTIMONY OF
MARK BYRD FOR
DUKE ENERGY PROGRESS, LLC**



1 **Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.**

2 A. My name is Mark Byrd, and my business address is 410 S. Wilmington Street,
3 Raleigh, North Carolina 27601.

4 **Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?**

5 A. I am employed as Manager of Transmission Planning, Carolinas East, by
6 Duke Energy Progress, LLC (“DEP”). DEP is a wholly owned, indirect
7 subsidiary of Duke Energy Corporation (“Duke Energy”).

8 **Q. WHAT ARE YOUR RESPONSIBILITIES AS MANAGER OF**
9 **TRANSMISSION PLANNING?**

10 A. I am responsible for helping maintain the overall grid reliability of DEP’s
11 transmission system. This includes planning for the expansion of DEP’s
12 transmission grid to assure adequate reliability, reviewing generation
13 interconnection requests, conducting system impact and other studies under
14 DEP’s open access transmission tariff, and conducting joint planning studies
15 with other load-serving entities in North Carolina through the North Carolina
16 Transmission Planning Collaborative, as well as with other southeast utilities
17 in the SERC Reliability Corporation (“SERC”).

18 **Q. PLEASE DESCRIBE YOUR EDUCATIONAL AND PROFESSIONAL**
19 **BACKGROUND.**

20 A. I graduated from North Carolina State University with a Bachelor of Science
21 degree in Electrical Engineering in 1979 and a Master of Science degree in
22 Electrical Engineering in 1981. I have worked for DEP for 37 years, initially
23 in the area of transmission maintenance and operations and then followed by

1 transmission planning. I also have held various management roles at DEP. I
2 am a licensed Professional Engineer in the State of North Carolina. I also have
3 represented DEP as a past member of the SERC Engineering Committee and
4 as the former chairman of the Planning Task Force for the Virginia-Carolinas
5 Sub-region of SERC. I also have represented the SERC region as a member
6 and chairman of the North American Electric Reliability Corporation's
7 ("NERC") System Analysis & Modeling Subcommittee ("SAMS").

8 **Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THE NORTH**
9 **CAROLINA UTILITIES COMMISSION?**

10 A. Yes, I have previously supplied testimony in various proceedings before the
11 North Carolina Utilities Commission, as well as the Public Service
12 Commission of South Carolina.

13 **Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?**

14 A. The purpose of my testimony in this proceeding is to describe the need and
15 necessity for the construction of the proposed 6.91 miles of new 230kV
16 transmission line in Carteret County, North Carolina.

17 **Q. WERE YOU INVOLVED IN PREPARING DEP'S APPLICATION IN**
18 **THIS DOCKET?**

19 A. Yes.

20 **Q. WHY IS DEP REQUESTING THIS COMMISSION TO GRANT THE**
21 **CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY?**

1 A. As detailed in the Certificate application, DEP's assessment of electric energy
2 requirements has identified the need to upgrade the transmission system in the
3 Carteret County, North Carolina area.

4 DEP is required by the Federal Energy Regulatory Commission ("the
5 FERC") to comply with the Reliability Standards of the North American
6 Electric Reliability Corporate ("NERC"). NERC may impose stringent
7 penalties for violations of NERC Reliability Standards. In accordance with
8 these standards, DEP plans its transmission system to supply projected
9 demands in a reliable manner at all demand levels over the range of forecast
10 system demand, under contingency conditions. In compliance with these
11 Reliability Standards, DEP routinely conducts studies of its transmission
12 system to identify required improvements.

13 By summer 2020, an outage of the Havelock terminal of the Havelock
14 – Morehead Wildwood 115 kV North line will cause voltages in the Havelock
15 area to fall below planning criteria. The construction of this new transmission
16 line will mitigate the voltage problem, increase electric capacity and service
17 reliability across the Eastern North Carolina region, and ensure that the NERC
18 Reliability Standards are met.

19 The new line from the proposed Harlowe 115kV – 230kV Substation
20 located north of State Route ("SR") 101 in the Town of Harlowe to the
21 proposed Newport 230kV Switching Station along the Havelock – Morehead
22 Wildwood 230kV line near the Town of Newport will increase electric
23 capacity for the immediate area and ensure reliable service in the DEP service

1 area in this region. Maintaining the transmission backbone is critical to
2 ensuring that electricity remains reliable in the future. The new line will
3 provide benefits to the entire region, including Carteret and Craven County
4 residents and businesses, through enhanced reliability. The transmission
5 system serves DEP customers as well as customers of rural electric
6 cooperatives and municipally owned electric utilities.

7 Accordingly, the new transmission line is needed to ensure that
8 electricity remains reliable and that the region does not suffer blackouts or
9 other reliability issues that have plagued other parts of the country in recent
10 history. The new transmission line is needed to ensure that the NERC
11 Reliability Standards are met.

12 **Q. DOES THIS CONCLUDE YOUR PRE-FILED DIRECT TESTIMONY?**

13 **A. Yes.**

CERTIFICATE OF SERVICE

I certify that a copy of Duke Energy Progress, LLC's Application for a Certificate of Environmental Compatibility and Public Convenience and Necessity to Construct a Transmission Line in Carteret County, North Carolina in Docket No. E-2, Sub 1113, has been served by electronic mail, hand delivery, or by depositing a copy in the United States Mail, 1st Class Postage Prepaid, properly addressed to parties of record.

This the 3rd day of August, 2017.



Robert W. Kaylor
Law Office of Robert W. Kaylor, P.A.
353 E. Six Forks Road, Suite 260
Raleigh, NC 27609
Tel: 919.828.5250
bkaylor@rwkaylorlaw.com
North Carolina State Bar No. 6237